IPC Integrated Protection Relay

ANZ Ex 08.4071X

1. Description

The Ampcontrol IPC Integrated Protection Relay is an intelligent protection relay based on microprocessor technology.

The integrated relay provides the necessary functions required for protecting electrical outlets supplying mobile machines powered by reeling or trailing cables. 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 IPC Relay can provide machine communication through the use of a Remote Termination Unit (RTU) connected between the pilot and earth at the machine end of the trailing cable. Through the use of the RTU 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 AS2081.4 1988. 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 of the cable can be carried out. If the result of the Insulation Test is above the preset resistance level, the IPC’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.

The IPC 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. Relay RL3 can be turned off or configured to follow the Fan Interlock Drive output of the IPC Relay. 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 IPC Remote Display Module (RDM-1K) 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 IPC User Manual 119051 for full details

2. Protection Functions

- Earth Leakage
- Earth Fault Lockout
- Earth Continuity
- Over-current /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

4. Application

The IPC Integrated Protection Relay is Mines Department Approved for use in mining operations. 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, and has a built in delay to cope with generator supply.

4.3 Remote Data Communications

The IPC 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), which has its output multi-drop connected to a DNET-IP2 Protocol Converter. The Protocol Converter provides the communications link to a PLC (See User Manual 118626 for further details).

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

5. Specifications

Auxiliary Supply Volts:

110vac ± 10% 10VA, 50Hz ± 2Hz

Earth Leakage Protection:

Trip setting 100-500mA in 50mA increments
Time Delay - Instantaneous (<80mS), 150mS - 470mS in 40mS increments

Earth Continuity Protection:

Reset if resistance is <45 ohms
Trip if resistance is > 45 ohms
Shunt Leakage Trip if <1500 ohms
Operating Time 80, 120, 160, 200, 300, 400, 500mS
Pilot cable parameters: C <0.3uF, L <10mH, L/R<600uH/Ω.

Earth Fault Lockout Protection:

IS Test

Lockout if resistance is:	415V < 4.15k ohms
	1000V < 10k ohms
	3.3kV < 33k ohms

Insulation Test

Lockout resistance is selectable at 0.1, 0.2, 0.5, 1, 2, 5, 10, and 15 Meg Ohm

Over-current / 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: 0.05, 0.075, 0.1, 0.15, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 time's

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)

Under-voltage 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, RL3, RL4

1 N/O 5A/190VAC 100VA max
1 C/O 5A/190VAC 100VA max

6. Equipment List

110050	Integrated Protection Relay IPC1V04
110145	Module RTUD 1V01 Remote Terminal Unit
101182	IPC Base Plate
101500	Module IPC Remote Display RDM-1K
119055	Module CCMC-415V Cable Connection.
101490	Module CCMC-1000V Cable Connection
101491	Module CCMC-3.3kV Cable Connection
101487	Module CCMA-110V Cable Connection
101503	Module IPA/IPB Relay/LED Output
101526	Fuse Holder IPB Pilot Protection
117139	Fuse 3A/660V Pilot Protection (Box 10)
119051	Manual User IPC1 V04
101500	Module IPC RDM c/w KEYPAD
101649	Toroid EL500/60/100T 500mA 60mm ID
101650	Toroid EL500/85/100T 500mA 85mm ID
101654	Toroid EL500/112/100T 500mA 112mm ID
101272	Current TXF 100/1 45mmID OL1 T/S IPA/B
101826	Module EFTM 415/1kV IPC Earth/Fault Test

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