Micro Computer Numerical Motor Protection Device

A Complete Solution for Motor Protection, Monitoring & Control

AN ISO 9001:2015 CERTIFIED COMPANY

GG Excel

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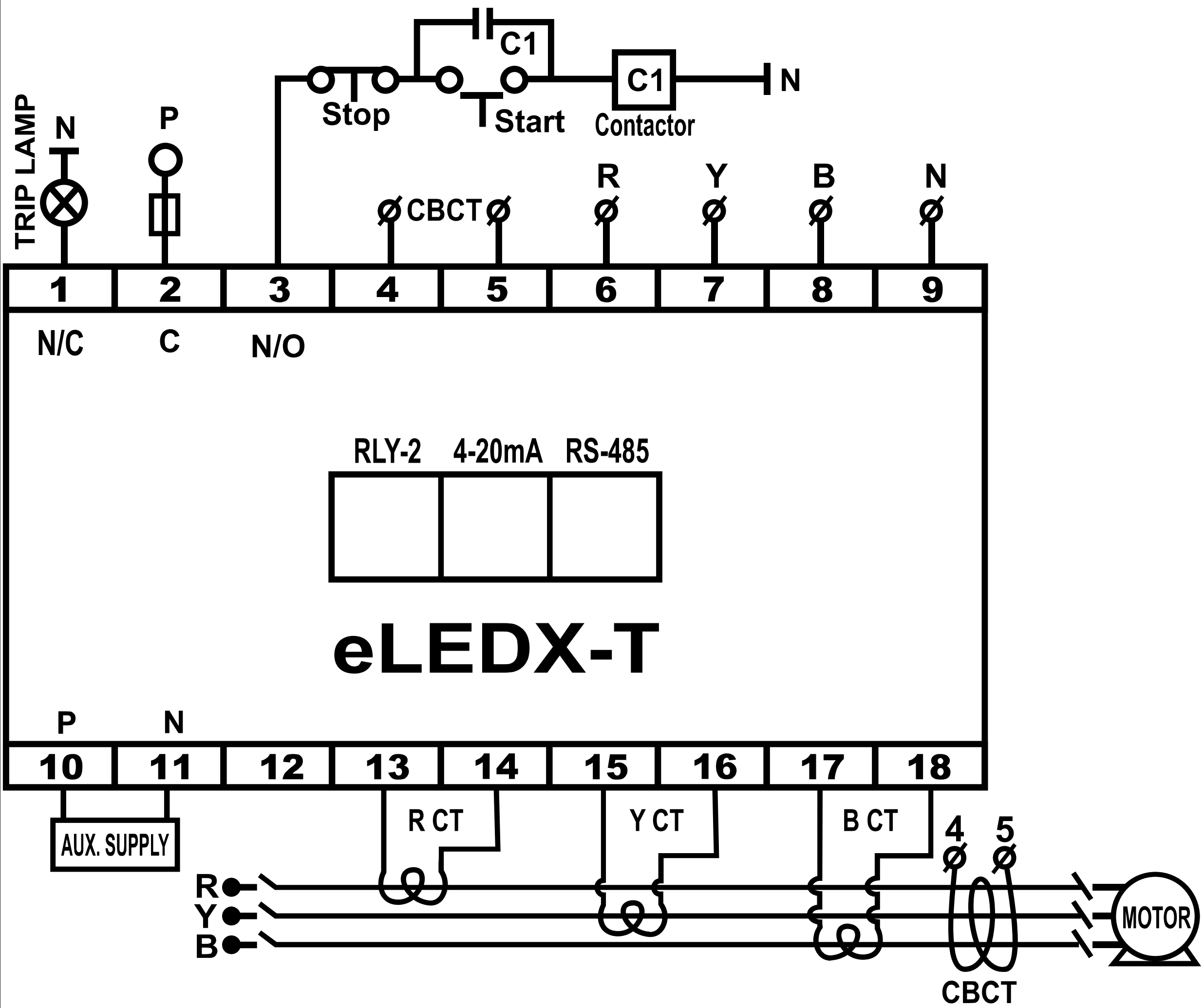
CONNECTION DIAGRAM



CHECK POINT

1. The Motor Protection Device is recommended to be connected to CTs on line side (not in phase)
2. Direction of C.T. is not required.
3. Do not interchange C. T. of one range of MPD with other range of MPD.
4. In case of FAULT MPD shows last fault. MPD does not allow the motor to start without resetting the device.
5. The parameter can be set during running of the motor. However, it is recommended to stop the motor for changing parameters.

Setting Sequence for eLEDX-T Model

- In normal mode display is in scrolling mode.
- User can stop scrolling by pressing Enter key. The parameters can be viewed sequentially by pressing up key. User can go back to scrolling by pressing Enter key again
- User can set the different parameter in Function mode.
  When optional password facility is provided refer page No. 12
  - ▶ Press [R↵] & [RESET] keys simultaneously for entering in function mode.
  - ▶ To, change parameter value use [Y▲] **(increment)** and [B▼] **(decrement)** keys. By pressing [R↵] key changed value is stored in memory.
  - ▶ Parameter list which user can change & store in memory is as indicated in next page :

PARAMETER	DISPLAY	RANGE
FUNCTION MODE	FUn	
FULL LOAD CURRENT SELECTION MODE	AutO/mAn l	In auto mode, for all the parameters value is set automatically. Only user needs to enter FLC (full load current) as per motor name plate In Manual Mode, for all the parameters, value to be set manually.

AUTO MODE :

PARAMETER	DISPLAY	RANGE
FULL LOAD CURRENT	FLC	As per the current range selected.
SET OK	SEt	

VALUES OF PARAMETERS WHEN FLC IS ENTERED IN AUTO MODE :

PARAMETER	DISPLAY	AUTOMATIC SET VALUE
Device ID	d-Id	Device ID (1 to 247) (for RS485 mode)
Maximum output for 4-20 mA	mOUt	mOut (as per current range selected) (for 4-20 mA output mode)
UNDER CURRENT Enable / Disable	UC-E/UC-d	Enable
Under current trip point	UC-P	40% of FLC
Under Current trip time	UC-t	20 Sec.

PARAMETER	DISPLAY	AUTOMATIC SET VALUE
Start delay for Lock rotor	-Lt-	10 Sec.
Lock rotor trip point	Lr-P	FLC (picks up at 3 times)
Earth fault trip start delay	EotE/Eotd	Enable (10 secs.)
Earth fault trip point	EF-P	30% OF FLC*(refer note 2)
Earth fault trip time	EF-t	1.0 Sec.
Short circuit trip point	SC-P	FLC (picks up at 8 times)
Overload trip point	OL-P	FLC (picks up as per curve)
Overload curve selection	OL-C	5 C *(Refer Note 1)
Single Phasing	SPPE/SPPd	Enable
Unbalance	Ub-E/Ub-d	Enable
Unbalance trip point	Ub-P	30%
Unbalance trip time	Ub-t	10 Sec.
Pre-overload Alarm Point	AL-P	90% value of overload trip point setting
Pre-overload Alarm Time	AL-t	5 Sec.

Note : (1) The user can select curve as per application requirement in Manual Mode.

(2) For 40A-250A, RANGE, EF-P is 20% of FLC.

Thermal Reset enable/disable	thrE/thrd	Enable (resets at 70% thermal capacity)
Reset inhibit delay	dLYI	Not Applicable as thermal reset is enabled
Low Voltage Trip Point	LO-P	360 V
Low Voltage Trip Time	LO-t	30 Sec.
High Voltage Enable/Disable	HI-E/HI-d	Disable
High Voltage Trip Point	HI-P	480 V
High Voltage Trip Time	HI-t	3 Sec.
Dry Run KW Trip Value	dr-P	KW equivalent of lowest value of current range selected
Dry Run K W Delay	dr-t	30 Sec.

MANUAL MODE :

PARAMETER	DISPLAY	RANGE
Device ID	d-Id	Device ID (1 to 247) (for RS485 mode)
Maximum output for 4-20 mA	mOUt	mOut (as per current range selected) (for 4-20 mA output mode)
UNDER CURRENT Enable / Disable	UC-E/UC-d	Enable OR Disable
Under current trip point	UC-P	10% to 80% of FLC

Under Current trip time	UC-t	1 to 60 Sec.
Start delay for Lock rotor	-Lt-	1 to 30 Sec.
Lock rotor trip point	Lr-P	As per the current range selected (picks up at 3 times the set value)
Earth fault trip start delay	EotE/Eotd	Enable OR Disable
Earth fault trip point	EF-P	10% to 30% OF FLC
Earth fault trip time	EF-t	0.5 to 3.0 Sec.
Short circuit trip point	SC-P	As per the current range selected (picks up at 8 times the set value)
Overload trip point	OL-P	As per the current range selected
Overload curve selection	OL-C	2.5/5/10/15/20/30
Single Phasing	SPPE/SPPd	Enable or Disable
Unbalance	Ub-E/Ub-d	Enable or Disable
Unbalance trip point	Ub-P	10% to 40%
Unbalance trip time	Ub-t	3 to 10 Sec.
Pre-overload Alarm Point	AL-P	As per the current range selected
Pre-overload Alarm Time	AL-t	1 to 60 Sec.
Thermal Reset enable/disable	thrE/thrd	Enable or Disable

Reset inhibit delay	dLYI	1 to 999 sec.
Low Voltage Trip Point	LO-P	100 to 500 VOLT
Low Voltage Trip Time	LO-t	1 to 60 sec.
High Voltage Enable/Disable	HI-E/HI-d	Enable or Disable
High Voltage Trip Point	HI-P	100 to 500 Volt
High Voltage Trip Time	HI-t	1 to 5 Sec.
Dry Run KW Trip Value	dr-P	KW equivalent of current range selected
Dry Run K W Delay	dr-t	1 TO 60 Sec.
RS 485 Band Rate and Parity	bAUd	9.6n, 9.6e, 9.6o (9600bps, None/Even/Odd) 19.2n, 19.2e, 19.2o (19200bps, None/Even/Odd)
History	HISt	Last five Fault
SET OK	SEt	SET OK

- User can reset the fault using RESET key.
- User can see total motor running Hour counter by pressing Y▲ **(increment)** and B▼ **(decrement)** simultaneously.
- For online calibration current, press Y▲ **(increment)** and B▼ **(decrement)** simultaneously for appx. 10 sec.
- To view set parameters, press RESET and B▼ **(decrement)** simultaneously for 3 sec.

Fault Annunciations : eLEDx -T

Display	Healthy	Trip	% TH	Description
Ir.0.0	●	○	○	Motor Running Current in R Phase
th.000	○	○	●	% Thermal Capacity used
oL Ir.34.5 th.100	○	●	○	Over load in R Phase at 34.5Amp. Thermal Capacity used-100%
UC IY.10.0 th.70	○	●	○	Under Current in Y Phase at 10 Amp. Thermal Capacity used-70%
Lr Ib.90.0 th.80	○	●	○	Locked Rotor in B Phase at 90 Amp. Thermal Capacity used-80%
SC Ir.240 th.70	○	●	○	Short Circuit in R Phase at 240 Amp. Thermal Capacity used-70%
EF th.60	○	●	○	Earth Fault Thermal Capacity used-60%
SPP IY.0.0 th.60	○	●	○	SPP in Y Phase Thermal Capacity used-60%
Ub Y-b th.60	○	●	○	Unbalance between Y & B Thermal Capacity used-60%
Lo urY th.70	○	●	○	Low voltage Fault R & Y Phase Thermal Capacity used-70%
HI urb th.70	○	●	○	High voltage Fault Y & B Phase Thermal Capacity used-70%
d.run th.60	○	●	○	Dry Run Fault Thermal Capacity used-60%

Parameter setting details

d-Id (Device ID) (Optional) : Device id for RS485 communication.

mOUt (Maximum Output) (Optional) : Maximum output for 20mA to be set as per the current selection by user.

UC-E-d (Under Current): It has enable/disable selection facility, user must keep this function enable to prevent motor against Under Current / Dry Run Protection.

UC-P (Under Current Point): Under Current occurs when motor current goes below set value.

UC-t (Under Current Time) : It is related to under current tripping delay when current goes to below set under current value. It can be set by user between the range of **1 to 60 sec.**

-Lt- (Lock Rotor Start Delay) : During Motor starting, trip delay range for locked rotor is 1 to 30 sec.The user can set the value as per the application. In heavy inertia loads, say for Blower, delay time should be set at 20 sec or above.

Lr-P (Lock Rotor Point) : Motor locked rotor trip operation occurs when locked rotor current exceeds three times the set value. It can be set as per motor rated full load current.

EotE/d (Earth Fault trip start delay): It has enable/ disable selection facility. User must select enable to delay Earth fault trip for 10 sec. during motor starting.

EF-P (Earth Fault trip Point) : Range is 10% to 30% of FLC.

EF-t (Earth Fault trip time) : Range is 0.5 to 3.0 sec.

SC-P (Short Circuit Point) : Motor short circuit trip operation occurs when the motor current exceeds 8 times the set value. It can be set as per motor rated full load current. It is instantaneous trip function.

OL-P **(Over Load Point) :** Motor over load trip operation occurs when motor over load current exceeds the set over load current value. It follows inverse time over current characteristic and "Thermal capacity" algorithm to initiate tripping. It can be set by the user as per motor rated full load current or between running current and rated current, it should not be set more than motor rated full load current.

OL-C **(Over Load Curve) :** It should be selected by user as per starting load inertia of motor. It has six over load curves 2.5C (fastest), 5C, 10C, 15C, 20C, 30C (slow). It follows I-T characteristic as given in page No. 15.

SPPE/d **(Single Phasing) :** It has enable/disable selection facility. User must keep this function enable to prevent motor against phase loss.

Ub-E/d **(Unbalance) :** It has enable/disable selection facility. User must keep this function enable to protect the motor against unbalance current. It is also related to voltage unbalance.

Ub-P **(Unbalance trip point) :** Range is 10% to 40%

Ub-t **(Unbalance trip time) :** Range is 3 to 10 Sec.

AL-P **(Pre-overload Alarm Point) :** Pre-overload alarm point can be set within the selected current range.

AL-t **(Pre-overload Alarm Time) :** Pre-overload alarm time can be set from 1 to 60 sec.

thrE/d **(Thermal Reset enable / disable) :** Thermal reset function must be kept enable to have reset to restart the motor after thermal capacity falls below the default set value of 70%.

dLY1 **(Reset Inhibit function) :** Fault reset inhibit time is adjustable from 1 sec. to 999 sec.

LO-P **(Low Voltage Trip Time) :** When the low voltage goes below the set low voltage point, the device trips.

LO-t **(Low Voltage Trip Time) :** the low voltage trip time delay can be set by user between 1 to 60 sec.

HI-E/HI-d (High Voltage enable/disable) : It has enable/disable selection facility. User must keep this function enable to protect the motor against High Voltage.

HI-P (High Voltage Trip Point) : When the high voltage goes above the set high voltage, the device trips.

HI-t (High Voltage Trip Time) : High voltage Trip delay can be set from 1 to 5 sec.

dr-P (Dry run KW Trip Point): The dry run KW can be set as per KW=3 x 240 x (current) x 0.8 for equivalent KW for current range selected.

dr-t (Dry run KW Trip Time) : Time delay for tripping of dry KW can be set from 1 to 60 sec.

bAUd (Baud rate & Parity) : RS 485 communication baud rate and parity selection.

PASSWORD MODE :

Press following two keys simultaneously R↵ & B▼ ⇨ Display shows `E-P` ⇨ Press RESET Key

press RESET key, for shifting cursor from first to fourth digit. The digit selected will blink. Use Y▲ and B▼ key to select password.

Press R↵ to save password, then display shows `SEt`

• RS 485 MODBUS-RTU PROTOCOL

Communication line Parameters : **Baud rate = 9600, Word length = 8, Parity = None, Stop bit = 1**

Protocol : **Modbus RTU**

Set device ID as per instrument device ID. Register map should be start from 4000 and register length should be 30 (from 4000 to 4029). The register map is described below. All addresses are in decimal. All parameters are integer.

Register Address	Description	Remark
4000	R Phase current	x 10
4001	Y Phase current	x 10
4002	B Phase current	x 10
4003	VRN Voltage	x 1
4004	VYN Voltage	x 1
4005	VBN Voltage	x 1
4006	VRY Voltage	x 1
4007	VYB Voltage	x 1
4008	VBR Voltage	x 1
4009	Earth	x 1
4010	Reserved	
4011	KW Value	x 100
4012 & 4013	KWh (Energy) Value 4012 contain higher word of KWh value 4013 contain lower word of KWh value	x 10000

Register Address	Description	Remark	
4014	Reserved		
4015	Indicates Fault Condition	Value : 0 =Healthy 1=Single Phasing 2=Unbalance 3=Under current 4=Overload 5= Locked rotor 6=Earth	7=Short circuit 9=Low Voltage 10=High Voltage 12=Dry run 16=Pre-overload alarm 17=High voltage & Pre-overload alarm
4016	Total Hour	x 1	
4017	Total Minute	x 1	
4018	Overload set value	x 10	
4019	PF	x 100	
4020	Apparent power (KVA)	x 100	
4021	Reserved	-	
4022	Thermal Percentage	x 1	
4023	Reserved	-	
4024	Reserved	-	
4025	Average Current	x 10	
4026	Average Phase to Phase Voltage	x 1	
4027			
4028 & 4029	KVAh (Energy) Value 4028 contain higher word of KVAh value 4029 contain lower word of KVAh value	x 10000	

• RS 485 MODBUS-RTU PROTOCOL

Communication line Parameters : **Baud rate=9600, Word length=8, Parity=None, Stop bit=1,** Protocol : **Modbus RTU**

Set device ID as per instrument device ID, Register address should start from 3000 and register length should be 22 (from 3000 to 3021). The register map is described below. All addresses are in decimal. All parameters are long.

Register Address	Description	Remark
3000	Average Current	x 10
3002	Average Phase to Phase Voltage	x 1
3004	KW Value	x 100
3006	KWh (Energy) Value	x 10000
3008	Indicates Fault Condition	Value : 0 =Healthy 1=Single Phasing 2=Unbalance 3=Under current 4=Overload 5= Locked rotor 6=Earth 7=Short circuit 9=Low Voltage 10=High Voltage 12=Dry run 16=Pre-overload alarm 17=High voltage & Pre-overload alarm
3010	PF Value	x 100
3012	Thermal Percentage	x 1
3014	Apparent power (KVA)	x 100
3016	Apparent Energy (KVAh)	x 10000
3018	Total Hour	x 1
3020	Total Minute	x 1

• RS 485 MODBUS-RTU PROTOCOL

Communication line Parameters : **Baud rate=9600, Word length=8, Parity=None, Stop bit=1,** Protocol : **Modbus RTU**

The register map is described below. All addresses are in decimal.
All parameters are integer.

Register Address Read/Write	Description	Remark
0001	Reset Command	For Reset, set value=1
0002	Full Load Current Selection Mode	Value : 2=Auto, 1=Manual
0003	Full Load Current (FLC)	X 10 (Ad per current range)
0004	Device ID (For Rs-485 Model)	only readable
0005	mOut (For 4-20mA Output Mode)	X 10 (As per Current Range)
0006	Under Current Enable / Disable	Value : 2=Enable, 1=Disable
0007	Under Current Value in %	30 to 80
0008	Under Current Trip Time	1 to 60 Sec.
0009	Lock rotor start delay	1 to 30 Sec.
0010	Lock rotor value	x 10 (As per current range)
0011	Earth delay Enable / Disable	Value : 2=Enable, 1=Disable
0012	Earth value in %	10 to 30
0013	Earth Trip Time	5 to 30 (1=0.1 Sec.)
0014	RFU (Reserved For future use)	-------
0015	Short circuit value	x 10 (As per current range)
0016	Over load value	x 10 (As per current range)
0017	Over load curve	Value : 1=2.5C, 2=5C, 3=10C 4=15C, 5=20C, 6=30C

Register Address Read/Write	Description	Remark
0018	Single phasing Enable/Disable	Value : 2=Enable, 1=Disable
0019	Unbalance Enable / Disable	Value : 2=Enable, 1=Disable
0020	Unbalance in %	10 to 40
0021	Unbalance Trip Time	3 to 10 Sec.
0022	Pre - Over load alarm point in %	90% value of overload trip point setting
0023	Pre - Over load alarm time	1 to 60
0024	Thermal reset Enable/Disable	Value : 2=Enable, 1=Disable
0025	RFU (Reserved for future use)	------
0026	Reset delay time	1 to 999
0027	RFU (Reserved for future use)	-----
0028	Low voltage trip value	100 to 500
0029	Low voltage trip time	1 to 60 Sec.
0030	High voltage Enable/Disable	Value : 2=Enable, 1=Disable
0031	High voltage trip value	100 to 500
0032	High voltage trip time	1 to 5 Sec.
0033	Dry run kW trip value	kW equipment of lowest value of current range selected
0034	Dry run kW trip time	1 to 30 Sec.
0035	Baud rate & Parity	Only readable

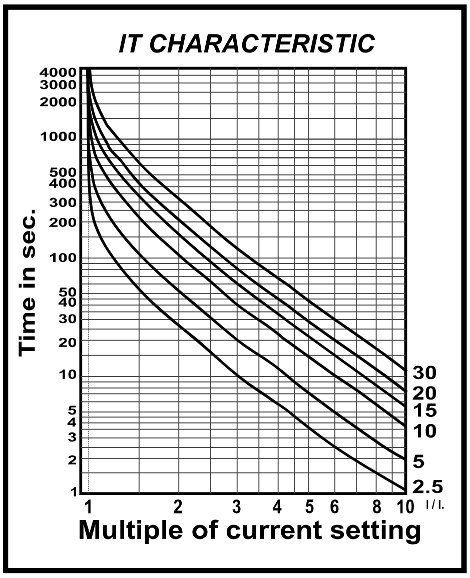
Motor Protection Device Range Selection Chart :

As per different suitable range of Protection Device for Motor HP, consider line current based selection as under..

Range	Min. Earth fault pickup current at 10% FLC	Suitable HP
0.2 to 12.5 Amp	0.6A	0.5 to 7.5 hp
0.8 to 25 Amp	0.6A	3 hp to 15 hp
2 to 62.5 Amp	0.6A	20 hp to 40 hp
4 to 125 Amp	0.6A	50 hp to 75 hp
40 to 250 Amp	4A	100 hp to 150 hp

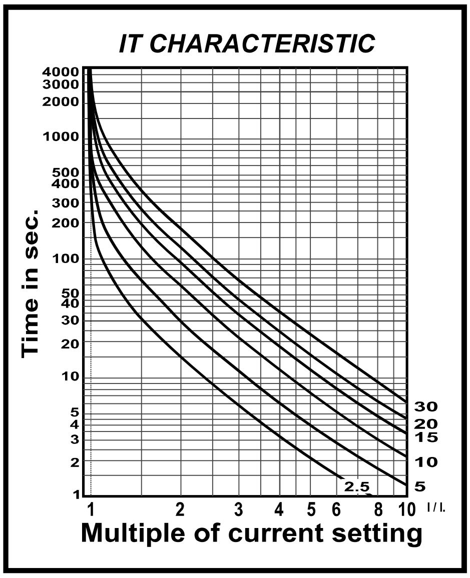
OVER LOAD COLD CURVE

IT Curve - 2.5 C, 5 C, 10 C, 15C, 20C, 30C



OVER LOAD HOT CURVE (TYPICAL)

IT Curve - 2.5 C, 5 C, 10 C, 15C, 20C, 30C



☞ **SR. NO. :**

☞ **AUX. SUPPLY :**

☞ **OL RANGE AMP. :**

☞ **CT ID :**

STANDARDS EQUIPMENT USED : CONSTANT AC VOLTAGE & CURRENT SOURCE.

CT USED : FIXED RATIO CT's CUSTOMIZED TO SUIT THE CURRENT RANGE OF MOTOR PROTECTION DEVICE.

TRACEABILITY : THE ABOVE DEVICE WAS CALIBRATED AND TESTED WITH REFERENCE TO STANDARD EQUIPMENT.

☞ **RESULTS OF TEST :**

☞ **SPECIAL REMARKS :**

☞ **TEST ENGINEER :**

☞ **DATE :**

WARRANTY

THE EQUIPMENT SUPPLIED UNDER THIS T.C. IS GUARANTEED AGAINST DESIGN, MANUFACTURING AND WORKMANSHIP DEFECTS FOR A PERIOD OF **12 MONTHS** FROM THE ABOVE DATE. **EXCELTECH INDIA PRIVATE LIMITED** UNDERTAKES TO REPLACE / REPAIR THE FAULTY UNIT AT OUR WORKS FREE OF COST. THE MANUFACTURERS LIABILITY IS LIMITED TO THE VALUE OF GOODS SUPPLIED. THE MANUFACTURER WILL TAKE NO RESPONSIBILITY FOR ANY CONSEQUENTIAL DAMAGE CLAIMED WHATSOEVER. THIS WARRANTY CERTIFICATE IS FROM THE MANUFACTURER. THE MANUFACTURING RESERVES THE RIGHT TO DETERMINE THE REASON FOR DEFECT / DAMAGE BEFORE PROVIDING SERVICE.