

IPD-11kV Integrated Protection Relay

IEC Ex ITA 07.0018X

1. Description

The Ampcontrol IPD-11kV Integrated Protection Relay (Version IPD-11kV V1.0) is an intelligent protection relay based on microprocessor technology.

The integrated relay provides the necessary functions required for protecting electrical outlets supplying underground mining machinery. 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 IPD-11kV Relay can provide machine communication through the use of a Remote Termination Unit (RTU-D) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the RTU-D Remote Termination Unit the relay parameters are automatically up loaded from a remote machine when a cable is inserted into a power outlet.

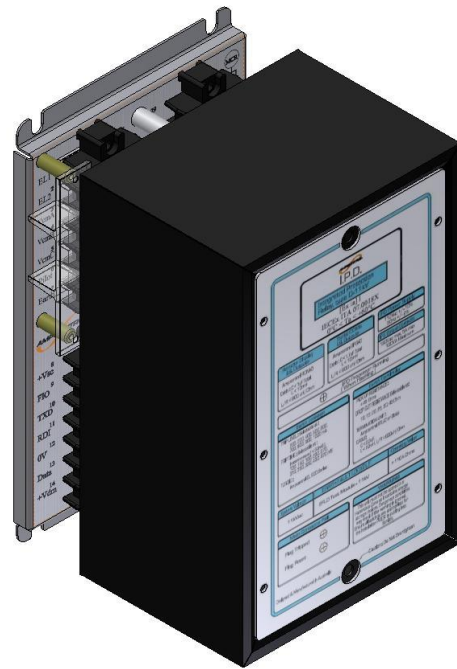
The earth fault lockout function tests the resistance of the 3 phase lines to earth by applying an intrinsically safe signal prior to the closure of the main contactor in accordance with AS/NZS2081.4 2002. The test is initiated once all starting conditions are met. If the resistance is above the preset level then an automatic high voltage DC "Insulation Test" to earth can be carried out. If the result of the Insulation Test is above the preset resistance level, the IPD-11kV's MCR relay energises, which in turn closes the main contactor. A manual "Insulation Test" is provided as a maintenance/fault finding tool. (When this test is performed the MCR relay does not close at completion of a healthy test).

The Insulation Test allows cable insulation levels to be trended as an aid to preventative maintenance.

In accordance with AS2081.3 2002 the IPD-11kV continuously monitors the Earth Leakage toroid. If the connection is lost the Relay will trip.

The IPD-11kV Relay has 5 Digital inputs, which feed into a microprocessor unit. The microprocessor has been programmed to control four output relays. Relay MCR for the main contactor and Relay CBR for the circuit breaker. Relay RL3 is not used in the IPD-11kV. Relay RL4, when closed, applies 110V to the HV Test Module for the Insulation Test. All of the tripping logic and outlet control is performed by the microprocessor, so that virtually no 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 IPD Remote Display Module (RDM-D) or remotely via a communication link.



Opto Isolated Outputs are available for connection to PLC's or an optional Relay Output Modules (ROU).

See IPD-11kV User Manual 141559 for full details.

2. Protection Functions

- Earth Leakage
- Earth Fault Lockout
- Earth Continuity
- Overcurrent / Overload
- Short Circuit
- Contactor Fail

3. Features

- Automatic and Manual High Voltage Insulation Test
- Machine Communications
- User friendly.
- Relay and Remote Termination Unit programmed from the Remote Display Module
- 28 Status messages to indicate what is required to energise the outlet.
- Microprocessor based
- Fail safe operation
- Diode or Remote Termination Unit operation
- IS Remote Display Module - Ex ia
- 120 Event Log
- Local or remote operation
- Sequencing and remote communication via PLC link
- Plug-in for quick change out

- Fan Interlocking provided on any outlet
- Thermal modelling
- Fully functional for a period of two (2) seconds during extreme control power dip or power loss.
- Relay & Digital Input Status to aid fault finding
- Continuous monitoring of the Earth Leakage toroid

4. Application

The IPD-11kV Integrated Protection Relay is certified for Group I Hazardous areas. For the protection of mining equipment in hazardous areas the relay is installed in a flameproof enclosure with the Remote Display Module being installed outside the enclosure. This is possible because of its intrinsically safe design.

4.1 Sequence Control

Through machine communication, the identity of the machine can be transferred via serial communications to a PLC. This allows the PLC to arrange sequencing particularly in longwall installations.

4.2 Fan Interlocking

A fan interlocking facility can be selected to prevent outlets from being energised until a mine ventilation fan is operational. This facility eliminates the need for dedicated outlets.

4.3 Remote Data Communications

The IPD-11KV Integrated Protection Relay has the facility for connecting remote monitoring equipment. This can be in the form of peripheral equipment such as PLC's.

For PLC applications each integrated protection relay is connected to a Serial Interface Module (IPSI-D), which has its output multi-drop connected to a DNET-IP2 Protocol Converter. The Protocol Converter provides the communications link to a PLC.

The Ampcontrol DNET-IP2 Serial Communication System transfers data and commands between the Host System and the modules using RS232, RS422 and RS485 protocols.

(See User Manual 141559 for further details)

5. Specifications

Auxiliary Supply Volts:

110vac \pm 10% 10VA, 50Hz \pm 2Hz

Earth Leakage Protection:

Trip setting 500-2500mA in 250mA increments
Time Delay - Instantaneous (<50mS), 100mS then 150mS - 470mS in 40mS increments

Earth Continuity Protection:

Trip Setting 10, 15, 20, 25, 30 and 45 Ω
Reset if resistance is < Trip Setting
Trip if resistance is > Trip Setting
Shunt Leakage Trip if < 1500 Ω
Operating Times - 80, 120, 160, 200, 300, 400 and 500mS
Pilot cable parameters - C < 0.3uF, L < 10mH, L/R < 600uH/ Ω .

Earth Fault Lockout Protection:

IS Test

Lockout if resistance is: < 110k Ω

Insulation Test

Lockout resistance is selectable at 15, 20, 25, 30, 35, 50, 80 and 100M Ω

Test time = 4 seconds

Overcurrent / Overload Protection:

Current Range: 7.5 to 464 Amps (60 to 116 A in 4A increments x multiplier)

Current Multiplier: 1/8, 1/4, 1/2, 1, 2, 4 times

Time Multiplier: 0.005, 0.01, 0.015, 0.02, 0.03, 0.04, 0.05, 0.075, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 times

Cooling Multiplier: 0.2, 0.3, 0.4, 0.5, 0.8, 1, 2, 5, 10, 20, 50 times

Current Balance:

Trip Settings: 5%, 10%, 20%, 50% and off

Short Circuit Protection:

Trip Setting: 3 to 10 times in 0.5 increments (times full load)

Trip Time: 20, 40, 60, 80, 100, 120, 160mS

Back EMF Timer:

Trip Delay Settings: 2, 5, 10 and 20 Seconds

Machine Numbers: Can be allocated from 1 to 40

Fan Current

Threshold Level: 32% to 96% in 8% increments (% of full load current)

Undervoltage Protection:

Selectable from 20% to 80% in 10% increments

Trip Delay 800mS

Serial Communications:

For information on Protocol and hardware requirements see DNET-IP2 Serial Communication System User Manual.

Relay Contacts:

MCR, CBR: 1 x N/O 5A/190VAC 100VA maximum, & 1 x C/O 5A/190VAC 100VA maximum

RL3: Not Used

RL4: 1 x N/O 5A/190VAC 100VA maximum

6. Equipment List

112464	Integrated Protection Relay IPD-11kV
112463	IPD-11kV Base Plate
112444	EFLO Test Module 11kV
112443	HV Test Module 11kV
141559	IPD-11kV User Manual