Features:

- Single Element (Phase/EF) over current IDMT with instant trip.
- Relay can also be used for REF or Current operated Neutral Displacement application.
- Back - lit LCD display for settings.
- Display of Load current in terms of primary.
- Selection of Curve: Seven selectable curves Normal Inverse1 (C1), Normal Inverse2 (C2), Very Inverse (C3), Extremely Inverse (C4), Extremely Inverse (C4A) as per EE Relays, Long Time Inverse (C5) & Definite Time (C6).
- Design using DSP technology.
- Latching of fault current up to last 5 faults with time stamping.
- Password protection for setting.
- Site selectable CT secondary.
- Relay can be set either as IDMT or Definite time.
- Programmable operating time in instantaneous element.
- In build Breaker Fail detection.
- **USB (at front) and RS422/ RS485 (at rear) Communication Port for remote SCADA (only for ADR211A i.e. communicable Relay).**

General:

The ADR111A/ ADR211A is member of ASHIDA Numerical Relay family (*Aditya Series*) design to meet demand of low and medium switchgear control. The ADR111A/ ADR211A is a Single Pole Protection relay with Instantaneous high-set trip to simplify feeder protection wiring. The ADR111A/ ADR211A continuously monitor phase current, through CT connection. The high-speed micro-controller **samples** this current through a **12-bit A/D converter**. The micro-controller performs powerful **Numerical Algorithms** to find out Amplitude of current signal, and then this value is used for protection and metering function. All measurement is tuned to fundamental frequency. Input current is also displayed on 16 x 2 LCD display for metering. The Relay is having three main functions 1) Protection 2) Self-Supervision 3) Measurement.

PROTECTION FUNCTIONS:

The ADR111A/ ADR211A give maximum benefit/cost ratio. The ADR111A/ ADR211A give all the advantage of numerical relay at affordable cost. Following is summary of different protection functions provided by relay

ANSI	IEC	Protection Functions
50	I>>	Instantaneous Over current Protection (OC-Inst.)
50N	I_E>>	Instantaneous Ground OC (EF) Protection (EF-Inst.)
50,51	I>t, I_P	Time Over current Protection (Phase) (OC-IDMT.)
50N, 51N	I_E>t, I_{EP}	Time Ground Over current Protection (EF-IDMT)
50BF	-	CB Failure detection protection functions

Over current/ Earth Fault Protection:

The ADR111A/ ADR211A has Single sensing element. The tripping current can be set from 5% to 250% in steps of 1% by Keys provided on front panel. The unit has selection of IDMT characteristic of international IEC standard, i.e. Very inverse / Extremely Inverse / Long Inverse and Normal inverse (both 3.0 sec and 1.3sec at 10 times). The Time Multiplier Setting (TMS) can be set from x0.01 to x1.5 in steps of 0.005 for IDMT delay multiplication. The instantaneous tripping function is having range of 50% to 3000% and can be set in steps of 50%. The high speed CPU continuously monitors the current input and compare with IDMT as well as instantaneous setting. If current is above instantaneous setting the relay provides immediate trip command bypassing IDMT delay. If input current is less than instantaneous setting but more than IDMT setting, CPU calculates IDMT delay as per selected IDMT characteristic and TMS setting and provides trip command if fault persist even after this time delay.

All the settings are password protected to prevent unauthorised change.

The stages of over current/ Earth Fault function are programmable as per IDMT characteristic based on IEC standards. The inverse time delay is calculated with the following mathematical formula:

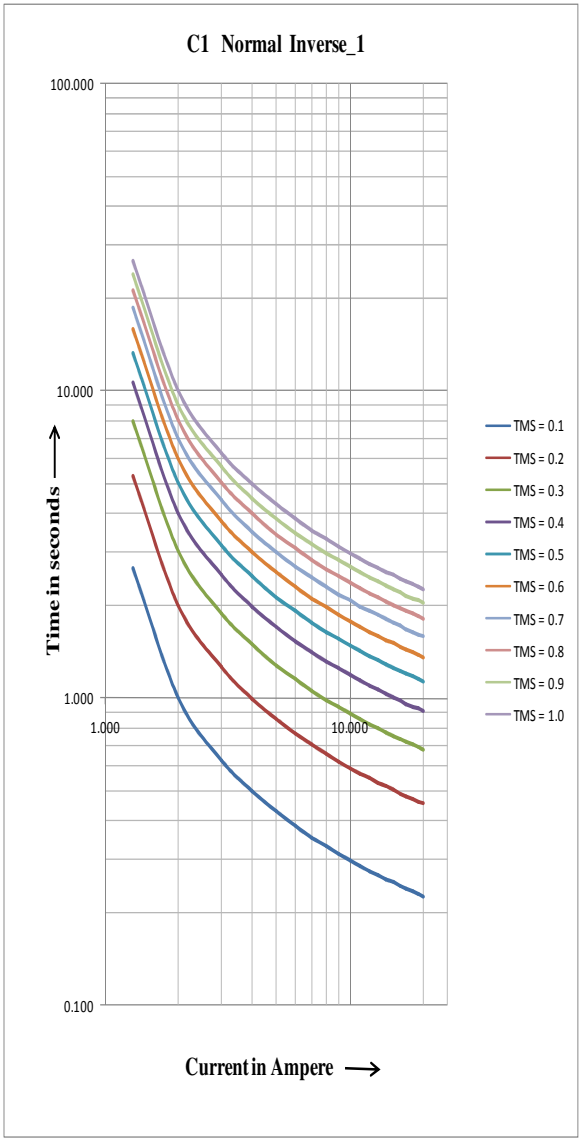
For IEC Curve

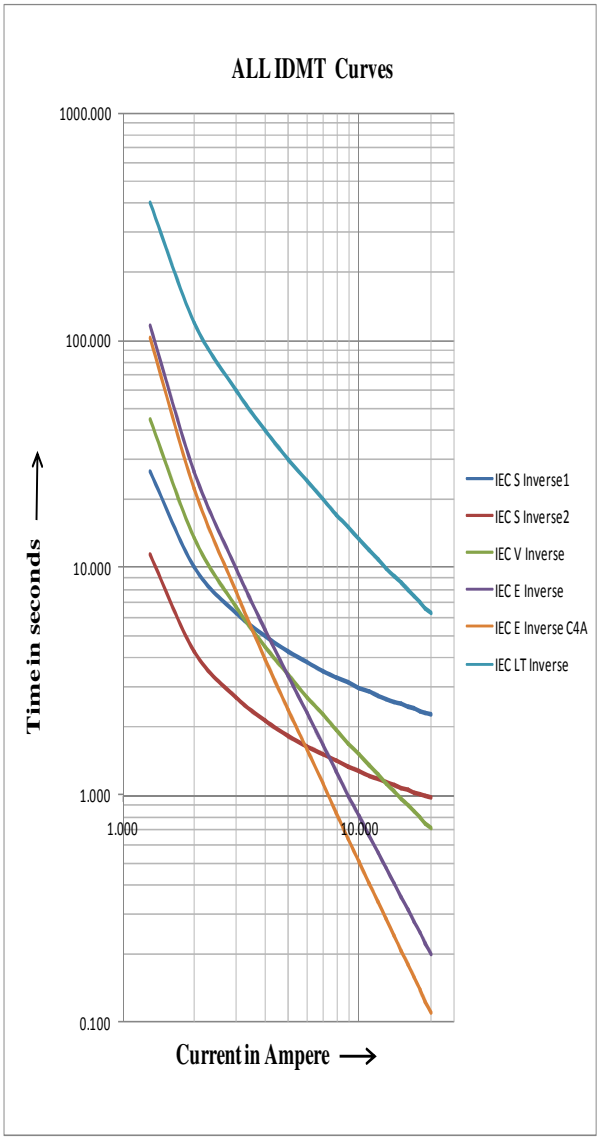
$$t = \frac{K * a}{\left(\frac{I}{I_{ref}}\right)^{b} - 1}$$

For Extremely Inverse C4A Curve as per EE Relays

$$t = \frac{K * a}{\left[\left(\frac{I}{I_{ref}}\right)^{b} * 1.3\right] - 1} + 0.22$$

Curve Type	Description	a	b
C1	Normal Inverse_1	0.14	0.02
C2	Normal Inverse_2	0.06	0.02
C3	Very Inverse	13.5	1
C4	Extremely inverse	80	2
C4A	Extremely Inverse (C4A) as per EE Relays	80	2.2
C5	Long Time Inverse	120	1
C6	Definite Time	-	-





Breaker Fail Function (50 BF)

Normally after tripping the current should become Zero within 100 to 200 ms depending upon type of fault and breaker mechanism. After Fault, Relay starts one internal timer (settable from 00 to 800 ms) & if fault is not cleared during this time then relay declare as Breaker Fail (LBB function).

SUPERVISION FUNCTION

The ADR111A/ ADR211A continuously keeping track on its internal hardware and the movement it detects any failure of any component, it gives message on LCD display, this feature is very

useful to give pre information to avoid any mal-operation. In such situation it uses some default setting and remains in protection mode.

MEASUREMENT FUNCTION

In normal condition the relay displays actual current flowing through the relay. Using the front keyboard all relay settings can be viewed. If current is in fault range the relay gives trip command. The type of the fault is displayed on LCD display. During the fault condition, the relay measures the fault current and stores it in non-volatile memory. The fault current can be read using keyboard on LCD display, last 5 fault values along with tripping counter can be viewed. All settings can be done locally as well as remotely via communication port and saved in non-volatile memory.

ORDERING INFORMATION

The relay is available with different model option. It is user's responsibility to specify correct model no. while ordering.

While Ordering Specify the following Information for ADR111A/ ADR211A Relay

Definition of Model No of Aditya Series of Relays

AM – XXX – XX – XX – XX – XX – XX –XX

XX= Communication protocol	
00	Not applicable
02	IEC60870-5-103 Protocol

XX= PT Secondary	
00	Not applicable

XX= CT Secondary	
03	1/5 Amp.

XX= Auxiliary Supply	
28	24 – 230 VAC/DC (±20%)

XX= Cabinet Type	
04	Draw out

XX= Cabinet Size	
01	CSA (138 X 138MM)

XXX = Sub Type	
110	Single Pole OC/EF relay Settings: OC/EF : 5 - 250% in steps of 1%, HF: 50 – 3000% In steps of 1% TMS: X0.01 – X1.5 In steps of X0.005 Contacts: 2 NO for trip, 1 NO for BF

TECHNICAL SPECIFICATIONS

AC Measuring Input:			
I.	Measurement Accuracy	Typical ± 2% In	
II.	Frequency measurement range	45 Hz – 55 Hz	
Current Input:			
I.	CT secondary	1 / 5 Amp. (Selectable)	
II.	Nominal Burden at In (without tripping condition)	< 0.20 VA at rated current (In)	
III.	Thermal Withstand Capacity	40 x rated current (In) for 3sec 2 x rated current (In) continuous	
IV.	Measurement Linearity Range for Non – Offset AC Current	Linear up to 40 In	
Auxiliary Supply Input:			
I.	Nominal operating range	24 – 230V AC/DC	
II.	Voltage operating range	80% of lower nominal range and 120% of upper nominal range (For DC Supply) 80% of lower nominal range and 110% of upper nominal range (For AC Supply)	
III.	Nominal Burden on 24 – 230V Auxiliary Power Supply	24 – 230 VAC	< 12 VA
		24 – 230 VDC	< 5 W
IV.	Tolerable AC ripple	Up to 15% of highest dc supply, As per IEC 60255-26: 2013	
V.	Relay power up time	< 2.5 Sec	

Output contact:			
I.	Output Contacts	Continuous	5A/250Vac
		Make & carry	30Amp for 3sec AC /DC
		Short time withstand	50Amp for 1sec AC /DC
		Breaking capacity	AC- 1250VA max @ 250V(PF 0.4)
			DC- 100W Resistive max. 5A or 300V
			50 Watt Inductive (L/R 45ms) max. 5A or 300V
		Operating Time	<10msec
		Minimum no. of operations	10,000 operation loaded condition & unloaded 100,000 operations

Operating condition:		
I.	Relative Humidity	: Humidity (RH) 95% maximum
II.	Operating temperature range	: -25 ºC to +65 ºC
III.	Storage temperature range	: -25 ºC to +70 ºC

Accuracy of protection function:			
I.	**Phase/ Ground Over current:**		
	For operating Value	Pick-up	1.05 x setting ±5%
		Drop –off	0.95 x setting ±5%

	For operating Time	IDMT Characteristic shape	As per class5 of 60255-151 cl.5.2** or 55ms whichever is greater
		DT Operation	±5% or 55ms whichever is greater*
		Note " * " indicates Reference Condition that is Fault current 2 time above set value.	
II.	**CB Fail**		
	For operating Time	DT Operation	±5% or 55ms whichever is greater
		CBF Reset	<60ms

**Note: As per IEC60255-151 Class 5 (assigned error 5%) the tolerance calculated as below;

Value of characteristic quantity as multiple of setting value (GS)	2N	5N	10N	20N
Limiting error as multiple of an assigned error	2.5	1.5	1	1
Percentage for time accuracy claim	12.5%	7.5%	5%	5%

Mechanical Details			
I.	: For Cabinet Type	CSA -150 without IP cover	MAC01974
	: For Cabinet Type	CSA -150 with IP cover	MAC01975
	: For Electrical Connection Diagram	AM – 130–01–04–XX–XX–XX–XX	APR07409
	: Net Weight	Approx. 2.5 Kg.	

Operational Indicators (Flags)		
I.	ON / Error	: Green LED indicates Relay OK. : Red LED indicates internal error.
	PKP / HF	: Green LED indicates Relay pickup. : Red LED indicates instantaneous trip.
	Fault	: Red LED indicates FAULT, Hand Reset (HR) Type.
	TRIP / BF	: Green LED indicates Trip command is being executed. SR type when TRIP contact selected as SR and HR type when TRIP contact selected as HR : Red LED indicates Breaker Failure. SR type when TRIP contact selected as SR and HR type when TRIP contact selected as HR

RELAY SETTING

Relay setting

Sr. No	Parameter	Setting / Ranges
1.	Password	000 – 099 in steps of 1
2.	New Password	000 – 099 in steps of 1
3.	Unit ID	001 – 250 in steps of 1
4.	I>	5 – 250 % in steps of 1%
5.	I> TMS	0.01 – 1.50 in steps of 0.005
6.	I>>	50 – 3000 % in steps of 1% (00 is Bypass)
7.	I> Curve	C1 – C6 in steps of 1
8.	I> C6 Time	0.00 – 99.9 s in steps of 0.1 s
9.	I>> Delay	0.00 – 10.0 s in steps of 0.01 s
10.	BF Delay	000 – 800 ms in step of 50 ms (00 is Bypass)

11.	CT Sec	001 – 002 (001 = 1A, 002 = 5A)
12.	CT Pri	10 – 5000 A in steps of 1A
13.	Trip Cont	001 – 002 (001 = SR, 002 = HR)
14.	BF Cont	001 – 002 (001 = SR, 002 = HR)
15.	Com Port	FRONT/ REAR
16.	Set Parity	None / Even / Odd
17.	Baud Rate	01 – 05 (01 = 2400, 02 = 4800, 03 = 9600, 04 = 14400 & 05 = 19200)
18.	Hrm. Rst.	0 – 80 % in steps of 5% (00 is Bypass)

Date and Time setting

Sr. No	Parameter	Settings / Ranges
1.	SET Hours	00 to 23 Hrs in step 1.
2.	SET Minutes	00 to 59 Mins in step 1.
3.	SET Seconds	00 to 59 Sec. in step 1.
4.	SET Date	01 to 31 Days in step of 1.
5.	SET Month	01 to 12 Months in step of 1.
6.	SET Year	00 to 99 Years in step of 1.

CONFORMANCE TO STANDARD

Electromagnetic Compatibility Type Test:			
Sr. No.	**Standard**		**Test**
I.	High Frequency Disturbance Test	IEC60255-22-1, IEC60255-26 (ed3): 2013	1) 2.5 kV Common Mode 2) 1 kV Differential Mode EUT Condition Energized
II.	Electrostatic Discharge Test- Direct Application	IEC60255-22-2, IEC60255-26 (ed3) : 2013	1) 8kV air discharge 2) 6kV contact discharge Test Mode Direct and Indirect Method EUT Condition Energized
III.	Fast Transient Disturbance Test	IEC60255-22-4, IEC60255-26 (ed3) : 2013	Test Voltage : ±4 KV Repetition rate : 5 KHz and 100 KHz. EUT Condition : Energized
IV.	Surge Immunity Test	IEC60255-22-5, IEC60255-26 (ed3) : 2013	Front time / time to half value : 1.2/50 µS Source impedance : 2Ω Common Mode : ±4 KV Differential Mode : ±2 KV EUT Condition : Energized
V.	Pulse Magnetic Field Immunity Test	IEC61000-4-9, IEC60255-26 (ed3) : 2013	Class 5: 1000A/m field applied continuously in all planes for the EUT
VI.	Radiated Electromagnetic Field Disturbance Test	IEC60255-22-3, IEC60255-26 (ed3) : 2013	Voltage Level 10 V/m Frequency Range 80 - 1000 MHz Modulation 80% AM @ 1 KHz Spot Frequency 80, 160, 380, 450 & 900 MHz

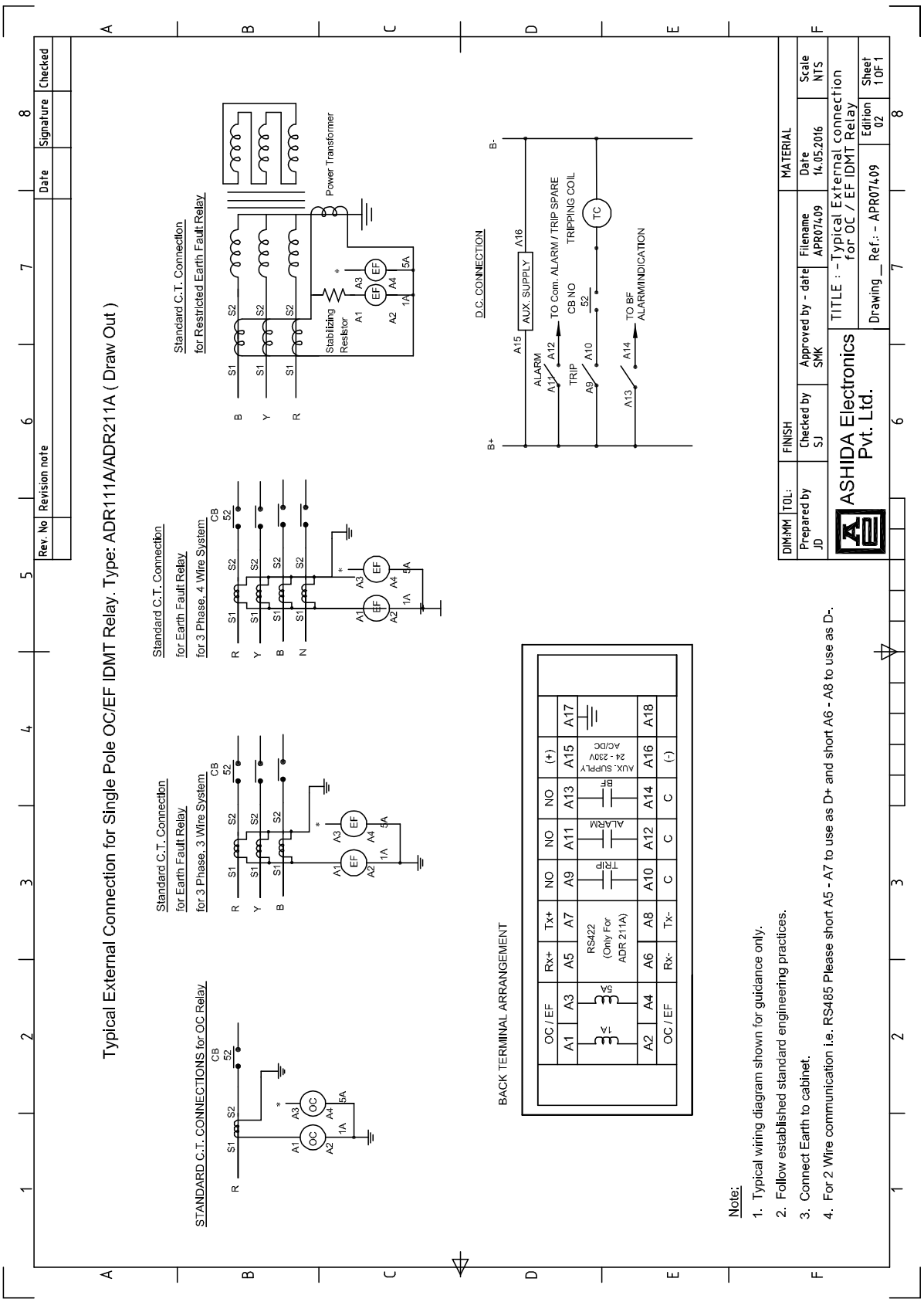
VII.	Conducted Disturbance Induced By Radio Frequency Field	IEC60255-22-6, IEC60255-26 (ed3) : 2013	Voltage Level 10 V Frequency Range 0.15 – 80 MHz Modulation 80% AM @ 1 KHz EUT Condition Energized Spot Frequency 27, 68 MHz
VIII.	Power Supply Immunity Test	IEC60255-11 IEC61000-4-11 IEC61000-4-29 IEC60255–26 (Ed3) : 2013	: AC voltage dip: 40%: 200 ms 70%: 500ms 80%: 5s AC Interruption: 10ms, 20ms, 50ms, 100ms, 200ms, 0.5s and 5s DC Voltage dip: 40% : 200ms 70% : 500ms DC Interruption: 10ms, 20ms, 30ms, 50ms, 100ms, 200ms, 0.5s, 1s and 5s
IX.	Conducted & Radiated frequency Emission Test	IEC60255-25, IEC60255-26 (ed3) : 2013	: Conducted Frequency Range Limit 0.15 – 0.5 MHz 79 dB/µV (Quasi peak) 66 dB/µV (Average) 0.5 – 30 MHz 73 dB/µV (Quasi peak) 60 dB/µV (Average) EUT Condition Energized : Radiated Frequency Range Limits 30 – 230 MHz 50 dB (µV/m) 230 – 1000 MHz 57 dB (µV/m) EUT Condition Energized

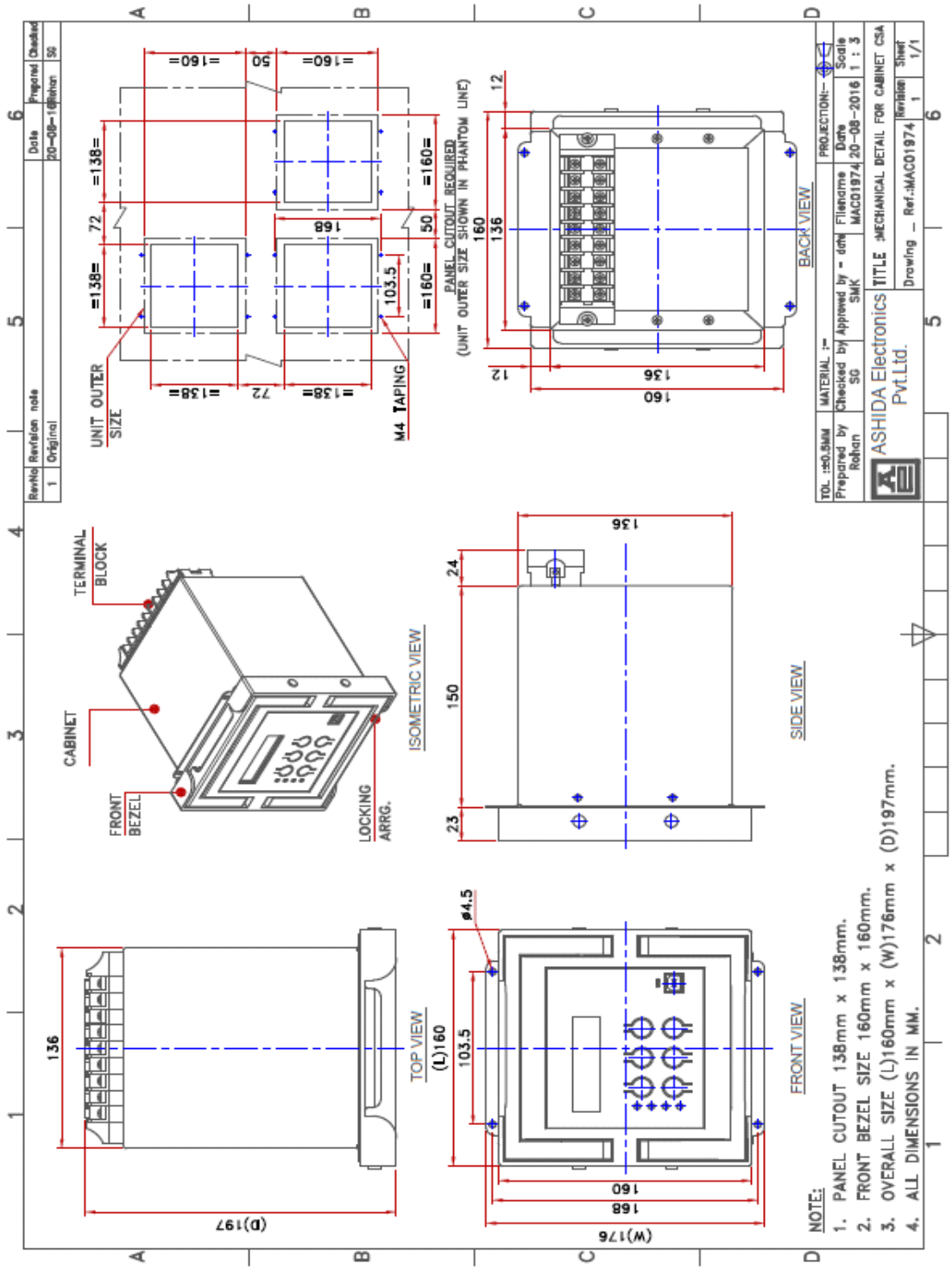
Insulation Tests:			
I.	Dielectric Test	IEC60255-27	: At 2kV 50Hz a) Between all terminals connected together and case earth for 1 minute b) Between independent circuits with case earth for 1 minute.
II.	Impulse Voltage Test	IEC60255-27	Test Voltage 5kv, 1.2/50 µSec Energy 0.5 J No. of impulses 3 on each Polarity +ve and –ve EUT Condition Non Energized
III.	Insulation Resistance	IEC60255-27	: ≥ 100MΩ @ 500V DC

Environmental tests:		
I.	Cold test	: IEC-60068-2-1
II.	Dry heat test	: IEC-60068-2-2
III.	Damp heat test, steady state	: IEC-60068-2-78
IV.	Change of Temperature	: IEC-60068-2-14
V.	Damp heat test, cyclic	: IEC-60068-2-30
VI.	Enclosure Protection Test IP52 (with optional IP cover) IP31 (without optional IP cover)	: IEC 60529

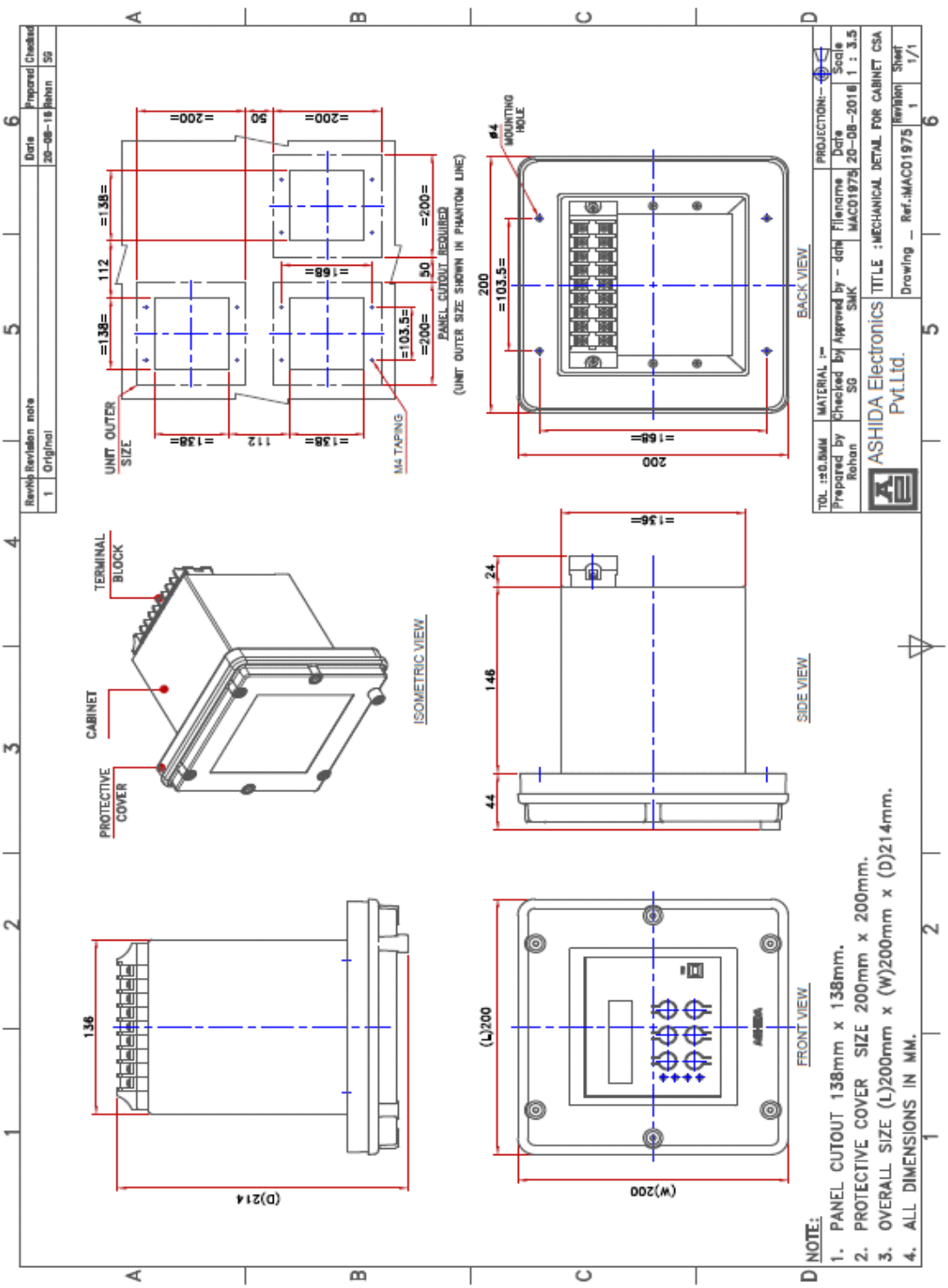
CE compliance		
I.	Immunity	: IEC-60255-26
II.	Emissive Test	: IEC- 60255-26
III.	Low voltage directive	: EN-50178

Mechanical tests		
I.	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.
II.	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.
III.	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.
IV.	Shock Withstand Test	: IEC 60255-21-2 Class-2 30g, 11ms : 3 shocks of 15gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
V.	Shock Response Test	: IEC 60255-21-2 Class-2 : 5 shocks of 10gn peak acceleration and 11ms pulse in each of two opposite direction. No. of axis : 3
VI.	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.


Typical External Connection for Single Pole OC/EF IDMT Relay. Type: ADR111A/ADR211A (Draw Out)
STANDARD C.T. CONNECTIONS for OC Relay
Standard C.T. Connection for Earth Fault Relay for 3 Phase, 3 Wire System
Standard C.T. Connection for Earth Fault Relay for 3 Phase, 4 Wire System
Standard C.T. Connection for Restricted Earth Fault Relay
Power Transformer
Stabilizing Resistor
D.C. CONNECTION
AUX. SUPPLY
TO Com. ALARM / TRIP SPARE
TRIPPING COIL
CB NO
TO BF ALARM/INDICATION
BACK TERMINAL ARRANGEMENT
RS422 (Only For ADR 211A)
AUX. SUPPLY 24 - 230V AC/DC
Note:
1. Typical wiring diagram shown for guidance only.
2. Follow established standard engineering practices.
3. Connect Earth to cabinet.
4. For 2 Wire communication i.e. RS485 Please short A5 - A7 to use as D+ and short A6 - A8 to use as D-.
Rev. No
Revision note
Date
Signature
Checked
DIM:MM
TOL:
FINISH
MATERIAL
Prepared by JD
Checked by SJ
Approved by - date SMK
Filename APR07409
Date 14.05.2016
Scale NTS
ASHIDA Electronics Pvt. Ltd.
TITLE : -Typical External connection for OC / EF IDMT Relay
Drawing _ Ref.: - APR07409
Edition 02
Sheet 1 OF 1



Note: All dimensions in mm.



Note: All dimensions in mm.