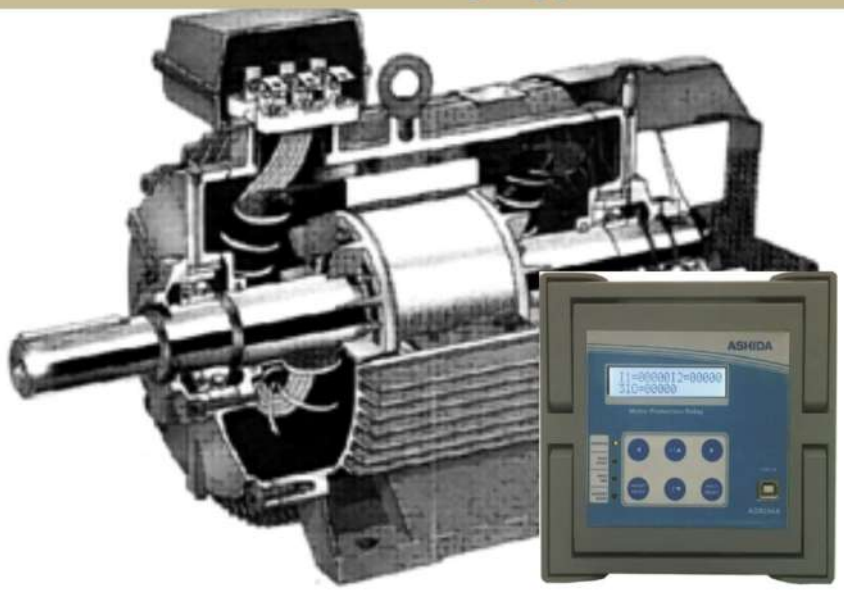
Motor Protection Relay Type ADR244A



Introduction:

ASHIDA has designed economical & reliable Multifunction ADR244A Draw-out/Non draw-out Protection & Control System. The simple and compact construction of Aditya series, ADR244A relay provides integrated Protection, Control and Monitoring functions for Induction motors. Draw-out/Non draw-out versions are available based on ordering information.

Functional Overview:

Key Protection & Control Functions:

- Draw-out / Non draw-out cabinet
- Two Independent Settings Groups
- Thermal Overload Protection (49)
- Non Directional Phase & Ground Over Current Function (50/51/51N/50N)
- Two Independent Stages for Non Directional Phase Over Current Protection
- Two Stages of Non Directional Ground Over Current Protection

- Internally Derived (3I0>) / Externally measured Ground Over Current Protection
- Inverse time Over Current Protection (IEC & IEEE curves) + User define curve
- Harmonic blocking and unblocking feature.
- Cold load pick up.
- High Impedance Restricted Earth Fault Protection (64R).
- Inverse & Definite time Negative Sequence Over Current Protection (46)
- Broken Conductor Protection (46BC)
- Phase reversal Protection (47)
- Locked rotor / Motor stall Protection (50LR)
- Breaker Failure detection (50BF)
- Prolong start Protection (48)
- Too many starts / Number of starts function (66)
- Emergency start up
- Trip circuit supervision function
- Programmable Inputs & Outputs
- CB Close / Trip from HMI
- Target LEDs for indication with dual colours (4 nos.)
- Self Supervision of relay
- Metering function
- Disturbance Recording (10 nos.)
- Event Recording (512 nos.)
- Fault Recording on HMI display (10 nos.)
- Non-Volatile memory
- Fully communicable with IEC standard open protocol IEC60870-5-103
- Separate communication port for SCADA Communication
- PC front port communication for convenient relay settings
- User friendly local operation with key pad
- Liquid crystal display (16x2) with backlight
- Password Protection.

Software Support:

- Setting Editor.
- Programmable scheme logic Editor.
- Settings upload / download.
- Offline Settings Editor.
- Online Measurement.
- Disturbance analysis.

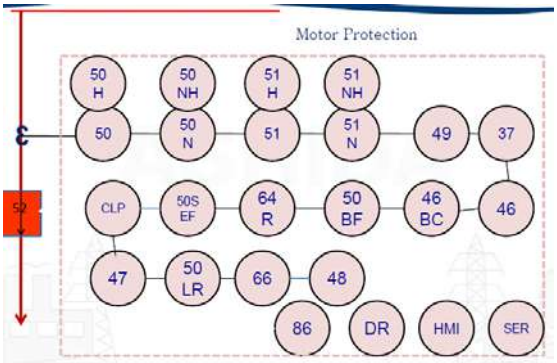
Applications:

ADR244A numerical multifunction relay designed for induction motor protection/feeder protection applications. Relay designed with fast and selective tripping ensures the stability and availability of electrical power system.

ADR244A relay apply for protection, control & monitoring of motor/radial and ring main feeder to achieve sensitivity and selectivity on phase, ground faults and unbalance load conditions.

ANSI Code	Description
CLP	Cold load pick up
37	Under current Protection
46	Negative Phase Sequence Protection
46BC	Broken Conductor Detection
47	Phase Reversal Detection
48	Prolong start
49	Thermal overload Protection
50	Instantaneous/Definite Time Phase Over current Protection
51	Inverse Time Phase Over current Protection
50N	Instantaneous/Definite Time Ground Over current Protection
50LR	Locked rotor/Motor stall Protection
51N	Inverse Time Ground Over current Protection
64G	High Impedance Restricted Earth Fault Protection
66	Number of starts
50BF	Breaker Failure
86	Lockout (Trip command)

The functional overview of ADR244A:



Protection functions Overview

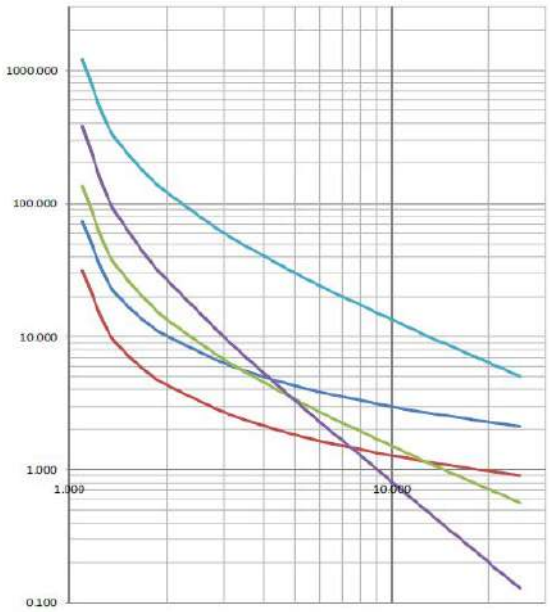
Non Directional Over Current Protection (50/50N/51/51N):

The core functionality of ADR244A relay is equipped with multi function feeder protection. The relay provides Non Directional phase and ground over current protection with multiple settings (Two stages for phase over current and ground over current) for various power system applications and wide range of protection settings. The function is equipped with digital filter algorithms, providing the rejection of higher harmonics & DC offset. Selectable IEC / IEEE inverse time curves & user define curve with non directional over current protection will be providing greater selectivity, flexibility and sensitivity to users for better relay co-ordinations.

ADR244A relay provides inverse time over current characteristic for phase and ground over current elements. Each stage of phase and ground over current elements are independently settable with inverse time or definite time characteristic. The following tripping characteristics are available;

$$t = T * \left(\frac{K}{\left(\frac{I}{I_s} \right)^{\alpha} - 1} + L \right)$$

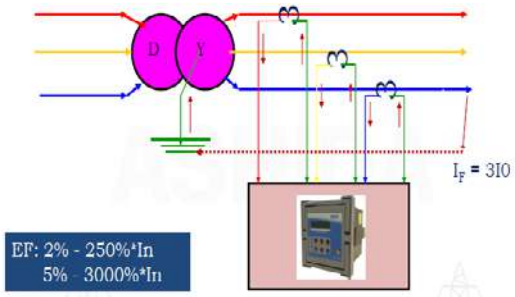
Description	Standard	K	α	L
IEC S Inverse	IEC	0.14	0.02	0
S Inverse 1.3 Sec	---	0.06	0.02	0
IEC V Inverse	IEC	13.5	1	0
IEC E Inverse	IEC	80	2	0
UK LT Inverse	UK	120	1	0
IEEE M Inverse	IEEE	0.0515	0.02	0.114
IEEE V Inverse	IEEE	19.61	2	0.491
IEEE E Inverse	IEEE	28.2	2	0.1217
US Inverse	C08	5.95	2	0.18
US ST Inverse	C02	0.02394	0.02	0.01694



IEC / IEEE Inverse curves for tripping of over current elements

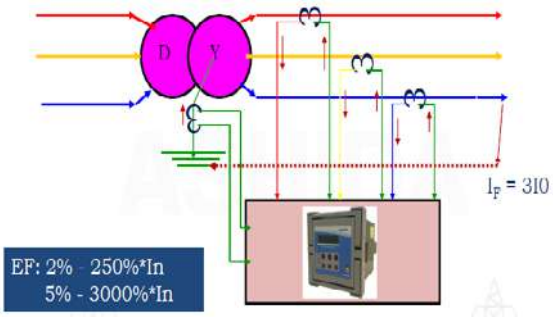
ADR244A relay provides the inverse time dropout characteristic (electromechanical relay reset) for IEEE curves. The output of protection function shall be reset after dropout time delay.

ADR244A relay provides two stages of definite time/inverse time internally derived zero sequence over current (3I0>) protection to detects asymmetrical faults in electrical network. It can apply to over head transmission line, underground cable, and feeder. The ground current (3I0>) calculated from three line currents.

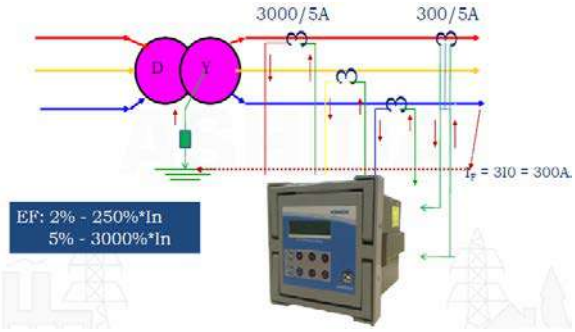


Internally derived residual over current application

ADR244A relay provides two stages of externally ground over current protection. ADR244A relay measures ground fault current through neutral CT input. Externally ground CT input can also apply for high impedance restricted earth fault protection or sensitive ground fault protection through CBCT.



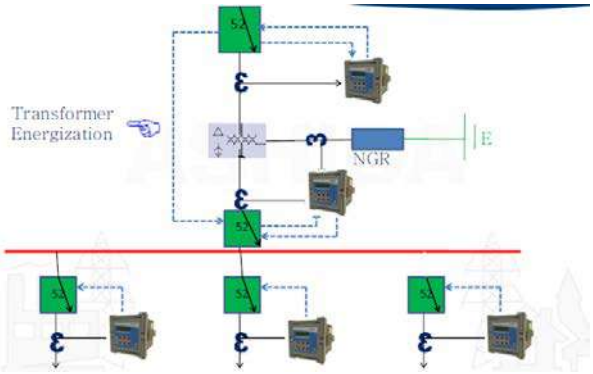
Externally measured ground over current through neutral CT



Externally measured ground over current through CBCT

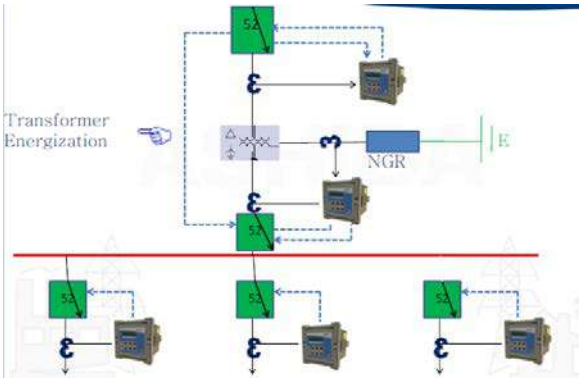
Harmonic blocking / Unblocking for Over Current Protection (50H/51H/50NH/51NH):

Harmonic blocking / unblocking feature equipped in ADR244A relay provides stability on inrush current during transformer energization. Harmonic blocking/unblocking feature is independent for each stage of phase and ground over current protection.

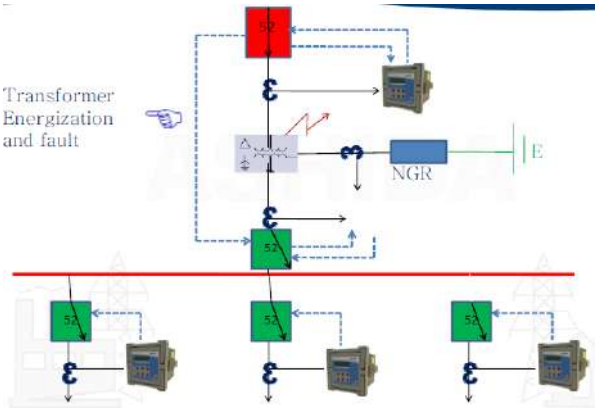


Additional functions (CLP & SOTF):

ADR244A provides the cold load pick up (CLP) and switch on to fault (SOTF) as additional functions. User can select the one of this function for application. Cold load pick up function provided in relay for multiple applications. The application of this feature can be use to avoid wrong operation on inrush current during transformer energization without compromising sensitivity of over current protection.



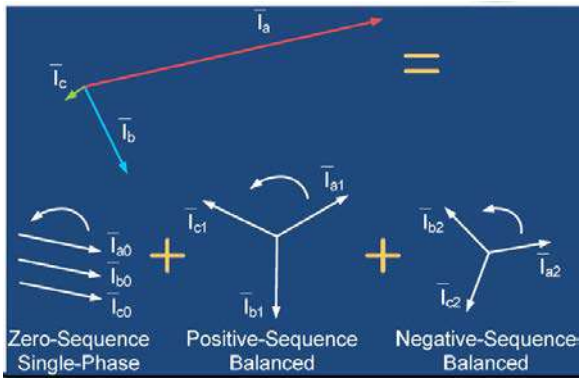
The ADR244A provides SOTF function to protection feeder against switch on to fault condition during feeder/transformer energization.



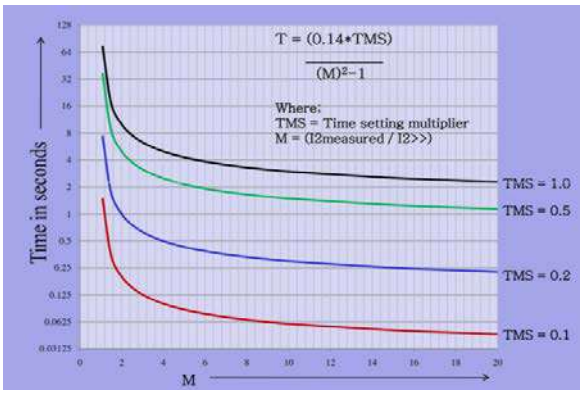
Negative Phase Sequence Over Current Protection (46):

Two independent stages of Definite and Inverse time Negative sequence over current protection will be providing back up protection of over head transmission line / underground cable / feeder against unbalanced faults, very high resistive phase/ground faults and unbalanced loads. Protection can also apply in condition when there is a very high resistive ground fault

and ground element may not sense the fault current.

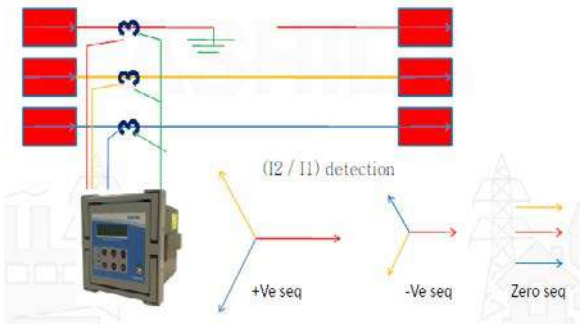


The negative phase sequence over current element can be programmed as IDMT or definite time characteristic. ADR244A relay provides ten selectable IEC / IEEE inverse curves and one user define curve for each stage.



Broken Conductor Protection (46BC):

ADR244A equipped with broken conductor detection protection. Broken conductor condition can be detected by ratio of Negative sequence current to Positive sequence current (I2/I1) provides higher sensitivity on High resistive fault.



Phase Reversal Protection (47):

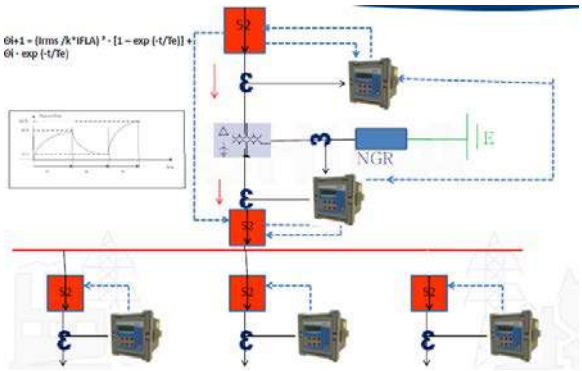
ADR244A relay detects phase reversal conditions during starting/running of induction motor.

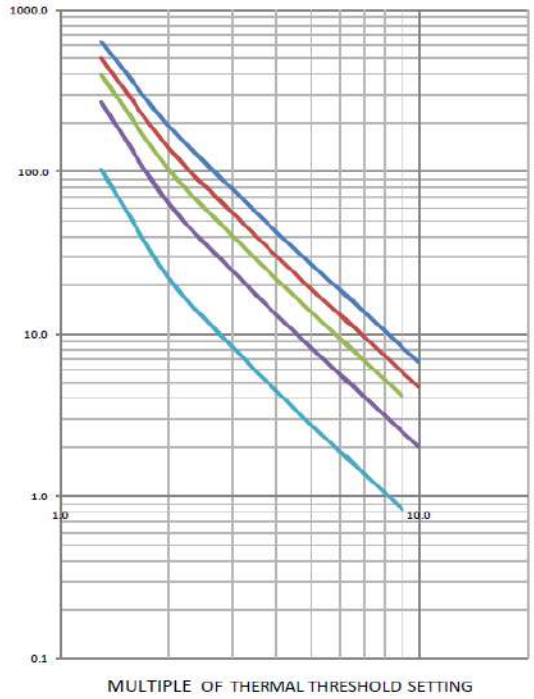
Prolong start Protection (48):

ADR244A relay detects motor prolong start conditions effectively and provides protection to motor.

Thermal overload Protection (49):

ADR244A relay provides thermal over load protection of motor/transformer against over load conditions. Relay estimate thermal contents and initiate alarm & tripping if the thermal contents are higher than the preset value. Trip time of relay follows the according to the thermal time constant value set in to relay.



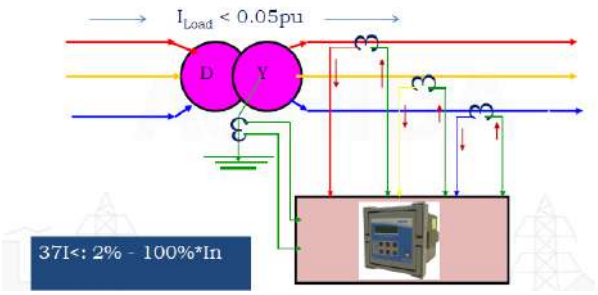


Breaker Failure detection (50BF):

If the fault current is not interrupted after a time delay expired, circuit breaker failures detected, and execute trip command to upstream circuit breaker. ADR244A relay incorporates circuit breaker failure protection to detect failure of tripping command execution due to mechanical or electrical problems in circuit breaker.

Under current detection (37):

ADR244A provide under current protection with definite time delay option.



Trip circuit supervision (74T):

Any binary inputs for circuit breaker poles can be used for monitoring the circuit breaker trip coils including connecting cables. Relay initiate alarm whenever the circuit breaker control/DC circuitry gets interrupted.

The ADR244A is having 4 separate digital opto-coupler status input which can be used to continuously monitor heartiness of trip-circuit.

Relay monitor Trip coil continuity through CB NO during close condition and through CB NC during Trip condition. If any discontinuity observed it generate Alarm signal.

Programmable Inputs, Outputs & Logic:

The ADR244A relay equipped with 7 nos. of programmable digital outputs and 4 nos. of optically isolated digital inputs. All 4 nos. of digital inputs are the programmable digital inputs to be configured for desired applications including trip circuit supervision.

Programmable LEDs and Pushbuttons:

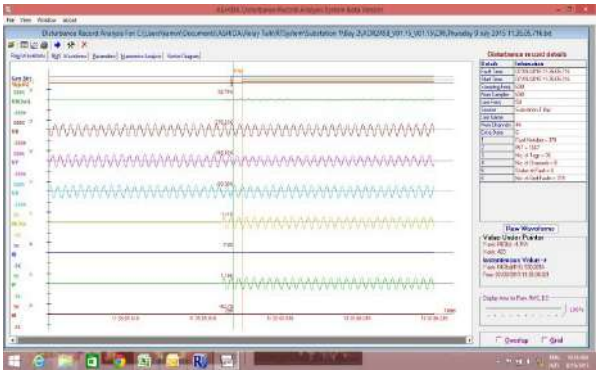
The ADR244A relay provides total 4 nos. of target & programmable LEDs with dual colors indication. The LEDs can be programmed either through HMI or through PC software (RTV2 software).

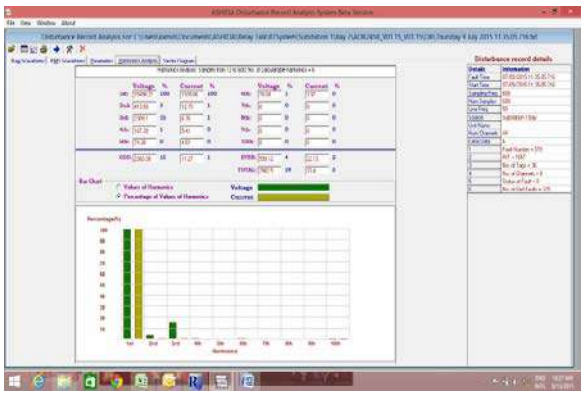
Event Recording:

ADR244A relay is providing feature to record and store 512 nos. of events in non-volatile memory through internally by protection and control functions and externally by triggering of digital inputs, and can be extracted using communication port or viewed on front of LCD display. The event shall be trigger on time stamp through time synchronization or internal clock setting.

Disturbance recording:

ADR244A relay is provides built in disturbance recording facility for recoding of analogue and digital channels. Relay records 10 nos. of disturbances and store in to non-volatile memory. Disturbance records can be saved in IEEE COMTRADE format and same can be analyzed in disturbance analysis software.





Fault recording:

ADR244A relay is providing fault record facility. The fault records can be display either on HMI display or in RTV2 software. The relay can records 10 nos. of fault records in non-volatile memory.

Metering:

Online metering feature of ADR244A relay is providing metering of parameters (i.e. current magnitude) on HMI display or in RTV2 software.

Independent Protection settings groups:

ADR244A relay provides two independent settings groups to allow operate relay on different power system operating conditions.

Communication Protocols:

ADR244A relay provides internationally standardized IEC60870-5/Modbus protocol for communication via RS485 port of protection relays. IEC 60870-5-103 protocol used worldwide and supported by relay manufacturers.

Typical Tests Information:

The Relay Confirm to following standard			
Electromagnetic Compatibility Type Test:			
Sr. No.	**Standard**		**Test**
1.	High Frequency Disturbance Test	IEC60255-22-1	: Frequency : 1MHz Damped Oscillatory : Longitudinal :2.5 KV Common Mode, 1 KV Differential Mode : Duration: sec duration 2 sec. : On Mains Port.
2.	Electrostatic Discharge Test-Direct Application	IEC60255-22-2	: IEC 61000-4-2. : Contact discharge: 2, 4, 6 kV, : Air discharge: 2, 4 8 KV : Polarity: both +ve and –Ve polarities.
3.	Fast Transient Disturbance Test	IEC60255-22-4	: Class A : 4KV; 5/50ns; 5KHz & 100KHz: Repetition rate 300ms; Both polarities; Ri = 50Ω; duration 1 min.
4.	Surge Immunity Test	IEC60255-26 & IEC61000-4-5	: Differential Mode = 2kV : Common Mode = 4kV : 1.2/50μs, 8/20μs 5 surges of each polarity
5.	Power Frequency Immunity Test	IEC60255-22-7	: Class-A
6.	Pulse Magnetic Field Immunity Test	IEC61000-4-9	: TEST LEVEL 5, TEST specifications = 1000A/m field applied in all planes
7.	Radiated Electromagnetic Field Disturbance Test	IEC60255-22-3	: 10V/m, Performance Class-A : 10V/m, freq = 80MHz to 1GHz, 80% AM at 1kHz. SPF = 80, 160, 380, 450, 900 MHz
8.	Conducted Disturbance Induced By Radio Frequency Field	IEC60255-26	: Freq. 150kHz – 80MHz, Amplitude 10 V, Modulation 80% AM @ 1 KHz. SPF = 27 and 68 MHz
9.	Power Supply Immunity Test	IEC60255-11 & IEC61000-4-11	: DC voltage dip: 40% dip 200ms and 70% for 500ms for DC 10 & 20ms without loss of protection for DC 30ms, 50ms, 100ms, 200ms, 300ms, 0.5s, 1s and 5s with temporary loss of protection for DC AC voltage dip: 10, 20ms without loss of protection for AC 50ms, 100ms, 200ms, 0.5s, 5s with temporary loss of protection

10.	Conducted & Radiated frequency Emission Test	IEC60255-25	: Conducted 0.15MHz - 0.5MHz, 79dB (microV) Q-Peak, 66dB (microV) for average 0.5MHz - 30MHz, 73dB (microV) Q-Peak, 60dB (microV) for average Radiated (3mtr) 30MHz - 230MHz, 50dB (microV) Q-Peak, 230MHz - 1GHz, 57dB (microV) Q-Peak,

Insulation Tests:			
11.	High Voltage Test	IEC60255-27	: At 2kV 50Hz between all terminal connected together and earth for 1 minutes
12.	Impulse Voltage Test	IEC60255-27	: Test voltage: 5KV (peak) 1.2 / 50us, : Energy :0.5 J, : Polarity : + ve and – Ve : Nos. of impulses : 3 positive and 3 negative impulse : Duration between Impulses : 5 sec.
13.	Insulation Resistance	IEC60255-27	: ≥ 100MΩ @ 500V DC

Environmental tests:		
14.	Cold test	: IEC-60068-2-1
15.	Dry heat test	: IEC-60068-2-2
16.	Damp heat test, steady state	: IEC-60068-2-78
17.	Change of Temperature	: IEC-60068-2-14
18.	Damp heat test, cyclic	: IEC-60068-2-30
19.	Enclosure Protection Test (IP54)	: IEC 60529

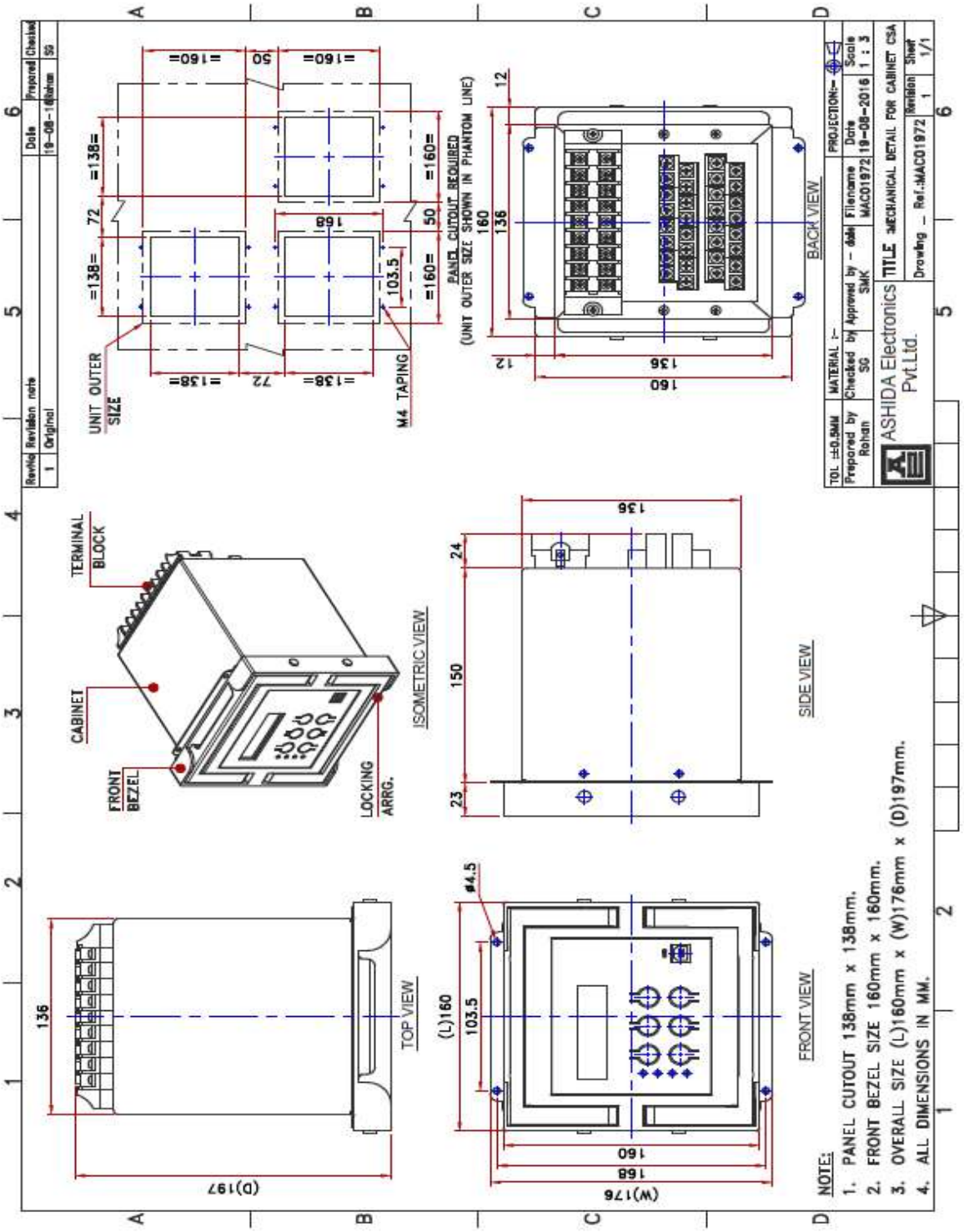
CE compliance		
20.	Immunity	: IEC-60255-26
21.	Emissive Test	: IEC- 60255-26
22.	Low voltage directive	: EN-50178

Mechanical tests		
23.	Vibration Endurance Test	: IEC 60255-21-1 class 2 : Frequency Range = 10Hz – 250Hz , acceleration. = 2gn : Sweep rate 1 octave/min; 20 cycle in 3 orthogonal axis.

24.	Vibration Response Test	: IEC 60255-21-1 class 2 : Frequency Range = 10Hz – 150Hz , acceleration. = 1gn : Sweep rate 1 octave/min; Displacement =0.075mm, in 3 orthogonal axis.
25.	Bump Test	: IEC 60255-21-2 Class-1 : 1000 bumps / direction of 10gn peak acceleration and 16ms pulse duration in each of the two opposite direction per axis as per No. of axes. 3.
26.	Shock Withstand Test	: IEC 60255-21-2 Class-1 : 3 shocks of 15gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
27.	Shock Response Test	: IEC 60255-21-2 Class-2 : 3 shocks of 10gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
28.	Seismic Test	: IEC 60255-21-3 Class-2 : Sweep 1/Axis (@a sweep rate of 1 octave/minute) vibration in the frequency range (5-35 Hz) at displacement X-axis: 7.5mm, Y-axis: 3.5mm amplitude of 3.5mm with acceleration of X-axis: 2gn, Y-axis: 1gn.

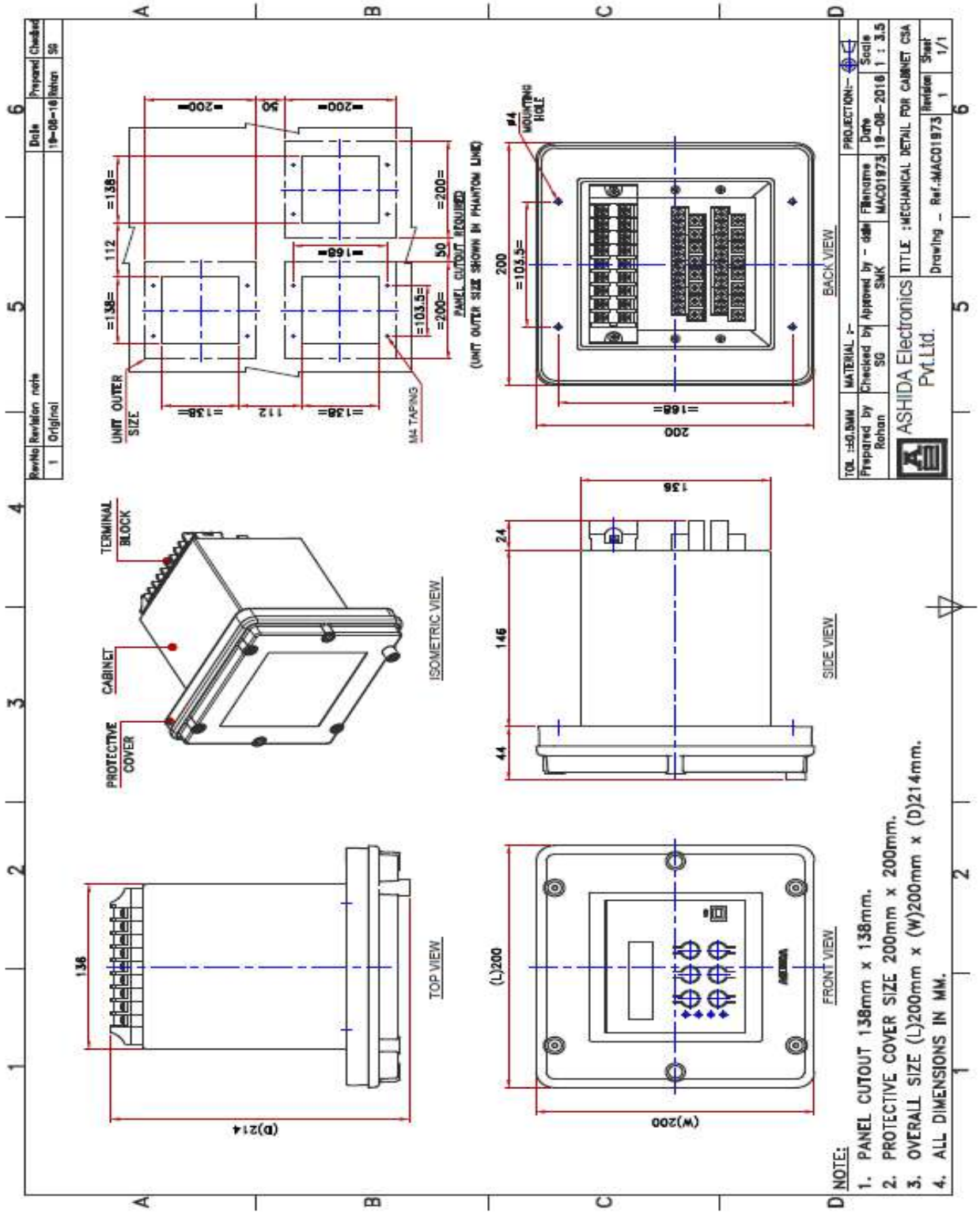
Note: Type test report is available on request

Mechanical Dimensions without IP cover



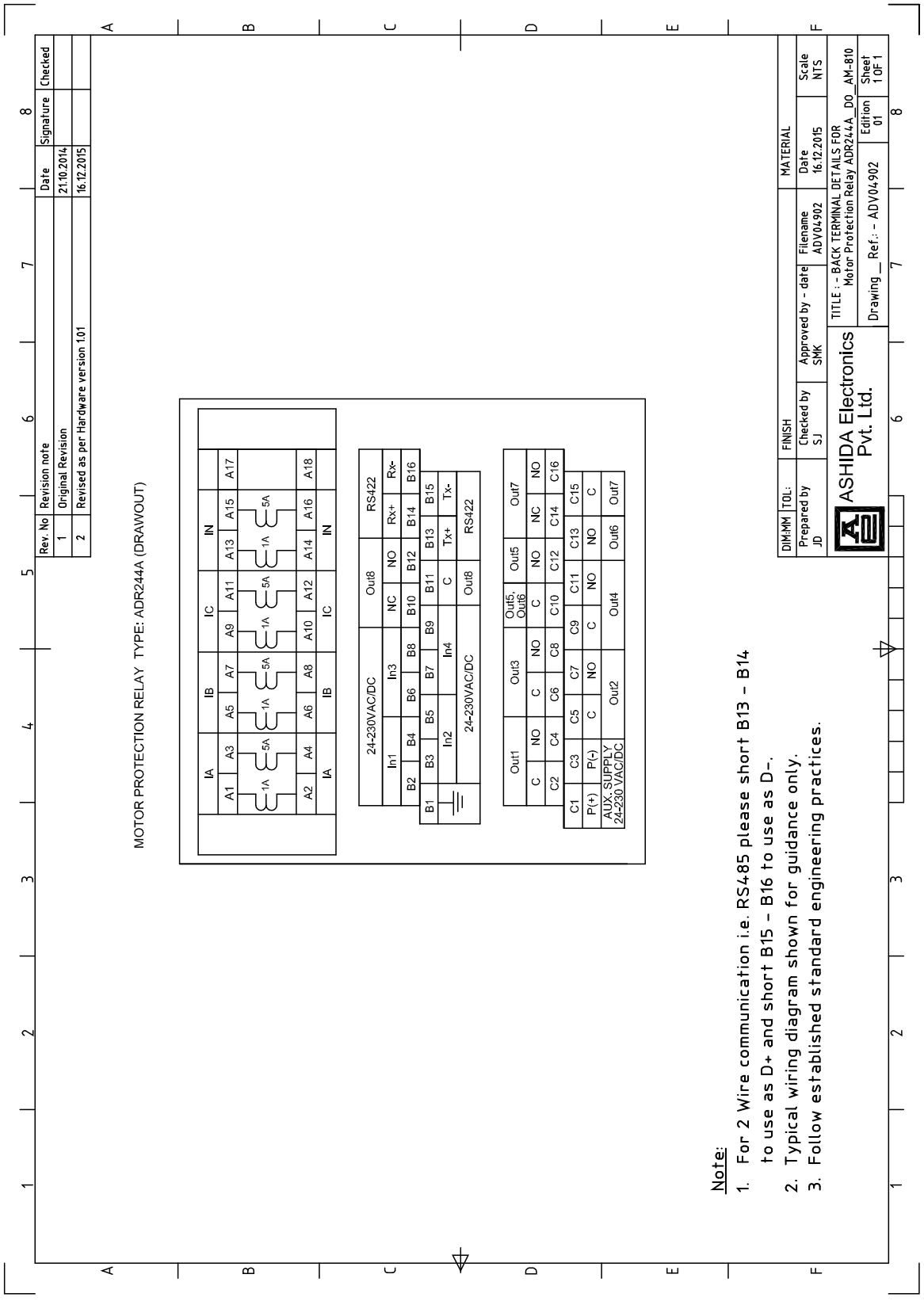
Note: *All dimensions in mm.*

Mechanical Dimensions with IP Cover



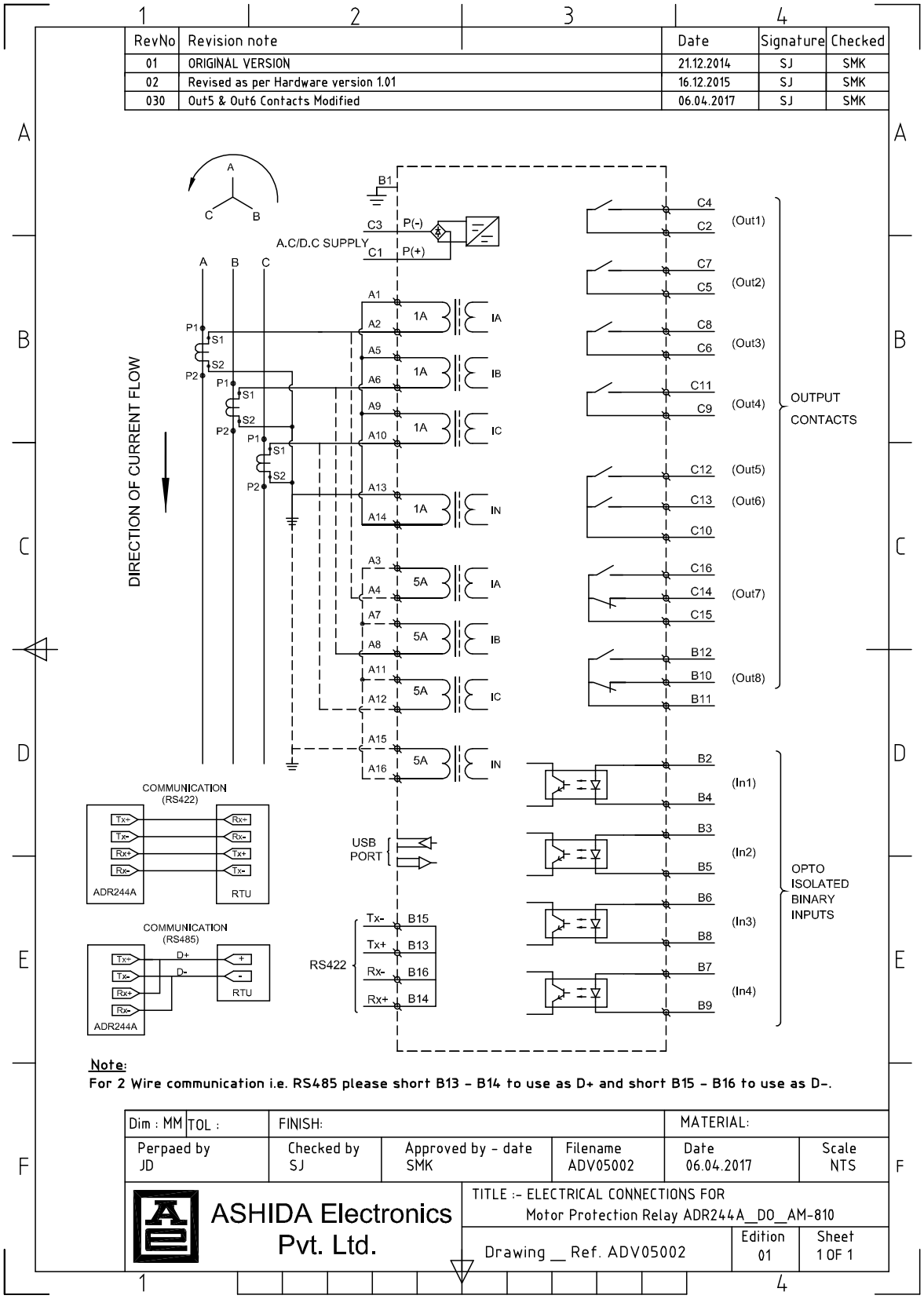
Note: *All dimensions in mm.*

Back Terminal Connection



Electrical wiring connection diagram

RevNo	Revision note	Date	Signature	Checked
01	ORIGINAL VERSION	21.12.2014	SJ	SMK
02	Revised as per Hardware version 1.01	16.12.2015	SJ	SMK
030	Out5 & Out6 Contacts Modified	06.04.2017	SJ	SMK



Note:
For 2 Wire communication i.e. RS485 please short B13 – B14 to use as D+ and short B15 – B16 to use as D–.

Dim : MM / TOL :	FINISH:			MATERIAL:	
Perpaed by JD	Checked by SJ	Approved by - date SMK	Filename ADV05002	Date 06.04.2017	Scale NTS

ASHIDA Electronics Pvt. Ltd.

TITLE :- ELECTRICAL CONNECTIONS FOR Motor Protection Relay ADR244A_DO_AM-810

Drawing __ Ref. ADV05002 | Edition 01 | Sheet 1 OF 1

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