

# GENERATION & NETWORK

## Numerical Motor Protection

Forming part of the PROCOM range of modular equipment, the IMM8000 range is designed to protect medium to high power MV motors.

# IMM8000



In addition to the standard protection functions, the IMM8000 relays include monitoring, measurement and recording of the electrical quantities of the network. The IMM8002 also allows the connection of three temperature sensors (RTDs). Parameter setting is possible locally either by the keyboard and screen or via an RS232 connection. Setting is also possible remotely via an RS485 link or current loop. The calculation of the electrical quantities is carried out using Fourier transforms. The functions of adjustment, reading, measurement and recording are all available in local or remote mode.

### Functions

- Short-circuits between phases [50]
- Earth-fault [51N]
- Locked rotor [51LR]/[51STALL]
- Under-voltage [27]/[27ST]
- Re-acceleration [27RC]
- Over-voltage [59]
- Thermal Overload [49]
- Over-temperature (IMM8002) [26] (IMM 8002 option)
- Pump un-priming [37P]/[37I]
- Imbalance, loss-of-phase or phase reversal [46]
- Too Long Starting [48]
- Starting inhibited by temperature [5-49] or abnormal voltage
- Number of starts protection [5-66]

# CHARACTERISTICS IMM8000

## Auxiliary voltage

- Auxiliary voltage ranges 19 to 70 or 85 to 255 Vcc or Vac, 50/60 Hz
- Burden 10 W (DC), 15 VA (AC)

## Measuring inputs

- Phase CTs ( $I_n=1A$  and 5 A) Measurement from 0 to 20  $I_n$  - burden at  $I_n < 0.2VA$   
Rating (permanent) =  $3 \times I_n$  (Transient) =  $100 \times I_n$  for 1 second  
Measures primary currents from 10A to 10kA
- Earth-fault CT ( $I_{n0}=1A$  and 5A) Measurement from 0 to 2.4  $I_{n0}$  - burden at  $I_n < 0.2VA$   
Permanent rating =  $I_{n0}$   
Transient rating = 50  $I_{n0}$  for 1second  
Measures primary currents from 10A to 10kA  
Display of the primary current from 50 to 100A  
Permanent withstand = 100A  
Transient withstand = 12,500A for 1 second on 100/1 CBCT
- CBCTs 50/1 or 100/1  $I_{n0}$  0 to 200kA  
class 2  
5VA 5P15
- Display of primary currents (I1, I3) Permanent withstand 1.5  $U_n$ ; transient withstand = 2  $U_n$  for 10s  
Burden < 0.2VA
- Display class Primary voltage setting of 0.10 kV to 100kV
- Recommended CTs 50 or 60 Hz measurement from 40 to 70 Hz, precision 0.02 Hz
- VTs 100,110, 120 or 240 V
- Rated frequency

## Logical inputs

- Activation Contact with internal or external voltage (24VDC)

## Output Contacts

- Relay WD NC contact, 10A / 250VAC rated currents  
20 A for 1mn
- Relays P, T, A, B Changeover contact, 10A/250VAC rated currents  
20 A for 1mn
- Ratings DC breaking capacity = 50W (at L/R = 40 ms)  
AC breaking capacity=1250VA;  $I < 3A$  (at  $\cos\phi = 0.4$ )

## Communication (MODBUS®)

- Transmission Asynchronous series, 2 wires RS 485  
or 4 wires 0-20 mA current loop
- Speed transmission 1200 to 19200 bauds (limited to 4200 bauds for current loops)

## Consignment of state

## Programming

- Display French, English
- Configuration software Windows® 95, 98, 2000 French, English

## Environment

- Transient impulse IEC 801.4 classifies 4 (equivalent IEC 1000-4-4 classifies 4)
- Shock IEC 255-5 (5 kV - 1.2/50  $\mu s$ )
- Dielectric withstand IEC 255-5 (2 kV - 1 min)
- Catch of communication IEC 255-5 (500 V - 1 min)
- Resistance isolation IEC 255-5 (> 1000 M $\Omega$  under 500V)
- EMC EN 55022
- Susceptibility IEC 255-22 (1/2/3/4)
- Operating temperature -10 to + 55 °C (IEC 68-2)
- Vibrations IEC 255.21.1 classifies 2
- The rung of protection IP 51 (CEI 529)

## Dimensions

- Height, length and depth overall 173x186x275mm (flush mounted)  
206x186x275mm (rack mounted)
- Weight 5 kg

## Thermal image [49]

- Thermal Threshold pick-up  $I_{ref}$  1.07  $I_n$ , equivalent to a thermal state  $\theta_N$  of 114%
- Thermal Alarm Pick-up 80 to 100%  $\theta_N$
- Heating time constant  $C_{you}$  4 to 180 min
- Cooling time constant  $C_{TR}$  4 to 1080 min
- Factor for negative sequence current 3 for  $I_{neg} \geq 0.3 I_n$  and 9 for  $I_{neg} < 0.3 I_n$

# CHARACTERISTICS IMM8000

## Temperature sensors (IMM8002) [26]

- Number and type 3 probes Pt100, Ni100, Ni120 or Cu10
- Alarm threshold 2 to 200°C

## Number of starts protection [5-49] [5-27] [5-59] [5-66]

- Number of authorized starts (N) from 1 to 8
- Time during N starts are authorized 15 to 60 min
- Time during new start is inhibited 15 to 60 min
- Hot starting control 40 to 100%  $\theta_N$  /  $U >$  : 70% to 150 %  $U_n$  /  $U <$  : 20% to 120 %  $U_n$   
Number of authorised starts exceeded

## Too long starting [48]

- Operating parameter  $I >$  at extremely inverse (EI) time
- Threshold running 2 to 10  $I_n$
- Start time 1 to 240 seconds

## Locked rotor after starting [51STALL]

- Operating parameter  $I >$  at independent time (inhibited during starting)
- Threshold locked rotor 2 to 5  $I_n$
- Locked rotor time 1 to 100 seconds

## Locked rotor during starting [51LR]

- Operating parameter  $I >$  at independent time
- Threshold locked rotor 1.5  $I_n$
- Locked rotor time 1 to 100 seconds

## Imbalance, loss of phase or inversion of phase [46]

- Operating parameter  $I_{neg} >$  at extremely reverse time
- Threshold 0.15 to 0.50  $I_n$

## Phase fault [50]

- Operating parameter  $I_n >$  at instantaneous time
- Threshold 1.4  $I_{ST}$
- Release time 70 ms +/- 30 ms with 1.5  $I_{set}$

## Earth fault [51N]

- Operating parameter  $I_{o} >$  with inverse time  
 $I_{o} >>$  at independent time: 0.1 to 1s/0.25s if [50] out of order
- Low-set and high-set thresholds 0.1 to 1.6  $I_n$  (residual connection) / 0.01 to 0.16  $I_{n0}$  (CBCT)

## Pressure loss [37P] [37I]

- Operating parameter  $I <$  or  $P <$  at independent time
- Threshold  $S_n$  10 to 50%  $S_n$
- Current threshold 15 to 70%  $I_n$
- Starting time 1 to 1000 seconds
- Release time 1 to 100 seconds

## Minimum of tension [27 ST] [27]

- Operating parameter  $U_{ST} <$  or  $U <$  at independent time
- Thresholds 20% to 120%  $U_n$
- Operating time 0.1 to 100 seconds

## Re-acceleration [27RC]

- Operating parameter  $U_{RC} <$  at independent time
- Threshold 20 to 120%  $U_n$
- Operating time 0.1 to 100 seconds

## Overvoltage [59]

- Operating parameter  $U >$  and  $U >>$  at independent time
- Thresholds 70 to 150%  $U_n$
- Operating time 0.1 to 100 seconds

## Tripping circuit failure

- Operating parameter tripping order
- Time delay 0.1 to 1 second

## Counters

- Number of starts 0 to 100,000
- Number of trippings 0 to 100,000
- Active & reactive power 0 to 1000 GWh and -1000 to +1000 GVARh

## Characteristics

- 2 ranges of auxiliary voltage (AC or DC).
- Configuration and setting by local operator or local or remote PC
- Reading and safeguard of the configuration on PC
- Measurement of various electrical quantities :
  - Average and instantaneous values of I1, I3 and Io, values expressed in primary currents
  - Phase-phase voltages
- Measurement of the starting current
- Recording running and starting time
- Measurement of the duration of the last start carried out
- Measurement of the negative sequence current
- Measurement of the thermal state
- Measurement of the active and reactive power
- Power-factor
- Temperature measurement (option)
- Indication of the number of authorised starts
- Measurement of the frequency
- One of two settings groups can be selected locally or remotely
- Too long start and locked rotor protection
- Assistance with motor maintenance (counting of the numbers of starts, trips, and operating hours)
- Easy Modbus® Communication
- Software of configuration and communication under Windows® 95, 98, NT, 2000
- Event logging with 10 ms resolution
- Remote reading of measurements, metering, alarms and the parameter settings
- Event reporting
- Self-diagnosis : RAM, ROM, EEPROM, output contacts, A/D converter, auxiliary voltage, software execution or hardware anomaly
- Cut-off temperature detection connection sensor

## Presentation

- Height 4U
- User interface with access to all the functions
- Backlight display (2 lines of 16 characters)
- 5 volt-free output contacts : self-monitoring, start authorisation, tripping and 2 indications
- 6 digital inputs : motor starting sensor, external trip, re-acceleration, speed, emergency restarting, thermal overcurrent state
- 1 watchdog LED
- 7 indicator LEDs
- 1 LED displaying the parameter setting mode

### Simplified functional diagram

