General Specification for Intelligent Motor Protection Relay

This specification defines the Requirements for the Intelligent Motor Protection Relay performing Metering, Monitoring and Motor Protection functions, associated with User Interface and communication features.
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1 Introduction
This part of the specification describes the requirements for the low voltage Intelligent Motor Protection Relay (IMPR). This relay must be integrated in the global Motor Management System for use within standard IEC or NEMA, switchgear and control gear.
The nominal values, the standard documents and the relays minimum settings are defined in this document. Information regarding motors and current transformers is not included in the specification.

2. General Requirements for the Intelligent Motor Protection Relay
Each individual Intelligent Motor Protection Relay (IMPR) shall be mounted inside a drawer of an MCC switchboard. In option, it can be completed by a local Human Machine Interface (HMI) display and control unit mounted on the front panel of the drawer.
The IMPR shall include accurate measurement processing functions and perform motor protection functions to prevent damaging the motor and thus extend the life of the motor and the availability of the process.
It shall be possible to display on the Human Machine Interface the metering and operation data and the configuration data as well.
Thanks to network communication capabilities, the IMPR shall support the integration in Power Monitoring Systems and in SCADA systems.

In order to ease implementation and startup, the IMPR shall include
- internal current transformers, at least for most usual currents, up to 100 A,
- several pre-defined operation modes and also allow for customised mode,
- an user-friendly configuration tool available on local HMI (at least for main parameters) and on a laptop.

3. Environment and Applicable Standards
The IMPR shall comply with the most relevant national and international standards and recommendations for industrial electrical distribution.
The IMPR shall have certifications according to UL and CSA standards, shall bear the CE marking, be CCC, EAC/GOST, RCM/CTIC’K, marine approved (BV, LROS, DNV, RINA, ABS ) and Atex certified ; therefore it shall conform to standards IEC/EN 60947-4-1 and Chinese deviations, UL 60947-4-1A and CSA 22-2 n°60947-4-1.
The IMPR shall be IP 20, according to IEC 60947-1 (protection against direct contact).
The protection for the HMI mounted outside the switchboard shall be IP 54.
The following control power supplies shall be available in the range of IMPR : 24 VDC and 100-240 VAC.

4. Specific Requirements for the Intelligent Motor Protection Relay
4.1. Metering
The IMPR shall include as a minimum the following features.
- Measurements including line currents, ground fault current, average line current, current phase imbalance, thermal capacity level, motor temperature sensor and, as an option, frequency, line to line voltage, line voltage imbalance, average voltage, power factor, active power, reactive power, active power consumption and reactive power consumption.
For line current measurements, the IMPR shall have integrated Current Transformers rated up to 100 A. For motors larger than 100 A, the connection of external current transformers shall be possible.
For ground current, it shall be possible either to calculate from line currents or, without need of any additional component, to connect on the IMPR an external ground Current Transformer.
The motor temperature measurement must be possible through several types of sensors including PTC binary, PTC analog, NTC analog and PT100. Without any additional component, the IMPR shall allow the connection of the temperature sensor.
Voltage measurement shall allow for line voltage up to 690V.
4.2. Motor Protection Functions

As a minimum, the IMPR shall allow the selection of the following protection functions: thermal overload, current phase imbalance, current phase loss, current phase reversal, long start, jam, undercurrent, overcurrent, ground current, motor temperature sensor, rapid cycle lockout and, as an option, voltage phase imbalance, voltage phase loss, voltage phase reversal, undervoltage, overvoltage, voltage dip management (autorestart and load shedding), power limits and power factor limits.

- The thermal overload trip curve shall be selectable between inverse (I²t) and definite time (Ixt) curves.
- The Auxiliary Fan Cooling application shall be also selectable.

4.3. Control Functions

The IMPR shall come with the following pre-defined Motor control modes: overload, independent, reverser, two-step, two-speed. In addition it shall be possible to derive a customised mode from any of the pre-defined modes.

For each mode, the IMPR shall come with the corresponding wiring diagram for 2 and 3 wires control.

4.4. Fault and alarm Monitoring

The IMPR shall include an Alarm management function and a Fault Management function, that can be independently enabled/disabled with the relevant threshold(s) for each protection function.

The Faults reset mode must be selectable between manual reset, automatic reset after a set time and remote reset via communication.

The Fault Management function shall also record the five most recent faults.

4.5. User Machine Interface

In option, the IMPR shall have a local Human-Machine Interface (HMI). This unit is to be used both for commissioning and/or for normal operation. It shall allow the configuration of the IMPR and the display of operating data such as measurements, counters, status, faults and warnings information.

The HMI shall have the capability to adapt to local languages by selection or download. During the operation of the IMPR, it shall be possible to select the HMI language between at least two languages. In addition it shall be possible to download other languages.

4.6. Communication

The IMPR shall communicate through an integrated communication port so that it can be connected to a communication architecture with information remote access.

It shall be an open communication system, meaning that it shall be directly connected to the main industrial network communication protocols including Modbus, Modbus/TCP (Ethernet network), CANopen, DeviceNe and Profibus DP.

The IMPR shall have the options to connect with these networks, one each per application, with native connectivity embedded directly from the factory.

4.7. Configuration Software

The IMPR shall use a user-friendly setting and operating multi-lingual software in a Windows environment with menus and icons for fast direct access to the data required, with guided navigation to go through all the data on the same function together in the same screen and with a file management. The IMPR shall allow customised logic by the end user via the “custom mode.”

5. Operation and Maintenance

The IMPR must not require any specific or periodic maintenance.
6. Sustainable Development
Production site organisation shall comply with the requirements of the ISO 9002 and ISO 14001 standards. For the devices, the manufacturer should be able to provide following arguments:
- Hazardous substances content (RoHS conformity declaration & REACH assessment referring to last update of SVHC candidate list).
- Environmental impacts characterized by several indicators (through Life Cycle Analysis & Product Environmental Profile) with at least:
  - Raw material depletion
  - Energy depletion
  - Global warming / carbon footprint
  - Water depletion
- Recyclability information (Product Environmental Profile / End of Life Instruction).
The devices shall be delivered in packaging compliant with European Directive 2004/12/CE