

HPB Integrated Protection Relay

Description

The Ampcontrol HPB Integrated Protection Relay (6.6 kV, 11kV or 22 kV) is an intelligent protection relay based on microprocessor technology. The Relay has been specifically designed to operate with very high interference to the pilot conductor that occurs on cables in open cut mining operations. This is more prevalent on a non-symmetric position of the pilot and earth conductors.

The integrated relay provides the necessary functions required for protecting electrical outlets supplying draglines, shovels, drills etc. All of the protection functions are combined into a compact, plug-in unit, which can be easily changed out to minimise down time in the event of a problem with the relay.

The HPB Relay can provide machine communication through the use of an HPB Termination Unit (HTU-1) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the HTU-1 Termination Unit the relay parameters are automatically up loaded from a remote machine when a cable is inserted into a power outlet.

The relay can perform an automatic "H.V. Insulation" test on the cable prior to the closure of the main contactor. The results of the test are displayed on the HPB Display Module (HDM-1) and can be remotely monitored.

The HPB Relay has 5 digital inputs, which feed into a microprocessor unit. The microprocessor has been programmed to control three output relays. Relay MCR for the main contactor and Relay CBR for the circuit breaker. RL3 is used to control the supply to the Cable Connection Module enabling it to perform the Earth Fault Lockout test. All of the tripping logic and outlet control is performed by the microprocessor, so that only minimal external control is required.

Extensive information display and monitoring features are included to facilitate fault finding and system trending. This information can be read locally on the HPB Display Module (HDM-1) or remotely via a communication link.

Opto isolated outputs are available for connection to optional LED or Relay Modules to provide additional "run" and "trip" indications. The Ampcontrol Relay Output Module (ROU) enables these indications to be interfaced with a PLC. **See HPB User Manual 117829 for full details.**



HPB 6.6kV Version Shown

Protection Functions

- Earth leakage
- Earth Fault Lockout
- Earth Continuity
- Over-current/Overload
- Short Circuit
- Contactor Fail

Features

- Machine Communications
- Insulation Test on the cable prior to closure of the main contactor
- User friendly. Relay and Remote Termination Unit programmed from the Remote Display Module
- Microprocessor based
- Fail safe operation
- Resistor or Remote Termination Unit operation
- 120 Event Log
- Local or remote operation
- Remote communication via PLC link
- Plug-in for quick change out
- Nine Status messages to indicate what is required to energise the outlet.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.
- Relay & Digital Input Status to aid fault finding

Application

The HPB Integrated Protection Relay is normally installed in a mobile substation and provides protection for draglines, drills, shovels and other surface mining equipment connected to the sub station.

Before an outlet can be energised the following conditions must apply:

- a) No protection faults present
- b) Local stop input open, remote stop loop closed
- c) Local start input closed

Once these conditions are met a cable fault lock out test is performed automatically. The start button must remain closed during the test, which may take up to 25 seconds to complete due to the charging of the cable capacitance. If the result of this test is satisfactory the HPB Relay goes into the run mode and the MCR Relay picks up and closes the main contactor.

Specifications

Note: An 11kV system includes the HPB22kV relay.

Auxiliary Supply Volts:

HPB 6.6kV: 110 Vac \pm 20% >20 VA, 50 Hz \pm 2 Hz
HPB 22 kV: 48 Vdc \pm 20% >40W

Earth Leakage Protection:

HPB6.6kV: Trip setting 200 mA to 1000 mA in 100 mA increments
HPB 22 kV: Trip setting 500 mA to 2500 mA in 250 mA increments
Time Delay: Instantaneous, <80 ms, and 150 ms – 470 ms (in 40 ms increments).

Earth Continuity Protection:

Trip Setting: 50 Ω , 75 Ω , and 100 Ω
Shunt Leakage Trip if < 200 Ω (Resistor Mode)
Operating Time: 300 ms, 400 ms, 500 ms, 1.0 s, 1.2 s, 1.5 s and 2 s

Earth Fault Lockout Protection:

HPB 6.6kV: Selectable at 2, 5, 10, 20 and 50 Meg ohm and off
HPB 22 kV: Selectable at 15, 20, 30, 50 and 100 Meg ohm and off
Test time is selectable at 10, 15, 20 and 25 seconds

Over-current Protection:

Current Range: HPB6.6kV: 7.5 to 464 Amps (60 to 116 Amps in 4 Amp increments times multiplier)
HPB 22kV: 15 to 928 Amps (60 to 116 Amps in 4 Amp increments times multiplier)
Current Multiplier: HPB 6.6kV: 1/8, 1/4, 1/2, 1, 2, 4 times
HPB 22kV: 1/4, 1/2, 1, 2, 4, 8 times
Current Balance:
Trip Settings: 5%, 10%, 20%, 50% and off

Short Circuit Protection:

Trip Setting: 3.0 to 10.0 times in 0.5 increments (times full load current)
Trip Time (ms): 20, 40, 60, 80, 100, 120, 160

Back EMF Timer:

Trip Delay Settings: 2, 5, 10, 15, 20, 30, 35, and 40 Seconds

Machine Numbers:

Can be allocated from 1 to 40

Under voltage Protection:

Selectable from 30% to 80% (in 10% increments), or disabled.
Trip Delay 800 ms

Serial Communications:

For information on data format and hardware see DNET-IP2 Serial Communication System User Manual 118626.

Relay Contacts:

MCR, CBR 1 N/O 5 A/190 Vac 100 VA maximum
1 C/O 5 A/190 Vac 100 VA maximum
RL3 1 N/O 5 A/190 Vac 100 VA maximum

Equipment List

144069 - HPB 6.6kV Integrated Protection Relay
142842 - HPB 22kV Integrated Protection Relay
118732 - HTU-1 Termination Unit
142848 - HPB Base
142845 - HPB Base – 48 V
118542 - HDM Remote Display Module Flush Mount
117648 - 6.6 kV Cable Connection Module
143369 - 22 kV Cable Connection Kit
144371 - 11 kV Cable Connection Kit
101503 - IPA/IPB Relay/LED Output Module
117829 - HPB User Manual
143911 - Power Supply 48V 2.5A 120W DIN Mount

AMPCONTROL ELECTRONICS

Ampcontrol CSM Pty Ltd ABN 35 000 770 141
7 Billbrooke Close CAMERON PARK NSW 2285
Phone: (02) 4903 4800
Fax: (02) 4903 4888
E-mail: electronicsorders@ampcontrolgroup.com
Web site: www.ampcontrolgroup.com

