FEATURES

- The full range of D-PRO air circuit breaker have been type tested by ASTA in accordance with the international standards IEC157-1, BS475, AS1930, IEC60947-2 and BSEN60947-2.

- Five frame sizes in withdrawable, manual or electrically operator with the current ratings from 1000A to 6000A. There are:
  1). Frame 1 : 3-pole version from 1000A - 2000A, 50KA/440Vac
  2). Frame 2 : 3-pole version from 1000A - 3200A, 65KA/440Vac
  3). Frame 3 : 4-pole version from 1000A - 3200A, 65KA/440Vac
  4). Frame 4 : 3-pole version from 3200A - 4000A, 80KA/440Vac and 5000A - 6000A, 63KA/440Vac
  5). Frame 5 : 4-pole version from 3200A - 4000A, 80KA/440Vac and 5000A - 6000A, 63KA/440Vac

- Three frame sizes in fixed construction with the current ratings from 1000A up to 3000A. There are:
  1). Frame 1F : 3-pole version from 1000A - 2000A, 50KA/440Vac
  2). Frame 2F : 3-pole version from 1000A - 3000A, 65KA/440Vac
  3). Frame 3F : 4-pole version from 1000A - 3000A, 65KA/440Vac

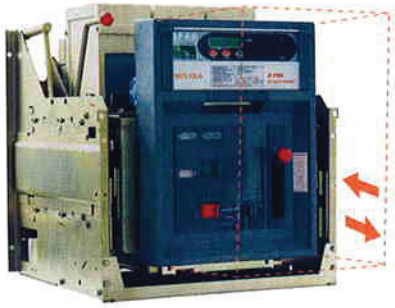
- Suitable for distribution, feeder protection, bus-tie connection, generator protection and disconnector thanks to the outstanding and reliable construction. In addition, a sophisticated protective relay engineered with auto-polarity of CT connection.

- Rated currents are based on IP32 ventilated environment which offers a superior overload capability and suitable to any stringent industrial ambient conditions.

- Variety of options available to meet the customer's demand.

CHARACTERISTICS

Withdrawable Version



Fixed Version

DPRO SERIES - WITHDRAWABLE TYPE

Conform to IEC 60947-2 Standards

Model	Frame	Pole	Rated Voltage	Insulation voltage	Rated current (IP32)	HZ	Icu (KA)	Ics (KA)	Icw 1S (KA)	Icw 3S (KA)	Height (mm)	Width (mm)	Depth (mm)	Weight (Kgs)
DPRO 2H103 NEW	1	3	415	690	1000	50/60	50	50	50	43.3	500	380	480	100
DPRO 2H123 NEW	1	3	415	690	1250	50/60	50	50	50	43.3	500	380	480	100
DPRO 2H163 NEW	1	3	415	690	1600	50/60	50	50	50	43.3	500	380	480	100
DPRO 2H203	1	3	415	690	2000	50/60	50	50	50	43.3	500	380	480	100
DPRO 103HX	2	3	415	690	1000	50/60	65	65	65	50	500	488	533	113
DPRO 123HX	2	3	415	690	1250	50/60	65	65	65	50	500	488	533	113
DPRO 163HX	2	3	415	690	1600	50/60	65	65	65	50	500	488	533	113
DPRO 203HX	2	3	415	690	2000	50/60	65	65	65	50	500	488	533	113
DPRO 253HX	2	3	415	690	2500	50/60	65	65	65	50	500	488	533	113
DPRO 323HX	2	3	415	690	3200	50/60	65	65	65	50	500	488	533	150
DPRO 104HX	3	4	415	690	1000	50/60	65	65	65	50	500	602	533	130
DPRO 124HX	3	4	415	690	1250	50/60	65	65	65	50	500	602	533	130
DPRO 164HX	3	4	415	690	1600	50/60	65	65	65	50	500	602	533	130
DPRO 204HX	3	4	415	690	2000	50/60	65	65	65	50	500	602	533	130
DPRO 254HX	3	4	415	690	2500	50/60	65	65	65	50	500	602	533	130
DPRO 324HX	3	4	415	690	3200	50/60	65	65	65	50	500	602	533	180

Conform to IEC 157-1 Standards

Model	Frame	Pole	Rated Voltage	Insulation voltage	Rated current (IP32)	HZ	Icu (KA)	Ics (KA)	Icw 1S (KA)	Icw 3S (KA)	Height (mm)	Width (mm)	Depth (mm)	Weight (Kgs)
DPRO 2H103	1	3	440	660	1000	50/60	-	50	50	43.3	500	380	480	100
DPRO 2H123	1	3	440	660	1250	50/60	-	50	50	43.3	500	380	480	100
DPRO 2H163	1	3	440	660	1600	50/60	-	50	50	43.3	500	380	480	100
DPRO 103	2	3	440	660	1000	50/60	65	50	-	50	500	488	533	106
DPRO 123	2	3	440	660	1250	50/60	65	50	-	50	500	488	533	106
DPRO 163	2	3	440	660	1600	50/60	65	50	-	50	500	488	533	106
DPRO 203	2	3	440	660	2000	50/60	65	50	-	50	500	488	533	106
DPRO 253	2	3	440	660	2500	50/60	65	50	-	50	500	488	533	113
DPRO 104	3	4	440	660	1000	50/60	65	50	-	50	500	602	533	110
DPRO 124	3	4	440	660	1250	50/60	65	50	-	50	500	602	533	110
DPRO 164	3	4	440	660	1600	50/60	65	50	-	50	500	602	533	110
DPRO 204	3	4	440	660	2000	50/60	65	50	-	50	500	602	533	110
DPRO 254	3	4	440	660	2500	50/60	65	50	-	50	500	602	533	120
DPRO 324	3	4	440	660	3200	50/60	-	50	-	50	500	602	533	160
DPRO 323	4	6	440	660	3200	50/60	-	80	-	80	500	820	533	190
DPRO 403	4	6	440	660	4000	50/60	-	80	-	80	500	820	533	190
DPRO 503	4	6	440	660	5000	50/60	-	63	63	50	500	820	533	280
DPRO 603	4	6	440	660	6000	50/60	-	63	63	50	500	820	533	280
DPRO 404HX	5	7	440	660	4000	50/60	-	63	63	-	500	928	533	225
DPRO 504	5	7	440	660	5000	50/60	-	63	63	-	500	928	533	330
DPRO 604	5	7	440	660	6000	50/60	-	63	63	-	500	928	533	330

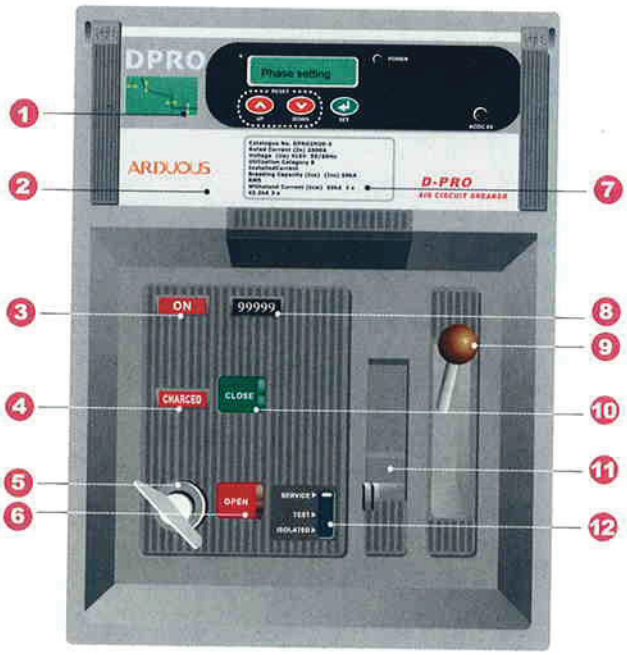
DPRO SERIES - FIXED TYPE

Conform to IEC 157-1 Standards

Model	Frame	Pole	Rated Voltage	Insulation voltage	Rated current (IP32)	HZ	P1 (KA)	P2 (KA)	Icw 1S (KA)	Icw 3S (KA)	Height (mm)	Width (mm)	Depth (mm)	Weight (Kgs)
DPRO 2H103F	1F	3	440	660	1000	50/60	-	50	50	43.3	597	326	500	70
DPRO 2H123F	1F	3	440	660	1250	50/60	-	50	50	43.3	597	326	500	70
DPRO 2H163F	1F	3	440	660	1600	50/60	-	50	50	43.3	597	326	500	70
DPRO 2H203F	1F	3	440	660	2000	50/60	-	50	50	43.3	597	326	500	70
DPRO 103HFX	2F	3	415	660	1000	50/60	-	63	63	50	597	404	518	80
DPRO 123HXF	2F	3	415	660	1250	50/60	-	63	63	50	597	404	518	80
DPRO 163HXF	2F	3	415	660	1600	50/60	-	63	63	50	597	404	518	80
DPRO 203HFX	2F	3	415	660	2000	50/60	-	63	63	50	597	404	518	80
DPRO 253HXF	2F	3	415	660	2500	50/60	-	63	63	50	597	404	518	80
DPRO 303HXF	2F	3	415	660	3000	50/60	-	63	63	50	597	404	518	84
DPRO 104F	3F	4	440	660	1000	50/60	65	50	-	50	597	518	518	90
DPRO 124F	3F	4	440	660	1250	50/60	65	50	-	50	597	518	518	90
DPRO 164F	3F	4	440	660	1600	50/60	65	50	-	50	597	518	518	90
DPRO 204F	3F	4	440	660	2000	50/60	65	50	-	50	597	518	518	90
DPRO 254F	3F	4	440	660	2500	50/60	65	50	-	50	597	518	518	90
DPRO 304F	3F	4	440	660	3000	50/60	65	50	-	50	597	518	518	95

FRONT ESCUTCHEON

1. Protective relay
2. Cover
3. Status indicator
4. Spring charge indicator
5. Key lock (option)
6. Open button (padlockable)
7. Rating plate
8. Counter
9. Charge handle
10. Close button (padlockable)
11. Racking handle shutter (padlockable)
12. Position indicator



OPTIONS

NO.	DESCRIPTIONS	NO.	DESCRIPTIONS
DP11	Motor Charge with Shunt Trip and Shunt Close	DP64	Position Switch 3a 3b
		DP65	Position Switch 6a 6b
DP12	Shunt Trip and Shunt Close	DP66	Door Interlock - Right Hand
DP13	Shunt Trip only	DP67	Door Interlock - Left Hand
DP14	Shunt Close only	DP71	Mechanical Interlock 2-way
DP21	Inst. U/V 240V AC (or 220V)	DP73	Mechanical Interlock 3-way (2 on ,1 off)
DP22	Inst. U/V 415V AC (or 380V)		
DP23	Inst. U/V 480V AC	DP74	Mechanical Interlock 3-way (1 on ,2 off)
DP24	Inst. U/V 110V AC		
DP28	Inst. U/V 50VDC	DP81	Key Interlock - with key
DP25	Spring Charge Indicator	DP82	Key Interlock - less key
DP26	2nd Shunt Trip Coils	DP86	6300/1A External CT
DP42	DPRO-A Relay with O/C and E/F	DP87	5000/1A External CT
DP43	DPRO-B Relay with O/C, E/F and DUV	DP88	6000/1A External CT
DP51	Auto Shutters for DPRO 2H	DP89	1000/1A External CT
DP52	Auto Shutters for DPRO 323HX	DP90	1250/1A External CT
DP53	Auto Shutters for DPRO 103 - 253	DP91	1600/1A External CT
DP54	Auto Shutters for DPRO 104 - 254	DP92	2000/1A External CT
DP55	Auto Shutters for DPRO 323 - 403	DP93	2500/1A External CT
DP56	Auto Shutters for DPRO 503 - 603	DP94	3200/1A External CT
DP57	Auto Shutters for DPRO 324	DP95	4000/1A External CT
DP58	Auto Shutters for DPRO 504 - 604	DP96	3000/1A External CT
DP59	Auto Shutters for DPRO 404HX	DP97	DPRO2H 1000/1A External CT
DP61	Auxiliary Switch 2a 2b	DP98	DPRO2H 1250/1A External CT
DP62	Auxiliary Switch 5a 5b	DP99	DPRO2H 1600/1A External CT
DP63	Auxiliary Switch 7a 7b		

- **Voltage range of electrical operation:**

  AC: 110V , 220V , 240V , 50/60HZ

  DC: 20V , 24V , 32V , 48V , 110V

  others on request

- **Abbreviations:**

  O/C: Over Current

  E/F: Earth Fault

  DUV: Delayed Under Voltage

  U/V: Under Voltage

  C T : Current Transformer

INTRODUCTION OF DPRO SERIES INTELLIGENT RELAY

USER INTERFACE

1 External supply 6V
2 Backlight LCD
3 LED status indicator
4 Navigation buttons

LCD Display

The DPRO is available in both an English version and a dual language (English & Chinese) version. An internal backlight LED for the LCD to provide for visibility in poor light conditions. The backlight LED can be configuring to remain on continually or to automatically turn off after a predefined timeout interval.

With the display menu the user can select which parameters are written to the LCD. In addition an auto scroll mode can be enable which will toggle through the list of selected parameters at a rate defined by the user.

The Three Buttons

Navigation through the menu structure is achieved with the use of the three buttons on the front panel.

Power LED

This LED has a dual function. Its normal function is to indicate the power is connected to the electronics. While the second function is to draw attention to itself by flashing when the relay is in pickup mode or has tripped.

STANDARDS OF TESTING

EMC Standards

The DPRO conforms to the below EMC standards.

EC 61000-4-2 : Electrostatic Discharge Immunity
EC 61000-4-3 : Electrostatic Field Immunity
EC 61000-4-5 : Surge Immunity
CISP 22-1997 : High Frequency Radiated Emissions

Operating Environment

Temperature : -10℃ to 70℃
Humidity : RH 90%, non-condensation

OVER CURRENT PROTECTION

Curve Selection

The DPRO provides for a variety of over current protection configurations. Ranging from the traditional long-time and short-time curves to the IEC and IEEE curves to the advanced custom curves. The custom curves are designed within the software package RelayTalk, and allow the designer to trace pointer over a standard time verses current sheet. Below is a list of the available protection curves:

- DPRO Extremely Inverse
- DPRO Ultra Inverse
- DPRO Ultra Inverse Extended
- DPRO Definite Time 1s
- IEC Inverse
- IEC Very Inverse
- IEC Extremely Inverse
- IEEE Inverse
- IEEE Very Inverse
- IEEE Extremely Inverse
- Piecewise Log
- Flash Curve A : programmed by factory
- Flash Curve B : programmed by factory
- Flash Curve C : programmed by factory
- EE Curve A : designed within the RelayTalk application
- EE Curve B : designed within the RelayTalk application
- Motor Start Curve : specially engineered for large motor starting protection
- Universal Overload Curve : built-in protection at 12.5 x Ir / 1s for protection ceiling of the overload

CHARACTERISTICS & EQUATIONS

DPRO Inverse Curves

$T= 60xM/(I^2-1)$	DPRO Extremely Inverse
$T= 40xM/(I-1)^{3.2}$	DPRO Ultra Inverse
$T= 300xM/(I-1)^{2.8}$	DPRO Ultra Inverse Extended
$T= 1xM$	DPRO Definite Time 1s

IEC Inverse Curves

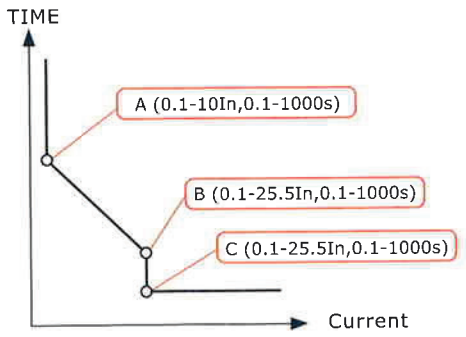
$T= 0.14xM/(I^{0.02}-1)$	IEC Inverse
$T= 13.5xM/(I-1)$	IEC Very Inverse
$T= 80xM/(I^2-1)$	IEC Extremely Inverse

IEEE Inverse Curves

$T= \{[0.05/(I^{0.02}-1)]+0.13\}xM$	IEEE Inverse
$T= \{[19.5/(I^2-1)]+0.5\}xM$	IEEE Very Inverse
$T= \{[28/(I^2-1)]+0.13\}xM$	IEEE Extremely Inverse

Where T=Trip time in seconds
M=Time Multiplier
I=Current / Pickup Setting

Piecewise Log



Piecewise Log

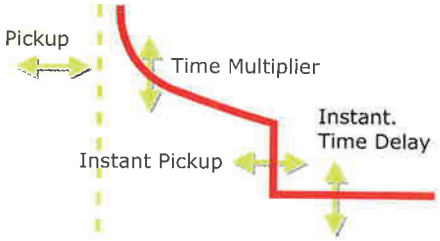
Overload Protection

Each curve can be turned to a Pickup setting (range from 25% to 125% in 1% increments) and Time Multiplier setting (range from 0.05 to 1.50 in 0.1 increments).

Instantaneous Protection

The instantaneous protection can be enabled separately with the Setting ranging from 2.0 to 16.0 x Ir in 0.1 increments.

Further to the independent instantaneous protection a time delay can be added to prevent nuisance tripping. This time can be adjusted from 0ms to 300ms in 20ms increments.



MEASUREMENT ACCURACY

Current Measurement

The DPRO performs an analog to digital conversion on the input current signal with a resolution of 10-bits. This provides for an accuracy of ±2% over the range of 0.2~12.5 x In.

Trip Time

The maximum expected error in the trip time over the entire range of overload current is ±10%, with a minimum trip time of 20ms.

Voltage Measurement

The DPRO performs an analog to digital conversion on the input voltage signal with a resolution of 10-bits. This provides for an accuracy of ±2% over the range.

TRUE RMS MEASUREMENT

Current Sampling

The DPRO provides from true RMS sampling at 1kHz for all phases, and the earth current as defined by the equation. This enables the harmonic content of waveforms to be calculated to the 9th harmonic. Further more to this analysis the total harmonic distortion (THD) is to calculate to the 9th term. This value is updated every 20ms and applied to the selected overload curve.

Voltage Sampling

When a DPRO-B relay is installed, the voltage waveform is also sampled at 1 kHz with a true RMS measurement taken. This value is then communicated to the DPRO-A to allow network analysis to be performed.

RELAY CONFIGURATION

Relay Rating

Two relays, which share a common terminal, have been provided with the DPRO. They have a current rating of 8A at 250V. To suppress undesirable arcing varistors are connected across the output contacts of each relay.

Event Control

Each Relay can be independently configured, by the software, to actuate on the following events:

- Relay has tripped
- Relay is in pickup mode
- If a system fault has been detected, these are classified as:
  - Watchdog reset
  - PTU disconnected
  - Programme memory corruption
  - EEPROM memory corruption

Trigger Control

In addition to event control of the relay, the DPRO can be configured to.

LEADING MICROCONTROLLER TECHNOLOGY

Flashing Memory

The DPRO has been designed with one of the most advanced 8-bit microcontroller. With an embedded flash memory, the DPRO is able to hold a significant array of menu options. Thus allowing the user to configure the DPRO for a variety of ways.

EEPROM Memory

In addition to the flash memory, also has an embedded EEPROM. This provides for permanent storage of configuration and settings, ensuring that the protection profiles are not missing when the power is off.

DPRO can also store two custom curves which can be download into the DPRO on-site.

FAULT LOG

Recording Fault Events

The DPRO provides for an extensive fault log for the last 20 events. Including within the fault category are trip unit disconnection, watchdog resets and general system faults internal to the microcontroller. When a fault (or event) is detected an unique fault code is written to the EEPROM which defines the fault. The DPRO provides a brief description of the fault as well as the time and date of when the fault occurred.

FAULT SIMULATION

Software Fault Simulation

The user can check the integrity of the DPRO by performing software fault simulations. This involves selecting the phase, fault current, simulation time and whether or not the ACB should trip.

The simulation begins with the analog to digital conversion of the sampled current waveform being replaced with an equivalent result from the memory. From this point onwards the code is executed as normal. This tripping time is measured from separate real-time clock thereby providing an independent measurement of time for the sampling rate of 1 kHz.

Once the simulation has been completed the DPRO is automatically reset and taken out of fault simulation mode within ten seconds of tripping.

UNDER VOLTAGE PROTECTION: DPRO-B

Dropout Voltage

The dropout setting is given as a percentage of the nominal voltage and can be set between 50% to 95%.

Time Delay

In the event of the DPRO entering an under voltage condition an internal clock is triggered with counts down to a predefined delay time. This delay time can be set from 100ms to 10 seconds.

D-PRO AIR CIRCUIT BREAKER WIRING DIAGRAM