Installation, Maintenance & Troubleshooting Guide For RAJA+ Agriculture Starters & Controllers

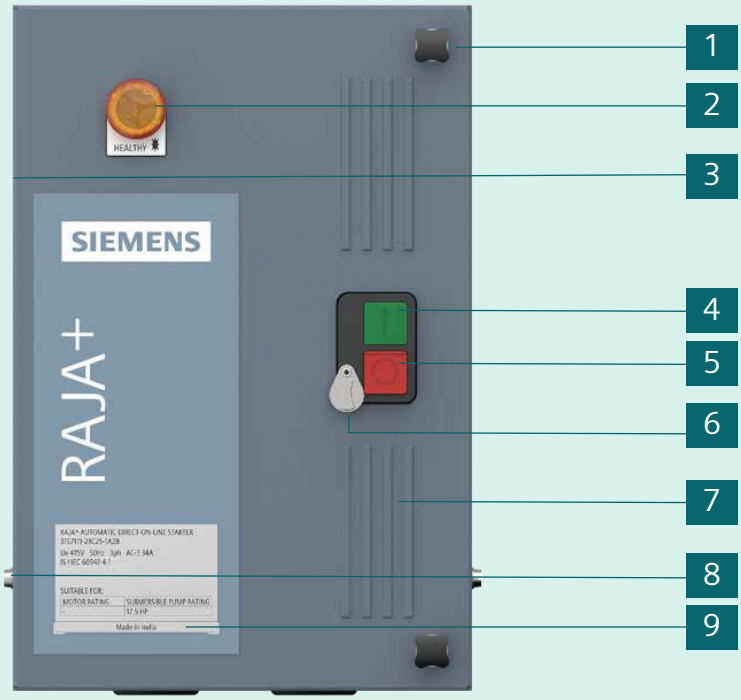
RAJA+

SIEMENS

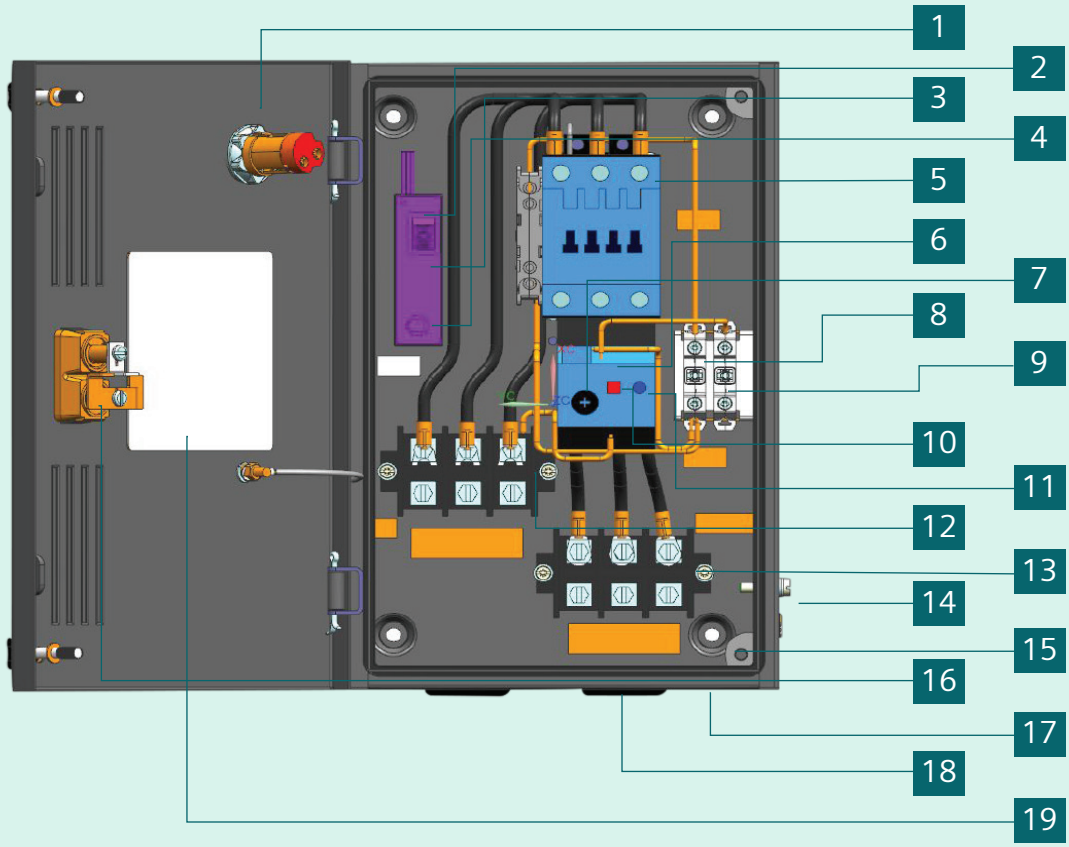
Contents:

Product: Automatic Direct ON Line Starter

1.1: Product Description

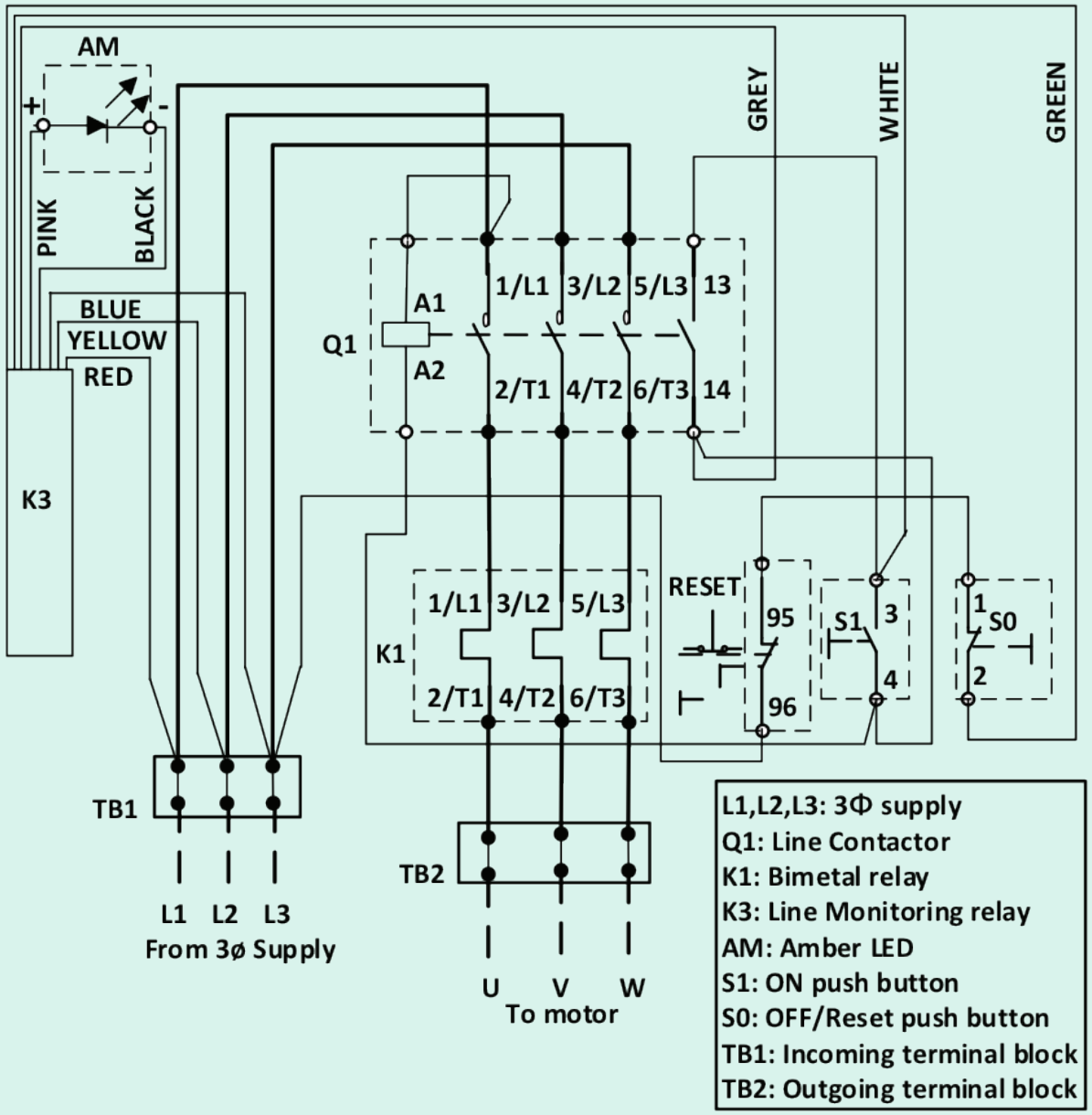


1: Door Knob	- For screwing & unscrewing the door
2: Amber LED	- For indicating the incoming power supply availability & healthiness.
3: Metal enclosure	- Metallic enclosure of ADOL starter
4: ON Push button (Green)	- For switching ON the motor
5: OFF/RESET push button (Red)	- For switching OFF the motor / Reset the overload relay
6: Mechanical Latch (OFF push button)	- For preventing undesired ON operation of motor
7: Door	- Door of ADOL starter
8: Earthing screw	- Earthing screw of ADOL starter for Customer
9: Name Plate	- Name plate with technical details of ADOL

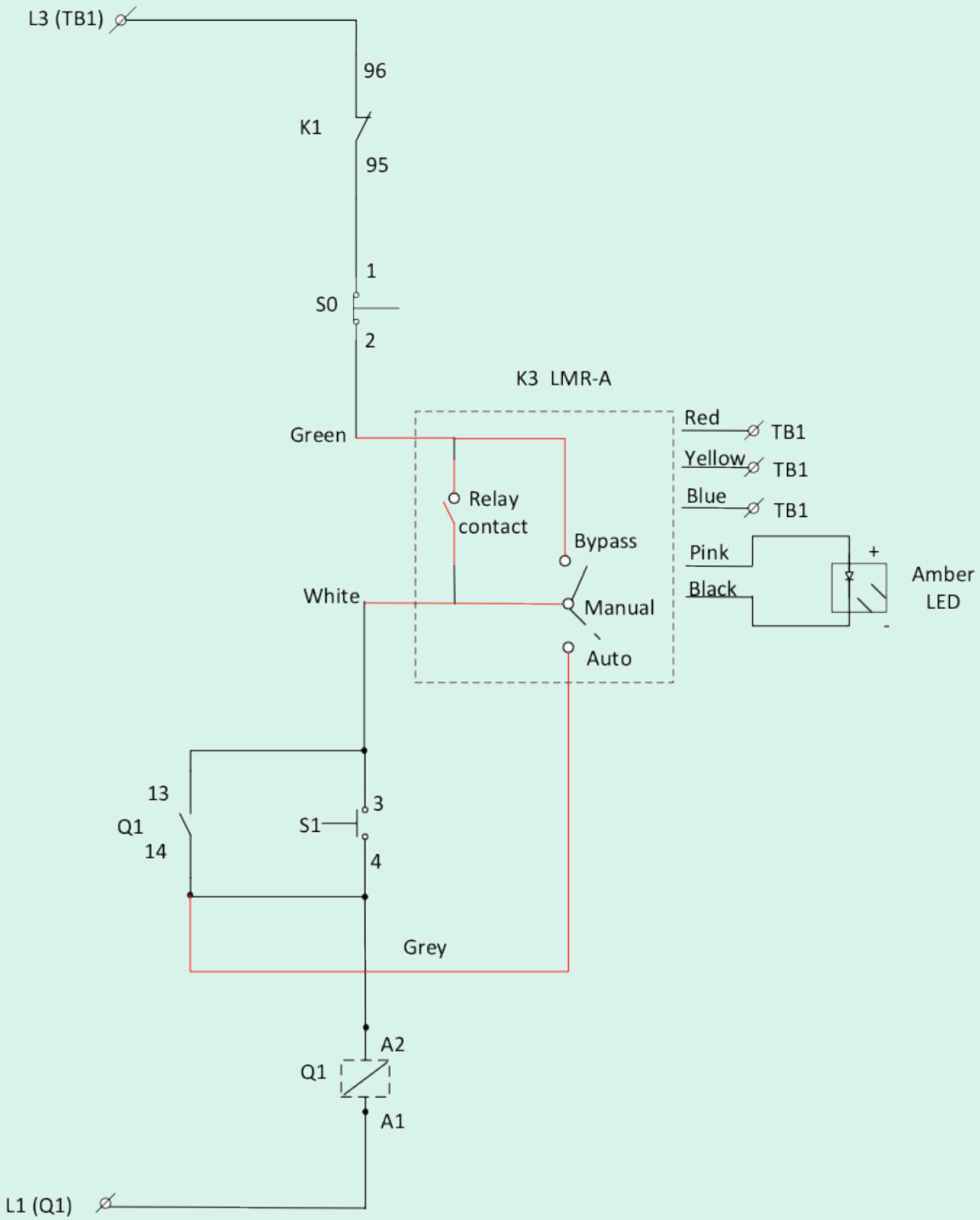


1: Amber LED	- For indicating the healthiness of incoming power supply
2: Starter Mode selecting switch	- For the selection of starter operating mode (Auto,Manual, Bypass)
3: LMRA	- For checking the healthiness of incoming power supply
4: LMRA On delay dial	- On delay setting dial (0.5-5min)
5: Contactor	
6: Thermal overload relay	
7: Relay setting dial	- Dial which can be set according to the motor current
8: Green NO Aux.contact	- For switching ON the motor if starter enclosure is open
9: Red NC Aux.contact	- For switching OFF the motor if starter enclosure is open
10: Relay Red test button	- For checking the relay trip circuit
11: Relay reset button	- For resetting the relay
12: Incoming terminal block (TB1)	- For connecting the incoming supply cables
13: Outgoing terminal block (TB2)	- For connecting the outgoing supply cables to motor
14: Earthing screw	- Starter earthing provision
15: Mounting hole	- 4x holes for mounting the starter
16: Links	- Links of ON & OFF push buttons
17: Gasket	
18: Grommet	- For the incoming & outgoing cable passage
19: Wiring diagram label	

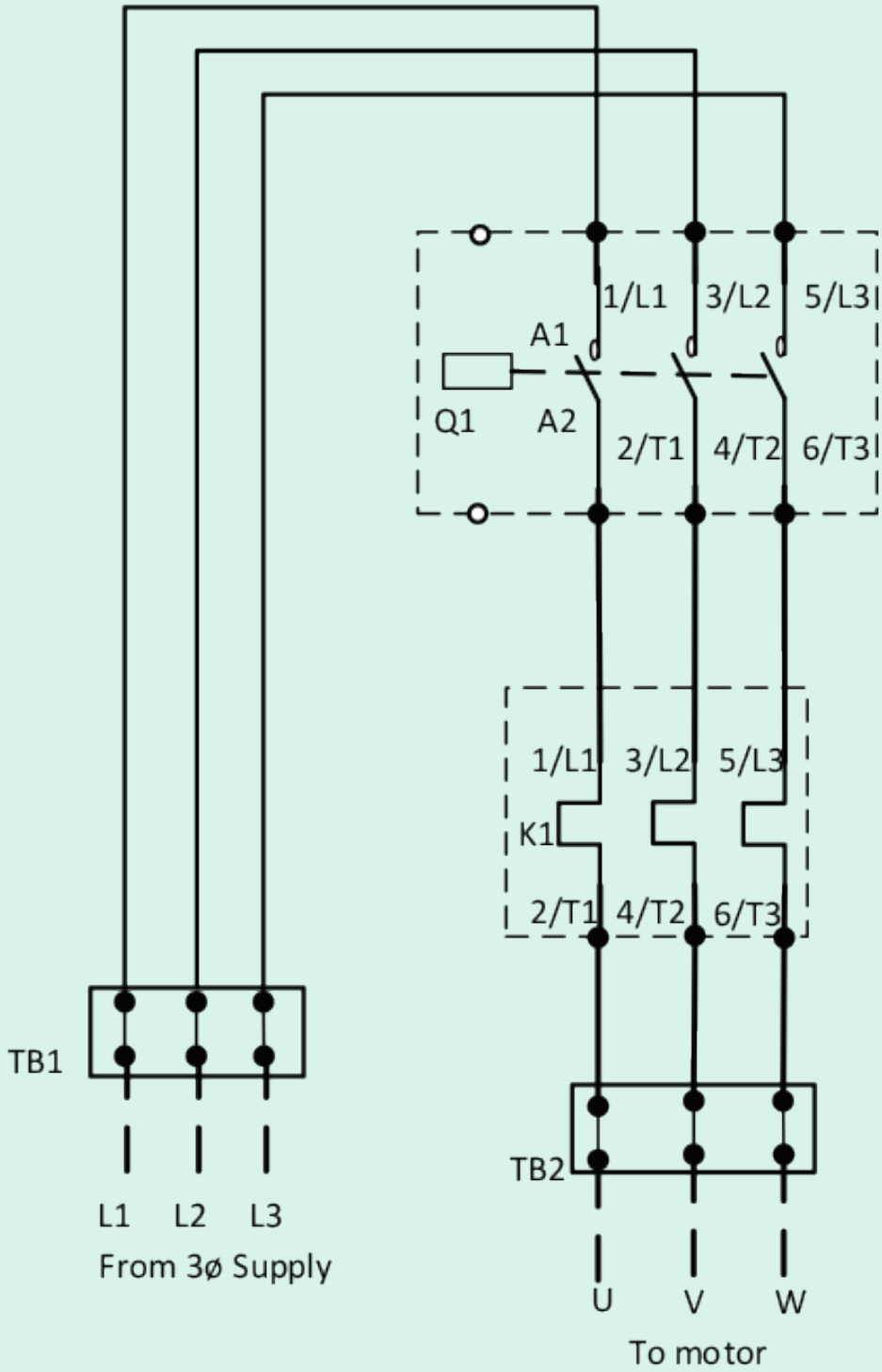
1.2: Wiring Diagram



Control logic diagram



Power circuit diagram



1.3: Technical details

Table: 1 Technical details of ADOL Starter

Type	(HP / kW)	Ie (A)	Contactor	Relay	Range (A)	Line Monitoring Relay	Recomm-ended Max. Back-up HRC Fuse rating, SIEMENS Make type 3NA7 – 500V*	Max. Recomm ended Cu cable size (sq:mm)
3TE7111-2SC18-1Axx	7.5/5.5	11.4	3TS3210-0Ax x-08K	3UW5102-2A	10-16	7UG0613-0yy20	32A	2.5
	7.5/5.5	14.5	3TS3210-0Axx-08K	3UW5102-2A	10-16	7UG0613-0yy20	32A	2.5
3TE7111-2BC21-1Axx	10/7.5	15.4	3TS3311-0Axx-08K	3UW5102-2B	10-16	7UG0613-0yy20	32A	2.5
3TE7111-2CC21-1Axx	10/7.5	19.5	3TS3311-0Axx-08K	3UW5202-2C	12.5-20	7UG0613-0yy20	32A	2.5
	12.5/9.3	19.5	3TS3311-0Axx-08K	3UW5202-2C	16-25	7UG0613-0yy20	32A	4.0
3TE7111-2DC23-1AZ8	12.5/9.3	25	3TS3511-0AZ8-08K	3US5600-2D	20-32	7UG0613-0yy20	63A	4.0
3TE7111-2CC24-1Axx	15/11	23	3TS3411-0Axx-08K	3UW5202-2C	16-25	7UG0613-0yy20	32A	4.0
3TE7111-2QC24-1AZ8	15/11	29	3TS3511-0AZ8-08K	3US5600-2Q	25-36	7UG0613-0yy20	63A	10
3TE7111-2RC25-1AZ8	17.5/13	34	3TS3611-0AZ8-08K	3US5600-2R	32-40	7UG0613-0yy20	80A	10

Note: xx: Coil voltage; Z6:200-400V AC; Z8: 260-460V AC
yy: Coil voltage; FE:200-400V AC; FF: 260-460V AC

*Type 1 coordination as per IS/IEC 60947-4-1 Standard.

1.4: Installation

1. Open the door by unscrewing the door knob.
2. Fix the starter enclosure vertically on a rigid surface free from vibration.
3. Remove the rubber grommets for incoming and outgoing cable connections. (Fig: 2)
4. Connect incoming and outgoing cables as follows (Fig: 2)
   -Select correct size of cable from Table 1.
   -Remove approx. 10mm of insulation.
   -Pass the cable through proper cable gland to avoid ingress of material.
   -Connect the incoming supply cables to terminal block TB1 and tighten the screws firmly (ref.tightening torque from Table 3).
5. NOTE: LMRA is set in Manual mode (Factory setting).
6. Set the overload relay scale (Fig: 2) using proper screw driver as per the procedure given below.
7. Set the overload relay to rated current mentioned on motor name plate.
8. Press green button of the Aux.contact block (Fig: 2) to start the motor and wait till it reaches to normal speed.
9. Reduce the overload relay settings till it trips.
10. Set the overload relay at slightly higher value.
11. Allow a reset time approx 4min. and reset the overload relay manually (Fig: 2)
12. Restart the motor. If the relay does not trip, consider the overload relay as properly set. If it trips, set it at little higher value and recheck.
13. Press the red knob (Fig: 2) on the overload relay to stop the motor
14. Fix the door by screwing the knob

Table: 2 Mounting Torque Values

Sr. No	Location	Size	Torque
1	Earthing screw (cover to body)	M5	2.5-3.0Nm
2	Contactor 3TS30..36	M4	0.8-1.4Nm
3	LMR-A	M4	0.8-1.4Nm
4	Terminal block 30A	M4	0.8-1.4Nm
5	Terminal block 60A	M4	0.8-1.4Nm
6	ON& OFF /Rest link	ST4.2x9.5	0.8-1.2Nm

Table: 3 Terminal Torque Values

Sr. No	Location	Size	Torque
1	3TS30..32	M3.5	0.8-1.4Nm
2	3TS33/34 (Power wiring)	M4	1.0-1.5Nm
3	3TS35/36 (Power wiring)	M5	2.5-3.0Nm
4	Terminal block 30A	M4	0.8-1.4Nm
5	Terminal block 60A	M5	1.5-2.1Nm
6	Contact block 3SB5	M3.5	0.8-1.2Nm
7	Aux terminal (side add on) of 3TS35/36, 3TS33/34	M3.5	0.8-1.4Nm
8	Coil Terminals A1/A2	M3.5	0.8-1.2Nm
9	Aux. terminals of all Relays	M3.5	0.8-1.2Nm
10	3UW51/52	M4	1.0-1.5Nm
11	3US56	M5	2.5-3.0Nm
12	Indicating light - Amber	M3	0.8Nm

1.5: Operating procedure in normal condition

Table: 4 ADOL operating sequence in normal condition

1A	1B	1C	1D	1E	1F	1G	1H	1I	1J	1K	1L
LMR-A Mode	3ϕ main supply	Amber LED indication	On-Delay	Amber LED	'ON' Push button	Starter Operation	'OFF' Push button	Starter Operation	Amber LED	3ϕ main supply	Amber LED indication
Manual	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	OFF	OFF	ON	OFF	OFF
Auto	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	Lock	OFF	ON	OFF	OFF
Bypass	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	OFF	OFF	ON	OFF	OFF
ON operation							OFF operation				

Starter operation:

LMR-A: Manual mode

1A : Keep the LMR-A in Manual mode.
1B : Switch ON 3-Phase incoming main supply.
1C : Amber LED will start blinking for a period of min 0.5 min.
1D : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.
1E : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy).
1F : Press the green push putton for switching ON the starter.
1G : Starter gets switched ON.
1H : Press the red push button for switching OFF the starter.
1I : Starter gets switched OFF.
1J : Amber LED indication remains continous ON.
1K : Switch OFF the 3-phase incoming main supply.
1L : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Auto mode

1A : Keep the LMR-A in Auto mode.
1B : Switch ON the 3-Phase incoming main supply.
1C : Amber LED will start blinking for a period of min 0.5 min.
1D : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.
1E : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy(Assuming incoming supply is healthy).
1F : Not applicable (No need to press ON push button)
1G : Starter gets switched ON automatically.
1H : Press the red push button and lock by mechanical latch for switching OFF the starter.
1I : Starter gets switched OFF.
1J : Amber LED indication remains continous ON.
1K : Switch OFF the 3-phase incoming main supply.
1L : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Bypass mode

1A : Keep the LMR-A in Bypass mode.

1B : Switch ON the 3-Phase incoming main supply.

(*Customer may switch ON the starter directly after switching ON the 3 phase incoming supply irresepctive of Blinking status as there is only indication for incoming supply faults and no Protection in Byapass mode.)

1C : Amber LED will start blinking for a period of min 0.5 min.

1D : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

1E : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy(Assuming incoming supply is healthy).

1F : Press the green push putton for switching ON the starter.

1G : Starter gets switched ON.

1H : Press the red push button for switching OFF the starter.

1I : Starter gets switched OFF.

1J : Amber LED indication remains continous ON.

1K : Switch OFF the 3-phase incoming main supply.

1L : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

1.6: Troubleshooting Guidelines in case any incoming supply fault is present before switching ON the Starter

Table: 5 ADOL operating sequence in fault condition

2A	2B	2C	2D	2E	2F	2G	2H	2I	2J
LMR-A Mode	3ϕ main supply	Amber LED indication	On-Delay	Amber LED indication	Possible causes of fault	Corrective action	Amber LED indication	'ON' Push button	Starter operation
Manual	ON	Blink	0.5-5min	Blink	#	1)	ON	ON	ON
Auto	ON	Blink	0.5-5min	Blink	#	2)	ON	NA	ON
Bypass	ON	Blink	0.5-5min	Blink	NA	NA	ON	ON	ON

#: Phase loss[1], Phase reversal[2], Under voltage[3], Over voltage[4], Phase unbalance[5]
NA – Starter is unprotected from incoming power supply faults,only protection from load side faults. In this mode, amber LED will continously ON if incoming power supply is healthy and will blink if the incoming power supply is unhealthy–Refer 1.8

Starter Fault conditon:

1) LMR-A: Manual mode

2A : Check the mode of LMR-A, if it is manual mode, please follow the below steps.

2B : Switch ON the 3-Phase incoming main supply.

2C : Amber LED will start blinking

2D : Amber LED will blink for a duration of min 30sec.

2E : After the On-delay duration, amber LED remains blinking indicating that the incoming supply is unhealthy.

[1]2F : - Check the rated operational voltage of the starter in incoming terminal block (TB1) between L1-L2, L2-L3, L1-L3 with suitable equipment e.g. multimeter.
- Check for the phase loss in any phase (L1,L2,L3) with suitable equipment e.g. multimeter.

[1]2G : - After resuming incoming main supply to normal condition, repeat the steps from 2A to 2D and then go to step no.2H

If fault still exists, then

[2]2F : - Check the phase sequence of all the phases of incoming main supply at terminal block TB1.
- Identify the wrong sequence of phase connected in any of the incoming terminal.

[2]2G : - Connect the phase sequence of all the phases correctly (R phase to L1 , Y phase to L2, B phase to L3) to the incoming main supply terminals of Terminal block TB1.
- Repeat the steps from 2A to 2D and then go to step no.2H

If fault still exists, then

[3]2F : - Check the rated operational voltage of the starter in incoming terminal block (TB1) between L1-L2, L2-L3, L1-L3 with suitable equipment e.g. multimeter.
- Check whether the 3-phase voltage in the incoming terminals of terminal block TB1 is less than minimum required voltage (Refer table no.6).

[3]2G : - Starter will be operational only if the 3-phase incoming supply voltage is between min.required voltage & max.voltage allowed (Refer table no.6).
- Repeat the steps from 2A to 2D and then go to step no.2H

If fault still exists, then

[4]2F : - Check the rated operational voltage of the starter in incoming terminal block (TB1) between L1-L2, L2-L3, L1-L3.
- Check whether the 3-phase voltage in the incoming terminals of terminal block TB1 is >Maximum voltage allowed. (Refer table no.6).

[4]2G : - Starter will be operational only if the incoming supply voltage is between min.required voltage & Max.voltage allowed (Refer table no.6).
- Repeat the steps from 2A to 2D and then go to step no.2H

If fault still exists, then

[5]2F : - Check the rated operational voltage of the starter in incoming terminal block (TB1) between L1-L2, L2-L3, L1-L3.
- Check whether the operational line voltage difference between any 2 phase in the incoming. terminals of terminal block TB1 is >50V.

[5]2G : - Starter will be operational only if the incoming supply voltage difference between any 2 phase in the incoming terminal block TB1 of the starter is <=50V.
- Repeat the steps from 2A to 2D and then go to step no.2H

2H : Amber LED will remain ON continously indicating that the fault is cleared

2I : Press the Green ON push button to switch ON the starter.

2J : Starter gets switched ON.

Table: 6 Range of Undervoltage & Over voltage

Starter Voltage Range (V)	Undervoltage fault		Overvoltage fault	
	Trip voltage for undervoltage fault (V)	Trip voltage for undervoltage fault (V)	Trip voltage for Overvoltage fault (V)	Max.voltage allowed (V)
(Z6) 200-400	≤ 195	205	≥ 400	390
(Z8) 260-460	≤ 250	260	≥ 455	445

2) LMR-A: Auto mode

2A : Check the mode of LMR-A, if it is Auto mode, please repeat the steps from 2B to 2H.

2I : No need to press ON push button.

2J : Starter gets switched ON automatically.

* LMR-A: Bypass mode

As in Bypass mode there is no protection from the inconing supply faults, however there may some conditions, example mentioned below where Starter may not ON –

1. Phase loss
2. Incmoing supply voltage less than the minimum required operational voltage of the Starter.
3. Incoming supply voltage is very high etc.....

In the above conditions check the Starters as explained in Auto & Manual Mode.

1.7: Troubleshooting Guidelines in fault condition when motor stops while it is in running condition

Table: 7 ADOL operating sequence in fault condition

3A	3B	3C	3D	3E	3F	3G	3H	3I	3J	3K	3L
Motor conditon	LMR Mode	Amber LED indication	Possible causes of fault	Corrective action	3ϕ main supply	Amber LED indication	Waiting duration	Amber LED indication	'ON' Push button	Starter operation	Motor conditon
Not Running	Manual	Blink	#	1)	ON	Blink	0.5-5min	ON	ON	ON	Running
Not Running	Auto	Blink	#	2)	ON	Blink	0.5-5min	ON	NA	ON	Running
Not Running	Bypass	Blink**	NA	NA	ON	Blink	0.5-5min	ON	ON	ON	Running

#: Phase loss[1], Phase reversal[2], Under voltage[3], Over voltage[4], Phase unbalance[5]
NA – Starter is unprotected from incoming power supply faults,only protection from load side faults. In this mode, amber LED will continously ON if incoming power supply is healthy and will blink if the incoming power supply is unhealthy– Refer 1.8

Starter Fault conditon:

1) LMR-A: Manual mode

3A : Motor suddenly stops after running for some time.
3B : Check the mode of LMR-A, if it is Manual mode.
3C : Amber LED will start blinking 3D,
3E : Follow steps from 2F to 2G of manual mode (Refer Table no.5 ; Corrective action 1))
3F to 3K : Follow steps from 1B to 1G of manual mode (Refer Table no.4)
3L : Motor starts running again.

1) LMR-A: Auto mode

3A : Motor suddenly stops after running for some time.
3B : Check the mode of LMR-A, if it is Auto mode.
3C : Amber LED will start blinking
3D ,3E : Follow steps from 2F to 2G of Auto mode (Refer Table no.5; Corrective action 2))
3F to 3K : Follow steps from 1B to 1G of Auto mode (Refer Table no.4)
3L : Motor starts running again.

**LMR-A: Bypass mode

As in Bypass mode there is no protection from the inconing supply faults, however there may some conditions, example mentioned below where Starter may not ON –

1. Phase loss
2. Incoming supply voltage less than the minimum required operational voltage of the Starter.
3. Incoming supply voltage is very high etc.....

In the above conditions check the Starters as explained in Auto & Manual Mode.

1.8: Troubleshooting Guidelines in case any fault is at load side

Steps to be followed

Thermal overload relay provide protection from:

a) overload condition at Motor

b) single phasing at load side

a) overload condition at Motor : check the suitable Motor current rating and adjust the overload relay setting dial as per the requirement.

b) Single phasing at load side – Overload relay tripped as inbuilt feature to protect from single phase faults. Check the single phasing condition at Motor side terminal TB2,TB3 to Motor.

For both conditions restart the Starter after proper reset time of approx. 4 min.

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