PROTECTION CONTROL & MEASUREMENT

SOLCON

Protection

MPS-6
Motor Protection & Control

The MPS-6 is based on the latest generation of microprocessor. Its advanced Motor Protecti on and Control circuitry, allows for Protection, Control, and Supervision for single motors or motors operating through Motor Control Centers (MCC).

Advantages at a Glance

- Monitoring 3-phase currents, 1-phase voltage and 3 temperature inputs
- Comprehensive protection and control package
- Power measurement (single phase voltage measurement)
- Energy (KWH) display and energy pulse output
- Programmable analogue output
- Real time clock
- Statistical data of last 10 trips, with time and date stamp
- RTD Bias (for Thermal Overload)
- Unbalance (Negative and Positive Sequence)
- Unbalance minimum time 1-30 seconds, preventing fast response
- Multiple Thermal Overload curves
- Unbalance Bias (for Thermal Overload)
- Unique built in software, allowing the learning of current and temperature fault simulation
- Too Many Starts Pre Alarm, configurable to energize dedicated output relay
- I>>0 Energizes output relay B upon Trip (upstream breaker trip)
- Every fault group can be configured to energize output relays A, B & C
- No Start Process - starting method, allowing switching to run, if I>= 10%
- Capture and display of minimum and maximum RMS average of three phase current, one voltage, minimum and maximum frequency
- G/F During Start setting, new feature to eliminating nuisance ground fault tripping with residual CT
- Emergency Restart function
- Restart (after mains or control voltage failure)
- Separate Aux Power Supply and Control Voltage
- MODBUS group of 20 user selected actual data parameters for fast scanning
- MODBUS communication (up to 19200 bps) - Remote parameter programming, control & supervision
- 6 programmable discrete inputs
- 6 programmable output relays
- Large and lit LCD display
- Dual control input AC or DC (same unit for 85V to 230V)
- Small din standard dimensions (fits into MCC drawer)
- Cost effective control solution
- Easy installation & operation

Start – Stop Control Functions

- Start
- Stop (Momentary or Maintained)
- Communication Remote Start/Stop
- Interlock (NO or NC)
- Contactors Control
- Running Indication
- U/V Start Prevent- P/C
- U/V Restart (Mains or Control U/V)
- Start Inhibit (Fault , Excessive No. of Starts-P/C)
- 6 Programmable Inputs

Programmable Outputs

- Three programmable output relays 8A, 250VAC
- Single Analogue output, programmable to Eleven parameter designations:
  - I1 - RMS current of phase 1
  - I2 - RMS current of phase 2
  - I3 - RMS current of phase 3
  - Average (RMS) of : I1,I2,I3
  - Max (RMS) of : I1,I2,I3
  - I0 - Ground fault RMS leakage current
  - Vp1 - Phase 1 to Neutral RMS Voltage
  - Power
  - Power Factor
  - Thermal Capacity
  - Max of T1,T2,T3 (degree Celcius)

Protection Features

Current based protection:

- Too Many Starts Level 1 (66)
- Undercurrent Level 1 & 2 (37)
- Load Increase - Alarm (51L)
- Over Current Level 1 – Jam (51R)
- Over Current Level 2 – Short (50)
- Thermal Capacity Level 1 & 2 (49/51)
- Current Unbalance Level 1 & 2 (46)
- Ground Fault during starting (50G)
- Ground Fault level 1 (50G)
- Ground Fault level 2 (50N)
- Max. Start Time (48)
- Under voltage (27)
- Over voltage Level 1 & 2 (59)
- Phase Loss (47)
- Communication failure (3)
- Internal failure (3)
- External Fault 1 & 2 - interlock (86 or 94)
- Control circuit fault (C version)
- Welded contactor (C version)

Protection Functions

Each protection can be Enabled / Disabled for:

- Alarm
- Trip
- Auto Reset
- Panel Reset
- Remote Reset
- Relay A
- Relay B
- Relay C
- Level 1 & 2 can be used for Alarm & Trip or both for trip with different time delays

Inputs and outputs

- Control supply 85-230V, AC/DC
- Three phase currents C.T. Sec. 1 or 5A
- One phase voltage
- Ground current C.T. Sec. 1 or 5A
- Three temperature sensors RTD-Pt100 (or thermistors)
- Six programmable discrete inputs
- Six programmable output relays (8A, 250VAC)
- Single analogue output programmable to Eleven parameter designations
- Emergency Start function (key operated feature), overriding the "Thermal Capacity" and "Too Many Starts", thus, allowing emergency restart after a fault

Measured Data (True R.M.S. at 0.5msec)

- One phase voltage phase to neutral
- Current each phase
- Ground current
- Temperature / Resistance each sensor
- Energy with programmable pulse output
- Power, Reactive power, Power factor
- Min & Max RMS 3 phase value of Current and Frequency

Communication

- RS 485, half duplex, MODBUS Protocol, baud rate 1200-38400 bits/sec. enables parameter modification, supervision, remote resetting and control (C version)
- Twenty user-selectable parameter grouping of Actual Data.
- Other protocols – plug-in option card (consult factory)

Real Time Clock

Time stamp for each trip – Date, Hour and Minute

Fault Simulation

Unique software provides voltage, currents and temperature faults enabling performance simulation, testing and self-learning of the MPS-6

MPS-6/C

Same as the MPS-6 except with capability of full control (start, stop, rotation direction change, star/delta) and remote supervision of all motor controls wired via the MPS-6

LCD Display and Keypad, enables:
- User friendly interface
- Accurate digital settings
- Ease of parameter readings
- Detailed trip and alarm messages
- Software lock for unauthorized modifications

LED indication:
- On
- Start/Run (flashing for Start)
- Alarm/Trip (flashing for Alarm)

Displayed parameters
The following data is displayed on the LCD and transmitted through the communication:

- Current in each phase
- Motor load as % of FLC
- Ground fault current
- Current
- RTD Temperature / Thermistor resistance
- Thermal Capacity
- Time to trip
- Time to start
- Actual Data
- Total run time
- Total number of starts
- Total number of trips
- Last start time
- Last start peak current
- Last Trip description
- Last Alarm description
- Phase currents at time of trip
- Ground fault current at time of trip
- Statistical Data

Typical Applications
- All types of low voltage motors requiring PLC remote control
- Municipal sewage & water systems
- Motors for the chemical process industry
- Motors for critical applications
- Motors requiring special protection or supervision

MPR-6/3
Motor Protection Relay

The MPR-6 monitors three phase currents, ground current, motor temperature (three RTDs/Thermistors) and creates an accurate "Thermal Model" of the motor to protect it from abnormal conditions due to power supply, motor and cabling faults, as well as operator malfunction.

MPR-6/3 with Directional Ground Fault

TPR-6
Digital Temperature Protection Relay

The TPR-6 monitors 6-14 RTD/Thermistor temperature inputs. It accurately measures the temperature increase to protect the motor/Transformer from damage due to heat build-up in the windings and or bearings. The built-in self test protects against disconnected sensors and operator faults.

- Advanced microprocessor based circuitry
- Display of operating RTD or Thermistor Data, Fault and Statistics.
- Programmable inputs and outputs
- RS 485 communication, MODBUS protocol, for remote setting and supervision
- Easy installation & friendly operation
- Two level protection for Alarm and Trip
- Selection between Trip and Trip fail safe
- Analogue Output related to any input or inputs combination
- RTD / Thermistor selection via Dip Switches
- Disconnected sensor protection

Protection Features
- RTD / Thermistor Selection (Any Input)
- Thermistor PTC / NTC selection (Any Thermistor Input)
- Over temperature Alarm Input number 1-14
- Over temperature Trip Input number 1-14
- Continuous analog output signal
- External fault 1 (from N.O/N.C. contact)
- External fault 2 (from N.O/N.C. contact)

Protection functions
Each protection can be assigned to any of the following functions:
- Alarm only - Relay A
- Trip only - Relay B
- Alarm & Trip
- Disabled
- Enabling Auto Reset
- Programmable Relay C

Programmable Relay Applications
- L.V. and M.V. motors (Windings & Bearings)
- Motors driven by Variable Frequency Drives
- Transformers
- Multi RTD and bearing devices such as turbines

MIP-6
Motor Insulation Protection Relay

The MIP-6 monitors deterioration in motor insulation level for low and medium voltage motors. It measures the motors' insulation resistance to ground and displays the actual and average highs and lows along a predefined period of time. The measured range is 0.1-20 Mega Ohms and it comes in low and medium voltage versions. Four programmable c/o relays provide digital output signals and an RS-485 communication port provides real time information. Optional 4-20mA analogue output is available as well.

Advantages at a glance:
- Monitors Low/Medium voltage Ac motors insulation for insulation deterioration
- Displays the present and average insulation resistance on LCD
- Monitoring while motors are de-energized.
- Automatic operation
- Programmable parameters
- State of the art, Microprocessor based technology
- Alarm / Trip Setpoint in the range of 0.1 to 20 Mega Ohms
- Utilize up to 48 VDC test voltage to increase personnel safety
- 2 lines 16 character each, illuminated display for easy readings and programming
- Six keys for easy programming.
- 3 LEDs for visualization at a glance
- Optional - Easy deterioration monitoring by storing history with time stamp for comparison
- Prevent unauthorized parameter settings
- 4 C/O 8 amp., 250V programmed contacts for signaling
- Optional analog 4-20mA output for remote reading
- Optional Modbus communication.
- Control voltage: 120V +/-20%, 50/60Hz
- Temperature Range 0°C to +50°C (default - all units), -10°C to +60°C (by special order)

Two types of units:
- Low voltage unit
- Medium voltage unit - up to 7.2kV medium voltage motors

MIP-6
Motor Insulation Protection Medium Voltage Resistor box

Controller

MPS-3000
Motor Protection & Control Relay

Vertical Construction

Horizontal Construction

Consult Factory for Vertictal Draw-out Construction

The MPS 3000 is the ideal protection for high voltage and large low voltage motors in applications requiring comprehensive protection with advanced warning. Especially in the process, chemical marine and offshore industries. Monitoring three phase currents, voltages and up to 10 temperature inputs, it provides a most complete motor protection package. Thermal capacity and overload calculation methods are incorporated as well as bias input into the Overload curve from current imbalance (positive/negative sequence) and temperature sensors, ensuring accurate modeling of the motor condition.

Protection
- Max. Start Time (48)
- Too Many Starts Pre-alarm
- Too Many Starts (66)
- Undercurrent Level 1 & 2 (37)
- Load Increase - Alarm (51L)
- Over Current Level 1 - Jam (51R)
- Over Current Level 2 - Short (50)
- Thermal Overload Level 1 & 2 (49/51)
- Current Imbalance Level 1 & 2 (46) (Positive / Negative Sequence)
- Under-voltage (27)
- Over-voltage Level 1 & 2 (59)
- Phase loss (47)
- Phase sequence (47)
- Ground Fault Level during starting (50G)
- Ground Fault Level 1 (50G)
- Ground Fault Level 2 (50N)
- Communication failure (3)
- Internal failure (3)
- External Fault 1, 2 & 3 - interlock (86 or 94)
- High Temp. Level 1 & 2 sensors 1-10 (49R)
- Under Power Level 1 (32L)
- Under Power Level 2 (32R)
- Low Power Factor (55)
- Auxiliary relay closes upon detection of welded contactor status (programmable)

Level 1 & 2 can be used for Alarm & Trip or both for trip, each with individual time delays

Protection function
Each protection can be designated as:
- Alarm Fail-safe
- Trip (or Trip Fail-safe)
- Auto Reset
- Panel Reset
- Remote Reset

Inputs
- Control supply 120-230V, AC/DC Optional 19-60VDC
- Three phase voltage, directly up to 690V, Above 690V through PT
- Three phase currents (1 or 5A)
- Ground current (1 or 5A)
- 10 temperature sensors, with two types:
  - 10 RTD-Pt100 (or CU)
  - 6 RTD-Pt100 (or CU) and 4 Thermistors (Programmable as NTC or PTC)
- Four programmable discrete inputs
- Four programmable Analogue Inputs 0/4-20mA. (0-1mA by special order). Selection between 20 parameters

Outputs
- Four programmable Relays 8A, 250VAC.
- Four Programmable Analogue Outputs:
  - I1, I2, I3, T1, T2 or T3 measured values
  - Motor Load Current
  - Maximum of I1, I2 and I3 values
  - Ground Current
  - Minimum of T1, T2 and T3 values
  - Maximum of T1, T2 and T3 values
  - Thermal Capacity
  - Programming allow selection between: 0-20mA or 4-20 mA

Emergency Start (key activated)
Canceling the Thermal Capacity and Too Many Starts limits to allow emergency restart after fault.

Settings
With LCD and keypad on the front panel or through the communication port.

Simulation
Simulation of voltage, current and temperature inputs enables relay learning and testing.

Measured values (True R.M.S. at a sampling rate of 0.5msec.).
- Three phase voltage (phase to phase)
- Three phase voltage (phase to neutral)
- Current, each phase
- Ground current
- Temperature / Resistance, each sensor
- Energy with programmable pulse output
- Power, Reactive power, Power factor
- Minimum & Maximum RMS Average value (three phases) for: Voltage, Current and Frequency

Statistical data
- Total run time
- Total number of starts
- Total number of trips
- Last start time period
- Last start current peak

Calculated data
- Motor current
- Current imbalance
- Thermal capacity
- Time to trip
- Time to start (after fault)
- Energy

Fault data
- Last trip
- Last alarm
- Trip current each phase
- Trip earth fault current
- Trip voltage (each phase)
- History of last 10 trips with time stamp (Date, Hour & Minutes).

Communication
RS-485, half duplex, MODBUS Protocol, at rates of 1200-19200 bits/sec. Enables parameter change, supervision and remote resetting.
Twenty user-selectable parameters grouping of Actual Data. For other protocols (plug-in board) – consult factory.

LCD Display
Large 150mm x 30mm (6″x 1″) display area.
(On vertical version the LCD dimensions are slightly smaller).

LED Indication
- On
- Stopped
- Starting
- Running
- Alarm
- Trip
- Relay A (Controller)
- Relay B (Controller)
- Internal Failure

Real Time Clock
Each fault is Date, Hour and Minute stamped.

Dimensions & Weight
Horizontal (WxHxD mm): 310x135x160, 3.3Kg
Vertical (WxHxD mm): 135x310x160, 3.3Kg

Available models
MPS-3000/R – Motor Protection Relay
MPS-3000/C – Motor Protection Controller

MPS-3000/C
Similar to the MPS-3000/R except with 4+16 discrete inputs to enable full control (start, stop, rotation direction change, Plant Interlock etc.)
The MPS-3000 also incorporates two additional protection functions:
- Control Circuit Open (74)
- Welded Contactor (74)

DPM 10
Digital Power Meter

The DPM-10 is an advanced microprocessor based electronic power display meter, which combines highly accurate readings with reliability, for complete supervision and monitoring of electric power. By replacing several analogue devices and selector switches, the DPM-10 is a cost effective alternative providing enhanced flexibility required by modern power systems.

Easily integrated into any energy management network, the DPM-10 includes RS 485 communication with open MODBUS protocol which can provide bi-directional access to and from any power monitoring system.

Advantages at a glance

- True RMS measurement (scan time 0.5 mSec.)
- Accurate calculation of non-sinusoidal waveform
- Power & Energy measurements
- Accuracy class 0.5 with long term stability
- Bright Seven Segment, visual clarity at long distance viewing
- Field programmable parameter display configuration
- User-friendly programming via front panel or communication
- Programmable Pulse output Relay (KWH)
- Versatile communication RS 485 & 232 with Modbus Protocol
- Suitable for 3 or 4 wire systems, 2 or 3 C/Ts and P/Ts
- Isolated inputs
- Electro magnetic compatibility
- Compact dimensions: 144 x 144 x 95 mm

Instantaneous Measurements

Voltage - 3 phase to neutral	(V, KV)
Current - 3 phases	(A,KA)
Maximum demand	(A,KA)
Active Power	(KW, MW)
Reactive Power	(KVAR, MVAR)
Active Energy	(KWH, MWH)
Reactive Energy	(KVARH, MVARH)
Power Factor	(Log or lead)
Frequency	(Hz)

Typical Applications

- Panel boards, switchboards, switchgear, MCCs
- Diesel Generator sets (4 quadrants calculation)
- UPS systems
- Stand alone display mode or as part of an energy monitoring system

PFC 10
Power Factor Controller

The PFC-10 is used to continuously control the capacitor bank, thereby improving the Power Factor of operating facilities. The PFC-10 also provides nine alarm indications such as, power-factor deviation from the target setting and Total Harmonic Distortion (THD) when exceeding the preset valve.

- Second generation digital design and technology
- True RMS voltage and current measurement
- Real Power Factor (COS Ø) through active/reactive power measurement
- Built to sustain high harmonic ratio
- Simple adjustment (four parameters) for standard operation
- Automatic c/k adjustment
- Unique display of historical power factor average
- Measures and displays THD with alarm capability
- Full RS485 communication with Modbus RTU protocol (Optional)
- Choice of operating voltage range in the same unit (115/230/400V)
- Automatic frequency adjustment 50/60Hz
- Minimum measured current at 0.5%

Control

- Programmable One or Four quadrant controls
- One quadrant operation includes automatic identification of current direction
- Four quadrant operation includes automatic measurement for regenerative power
- Automatic count-down algorithm for reduced time between steps
- Increased capacitor MTBF (a 20 sec. delay is applied to switched out capacitor steps, in auto mode)
- Automatic measurement allows fast step switching for immediate Power Factor improvement
- Immediate disconnection upon mains loss automatically reconnects the same steps upon mains restoration.
- Measured Parameters assist in fault detection (1PH instead of 3 PH etc.) P, Q, V, I.

Alarms

- Low PF for more than 10 minutes
- Negative PF for more than 10 seconds
- Over-current for more than 30 seconds
- THD alarm (Adjustable level)
- Continuous Internal Testing (alarm upon failed test)
- Capacitor steps will trip when:
  a. Voltage outage exceeds 2 seconds
  b. Current drops below threshold level for more than 2 seconds

Faults

- Continues to operate in alarm mode
- Automatic C/T polarity detection in one quadrant operation
- Four quadrant operation, phase sequence can be reversed instead of C/T polarity
- All faults (except Internal Trip) include auto reset upon fault removal

DGC-2000
Diesel Generator Control

The DGC-2000 is a third generation fully automatic microprocessor based controller designed for most types of diesel generators systems. The DGC-2000 incorporates 26 different trips, faults and alarms which may be individually Enabled or Disabled, thus, providing flexible adjustment of its settings. Auto reset feature allows resetting of the trips, faults or alarms after user preset time. Most of the described protection contains Level and Time Delay Adjustment, manually or through the RS 232/ RS 485 serial integrated bus.

Functions

- Complete diesel engine control such as: pre-heating, fuel valve, starter, air damper, etc.
- Separate Trip, Fault, Alarm and Horn relays
- Engine cool down
- Auto reset features
- Pause mode
- Serial communication with Modbus protocol
- Line/generator load switch transfer control
- Local and remote control
- Plug-in AC/DC relays Adapter
- Short circuit protected control relays
- Special circuitry allows functioning at battery voltage below 4VDC, thus allowing for voltage drop at starting
- Flexible field settings of all setting parameters
- Easy jumper-less settings of the discrete inputs (N/O, N/C, connected to + or –).
- Wrong polarity detection of discrete inputs connection.

Protection

- Over Cranking
- Low Oil Pressure
- Under Temperature
- Over Temperature
- Low Coolant Level
- Under/Over Speed
- Under/Over Voltage
- Under/Over Current
- Under/Over Power
- Gen. Over Temperature
- Under/Over Bat. Voltage
- Low Fuel Level
- Sensor Fault
- Charging Fault
- External Fault
- Diesel Maintenance
- Internal Fault

Monitoring (Actual Measurement)

- Mains Phase/Line Voltages
- Mains Frequency
- Generator Phase/Line Voltages
- Generator Line Currents.
- Generator Active Power
- Generator Reactive Power
- Generator Active Energy
- Generator Reactive Energy
- Generator Power Factor
- Generator Frequency (generator frequency, magnetic pick-up frequency and auxiliary alternator frequency)
- Coolant Temperature (discrete or analogue)
- Engine Oil Pressure (discrete or analogue)
- Fuel Level (discrete or analogue)
- Water Coolant Level (discrete or analogue).

Additional Products

Additional catalogues available from Solcon's product range

HRVS-DN
High Voltage Digital Soft-Starter
60-2700A, 1500-15000V

RVS-DN
Low Voltage Digital Soft-Starter
8-3000A, 230-1000V

RVS-AX / RVS-DX
Analogue & Digital soft-starter

SOLSTART PLUS
Analogue Soft Starter 31-170A,
with a built-in bypass

SOLSTART
Mininature soft-starter
For single & triple phase motors

SOLBRAKE
DC Injection brake

TPS
Thyristor Power Controller (Heaters)
Zero Crossing and Phase Control

IPNP-RMU
Remote Monitoring/Supervision Unit
Cellular, Internet, Satellite

EPT
Electronic Potential
Transformer 2300-36000V

SOLCON

誥鑫企業有限公司
ARITH COMPANY LTD.
地 址 : 台北市復興北路427巷30號
電 話 : (02)2717-5038
傳 真 : (02)2717-5039
e-mail: taipei@arith.com.tw
網 址 : http://www.arith.com.tw