Motor Management System

TeSys T

Catalogue
October

06

a brand of Schneider Electric

Telemecanique

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Flexibility

- Interchangeable modular functions, to better meet the requirements for extensions
- Software and accessories common to multiple product families

Ingenuity

- Auto-adapts to its environment, "plug & play"
- Application functions, control, communication and diagnostics embedded in the products
- User-friendly operation either directly on the product or remotely

Simplicity

- Cost effective “optimum” offers that make selection easy for most typical applications
- Products that are easy to understand for users, electricians and automation specialists
- User-friendly intuitive programming

Compactness

- High functionality in a minimum of space
- Freedom in implementation

Openness

- Compliance with field bus, connection, and software standards
- Enabling decentralised or remote surveillance via the web with Transparent Ready products

Contents

Motor Management System
TeSys T

TeSys T controllers and extension modules

Protection components
Protection relays and controllers

Applications	**Motor protection**		
	Thermal motor protection		
			
Protection	- Motor overload - Stalling - Phase failure		
Communication	–		
Used with contactor type	LC1 K, LP1 K	LC1 D	LC1 F
Motor current (In)	0.11…16 A	0.1…150 A	30…630 A
Relay type	**LR2 K**	**LR● D**	**LR9 F**
Pages	Please consult our catalogue “Motor starter solutions. Control and protection components”.		

		Machine protection		Motor and machine protection	
Protection of slip ring motors and of circuits without current peaks	**Protection of resistors, bearings, capacitors**	**Specific motor protection**		**Protection and control**	
					
- Strong overcurrent - Stalling	- Frequent starting - Harsh environments	- Overtorque - Mechanical shocks - Locked rotor - Phase failure	- Overtorque - Mechanical shocks	- Thermal overload - Phase imbalance and phase failure - Motor stalling - Long starting times - Earth fault	- Thermal overload - Phase imbalance and phase failure - Locked rotor - Long starting times - Phase reversal - Earth fault
–				AS-Interface, Modbus, CANopen, Advantys STB	Modbus, CANopen, DeviceNet, Profibus DP
All contactors		All contactors		All contactors	All contactors
0.7…630 A	Unlimited	0.3…38 A	0.3…60 A	0.35…800 A	0.4…810 A
RM1 XA	**LT3 S**	**LR97D**	**LT47**	**LUTM ●0BL**	**LTM R**
Please consult our catalogue “Motor starter solutions. Control and protection components”.					24

Protection components
Motor and machine protection

Introduction

Exceeding the operating limits of an electric motor will lead, eventually, not only to destruction of the motor itself but also of the mechanisms it drives.

This type of load can be the cause of electrical or mechanical faults.

■ Electrical faults:
□ overvoltage, voltage drop, imbalance and phase failure which cause variations in the current drawn,
□ short-circuits which can cause the current to reach levels capable of destroying the load.

■ Mechanical faults:
□ locked rotor,
□ brief or prolonged overload which leads to an increase in the current drawn by the motor, and therefore overheating.

The cost of these faults must take into account loss of production, loss of raw materials, repair of the production tool, poor quality of production and delays in delivery.

These faults can also have dramatic consequences on the safety of persons in direct or indirect contact with the motor.

To prevent these faults, protection measures are necessary.
They make it possible to isolate the equipment to be protected from the mains supply, by measuring electrical values (voltage, current, etc…).

Each motor starter must therefore have:

■ **short-circuit protection**, to detect and break, as quickly as possible, abnormal currents generally greater than 10 times the rated current (In).

■ **overload protection**, to detect increases in current up to about 10 In and switch off the starter before overheating of the motor and conductors damages the insulation.

This protection is provided by specific devices such as fuses, circuit-breakers and thermal overload relays, or by more integrated devices offering several types of protection.

Causes, effects and consequences of various faults

There are two types of fault:
- Internal faults within the motor.
- External faults: these are located outside the electric motor but their consequences can lead to damage inside the motor.

Faults	Cause	Effects	Consequences on the motor and on the machine
Short-circuit	Contact between several phases, or between one phase and neutral or between several turns of the same phase.	■ Current peak ■ Electrodynamic forces on the conductors	Destruction of windings
Overvoltage	■ Lightning ■ Electrostatic discharge ■ Operation	Dielectric breakdown in the windings	Destruction of the windings due to loss of insulation
Phase imbalance and phase failure	■ Opening of a phase ■ Single-phase load upstream of the motor ■ Short-circuit between the turns of the same winding	■ Reduction of usable torque, efficiency and speed ■ Increase in losses ■ Starting impossible if phase failure	Overheating *(1)*
High starting frequency	■ Failure of the automation system ■ Too many manual control operations ■ Numerous fault trips	High stator and rotor temperature rise due to the frequent start current	Overheating *(1)* Consequences on the process
Voltage variations	■ Instability of the mains voltage ■ Connection of heavy loads	■ Reduction of usable torque ■ Increase in losses	Overheating *(1)*
Harmonics	Pollution of the mains supply by variable speed drives, inverters, etc...	■ Reduction of usable torque ■ Increase in losses	Overheating *(1)*
Long starting time	■ Resistive torque too high (load too heavy) ■ Voltage drop	Increase in starting time	Overheating *(1)*
Jamming	■ Mechanical problem (crusher) ■ Seizures	Overcurrent	Overheating *(1)* Consequences on the process
No-load running	■ Pump running empty ■ Mechanical break in drive to the load	Drop in current drawn	Consequences on the process
Frequency fluctuations	■ Overload of a supply powered by limited independent sources ■ Faulty alternator speed regulator	■ Increase in losses ■ Interferes with synchronous devices (clock, recorder, ...)	–
Overload	■ Increase in resistive torque ■ Voltage drop ■ Drop in power factor	Increase in current consumption	Overheating *(1)*
Loss of machine excitation	■ Significant drop in excitation current ■ Break in rotor winding	■ Increase in active power ■ Drop in power factor	Significant overheating of rotor and cage
Phase-Earth fault	■ Accidental Phase-Earth contacts ■ Accidental Phase-machine casing contacts (casing connected to earth)	■ Overvoltage developed in the mains supply ■ Rise in earth potential (safety of persons)	Consequences on safety of persons

(1) Then, in the longer term, depending on the seriousness of the fault and/or its frequency, short-circuit and destruction of the windings.

Protection functions

Short-circuit protection

General

A short-circuit results in a very rapid rise in current which can reach several hundred times the value of the operational current.
The consequences of a short-circuit are dangerous to both equipment and persons. It is therefore imperative to use protection devices to detect the fault and very quickly break the circuit.

Two types of protection are commonly used:
- fuses (cutout) which break the circuit by melting, which then requires their replacement,
- magnetic trip circuit-breakers, often more simply called "magnetic circuit-breakers", which only require re-setting to put them back into service.

Short-circuit protection can also be built-into multifunction devices such as motor circuit-breakers and contactor-breakers.

The main characteristics of short-circuit protection devices are:
- Their breaking capacity: this is the highest prospective short-circuit current value that a protection device can break at a given voltage.
- Their making capacity: this is the highest current value that the protection device can make at its rated voltage in specified conditions. The making capacity is equal to k times the breaking capacity.

566997

LS1 D32 fuse carrier

566998

GS1 K4
switch-disconnector-fuses

Fuses (cutouts)

Fuses provide individual phase protection (single-pole), with a high breaking capacity in a compact size:
- mounted either in fuse carriers,
- or in isolators, replacing the original links or shunt bars.

For motor protection, aM type fuses are used. Their design characteristics allow them to conduct the high magnetising currents that occur when motors are switched on. They are therefore unsuitable for overload protection (unlike gG type fuses). This is why an overload relay must be included in the motor power supply circuit.

566999

GV2 L
magnetic circuit-breaker

Magnetic circuit-breakers

These circuit-breakers protect installations against short-circuits, within the limit of their breaking capacity.
Magnetic circuit-breakers provide omnipole breaking as standard.
For relatively low short-circuit currents, the operation of a circuit-breaker is faster than that of fuses.
This protection conforms to standard IEC 60947-2.
The thermal and electrodynamic effects are also limited, therefore ensuring better protection of cables and equipment.

510586

TeSys U LUB 12 starter
with LUCA●● control unit

Protection functions *(continued)*

Overload protection

General

An overload condition is the most frequently encountered fault. The symptoms are a rise in the current drawn by the motor and thermal effects. A rapid return to normal operating conditions is important.
The actual operating conditions (ambient temperature, operating altitude and type of standard duty) are essential to determine the operating values of the motor (power, current) and to be able to select effective overload protection. These operational values are given by the motor manufacturer.

According to the level required, protection can be provided by:
- overload relays and thermal overload relays (bi-metallic or electronic type) which protect motors in the event of:
  - overload, by monitoring the current drawn by each phase,
  - phase imbalance or failure, by their differential mechanism.
- relays with PTC thermistor probes (Positive Temperature Coefficient),
- overtorque relays,
- multifunction relays.

LRD 02
thermal overload relay

RM4 JA current measurement relay

TeSys U starter with "thermal overload alarm" function module

Overload relays

These relays protect motors against overload. They must allow the temporary overload that occurs on starting and must only trip if the starting time is abnormally long.
The overload relay will be selected according to the length of the starting time (tripping class) and the motor rating.
These relays have a thermal memory (except for certain electronic overload relays, indicated by their manufacturers) and can be connected:
- either in series with the load,
- or to current transformers placed in series with the load.

Bi-metallic thermal overload relays
Combined with a contactor, these relays protect the line and the equipment against small and prolonged overloads. They must be protected against strong overcurrent by a circuit-breaker or fuses.
These relays may be used on an a.c. or d.c. system and are generally:
- 3-pole,
- compensated, i.e. insensitive to ambient temperature variations,
- with manual or automatic reset,
- graduated with a "motor FLC" scale: allowing direct setting to the full load current as shown on the motor rating plate.

They can also be sensitive to phase failure: this is known as 'differential'. This function conforms to standards IEC 60947-4-1 and 60947-6-2
This type of relay is extremely reliable and is a relatively low cost device.

Electronic thermal overload relays
Electronic thermal overload relays have the advantage of electronics which allow a more complex thermal image of the motor to be created.
They can be combined with products having complementary functions, such as:
- temperature sensing via PTC probes,
- protection against jamming and overtorque,
- protection against phase reversal,
- earth fault protection,
- protection against no-load running,
- alarm function.

Protection components
Motor and machine protection

567003

LT3 S relays for use with thermistor probes

567004

LR97 D07 instantaneous electronic overcurrent relays

510988

TeSys U LUB 32 starter with multifunction control unit LUC M

567006

TeSys U controller LUTM 20BL

567007

TeSys T controller LTM R08MBD

Protection functions *(continued)*

Overload protection *(continued)*

Relays for use with PTC thermistor probes

With direct sensing of the stator windings, these relays can be used to protect motors against:
- overload,
- a rise in ambient temperature,
- a ventilation circuit fault,
- a high starting frequency,
- mechanical shocks, etc...

Overload (or overtorque) relays

These relays protect the drive line in the event of a locked rotor, seizure or mechanical shocks. This is an additional protection.
Unlike thermal overload relays, these relays do not have a thermal memory. They have definite time characteristics (adjustable current threshold and time delay).
The overtorque relay can be used as overload protection for motors with long starting times or very frequent starting (for example, lifting hoists).

Multifunction relays

Overcurrent relays are limited when it is necessary to take into account problems associated with voltage, temperature or special applications.
New production or maintenance management needs have prompted manufacturers to offer products which provide not only adaptable protection, but also complete management of the motor and its load.
They incorporate:
- current and voltage sensors (TeSys T controllers),
- hybrid analog and digital electronic technology,
- the use of communication buses for data exchange and control,
- powerful motor modelling algorithms,
- integrated application programs whose parameters can be set.

These products make it possible to reduce installation and operating costs by reducing maintenance and downtime.

TeSys U starters:
The multifunction relay is incorporated in the motor starter.
This solution is very compact with reduced wiring. It is limited to 32 A.

TeSys U controllers:
The multifunction relay is separate from the power line and reuses the function blocks from the TeSys U solution. It can be used in conjunction with a contactor up to 810 A.

TeSys T controllers:
The multifunction relay is separate from the power line and incorporates inputs and outputs. It can be used in conjunction with a contactor up to 810 A.

Protection components
Motor and machine protection

Protection relay selection table

	Motor protection		Machine protection	Motor and machine protection	
Relay type	**Thermal overload relays LR2 K, LRD, LR9 F, LR9 D** *(1)*	**Relays for use with PTC probes LT3**	**Overtorque relays LR97 D, LT47**	**TeSys U controller LUT M**	**TeSys T controller LTM R**
Causes of overheating	*(2)*		*(2)*	*(2)*	*(3)*
Slight overload	■	■	□	■	■
Locked rotor	■	□	■	■	■
No-load running	▒	▒	▒	■	■
Supply phase failure	■	□	LR9 7D	■	■
Ventilation fault	▒	■	▒	▒	With probes
Abnormal temperature rise	□	■	▒	▒	With probes
Shaft bearing seizure	□	■	□	□	With probes
Insulation fault	□	▒	▒	■	■
Protracted starting time	■	□	■	■	■
Severe duty	□	■	■	□	With probes
Voltage variation	□	□	□	□	■
Frequency fluctuations	□	▒	▒	▒	■
Loss of machine excitation	▒	▒	▒	▒	■

■ Ideally suited

□ Possible solution

▒ Not suitable (no protection)

(1) Or motor circuit-breaker type GV2 ME.
(2) Protection based on current.
(3) Protection based on current and voltage.

Protection components
TeSys T Motor Management System

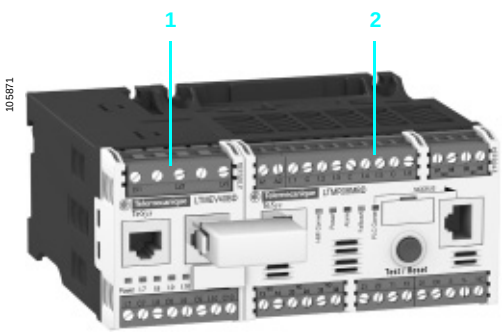
Application	**Multifunction motor and machine protection**	
		
Device type	**Controllers**	
For network/bus	Modbus	CANopen
Current range	0.4…100 A (with internal current transformer) 100…810 A (with external current transformer)	
Control voltage	⎓ 24 V ∿ 100…240 V	
Number of I/O	6 inputs 4 outputs	
Measurements	- Current between phases - Earth fault - Motor temperature	
Protection and monitoring functions	- Thermal overload - Motor temperature monitoring - Phase imbalance and phase failure - Locked rotor - Long starting times - Phase reversal - Earth fault	
Type reference	**LTM R●●M●●**	**LTM R●●C●●**
Pages	24	




Controllers		**Input extension modules,** for all LTM R controllers	
DeviceNet	Profibus DP	–	
0.4…100 A (with internal current transformer) 100…810 A (with external current transformer)		–	
⎓ 24 V ∿ 100…240 V		⎓ 24 V *(1)*	∿ 100…240 V *(1)*
6 inputs 4 outputs		2 independent inputs	
- Current between phases - Earth fault - Motor temperature		Voltage between phases	
- Thermal overload - Motor temperature monitoring - Phase imbalance and phase failure - Locked rotor - Long starting times - Phase reversal - Earth fault		Voltage monitoring Power monitoring Cos φ monitoring	
LTM R●●D●●	**LTM R●●P●●**	**LTM EV40BD**	**LTM EV40FM**
24		25	

(1) Input control voltage. The electronics are powered via the controller.

Protection components
TeSys T Motor Management System



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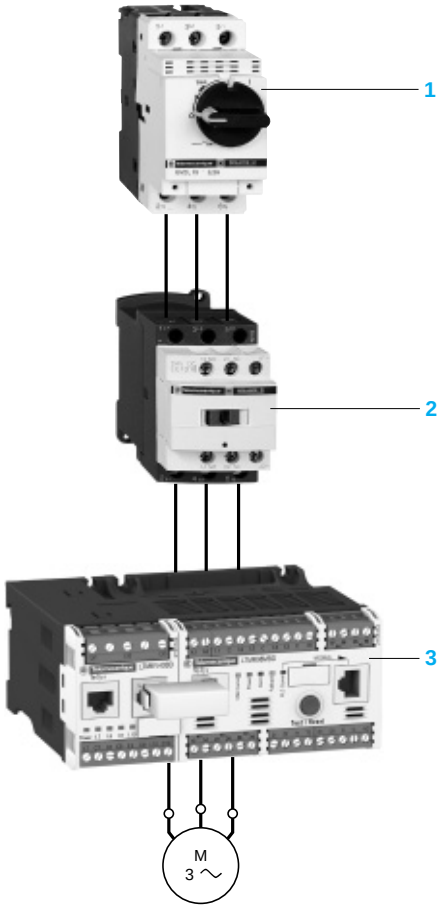
1 LTM EV40BD extension module
2 LTM R08MBD controller



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2 Circuit-breaker
3 Contactor
4 Controller with extension module

Presentation

TeSys T is a motor management system that provides protection, metering and monitoring functions for single-phase and 3-phase, constant speed, a.c. motors up to 810 A.

Suitable for the harshest applications, this product range offers:
- high-performance multifunction protection, independent of the automation system,
- a local HMI unit for reading, displaying and modifying the parameters monitored, diagnostics, etc.....
- configuration of the application using PowerSuite software,
- connection to the automation system via a communication network (selection according to various protocols).

Application

The TeSys T motor management system is used for motor control and protection in harsh industrial applications, in which downtime must be avoided because it is very costly: “Oil & Gas”, chemical industry, water treatment, metal, minerals and mining, pharmaceutical industry, microelectronics, tunnels, airports, etc.

With TeSys T, untimely stoppages of a process or manufacturing, associated with a motor, are anticipated via predictive analysis of fault situations.
Fault tripping is therefore reduced to a minimum.

Its use in motor control panels makes it possible to:
- increase the operational availability of installations,
- improve flexibility from project design through to implementation,
- increase productivity by making available all information needed to run the system.

The TeSys motor management system integrates perfectly with Schneider Electric low voltage equipment, such as Okken, Blokset and Prisma.

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LTM R08MBD

105846

LTM EV40BD

Presentation (continued)

Composition of the motor management system

The system comprises:
- an LTM R motor management controller
  - with integral current transformer up to 100 A,
  - above 100 A, by external current transformer up to 810 A,
- an LTM E extension module,
- an XBT N410 HMI terminal,
- configuration software incorporated in the PowerSuite software application,
- accessories for system set-up.

Communication

The LTM R controller is equipped with a communication interface to allow remote monitoring and control of the motor. All motor information is then available at automation system level.

The following networks are available:
- Modbus, CANopen, DeviceNet, ProfiBus DP,
- Ethernet TCP/IP ▲.

TeSys T system functions

Protection functions
- against thermal overload,
- against phase imbalance and phase failure,
- thermal motor protection via PTC probes,
- against phase reversal,
- against earth faults,
- against long starting times and motor stalling,
- against load fluctuations (I, U, P),
- against variations of Cos φ.

Metering functions
- Measurements (rms values):
  - current on the 3 phases,
  - voltage on the 3 phases (shedding),
  - motor temperature,
  - earth current,
- Values calculated:
  - average current,
  - frequency,
  - Cos φ, power, power consumption...

Motor control functions

A motor managed by TeSys T can be controlled:
- locally, using the logic inputs present on the product,
or via the HMI terminal,
- remotely, via the network (connection by terminal block or connector except for DeviceNet: terminal block only).

Motor control modes

5 predefined motor control modes are incorporated in the controller:
- overload mode: monitoring of motors whose control is not managed by the controller,
- independent mode: starting of non-reversing motors,
- reverser mode: starting of reversing motors,
- 2-step mode: 2-step starting of motors (star-delta, by autotransformer and by resistor),
- 2-speed mode: 2-speed starting of motors (Dahlander, pole changer).

A 6th "Custom" mode is available to allow the user to create a specific motor control mode that is not predefined in the controller.

Statistical and diagnostic functions
- fault statistics: counters and history per type of protection,
- motor statistics: saving of motor statistics values,
- diagnosis of faults affecting correct operation of the product.

▲ Availability of controllers for Ethernet TCP/IP: 1st quarter 2008.

Protection components
TeSys T Motor Management System

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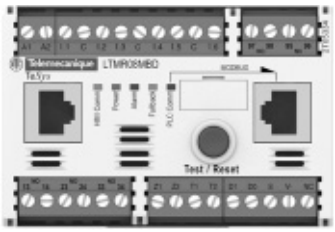

LTM R●●

Description

The LTM R controller

The controller is the central component in the motor management system.
It manages the basic functions such as:
- measurement of 3-phase current via integral current transformers from 0.4 to 100 A (up to 810 A by external current transformers),
- measurement of earth current by external earth fault toroid,
- measurement of motor temperature by PTC probe,
- Inputs and Outputs for the various motor control modes, fault management and associated functions.

Characteristics

As standard, the controller manages the following predefined control mode functions:
- overload mode,
- independent mode,
- reverser mode,
- 2-speed mode,
- 2-step mode,
- “Custom” mode.

Supply

2 types of controller power supply are available:
- ⎓ 24 V,
- ∿ 100…240 V.

Current ranges

3 current ranges allow measurement of motor current from 0.4 to 100 A:
- 0.4…8 A,
- 1.35…27 A,
- 5…100 A.

For use with external current transformers, choose the 0.4…8 A range (1 or 5 A current transformer secondary).

Inputs
- 6 discrete logic inputs.

Outputs
- 3 relay logic outputs (1N/O)
- 1 relay output for fault signalling (1N/O + 1N/C)

Measurements
- connections for a temperature probe,
- connections for an earth fault toroid.

LTM E extension module

The extension module adds the following functionalities to the TeSys T controller:
- voltage measurement on the 3 phases. This enables it to calculate numerous engine monitoring parameters (power, frequency, Cos φ …),
- 4 additional inputs.

Characteristics

Inputs
- 4 discrete logic inputs (independent).

Power supplies
- 2 types of power supply for the inputs: ⎓ 24 V and ∿ 100…240 V.

A ⎓ 24 V controller can be assembled with an ∿ 100…240 V extension module and vice versa.

Voltage measurement between phases up to 690 V nominal.

The Magelis XBT N410 HMI terminal

Two applications have been predefined for TeSys T. Depending on the application loaded, the HMI terminal makes it possible to:
- configure and monitor a motor starter (LTM_1T1_X_V1.dop) *(1)*
- monitor and modify certain parameters on up to 8 motor starters. (LTM_1T8_X_V1.dop) *(1)*.

XBT L1000 programming software is needed for loading applications into the HMI terminal.
These applications are available on the website “www.telemecanique.com”.

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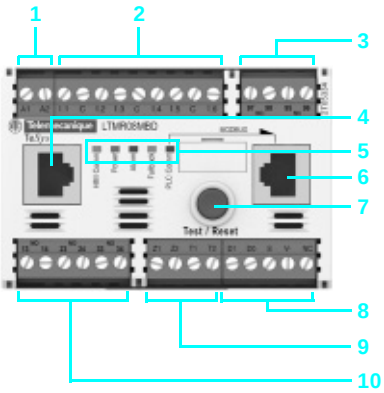
XBT N410

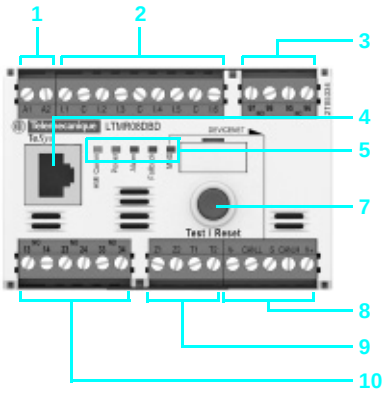
(1) Replace the X with an E for the English version, or an F for the French version.

LTM R controllers

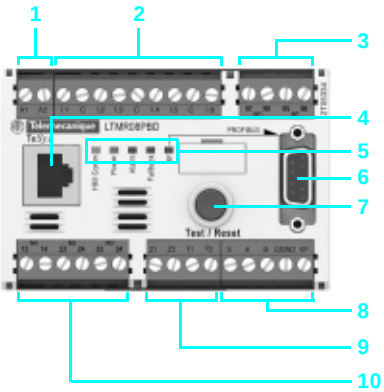
Modbus



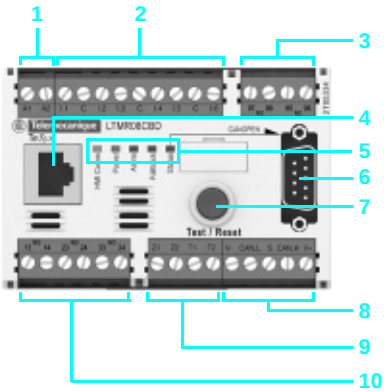
DeviceNet



Profibus DP



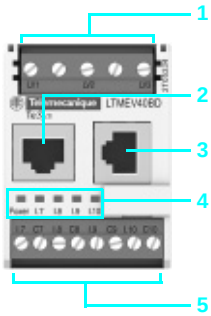
CANopen



Controllers feature the following on their front panel:

1 Controller power supply.
2 Input connections.
3 Fault outputs (N/O+N/C).
4 HMI port for connection to the HMI terminal, a PC or an extension module (RJ45).
5 Controller status LEDs
6 Network port for connection to the network by connector (except DeviceNet).
7 Test/Reset button.
8 Connection to network by terminal block.
9 Connection for an earth fault toroid and temperature probes.
10 Outputs for motor control mode function.

LTM EV40●● extension modules



Extension modules have the following on their front face:

1 Inputs for voltage measurement.
2 Port for connection to the HMI terminal or to the PC.
3 Port for connection to the controller.
4 Extension module status LEDs.
5 Connection of additional inputs.

Protection components
TeSys T Motor Management System

Thermal and current protection functions

Functions Description	Setting range	Controller LTM R	Controller and extension module (LTM R + LTM E)	Alarm threshold	Fault threshold
Thermal overload: thermal protection of motor by monitoring current consumption	Class: 5, 10, 15 20, 25, 30. Inverse ther/definite time				
Motor temperature: thermal monitoring of the motor using temperature probes (winding, paper...). Up to 3 sensors in series.	PTC binary PTC/NTC analogue: 20 ...6500 Ohm				
Phase imbalance: monitors the symmetry of currents. To be used for imbalance < 80% of the average current *(1)*.	10…70% I average 0.2…20 s				
Phase failure: monitors the symmetry of currents. To be used for imbalance < 80% of the average current *(1)*.	0.1…30 s				
Phase reversal: signals when the phase sequence is different from the defined sequence (motor running).	A-B-C A-C-B				
Long starting time: monitors the motor starting time	100…800 % of FLC *(2)* 1…200 s				
Locked rotor: locking detected by a sudden increase in current after the start phase	100…800 % of FLC *(2)* 1…30 s				
Min/.max. current load limit variations: monitors motor load through variations of current around preset thresholds.	**min.:** 30…100 % of FLC *(2)* 1…200 s **max:** 20…800 % of FLC *(2)* 1…250 s				
Earth fault: signals internal insulation faults, by vectorial summing of external currents, via earth fault toroid.	**internal:** 20…500 % min FLC *(2)* 0.05…25 s **external:** 0.02…10 A 0.05…25 s				
Frequent starting: Protects the motor against overheating due to frequent starting.	0…999.9 s				

Voltage and power protection functions

Phase imbalance: monitors the symmetry of voltage between phases. To be used for imbalance < 40 % of the average voltage *(3)*.	3…15 % 0.2…20 s				
Phase failure: monitors the symmetry of voltage between phases. To be used for imbalance > 40 % of the average voltage *(3)*.	0.1…30 s				
Phase reversal: signals when the phase sequence is different from the defined sequence (motor stopped).	A-B-C A-C-B				
Voltage variations. **Mln/max voltage limits:** monitors voltage variations around preset thresholds.	**min.:** 70…99 % 0.2…25 s **max:** 101…115 % 0.2…25 s				
Load shedding: opens outputs O.1 and O.2, if voltage drops below a preset threshold.	68…115 % 1…9999 s				
Power variations. **Mln/max power limits:** monitors power variations around preset thresholds.	20…800 % 0…100 s				
Variation of Cos φ. **Min/max limits of Cos φ :** monitors variations of Cos φ around preset thresholds.	0…1 0…25 s				

Function performed.

(1) Average current value measured on the 3 phases.
(2) FLC: Full Load Current (setting current).
(3) Average voltage value measured on the 3 phases.

Motor control functions

Functions	Description	With controller LTM R	With controller LTM R and extension module LTM E
Control modes	Local, via terminal block	X	X
	Local, via HMI terminal *(1)*	X	X
	Remote, via network	X	X
Operating modes	Overload	X	X
	Independent	X	X
	Reverser	X	X
	2-step	X	X
	2-speed	X	X
	“Custom” mode	X	X
Fault management	Manual reset	X	X
	Automatic reset	X	X
	Remote reset	X	X

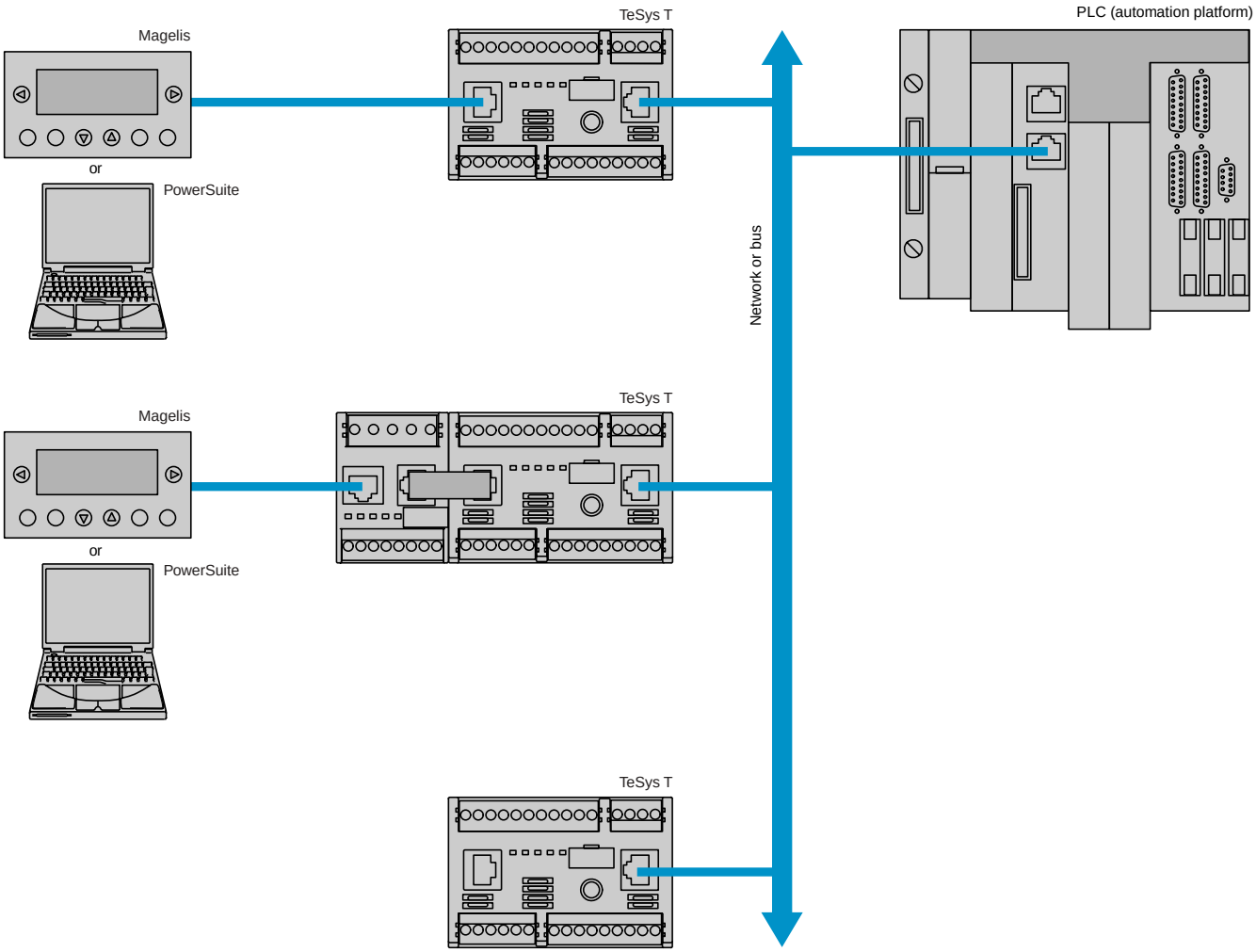
Metering functions and statistics

Functions	Description	Measurement range	With controller LTM R	With controller LTM R and extension module LTM E
Measurements *(2)*	Current/Phase	0.08…1000 A	X	X
	Earth current	0.1633 x CT ratio	X	X
	Average current	0.08…1000 A	X	X
	Current imbalance between phases	0…200 %	X	X
	Thermal capacity level	0…200 %	X	X
	Motor temperature rise	0…6500 Ohm	X	X
	Frequency	0…100 Hz		X
	Voltage between phases	∿ 0…830 V		X
	Voltage imbalance between phases	0…200 %		X
	Active power	0…6553.5 kW		X
	Reactive power	0…6553.5 kWr		X
	Power factor	0…100		X
	Active power consumption	0…400 kWh		X
	Reactive power consumption	0…400 kWrh		X
Fault statistics	Protection fault counters		X	X
	Protection alarm counters		X	X
	Diagnostic fault counters		X	X
	Motor control function counters		X	X
	Fault history		X	X
Fault diagnostics	Internal watchdog faults		X	X
	Controller internal temperature		X	X
	Temperature sensor connection		X	X
	Current connection		X	X
	Voltage connection			X
	Motor control commands (start, stop, run check back and stop check back)		X	X
	Control configuration checksum		X	X
	Loss of communication		X	X
Motor statistics	Number of motor control commands (O.1/O.2 starts)		X	X
	Operating time		X	X
	Number of starts/hour		X	X
	I max. of last start		X	X
	Duration of last start		X	X
Thermal overload statistics	Time to trip		X	X
	Time to restart		X	X
System operating statistics	Run, ON, Start, alarm, fault.		X	X

(1) HMI: Human Machine Interface.
(2) See measurement details page 21.

Protection components
TeSys T Motor Management System

Configuration and possible applications



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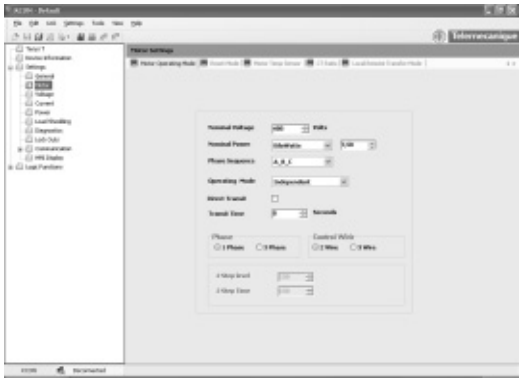

Example of TeSys T configurator setup screen

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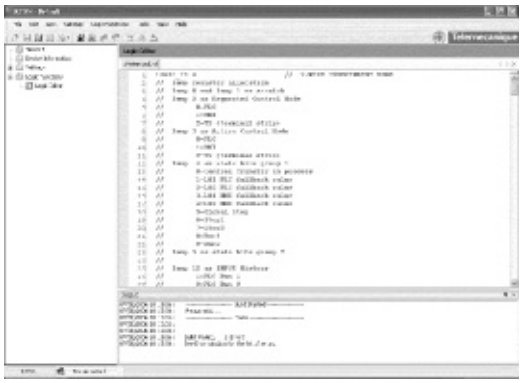


Example of logic editor screen.

Configuration using PowerSuite

The TeSys T configurator will be incorporated in the PowerSuite software application as from version 2.5.
It allows configuration, commissioning and maintenance of motor starters protected by TeSys T.

A library containing predefined motor control mode functions is available in order to:
- allow standardisation,
- avoid errors and
- reduce motor starter setup times.

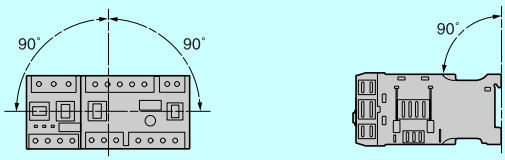
5 predefined motor control modes are incorporated in the controller:
- overload mode: monitoring of motors whose control is not managed by the controller,
- independent mode: starting of non-reversing motors,
- reverser mode: starting of reversing motors,
- 2-step mode: 2-step starting of motors (star-delta, by autotransformer and by resistor),
- 2-speed mode: 2-speed starting of motors (Dahlander, pole changer).

By using logic functions, a "Custom" mode makes it possible to:
- easily adapt these predefined motor control mode functions to the specific needs of your applications,
- create a link with the motor starter environment or
- create new functions.

The functions thus defined can be saved and used to build your function library for future applications.
To create special functions, a logic editor is incorporated in the configurator and allows a choice of 2 programming languages:
- function block,
- structured text.

Protection components
TeSys T Motor Management System

Environment

Product type			LTM R controllers		LTM EV40●● extension modules	
Conforming to standards			IEC/EN 60947-4-1, UL 508, CSA 22-2 n°14, IACS E10			
Product certifications			UL, CSA, BV, LROS, DNV, GL, RINA, ABS, RMRos, NOM, CCC, C-TIC'K, ATEX, GOST, KERI *(1)*			
Rated insulation voltage of the outputs (Ui)	Conforming to IEC/EN 60947-1, overvoltage category III, degree of pollution 3	**V**	690			
	Conforming to UL 508, CSA C222 n° 14	**V**	690			
Rated impulse withstand voltage (Uimp)	Conforming to IEC/EN 60947-4-1					
	∿ 100…240 V supply, inputs and outputs	**kV**	4.8		4.8	
	⎓ 24 V supply, inputs and outputs	**kV**	0.91		0.91	
	Communication circuits	**kV**	0.91		–	
	Voltage measurement circuit	**kV**	–		0.91	
Protective treatment	Conforming to IEC/EN 60068		"TH"			
	Conforming to IEC/EN 60068-2-30	**op. cycles/h**	12			
	Conforming to IEC/EN 60070-2-11	**op. cycles/h**	48			
Ambient air temperature around the device	Storage	**°C**	- 40…+80			
	Operation	**°C**	- 20…+60			
Operating position without derating	In relation to normal vertical mounting plane		± 30° in relation to mounting plate, ± 90° 			
Flame resistance	Conforming to UL 94	**°C**	960 (for parts supporting live components)			
	Conforming to IEC/EN 60695-2-12	**°C**	650 (for other parts)			
Shock resistance (1/2 sine wave, 11 ms)	Conforming to IEC/EN 60068-2-27 *(2)*		15 gn			
Vibration resistance	Conforming to IEC/EN 60068-2-6 *(2)* 5…300 Hz		4 gn (plate mounted) 1 gn (mounted on ⊓ rail)			
Resistance to electrostatic discharge	Conforming to IEC/EN 61000-4-2	**kV**	8, level 3: in open air 6, level 3: on contact:			
Immunity to radiated electromagnetic interference	Conforming to IEC 61000-4-3	**V/m**	10, level 3			
Immunity to fast transient bursts	Conforming to IEC 61000-4-4	**kV**	4, level 4: on supply and relay outputs 2, level 3: other circuits			
Immunity to radioelectric fields	Conforming to IEC/EN 61000-4-6	**V**	10, level 3			
Immunity to dissipated shock waves	Conforming to IEC/EN 61000-4-5		**Common mode**	**Serial mode**	**Common mode**	**Serial mode**
	Relay outputs and supply	**kV**	4	2	–	–
	⎓ 24 V inputs	**kV**	1	1	1	0.5
	∿ 100…240 V inputs	**kV**	2	1	4	2
	Communication	**kV**	2	–	1	–
	Temperature sensor (IT1/IT2)	**kV**	1	0.5	–	–

Altitude derating		**2000 m**	**3000 m**	**3500 m**	**4000 m**	**4500 m**
	Rated operational voltage (Ui)	1	0.93	0.87	0.8	0.7
	Max. operating temperature	1	0.93	0.92	0.9	0.88

Bus and network characteristics

Type of bus/network	Modbus	CANopen	DeviceNet	Profibus DP
Physical interface	2-wire RS 485	ISO 11898	ISO 11898	Polarised 2-wire RS 485
Addressing	1 to 247	1 to 127	1 to 64	1 to 125
Transmission speeds	1.2 to 19.2 K bits/s	10, 20, 50, 125, 250, 500, 800 and 1000 K bits/s + Auto baud	125 to 500 K bits/s	9.6 K to 12 M bits/s
Connections	RJ45/terminal block	9-way SUB-D/ terminal block	Terminal block	9-way SUB-D/ terminal block
Cables	2 shielded twisted pairs	4 shielded twisted wires	4 shielded twisted wires	2 shielded twisted pairs, type A

(1) Certain certifications are pending; please consult your Regional Sales Office.
(2) Without modifying the contact states, in the most unfavourable direction.

Controller and extension module characteristics

Product type				Controllers		Extension modules	
				LTM R●●●BD	LTM R●●●FM	LTM EV40BD	LTM EV40FM
Control supply							
Operational voltage (U)	Conforming to IEC/EN 60947-1		V	⎓ 24	∿ 100…240	–	
Resistance to voltage dips	Conforming to IEC/EN 61000-4-11		V	0 for 3 ms 70% of U for 500 ms		–	
Associated protection			A	gG fuse, 0.5		–	
Operational voltage			V	⎓ 20.4…26.24	∿ 93.5…264	–	
Current consumption	50/60 Hz		mA	⎓ 56…127	∿ 8…62.8	–	
Cabling							
Connectors	Pitch		mm	5.08		5.08	
Flexible cable without cable end	1 conductor		mm^2	0.2…2.5		0.2…2.5	
	2 identical conductors		mm^2	0.2…1.5		0.2…1.5	
Flexible cable with cable end							
Without insulated ferrule	1 conductor		mm^2	0.25…2.5		0.25…2.5	
	2 identical conductors		mm^2	0.5…1.5		0.5…1.5	
With insulated ferrule	1 conductor		mm^2	0.25…2.5		0.25…2.5	
	2 identical conductors		mm^2	0.2…1		0.2…1	
Solid cable without cable end	1 conductor		mm^2	0.2…2.5		0.2…2.5	
	2 identical conductors		mm^2	0.2…1		0.2…1	
Conductor size				AWG 24 to AWG 14		AWG 24 to AWG 14	
Tightening torque			N.m	0.5…0.6		0.5…0.6	
Flat screwdriver			mm	3		3	
Input characteristics							
Nominal values	Conforming to IEC/EN 61131-1			Type 1 positive logic (⎓: resistive, ∿: capacitive)			
	Voltage		V	⎓ 24	∿ 100…240	⎓ 24	∿ 100…240
	Current		mA	⎓ 7	∿ 3.1 for 100 V ∿ 7.5 for 240 V	⎓ 7	∿ 3.1 for 100 V ∿ 7.5 for 240 V
Logic inputs	Logic state 1	Voltage	V	15 max	79 < U < 264	15 max	79 < U < 264
		Current	mA	2 min…15 max	2 min at 110 V… 3 min at 220 V	2 min…15 max	2 min at 110 V… 3 min at 220 V
	Logic state 0	Voltage	V	5 max	0 < U < 40	5 max	0 < U < 40
		Current	mA	15 max	15 max	15 max	15 max
Response time	Change to state 1		ms	15	25	15	25
	Change to state 0		ms	5	25	5	25
Output characteristics							
Type				Volt free, single break			
Load	∿			250 V / 5 A B300			
	⎓			30 V / 5 A			
Permissible power in cat. AC-15	For 500 000 operating cycles		VA	480 / Ie max: 2 A			
Permissible power in cat. DC-13	For 500 000 operating cycles		W	30 / Ie max: 1.25 A			
Associated protection			A	gG fuse, 4			
Max. frequency			Hz	2			
Max. operating level			op. cycles/h	1800			
Response time	Change to state 1		ms	10 max			
	Change to state 0		ms	10 max			
Measurement details							
Current				1 % for the 0.4…8 A and 1.35…27 A ranges 2 % for the 5…100 A range			
Voltage				1% from 100 to 830 V			
Earth fault current	Internal measurement without earth fault toroid			5…15 % for current > 0.1 A in the 0.4…8 A range current > 0.2 A in the 1.35…27 A range current > 0.3 A in the 5…100 A range			
	External measurement with earth fault toroid			< 5 % or 0.01 A			
Temperature measurement				2 %			
Power factor				3 % for a Cos φ > 0.6			
Active and reactive power				5 %			
Internal clock				± 30 min / year			

LT6 CT●●●● external current transformer characteristics

Conforming to standards		IEC 60185, BS 7626			
Precision		Class 5P			
Precision limit factor		15			
Rated insulation voltage (Ui)		690			
Maximum operating temperature	**°C**	50			
Transformer ratio	**A**	100/1	200/1	400/1	800/1
Diameter of conductor passage hole	**mm**	35	35	35	32
Maximum cabling c.s.a.	**mm²**	30 x 10	30 x 10	30 x 10	incorporated *(1)*

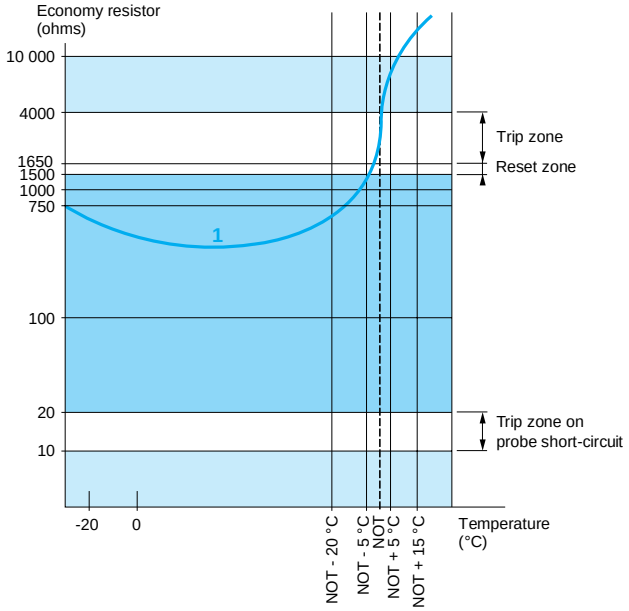
Earth fault toroid characteristics

Toroid type		**TA30**	**PA50**	**IA80**	**MA 120**	**SA 200**	**GA 300**	**POA**	**G0A**
Rated insulation voltage Ui	**V**	1000							
Operating temperature	**°C**	- 35…+ 70							
Protection index		IP30 (connections IP20)							
Transformer ratio		1/1000							
Rated operational current Ie	**A**	65	85	160	250	400	630	85	250
Max. conductor c.s.a. per phase	**mm²**	25	50	95	240	2 x 185	2 x 240	50	240

DA1 TT●● probe characteristics

Conforming to standards			IEC 60034-11 mark A
Economy resistor	At 25 °C	Ω	3 x 250 in series
Rated operational voltage (Ue)	Per probe	**V**	⎓ 2.5 max
Rated insulation voltage (Ui)		**kV**	2.5
Insulation			Reinforced
Length of connecting cables	Between probes	**mm**	250
	Between probe and motor terminal plate	**m**	1

Guaranteed operating zones: example with 3 probes type DA1 TT●●● (250 Ω at 25 °C) in series, conforming to standard EC 60034-11, mark A.



1 3 probes type DA1 TT●●● (250 Ω at 25 °C) in series.

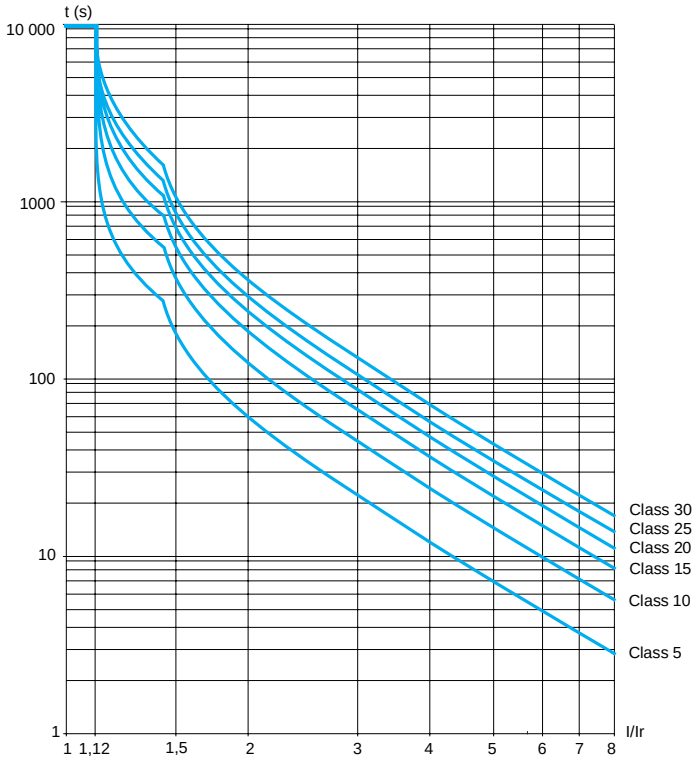
NOT: Nominal Operating Temperature

Protection unit tripped.

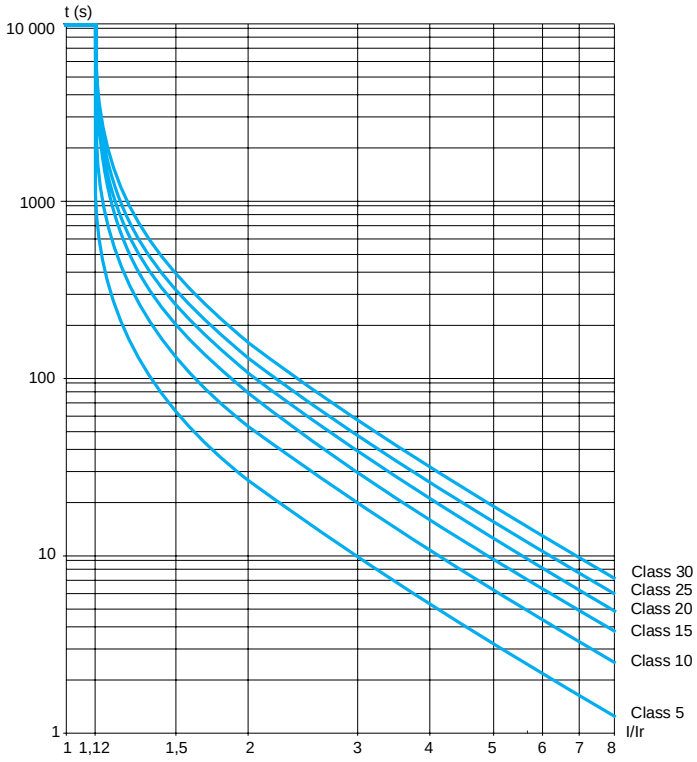
Protection unit reset.

(1) Electrical connection to be made using M10 bolt.

Cold state curves



Hot state curves



Protection components
TeSys T Motor Management System

105836

LTM R08MBD

105838

LTM R08CBD

105840

LTM R08DBD

105842

LTM R08PBD

Controllers

Setting range	Control voltage	Current ranges	Reference	Weight
A	V	A		kg
For Modbus				
8	⎓ 24	0.4…8	**LTM R08MBD**	0.530
	∿ 100…240 V	0.4…8	**LTM R08MFM**	0.530
27	⎓ 24	1.35…27	**LTM R27MBD**	0.530
	∿ 100…240 V	1.35…27	**LTM R27MFM**	0.530
100	⎓ 24	5…100	**LTM R100MBD**	0.530
	∿ 100…240 V	5…100	**LTM R100MFM**	0.530
For CANopen				
8	⎓ 24	0.4…8	**LTM R08CBD**	0.530
	∿ 100…240 V	0.4…8	**LTM R08CFM**	0.530
27	⎓ 24	1.35…27	**LTM R27CBD**	0.530
	∿ 100…240 V	1.35…27	**LTM R27CFM**	0.530
100	⎓ 24	5…100	**LTM R100CBD**	0.530
	∿ 100…240 V	5…100	**LTM R100CFM**	0.530
For DeviceNet				
8	⎓ 24	0.4…8	**LTM R08DBD**	0.530
	∿ 100…240 V	0.4…8	**LTM R08DFM**	0.530
27	⎓ 24	1.35…27	**LTM R27DBD**	0.530
	∿ 100…240 V	1.35…27	**LTM R27DFM**	0.530
100	⎓ 24	5…100	**LTM R100DBD**	0.530
	∿ 100…240 V	5…100	**LTM R100DFM**	0.530
For ProfibusDP				
8	⎓ 24	0.4…8	**LTM R08PBD**	0.530
	∿ 100…240 V	0.4…8	**LTM R08PFM**	0.530
27	⎓ 24	1.35…27	**LTM R27PBD**	0.530
	∿ 100…240 V	1.35…27	**LTM R27PFM**	0.530
100	⎓ 24	5…100	**LTM R100PBD**	0.530
	∿ 100…240 V	5…100	**LTM R100PFM**	0.530
For Ethernet TCP/IP ▲				
8	⎓ 24	0.4…8	**LTM R08EBD**	0.530
	∿ 100…240 V	0.4…8	**LTM R08EFM**	0.530
27	⎓ 24	1.35…27	**LTM R27EBD**	0.530
	∿ 100…240 V	1.35…27	**LTM R27EFM**	0.530
100	⎓ 24	5…100	**LTM R100EBD**	0.530
	∿ 100…240 V	5…100	**LTM R100EFM**	0.530

▲ : Available 1 st quarter 2008.

105846

LTM EV40BD

Extension modules, with voltage measurement on the 3 phases

Input control voltage	Number of inputs	Supply to the electronics	Reference	Weight
V				kg
⎓ 24	4	Via the controller	**LTM EV40BD**	0.210
∿ 100…240	4	Via the controller	**LTM EV40FM**	0.210

HMI terminal

Description	Supply voltage	Reference	Weight kg
Magelis compact display With matrix display 4 lines of 20 characters.	⎓ 24 V external	**XBT N410**	0.380

Description	Number and type of connectors	Reference	Weight kg
Connecting cable (2.5 m) For connecting the XBT N410 display unit to TeSys T.	SUB-D 25-way female RJ45	**XBT Z938**	0.200

Cables

Description	Number and type of connectors	Length m	Reference	Weight kg
Connecting cables For connecting the controller to the extension module	2 x RJ45	0.04	**LTM CC004** *(1)*	0.120
		0.3	**LU9 R03**	0.045
		1	**LU9 R10**	0.065

Replacement connectors

Description	Number and type of connectors	Reference	Weight
Complete set of connectors for the controllers and extension modules	10 screw terminals (all network versions included)	**LTM 9TCS**	0.200

(1) Sold in lots of 6.

Protection components
TeSys T Motor Management System

Configuration tools

Description	Composition	Reference	Weight kg
Technical documentation on CD-Rom	■ User's manuals ■ Electronic configuration files ■ TeSys T configurator in stand-alone version *(1)*	**LTM CD00**	0.100
Connection kit for PC serial port for Modbus multidrop connection	■ 1 x 3 m length cable with two RJ45 connectors, ■ 1 RS 232/RS 485 converter with one 9-way female SUB-D connector and one RJ45 connector.	**VW3 A8 106**	–
Interface for USB port (for use with cable VW3 A8 106) Length: 1.8 m	■ 1 USB cable, SUB-D 9-way ■ Drivers supplied on CD-Rom	**SR2 CBL06**	0.350

813354

LT6 CT4001

Current transformers *(2)*

Operational current		Reference	Weight
Primary	Secondary		
A	A		kg
100	**1** *(3)*	**LT6 CT1001**	0.550
200	**1** *(3)*	**LT6 CT2001**	0.550
400	**1** *(3)*	**LT6 CT4001**	0.550
800	**1** *(3)*	**LT6 CT8001**	0.680

Earth fault toroids (marketed under the Merlin Gerin brand)

Rated operational current Ie	Internal Ø of toroid	Reference	Weight
A	mm		kg
Closed toroids, type A			
65	30	**TA30**	0.120
85	50	**PA50**	0.200
160	80	**IA80**	0.420
250	120	**MA120**	0.530
400	200	**SA200**	1.320
630	300	**GA300**	2.230
Split toroids, type OA			
85	46	**POA**	1.300
250	110	**GOA**	3.200

510575

DA1 TT●●●

PTC thermistor probes *(4)*

Description	Nominal Operating Temperature (NOT)	Colour	Unit reference *(5)*	Weight
	°C			kg
Triple probes	90	Green/green	**DA1 TT090**	0.010
	110	Brown/brown	**DA1 TT110**	0.010
	120	Grey/grey	**DA1 TT120**	0.010
	130	Blue/blue	**DA1 TT130**	0.010
	140	White/blue	**DA1 TT140**	0.010
	150	Black/black	**DA1 TT150**	0.010
	160	Blue/red	**DA1 TT160**	0.010
	170	White/green	**DA1 TT170**	0.010

(1) The TeSys T configurator will be incorporated in the PowerSuite software application as from version 2.5.
(2) The transformers offered for use with TeSys U starters are suitable. Please see our "TeSys U motor starters - open version" catalogue.
(3) For use with LTM R08●● controllers.
(4) PTC: Positive Temperature Coefficient
(5) Sold in lots of 10.

Marking accessories (to be ordered separately)

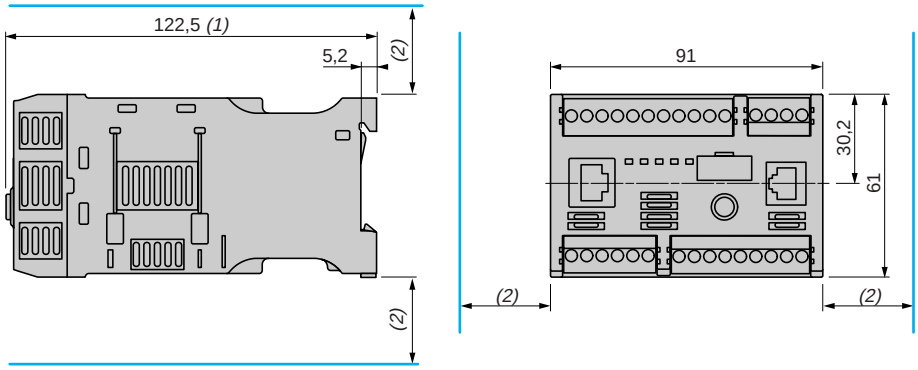
Description	Composition	Sold in lots of	Unit reference	Weight kg
Clip-in markers (maximum of 5 per unit)	Strips of 10 identical numbers (0 to 9)	25	**AB1 R●** *(1)*	0.002
	Strips of 10 identical capital letters (A to Z)	25	**AB1 G●** *(1)*	0.002

Connection accessories

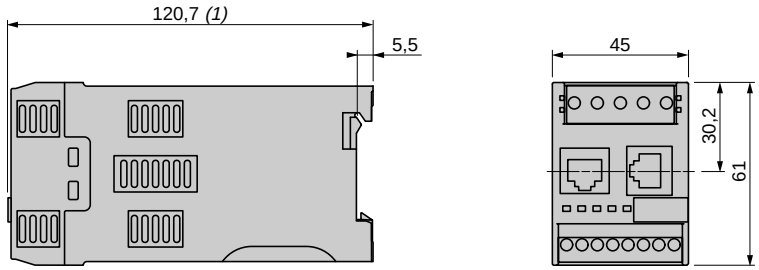
Description		Length m	Reference	Weight kg
For Modbus connection				
Cables fitted with 2 x RJ45 connectors		0.3	**VW3 A8 306 R03**	0.045
		1	**VW3 A8 306 R10**	0.065
		3	**VW3 A8 306 R30**	0.125
T-junctions		0.3	**VW3 A8 306 TF03**	0.032
		1	**VW3 A8 306 TF10**	0.032
RS 485 line terminator		–	**VW3 A8 306 R**	0.012
For CANopen connection *(2)*				
Cables		50	**TSX CAN CA50**	4.930
		100	**TSX CAN CA100**	8.800
		300	**TSX CAN CA300**	24.560
IP20 connectors 9-way SUB-D female Line end adapter switch	Elbowed (90°)		**TSX CAN KCDF 90T**	0.046
	Straight		**TSX CAN KCDF 180T**	0.049
	Elbowed (90°) with SUB-D 9-way connector for connection to PC or diagnostic tool		**TSX CAN KCDF 90TP**	0.051
For DeviceNet connection				
Cables		50	**TSX CAN CA50**	4.930
		100	**TSX CAN CA100**	8.800
		300	**TSX CAN CA300**	24.560
For Profibus DP connection				
Cables		100	**TSX PBSCA100**	–
		400	**TSX PBSCA400**	–
Connectors	With line terminator		**490 NAD 011 03**	–
	Without line terminator		**490 NAD 011 04**	–
	With line terminator and terminal port		**490 NAD 011 05**	–

(1) When ordering, replace the ● in the reference with the number or letter required.
(2) To order other connectors and cables (UL cables for harsh environments, etc.) please consult our catalogue "Machines and installations with CANopen. Performance and flexibility".

LTM R●● controllers



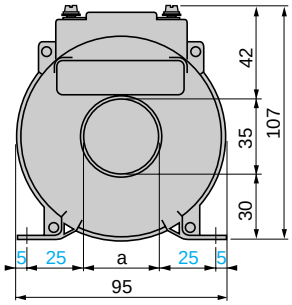
LTM EV40●● extension modules

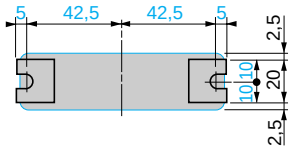


(1) 140 mm with RJ45 connector for connection to extension module and to network.
166 mm with Profibus DP/CANopen connector.
(2) Leave a gap around the device of: 9 mm at 45°C, 9 to 40 mm from 45 to 50 °C, 40 mm at 60°C.

Current transformers

LT6 CT

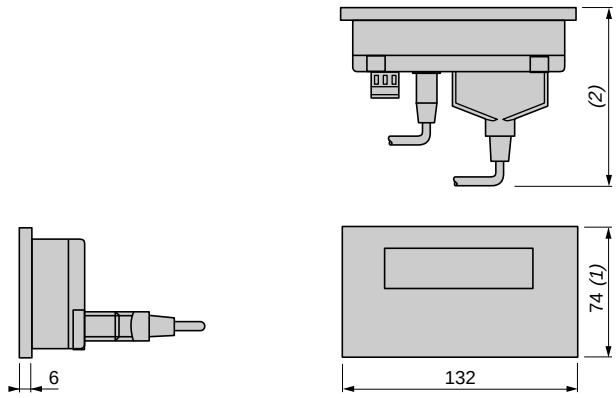




LT6	a
CT1001	35
CT2001	35
CT4001	35
CT8001	10

HMI terminal

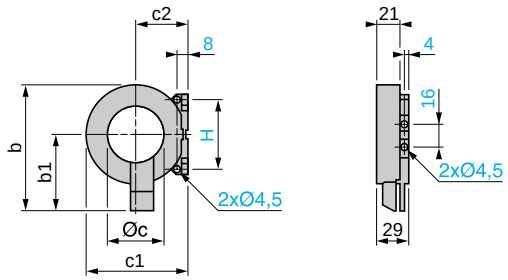
XBT N410



(1) 104 mm with fixing clips (supplied with the product).
*(2) 58 mm with SUB-D 25-way elbowed cable **XBT Z9680** for Twido, TSX Micro and Premium or **XBT Z998** for Advantys STB.*
*104 mm with SUB-D 25-way elbowed cable **XBT Z68/Z9681** for Twido, TSX Micro and Premium*

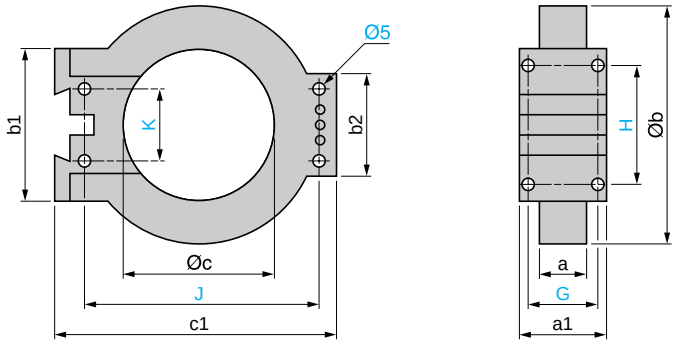
Earth fault toroids

TA30, PA50



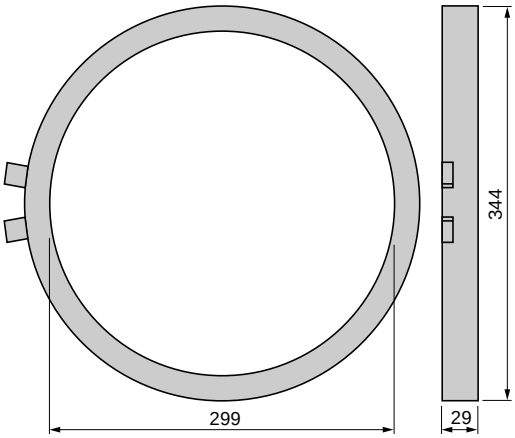
Type	b	b1	Øc	c1	c2	H
TA30	83	53	30	60	31	50
PA50	109	66	50	87	45	60

IA80, MA120, SA200

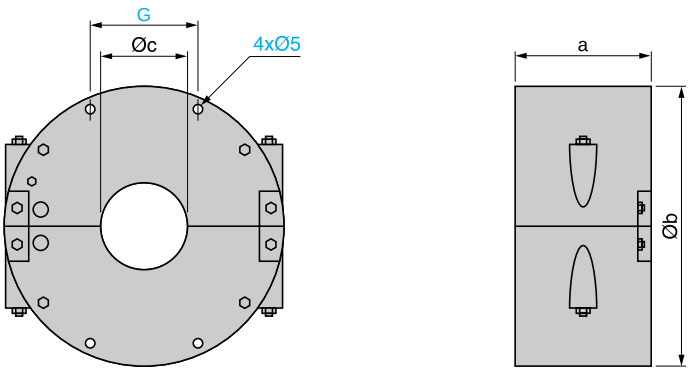


Type	a	a1	Øb	b1	b2	Øc	c1	G	H	J	K
IA80	26.5	44	122	80	55	80	150	35	65	126	40
MA120	26.5	44	164	80	55	120	190	35	65	166	40
SA200	29	46	256	120	90	196	274	37	104	254	60

GA300



POA, GOA

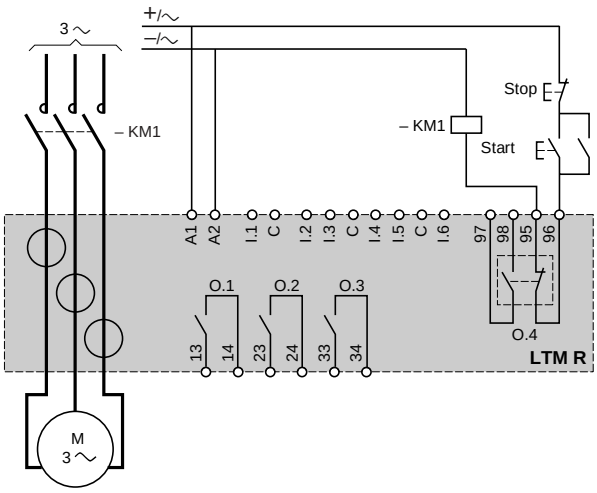


Type	a	Øb	Øc	G
GOA	72	148	46	57
POA	78	224	110	76

Schemes

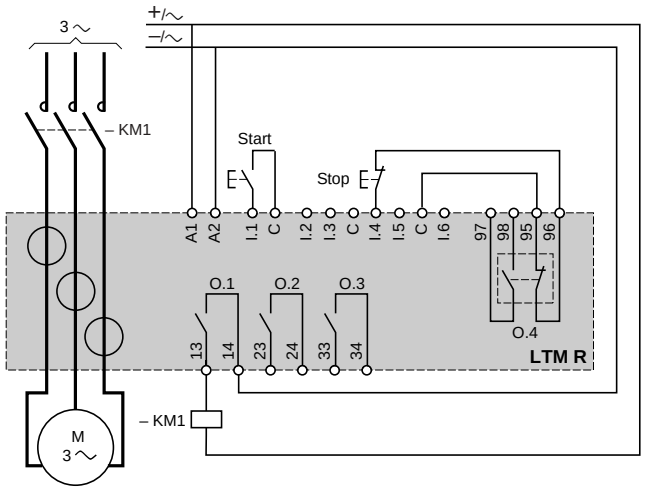
Overload mode

3-wire local-control

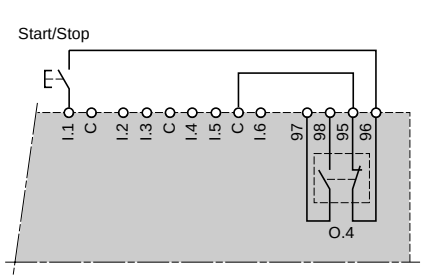


Independent mode

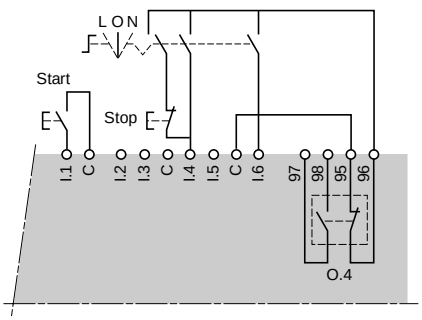
3-wire local-control



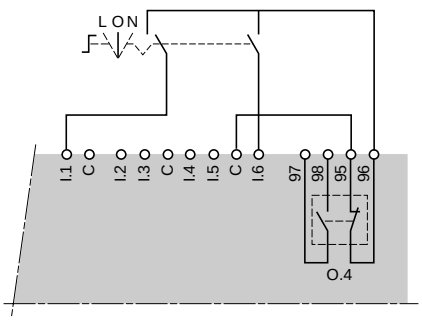
2-wire local-control



3-wire with switchable local/network control



2-wire with switchable local/network control

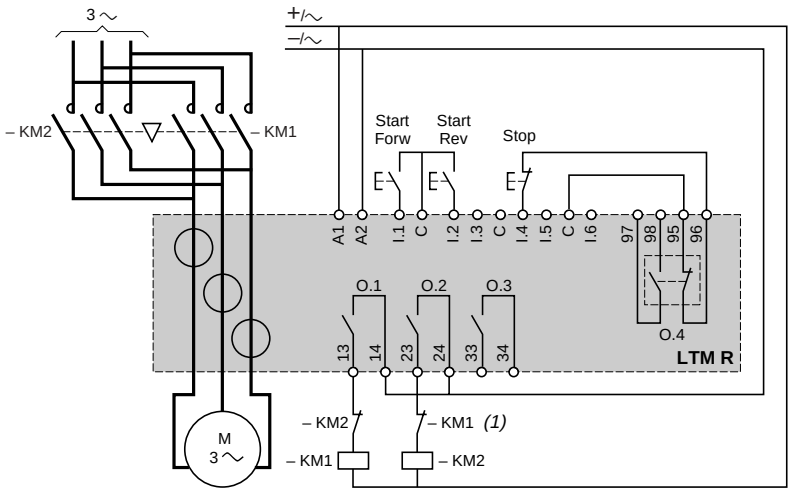


L: Local control
O: Stop
N: Network control

Schemes (continued)

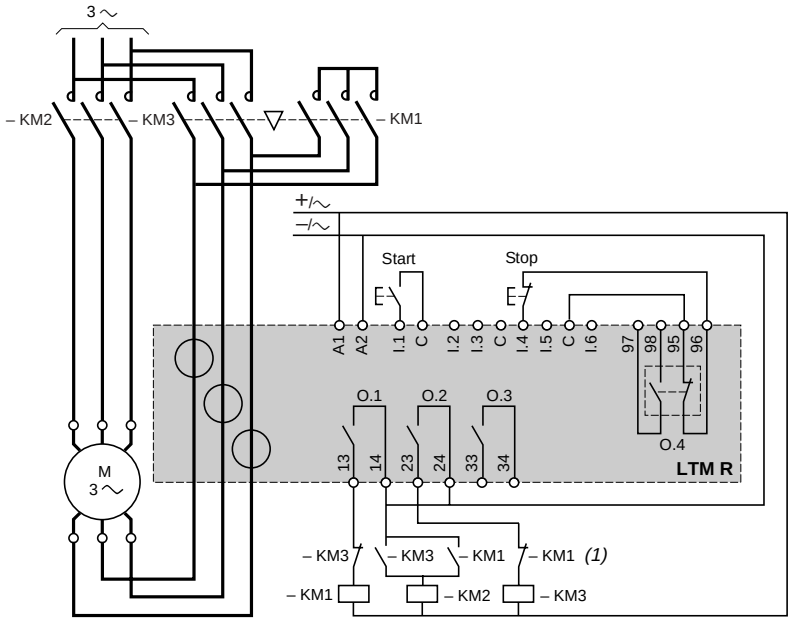
Reverser mode

3-wire local-control



2-step mode, star-delta application

3-wire local-control

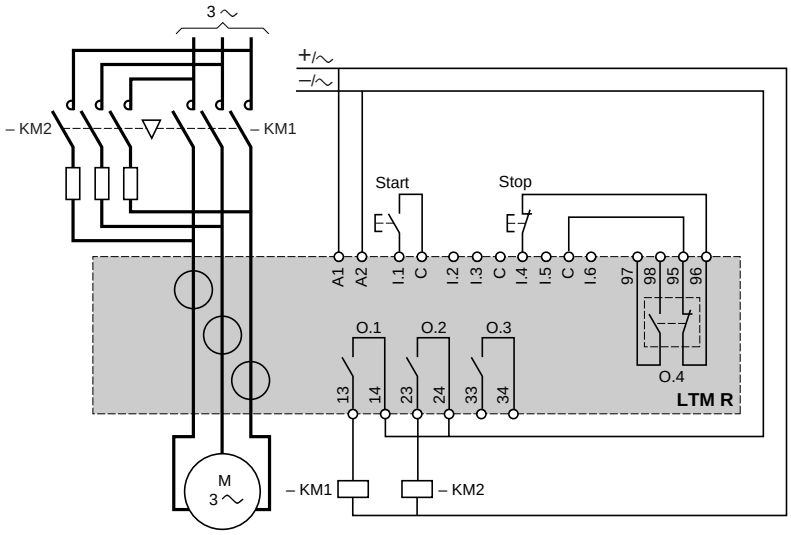


(1) Contacts for interlocking KM1 and KM2 are not obligatory because the controller electronically interlocks outputs O.1 and O.2.

Schemes (continued)

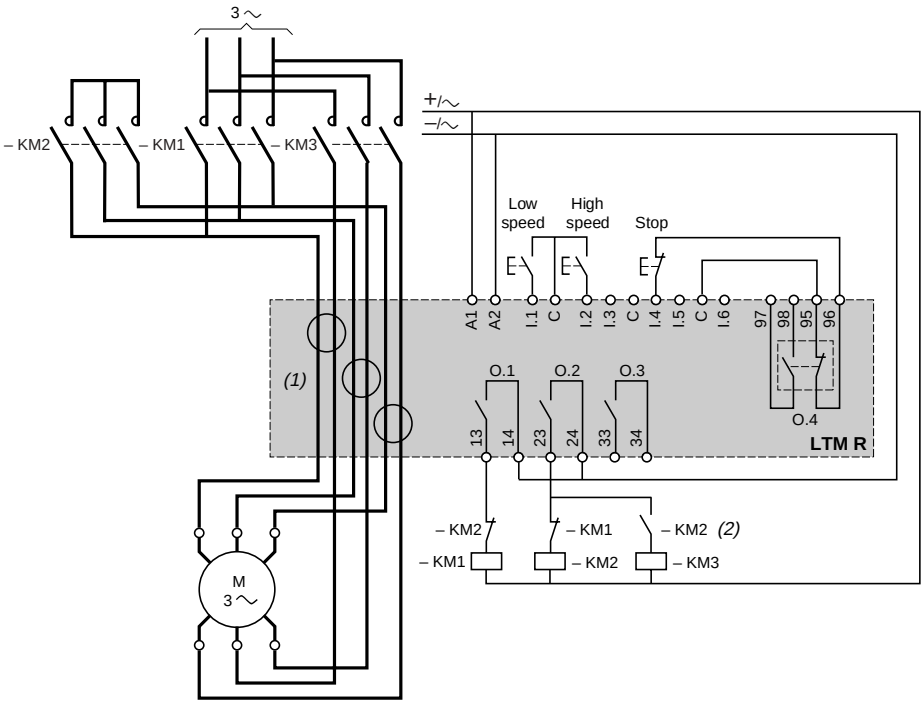
2-step mode, primary resistor application

3-wire local-control



2-speed mode, Dahlander application

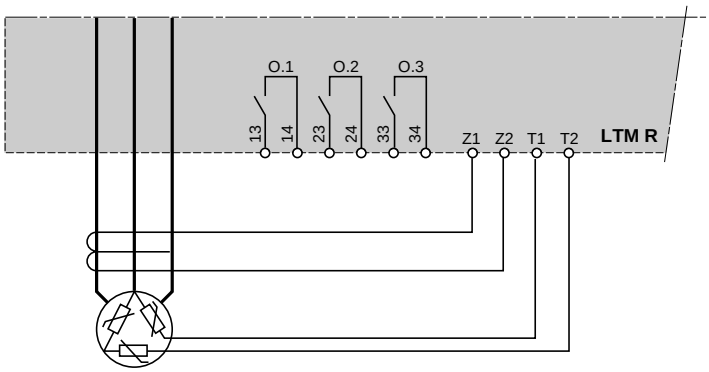
3-wire local-control



(1) For a Dahlander application, all the power cables must pass through current transformers. The controller can also be placed upstream of the contactor. In this case, and if the Dahlander motor is used in "variable torque" mode, all the cables downstream of the contactors must be of identical size.
(2) Contacts for interlocking KM1 and KM2 are not obligatory because the controller electronically interlocks outputs O.1 and O.2.

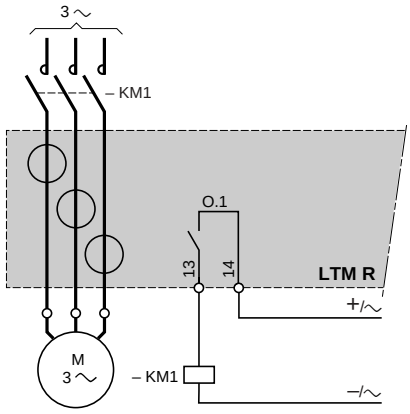
Schemes (continued)

Earth fault toroid and motor temperature probe connection

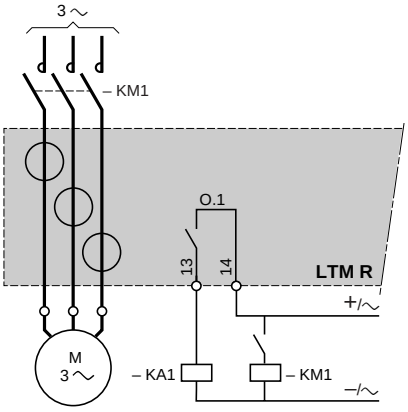


Connection of outputs for motor control mode function

Without intermediate relay



With intermediate relay



Combinations providing type 2 coordination

With circuit-breaker

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3 400/415 V			Circuit-breaker	Contactor	TeSys T controller	External current transformer
P kW	Ie A	Icc kA	Reference	Reference	Reference	Reference
0,06	0,22	130	**GV2 L03**	**LC1 D09**	**LTM R08●●**	–
0,09	0,36	130	**GV2 L03**	**LC1 D09**	**LTM R08●●**	–
0,12	0,42	130	**GV2 L04**	**LC1 D09**	**LTM R08●●**	–
0,18	0,62	130	**GV2 L04**	**LC1 D09**	**LTM R08●●**	–
0,25	0,88	130	**GV2 L05**	**LC1 D09**	**LTM R08●●**	–
0,37	0,98	130	**GV2 L05**	**LC1 D09**	**LTM R08●●**	–
0,55	1,6	130	**GV2 L06**	**LC1 D09**	**LTM R08●●**	–
0,75	2	130	**GV2 L03**	**LC1 D09**	**LTM R08●●**	–
1,1	2,5	130	**GV2 L03**	**LC1 D18**	**LTM R08●●**	–
1,5	3,5	130	**GV2 L04**	**LC1 D18**	**LTM R08●●**	–
2,2	5	130	**GV2 L04**	**LC1 D18**	**LTM R08●●**	–
3	6,5	130	**GV2 L05**	**LC1 D18**	**LTM R08●●**	–
4	8,4	130	**GV2 L05**	**LC1 D18**	**LTM R27●●**	–
5,5	11	130	**GV2 L06**	**LC1 D25**	**LTM R27●●**	–
7,5	14,8	50	**GV2 L07**	**LC1 D25**	**LTM R27●●**	–
9	18,1	50	**GV2 L08**	**LC1 D25**	**LTM R27●●**	–
11	21	50	**GV2 L08**	**LC1 D25**	**LTM R27●●**	–
15	28,5	70	**GV2 L10**	**LC1 D50**	**LTM R100●●**	–
18,5	35	70	**GV2 L14**	**LC1 D40**	**LTM R100●●**	–
22	42	70	**GV2 L14**	**LC1 D50**	**LTM R100●●**	–
30	57	70	**GV2 L16**	**LC1 D65**	**LTM R100●●**	–
37	69	70	**GV2 L20**	**LC1 D80**	**LTM R100●●**	–
45	81	25	**GV2 L22**	**LC1 D115**	**LTM R100●●**	–
45	81	70	**GV2 L22**	**LC1 D115**	**LTM R100●●**	–
55	100	36	**NS160NMA**	**LC1 D115**	**LTM R100●●**	–
55	100	70	**NS160HMA**	**LC1 D115**	**LTM R100●●**	**LT6 CT2001**
75	135	36	**NS160NMA**	**LC1 D150**	**LTM R08●●**	**LT6 CT2001**
75	135	70	**NS160HMA**	**LC1 D150**	**LTM R08●●**	**LT6 CT2001**
90	165	36	**NS250NMA**	**LC1 F185**	**LTM R08●●**	**LT6 CT2001**
90	165	70	**NS250HMA**	**LC1 F185**	**LTM R08●●**	**LT6 CT2001**
110	200	36	**NS250NMA**	**LC1 F225**	**LTM R08●●**	**LT6 CT2001**
110	200	70	**NS250HMA**	**LC1 F225**	**LTM R08●●**	**LT6 CT2001**
132	240	70	**NS400HMA**	**LC1 F265**	**LTM R08●●**	**LT6 CT4001**
132	240	130	**NS400LMA**	**LC1 F265**	**LTM R08●●**	**LT6 CT4001**
160	285	70	**NS400HMA**	**LC1 F330**	**LTM R08●●**	**LT6 CT4001**
160	285	130	**NS400LMA**	**LC1 F330**	**LTM R08●●**	**LT6 CT4001**
200	352	70	**NS630HMA**	**LC1 F400**	**LTM R08●●**	**LT6 CT4001**
200	352	130	**NS630LMA**	**LC1 F400**	**LTM R08●●**	**LT6 CT4001**
220	388	70	**NS630HMA**	**LC1 F500**	**LTM R08●●**	**LT6 CT4001**
220	388	130	**NS630LMA**	**LC1 F500**	**LTM R08●●**	**LT6 CT4001**
250	437	70	**NS630HMA**	**LC1 F500**	**LTM R08●●**	**LT6 CT6001**
250	437	130	**NS630LMA**	**LC1 F500**	**LTM R08●●**	**LT6 CT6001**

Substitution table

	Old range LT6 P multifunction protection relays			New range TeSys T controllers		
Motor current	Reference	Reference	External current transformer Reference	Reference	Reference	External current transformer Reference
	∿ 100…240 V	⎓ 24 V		∿ 100…240 V	⎓ 24 V	
I < 5 A	LT6 P0M005FM	LT6 P0M005S144	–	**LTM R08●FM**	**LTM R08●BD**	**–**
5 A < I < 25 A	LT6 P0M025FM	LT6 P0M025S144	–	**LTM R27●FM**	**LTM R27●BD**	**–**
25 A < I < 100 A	LT6 P0M005FM	LT6 P0M005S144	LT6 CT1001	**LTM R100●FM**	**LTM R100●BD**	**–**
100 A < I < 200 A	LT6 P0M005FM	LT6 P0M005S144	LT6 CT2001	**LTM R08●FM**	**LTM R08●BD**	**LT6 CT2001**
200 A < I < 400 A	LT6 P0M005FM	LT6 P0M005S144	LT6 CT4001	**LTM R08●FM**	**LTM R08●BD**	**LT6 CT4001**
400 A < I < 800 A	LT6 P0M005FM	LT6 P0M005S144	LT6 CT8001	**LTM R08●FM**	**LTM R08●BD**	**LT6 CT8001**

***Note**: For other voltages and combinations with fuses, please consult your Regional Sales Office.*

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