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

RAJA+

SIEMENS

Contents:

Fully Automatic Star Delta Controller with WLC

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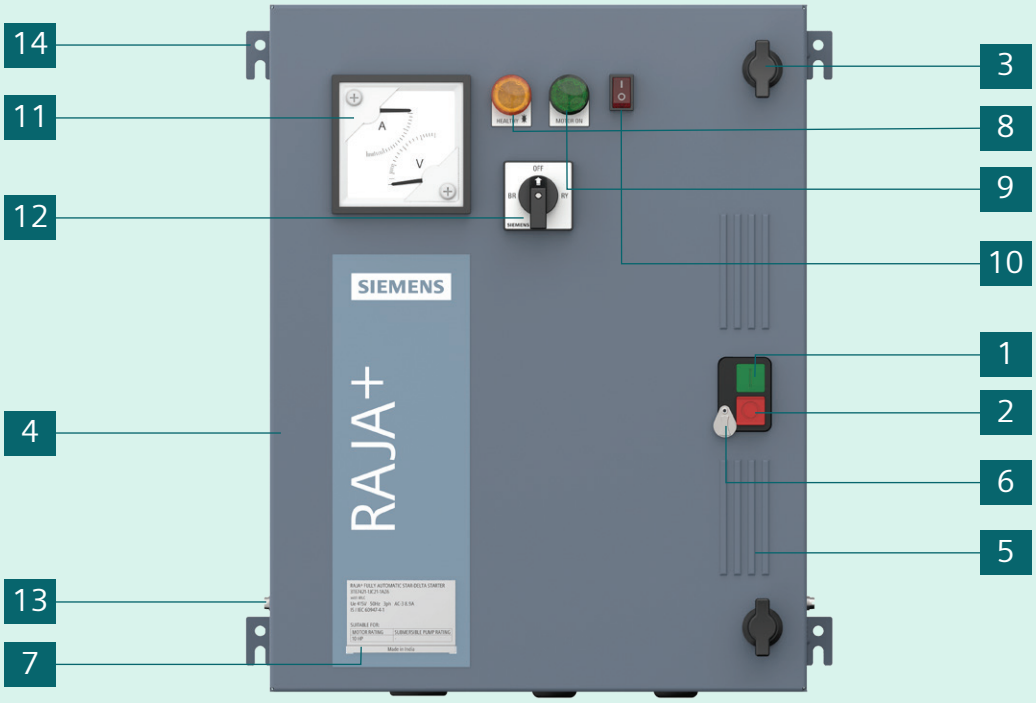
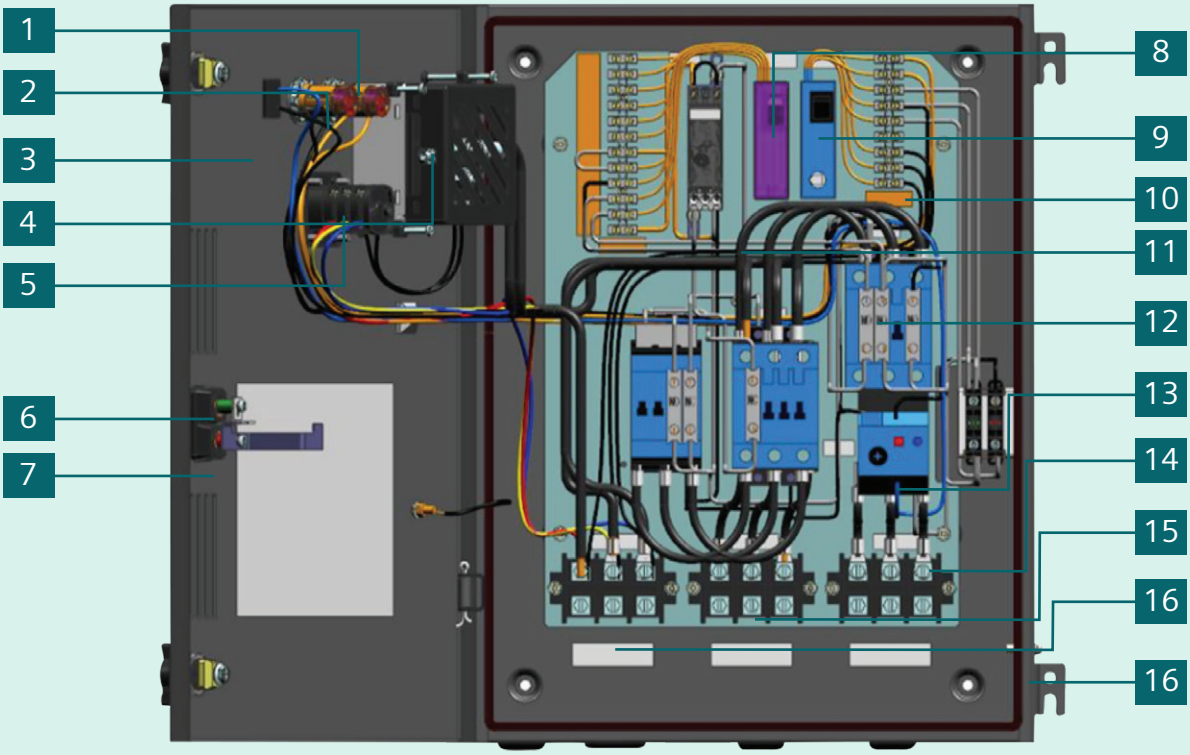


Fig:12 FASD Controller

1. 'ON' push button (green)
2. 'OFF/RESET' push button (red)
3. Door knob
4. Metal Enclosure
5. Door
6. Mechanical Latch (OFF push button) to be used for preventing undesired ON operation of Controller
7. Name plate
8. LED (amber) to indicate availability and healthiness of incoming power supply
9. Green LED to indicate Motor ON status
10. Rocker switch (Control ON/OFF)
11. Dual VA meter (For indication)
12. Phase Selector switch
13. Earthing screw
14. Controller Mounting bracket

Inside view of Fully Automatic Star Delta Controller with WLC



1: Amber LED

2: Green LED

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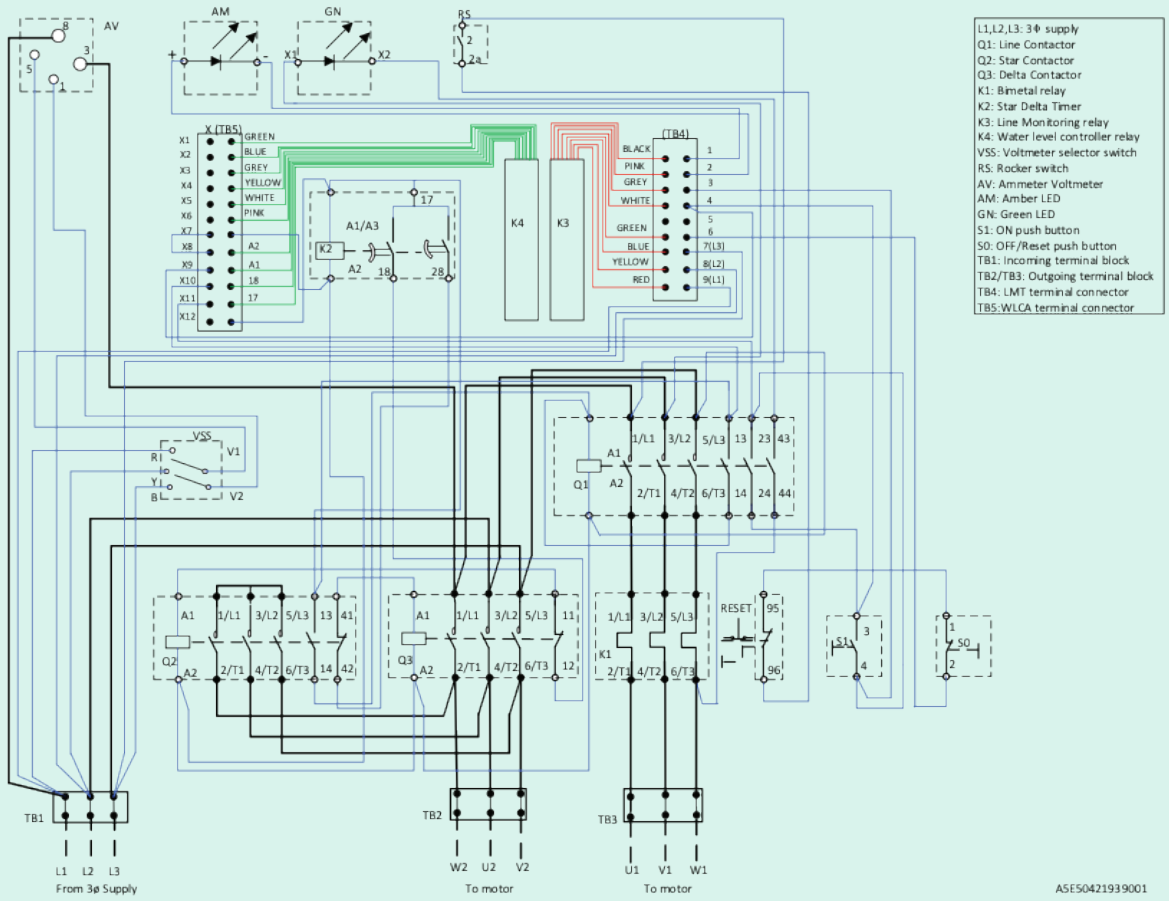
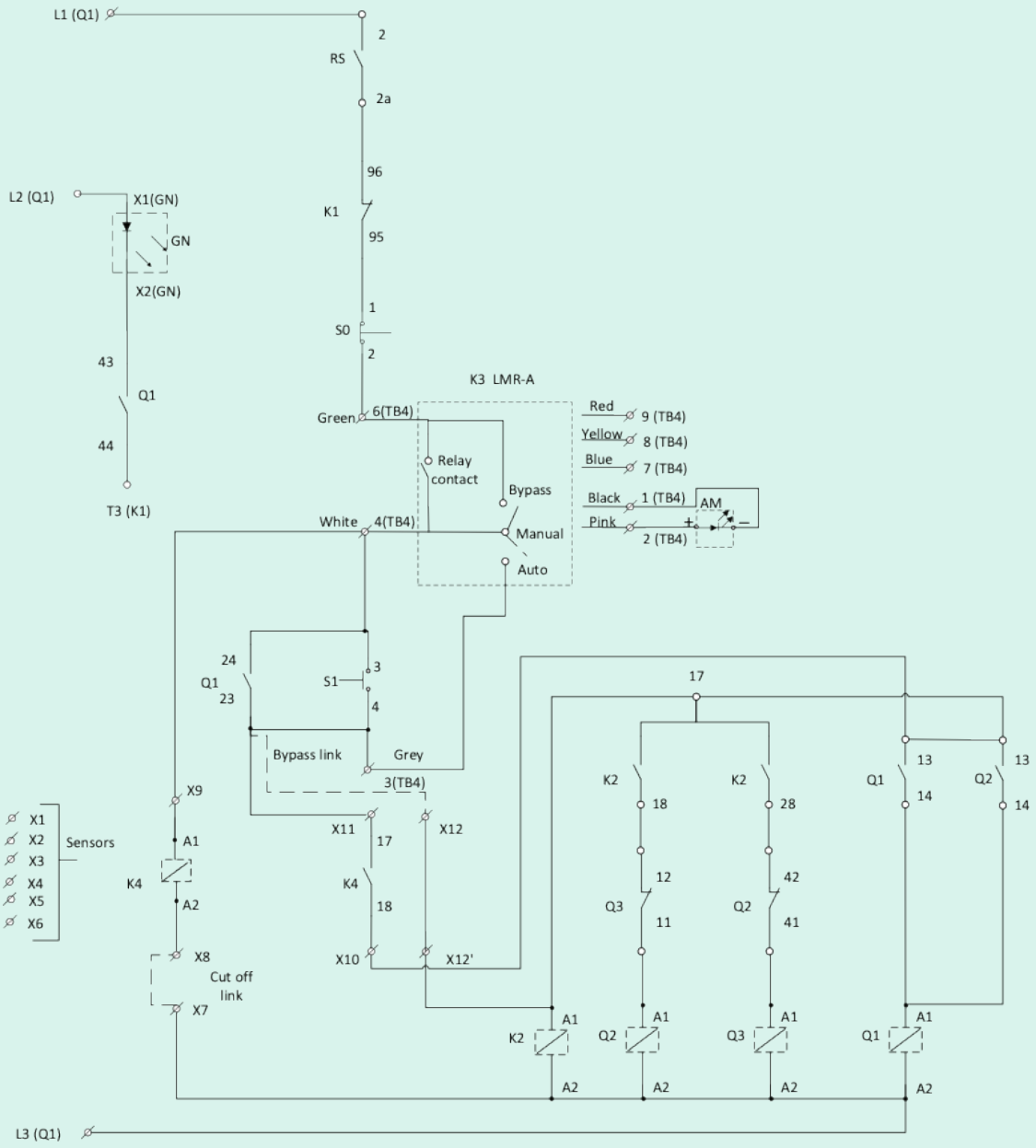
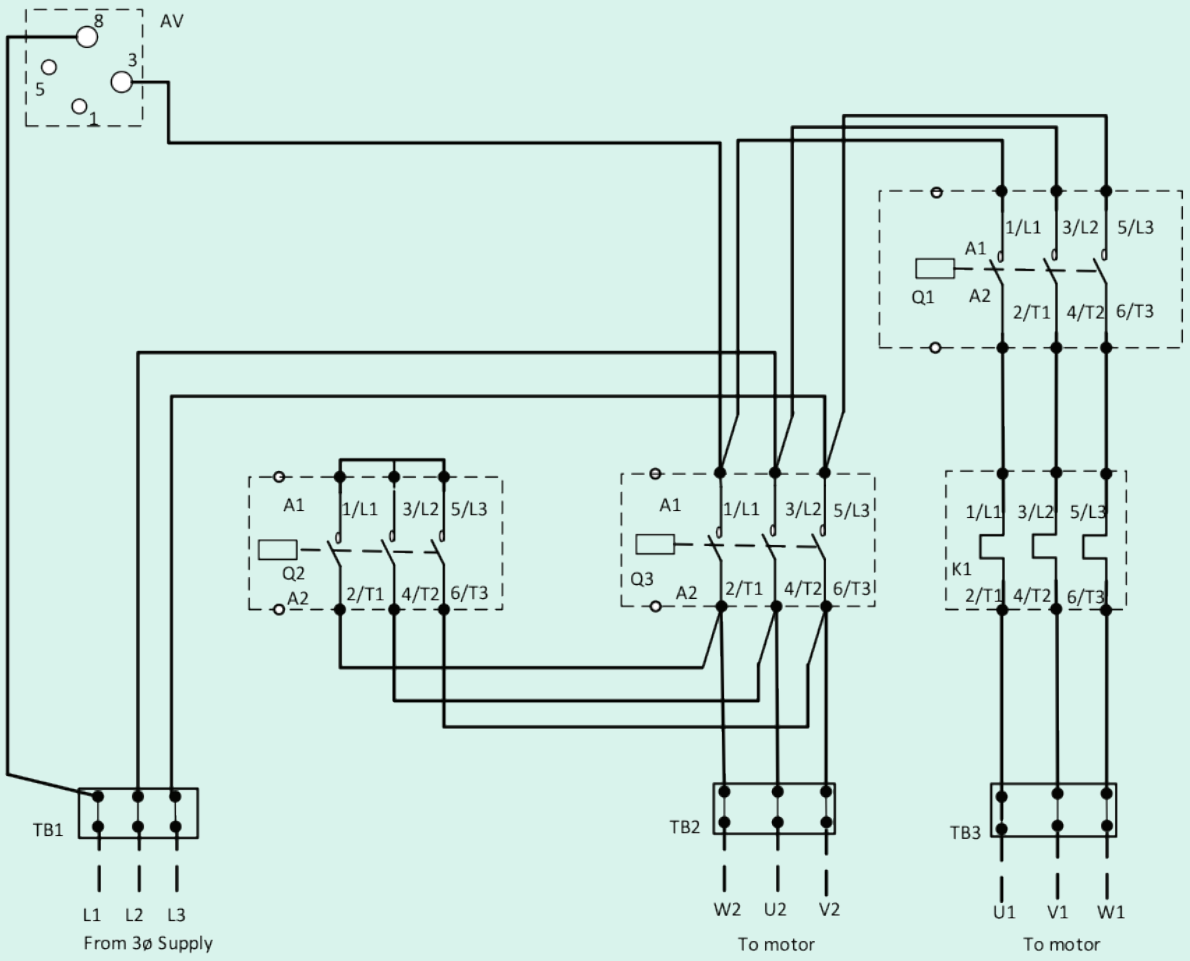


5.21 Control logic diagram



5.22 Power circuit diagram



5.3: Technical details

Table: 25 Technical details-FASD Controller with WLC

Type	(HP / kW)	IL/ Iph (A)	Line & Delta Contactor Type	Star contactor Type	Overload Relay	Range (A)	Line Monitoring Relay^	Nominal HRC fuses rating Type 3NA7 500V*	Max. Recommended Cu cable size (sq:mm) Incoming / outgoing
3TE7431-2BC24-1Axxγ	15/11	29 / 16.7	3TS33	3TS31	3UW5202-2B	12.5-20	7UG0613-0yy20	32A	6.0/2.5
3TE7431- 2CC25-1Axx	17.5/13	34 / 19.6	3TS35	3TS33	3US5600-2C8K	16-25	7UG0613-0yy20	50A	10/2.5
3TE7431-2DC26-1Axx	20/15	39 / 22.5	3TS35	3TS33	3US5600-2D8K	20-32	7UG0613-0yy20	63A	10/4.0
3TE7431-2DC27-1Axx	25/18.5	48 / 27.7	3TS35	3TS34	3US5600-2D8K	20-32	7UG0613-0yy20	63A	10/6.0
3TE7431-2RC28-1Axx	30/22	57 / 32.9	3TS35	3TS34	3US5600-2R8K	32-40	7UG0613-0yy20	80A	16/10

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

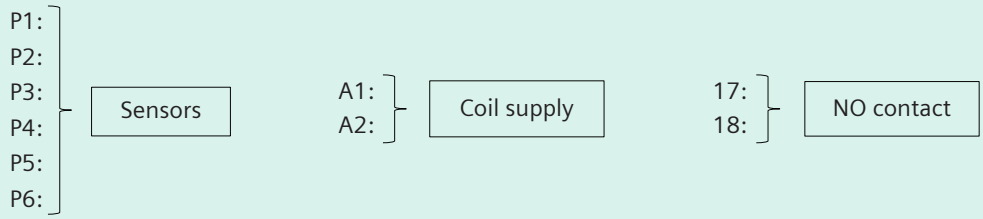
*Type 1 coordination as per IS/IEC 60947-4-1 Standard.

Water Level controller relay:
WLCA is used in the DOL Controllers for the regulation of water level in the tank.

Technical data:

Product	Water level controller relay
Control Voltage	415V AC
Frequency	50-60Hz
Operating modes	Single tank operation (Delivery or Suction mode)
	Dual tank operation (Delivery & Suction mode)
Trip time delay	2sec (+/-0.5sec)

Terminal connections:



Diagrammatic representation of the 3x modes of WLCA:

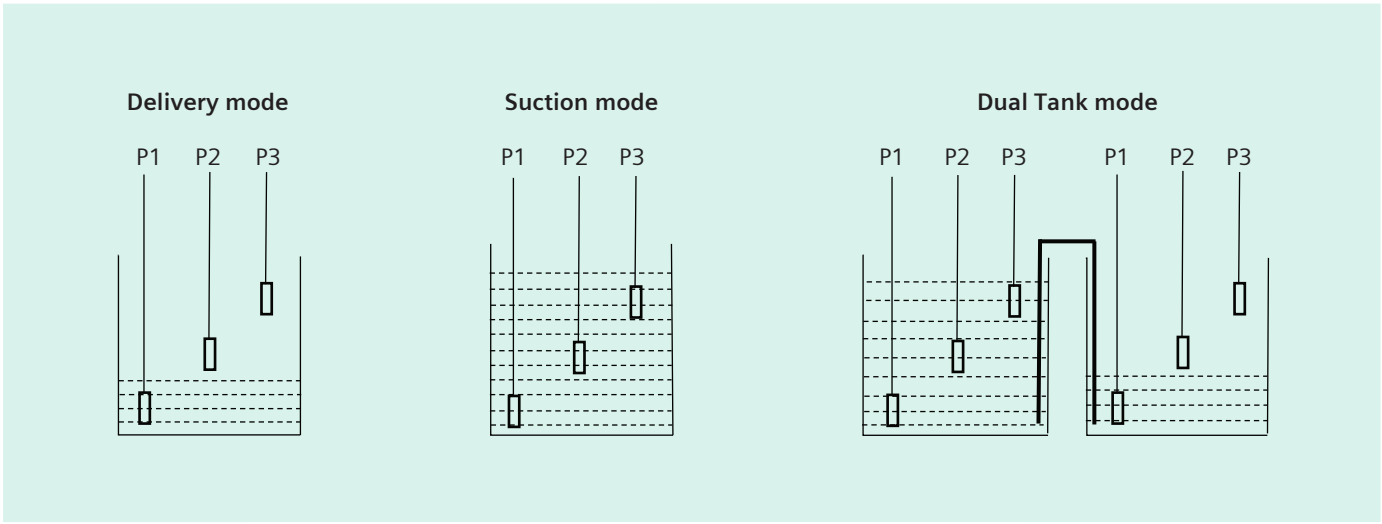


Fig.11

For Delivery mode to become operational: P2, P3 Sensor should be out of water

For Suction mode to become operational: P1, P2, P3 Sensor should be inside water

For Dual tank mode to become operational: P1,P2, P3 Sensor should be inside water & P5, P6 out of water

5.4: Installation

- Open the door by rotating the door lock anticlockwise.
- Mount the starter on a vertical wall/ plate free from vibrations with proper nuts and bolts.
  Refer operating instruction for mounting dimensions.
- Remove the rubber grommets for the incoming and outgoing cable connections. (Refer Fig. 13)
- Connect incoming and outgoing cables as follows (Refer Fig. 13):
  - Use proper cable glands to ensure dust proofing. For conduit entry use packed washers.
  - Select correct size of cables from Table 25
  - Connect line and motor leads exactly as per wiring diagram pasted inside the cover of the starter.
  - Terminate the incoming supply cables on terminal block TB1 & outgoing cables to motor on terminal block TB2,TB3 (Tightening torque -Refer table 25B)

    NOTE: LMRA is set in Manual mode (Factory setting)

    WLCA is set in Delivery mode (Factory setting)
  - Connect the earthing conductor to terminals marked (earth) on the starter body with torque 1.2 to 1.6Nm.

The Starter is now ready for commissioning.

- Initially set the overload relay to 0.58 times the rated motor current.
- Set the timer dial to the nearest value of starting time available on motor nameplate
- If it is not available, then set the dial to approximately 6-8secs.

Commissioning :

For exact setting of timer and overload relay, follow the instruction given below:

Before switching ON recheck all external connections.

- **Star-Delta Timer setting for FASD:**
  - First Switch ON the Rocker switch.
  - Start the motor by pressing the 'ON' button shown in Fig. 12
  - Measure the time taken by the motor to nearly reach rated speed or steady state current condition (indicated when the motor reaches a steady hum).
  - Stop the motor. Set the timer to this measured value by rotating the dial shown in Fig. 13A.

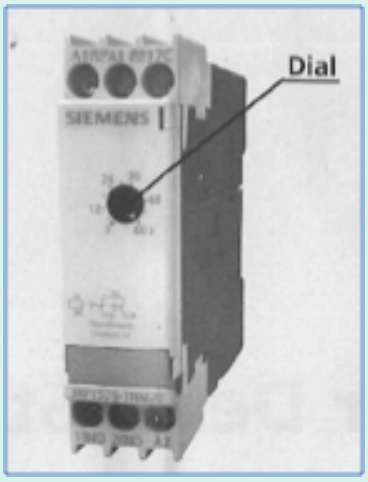


Fig. 13A: Timer Adjustment

- **Overload relay setting:**
  - For closer protection set the overload relay to actual phase current as measured by an ammeter. In the absence of an ammeter, use the procedure given below:
  - Start the motor and let it run for 30 mins. Then gradually reduce the relay settings till it trips. Set the relay at a slightly higher value than this setting. Overload relay characteristics shown in Fig. 6 can be used to estimate the average tripping time at different multiples of set current.
  - Allow a reset time of approx. 4 min. before pressing the blue knob on the relay to reset it.
  - Restart the motor after some time. If the relay does not trip then consider it to be properly set. If the relay trips, set at a little higher value than before and recheck.
- Close the front door.

Caution

- **During commissioning or maintenance always ensure that the main supply is disconnected by switching off the main switch & Rocker switch.**
- **In the case of FASD starters under no circumstances should the relay be set higher than the phase current i.e. 0.58 times the rated current on the motor nameplate.**
- **If the relay trips even when set at rated motor current the suitability of the starter/relay for the particular application should be checked with the nearest Siemens office.**

Operating Characteristics:

The given characteristics (Fig. 6) are average values of all ranges and sizes of bimetal relays and are mainly intended to indicate the inverse time current characteristics & tripping times of the same. The tripping times shown are for relays starting from the cold state. At operating temperatures (heated at rated current) these are reduced to about 25% of the value obtained from the characteristics.

Operation:

- Ensure the door is closed.
- Rotate the Latch away from OFF push button
- Switch On the rocker switch.
- Check the status of amber LED. Wait till amber LED is continuously ON then only proceed.
- Depending upon Selector switch knob position for phase selection, Indication of incoming power supply voltage can be seen on Dual VA meter.
- For starting the motor, press Green push button marked 'I' (Fig. 12)
- Line current of R phase is indicated by Dual VA meter.
- Indication of Motor ON can be seen on starter door through green LED.
- For stopping the motor press Red push button marked 'O' (Fig. 12)

Reset Operation

– If the overload relay trips, Reset manually.
(Allow a reset time of approx. 4 min.)

Table: 25A Mounting torque values

Sr. No	Location	Size	Torque
1	LMR-A	M4	0.8-1.1Nm
2	Contactor 3TS30...35	M4	0.8-1.1Nm
3	Terminal block 30A	M4	0.8-1.1Nm
4	Terminal block 60A	M4	0.8-1.1Nm
5	3RP Timer	M3	0.8-1.1Nm
6	Multiway strip	M3	0.4-0.6Nm
7	Dual VA Meter	M4	0.2-0.3 Nm
8	Customer Earthing	M5	1.2-1.6 Nm
9	Earthing screw (cover to body)	M5	1.2-1.6 Nm
10	Self tapping screw	ST4.2X9.5	0.8-1.2Nm
11	Selector Switch 3LD4	M4	0.8-1.1Nm
12	Door Knob	-	4-4.4 Nm
13	Base Plate	-	1.4-1.8Nm

Table: 25B Terminal torque values

Sr. No	Type	Size	Torque
1	3TS30..32	M4	0.8-1.4Nm
2	3TS33/34	M4	1.0-1.5Nm
3	3TS35	M4	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 3TS33/34, 3TS35/36	M3.5	0.8-1.4Nm
8	3TX4010-2A	M3.5	0.8-1.4Nm
9	3TY7561-1A	M3.5	0.8-1.4Nm
10	Coil Terminals A1/A2	M3.5	0.8-1.2Nm
11	Aux. terminals of all Relays	M3.5	0.8-1.2Nm
12	3UW52	M4	1.0-1.5Nm
13	3US56	M5	2.5-3.0Nm
14	Dual VA Meter 30A – Current terminals	M4	1.2Nm
15	Dual VA Meter 5/30/60/100A – Voltage terminals	M4	1.2Nm
16	Selector Switch 3LD4	M3	0.5Nm
17	Indicating light – Amber/Green	M3	0.8Nm
18	Multiway strips	M3	0.4 to 0.6 Nm
19	Timer	M4	0.8 to 1.2Nm
20	Power Link	M6	4-6Nm

5.5: Operating procedure in normal condition

Table: 26 FASD Controller with WLC operating sequence in normal condition

14A	14B	14C	14D	14E	14F	14G	14H	14I	14J	14K
LMR-A Mode	WLCA Mode	3ϕ main supply	Rocker switch	Amber LED indication	LMR-A On-Delay	Amber LED	'ON' Push button	Starter Operation	Green LED	Tank Operation
Manual	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
Auto	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	ON	NA	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	ON	NA	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	ON	NA	ON	ON	ON
Bypass	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	ON	ON	ON	ON	ON
ON operation										

14L	14M	14N	14O	14P
Starter Operation	Green LED	Amber LED	3ϕ main supply	Amber LED
OFF	OFF	ON	OFF	OFF
OFF	OFF	ON	OFF	OFF
OFF	OFF	ON	OFF	OFF
OFF operation				

Starter operation:

LMR-A: Manual mode

a. WLCA- Delivery mode

14A : Keep the LMR-A in Manual mode.

14B : Keep the WLC-A in Delivery mode.

14C : Switch ON 3-Phase incoming main supply.

14D : Turn ON the rocker switch (Using the selector switch position in RY,YB, BR the set voltage can be checked which is indicated in AV meter).

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P2, P3 sensors of WLC-A are out of water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON.
Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled till the water touches the level of P3 sensor.

14L : Starter switches OFF automatically after water tank level reach P3 sensor level. (Line & Delta contactor switches OFF).

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Manual mode

b. WLCA- Suction mode

14A : Keep the LMR-A in Manual mode.

14B : Keep the WLC-A in suction mode.

14C : Switch ON 3-Phase incoming main supply.

14D : Turn ON the rocker switch. (Using the selector switch position in RY,YB, BR the set voltage can be checked which is indicated in AV meter).

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors are in water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

14L : Starter switches OFF automatically after Water level of the suction tank goes below P2 sensor. (Line & Delta contactor switches OFF).

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Manual mode

c. WLCA- Dual tank mode

14A : Keep the LMR-A in Manual mode.

14B : Keep the WLC-A in Dual tank mode.

14C : Switch ON 3-Phase incoming main supply.

14D : Turn ON rocker switch

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors of suction tank are in water and P5,P6 sensors of delivery tank are out of water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P6 sensor or till the water level in the suction tank reaches below P2 sensor.

14L : Starter switches OFF automatically after the above step '10K'. (Line & Delta contactor switches OFF)

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Auto mode

a. WLCA- Delivery mode

14A : Keep the LMR-A in Auto mode.

14B : Keep WLC-A in delivery mode.

14C : Switch ON the 3-Phase incoming main supply.

14D : Turn ON the rocker switch.

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P2,P3 sensors of WLC-A are out of water.

14H : Not applicable (No need to press ON push button)

14I : Starter gets switched ON automatically. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3 sensor or till the water level in the suction tank reaches below P2 sensor.

14L : Starter switches OFF automatically after the above step '10K'.(Line & Delta contactor switches OFF).

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Auto mode

b. WLCA- Suction mode

14A : Keep the LMR-A in Auto mode.

14B : Keep the WLC-A in suction mode.

14C : Switch ON the 3-Phase incoming main supply.

14D : Turn ON the rocker switch.

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors are in water.

14H : Not applicable (No need to press ON push button)

14I : Starter gets switched ON automatically.

14J : Green LED turns ON indicating that the starter is ON.

14K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

14L : Starter switches OFF automatically after the above step '10K'.(Line & Delta contactor switches OFF)

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Auto mode

c. WLCA- Dual tank mode

14A : Keep the LMR-A in Auto mode.

14B : Keep the WLC-A in Dual Tank mode

14C : Switch ON the 3-Phase incoming main supply.

14D : Turn ON the rocker switch.

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors of suction tank are in water and P5, P6 sensors of delivery tank are out of water.

14H : Not applicable (No need to press ON push button)

14I : Starter gets switched ON automatically. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3 sensor or till the water level in the suction tank reaches below P2 sensor.

14L : Starter switches OFF automatically after the above step '10K'.(Line & Delta contactor switches OFF)

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Bypass mode

a. WLCA- Delivery mode

14A : Keep the LMR-A in Bypass mode.

14B : Keep the WLC-A in Delivery mode.

14C : 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 Bypass mode).

14D : Turn ON the rocker switch.

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P2,P3 sensors of WLC-A are out of water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled till the water touches the level of P3 sensor.

14L : Starter switches OFF automatically after delivery tank water level reach P3 sensor level.
(Line & Delta contactor switches OFF)

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Bypass mode

b. WLCA- Suction mode

14A : Keep the LMR-A in Manual mode.

14B : Keep the WLC-A in suction mode.

14C : Switch ON 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).

14D : Turn ON the rocker switch

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors are in water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

14L : Starter switches OFF automatically after Water level of the suction tank goes below P2 sensor. (Line & Delta contactor switches OFF).

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

LMR-A: Bypass mode

c. WLCA- Dual tank mode

14A : Keep the LMR-A in Bypass mode.

14B : Keep the WLC-A in Dual tank mode.

14C : Switch ON 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 Bypass mode).

14D : Turn ON rocker switch

14E : Amber LED will start blinking for a period of min 0.5 min.

14F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

14G : After the ON-delay duration, amber LED will ON continously indicating that the incoming supply is Healthy (Assuming incoming supply is healthy). WLC-A R LED will turn ON when P1,P2,P3 sensors of suction tank are in water and P5, P6 sensors of delivery tank are out of water.

14H : Press the green push putton for switching ON the starter.

14I : Starter gets switched ON. Star & Line contactor switch ON simultaneously. Then after preset time of Star delta Timer, Star contactor switches OFF and Delta contactor switch ON.

14J : Green LED turns ON indicating that the starter is ON.

14K : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3sensor or till the water level in the suction tank reaches below P2 sensor.

14L : Starter switches OFF automatically after the above step '10K'. (Line & Delta contactor switches OFF).

14M : Green LED turns OFF indicating that the starter is OFF.

14N : Amber LED indication remains continous ON.

14O : Switch OFF the 3-phase incoming main supply.

14P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

FASD Controller with WLCA in Bypass condition connecting procedure

1. Remove X7, X8 link from TB5 (WLCA 12-way multiway strip)
2. Remove X11 and connect it to X12 from TB5 (WLCA 12-way multiway strip)

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

Table: 27 FASD Controller with WLCA operating sequence in fault condition

15A	15B	15C	15D	15E	15F	15G	15H	15I	15J	15K	15L	15M	15N
LMR-A Mode	WLCA Mode	3ϕ main supply	Rocker switch	Amber LED	LMR-A On-Delay	Amber LED	Possible causes of fault	Corre-ctive action	Amber LED	'ON' Push button	Starter Opera-tion	Green LED	Tank Opera-tion
Manual	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	1)	ON	ON	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	2)	ON	NA	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	3)	ON	ON	ON	ON	ON
Auto	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	4)	ON	ON	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	5)	ON	ON	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	#	6)	ON	ON	ON	ON	ON
Bypass	Delivery	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	NA	NA	ON	ON	ON	ON	ON
	Suction	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	NA	NA	ON	ON	ON	ON	ON
	Dual Tank	ON	ON	Blink (On-delay duration)	0.5-5min	Blink	NA	NA	ON	ON	ON	ON	ON
ON operation													

#: Phase loss[1], Phase reversal[2], Under voltage[3], Over voltage[4], Phase unbalance[5], WLCA sensor misplacement[6]
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 5.8

Starter Fault conditon:

1) LMR-A: Manual mode

a. WLCA- Delivery mode

15A : Check the mode of LMR-A, if it is manual mode.
15B : Check the mode of WLC-A, if it is Delivery mode.
15C : Switches ON the 3-Phase incoming main supply.
15D : Switch ON the rocker switch
15E : Amber LED will start blinking
15F : Amber LED will blink for a duration of min.30sec.
15G : After the ON delay duration, amber LED remains blinking indicating that the 3phase incoming supply is unhealthy.
[1]15H : - 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]15I : - After resuming incoming main supply to normal condition,
- Repeat the steps from 15A to 15F and then go to step no.15J

If fault still exists, then

[2]15H : - Check the phase sequence of all the phases of incoming main supply.
- Identify the wrong sequence of phase connected in any of the incoming terminal.
[2]15I : - 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 15A to 15F and then go to step no.15J

If fault still exists, then

[3]15H : - 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 <minimum required voltage (Refer table no.28).
[3]15I : - Keep the 3-phase voltage to the incoming terminals of terminal block TB1 to a voltage between min.required voltage & Max.voltage allowed (Refer table no.28).
- Repeat the steps from 15A to 15F and then go to step no.15J

If fault still exists, then

[4]15H : - 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 >Maximum voltage allowed. (Refer table no.28).
[4]15I : - Keep the 3-phase voltage to the incoming terminals of terminal block TB1 to a voltage between min.required voltage & Max.voltage allowed (Refer table no.28).
- Repeat the steps from 15A to 15F and then go to step no.15J

If fault still exists, then

[5]15H : - 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]15I : - 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 15A to 15F and then go to step no.15J

[6]Note: Amber LED willnot blink or provide any indication for the misplacement of sensors in the Delivery & suction tank. Please follow the below steps for the corrective action of any fault which may arise due to the misplacement of sensors in the delivery tank.

[6]15H : - Check if the P2, P3 sensors of delivery tank are in water.
[6]15I : - If yes, then keep P2, P3 sensors out of water for operating the starter.
- Repeat the steps from 12K to 12N

15J : Amber LED will remain ON continously indicating that the fault is cleared
15K : Press the Green ON push button to switch ON the starter.
15L : Starter gets switched ON.
15M : Green LED turns ON indicating that the starter is ON.
15N : Delivery tank gets filled till the water touches the level of P3 sensor.

Table: 23 Range of Under voltage & Over voltage

Starter Voltage Range (V)	Undervoltage fault		Overvoltage fault	
	Trip voltage for undervoltage fault (V)	Healthy voltage (V)	Trip voltage for Overvoltage fault (V)	Healthy voltage (V)
(Z6) 200-400	195	205	400	390
(Z8) 260-460	250	260	455	445
(R0) 323-457	313	323	457	447
(Q0) 304-418	294	304	418	408

2) LMR-A: Manual mode

b. WLCA- Suction mode

15A : Check the mode of LMR-A, if it is manual mode.
15B : Check the mode of WLC-A, if it is suction mode.
15C to 15M : Follow steps from 15C to 15M of Manual & Delivery mode,Refer Table 27: Corrective action 1 (except the 6Note mentioned below)
15N : Water gets drawn out of the suction tank till the water level goes below P2 sensor.
[6]Note : Amber LED willnot blink or provide any indication for the misplacement of sensors in the suction tank. Please follow the below steps for the corrective action of any fault which may arise due to the misplacement of sensors in the suction tank.
[6]15H : Check if the P1, P2, P3 sensors of delivery tank are out of water.
[6]15I : If yes, then keep P1, P2, P3 sensors in water for operating the starter

3) LMR-A: Manual mode

c. WLCA- Dual tank mode

15A : Check the mode of LMR-A, if it is manual mode.
15B : Check the mode of WLC-A, if it is dual tank mode.
15C to 15M : Follow steps from 15 to 15K of Manual & Delivery tank mode ,Refer Table 27 : Corrective action 1 (except the (except the 6Note mentioned below)
15N : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3 sensor or till the water level in the suction tank reaches below P2 sensor.
[6]Note : Amber LED willnot blink or provide any indication for the misplacement of sensors in the Delivery & suction tank. Please follow the below steps for the corrective action of any fault which may arise due to the misplacement of sensors in the delivery tank.
[6]15H : Check if the P1,P2, P3 sensors of suction tank are out of water or P5,P6 sensors of delivery tank in water.
[6]15I : If yes, then keep P1, P2, P3 sensors in water & P5, P6 sensors out of water for operating the starter.

4) LMR-A: Auto mode

a. WLCA- Delivery mode

15A : Check the mode of LMR-A, if it is Auto mode.
15B : Check the mode of WLC-A, if it is Delivery mode.
15C to 15J : Follow steps from 15C to 15J of Manual & Delivery mode. Refer Table 27 (Corrective action 1)
15K : No need to press ON push button.
15L : Starter switches ON automatically.
15M to 15N : Follow steps from 15M to 15N of Manual & Delivery mode. Refer Table 27 (Corrective action 1)

5) LMR-A: Auto mode

b. WLCA- Suction mode

15A : Check the mode of LMR-A, if it is Auto mode.
15B : Check the mode of WLC-A, if it is Suction mode.
15C to 15J : Follow steps from 15C to 15J of Manual & Delivery mode. Refer Table 27 (Corrective action 1)
15K : No need to press ON push button.
15L : Starter switches ON automatically.
15M to 15N : Follow steps from 15M to 15N of Manual & suction mode. Refer Table 27 (Corrective action 2)

6) LMR-A: Auto mode

c. WLCA- Dual tank mode

15A : Check the mode of LMR-A, if it is Auto mode.
15B : Check the mode of WLC-A, if it is Dual Tank mode.
15C to 15J : Follow steps from 15C to 15J of Manual & Dual Tank mode. Refer Table 27 (Corrective action 1)
15K : No need to press ON push button.
15L : Starter switches ON automatically.
15M to 15N : Follow steps from 15M to 15N of Manual & dual tank mode. Refer Table 27 (Corrective action 3)

β LMR-A: Bypass mode

c. WLCA- In any 3x mode (Delivery, Suction, Dual Tank)

As in Bypass mode there is no protection from the incoming supply faults, however there may be 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.....

Also check the WLC-A faults which may arise due to the sensor misplacement in the tank.
In the above conditions check the Starters as explained in Auto & Manual Mode.

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

Table: 29 FASD Controller with WLCA operating sequence in fault condition

16A	16B	16C	16D	16E	16F	16G	16H	16I	16J	16K	16L
Motor condition	LMR-A Mode	WLCA Mode	Amber LED	Possible causes of fault	Corrective action	Amber LED	'ON' Push button	Starter Operation	Green LED	Motor condition	Tank operation
Not Running	Manual	Delivery	Blink	#	1)	ON	ON	ON	ON	Running	ON
Not Running		Suction	Blink	#	2)	ON	ON	ON	ON	Running	ON
Not Running		Dual Tank	Blink	#	3)	ON	ON	ON	ON	Running	ON
Not Running	Auto	Delivery	Blink	#	4)	ON	NA	ON	ON	Running	ON
Not Running		Suction	Blink	#	5)	ON	NA	ON	ON	Running	ON
Not Running		Dual Tank	Blink	#	6)	ON	NA	ON	ON	Running	ON
Not Running	Bypass	Delivery	Blink	NA	NA	ON	ON	ON	ON	Running	ON
Not Running		Suction	Blink	NA	NA	ON	ON	ON	ON	Running	ON
Not Running		Dual Tank	Blink	NA	NA	ON	ON	ON	ON	Running	ON
ON operation											

#: Phase loss[1], Phase reversal[2], Under voltage[3], Over voltage[4], Phase unbalance[5], WLC-A sensor misplacement[6]
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 5.8

Starter Fault conditon:

1. LMR-A: Manual mode

a. WLCA- Delivery mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Manual mode.
16C : Check the mode of WLCA, if it is Delivery mode.
16D : Amber LED will start blinking
16E to 16J : Follow steps from 15H to 15M of LMR-A manual mode & WLCA Delivery mode (Refer Table no.27, Corrective action 1)
16K : Motor starts running again.
16L : Delivery tank gets filled till the water touches the level of P3 sensor.

2. LMR-A: Manual mode

b. WLCA- Suction mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Manual mode.
16C : Check the mode of WLCA, if it is Suction mode.
16D : Amber LED will start blinking
16E to 16J : Follow steps from 15H to 15M of LMR-A manual mode & WLCA delivery mode (Refer Table no.27, Corrective action 1)
16K : Motor starts running again.
16L : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

3. LMR-A: Manual mode

b. WLCA- Dual tank mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Manual mode.
16C : Check the mode of WLCA, if it is Dual tank mode.
16D : Amber LED will start blinking
16E to 16J : Follow steps from 15H to 15M of LMR-A manual mode & WLCA Delivery mode (Refer Table no.27, Corrective action 1)
16K : Motor starts running again.
16L : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3 sensor or till the water level in the suction tank reaches below P2 sensor.

4. LMR-A: Auto mode

a. WLCA- Delivery mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Auto mode.
16C : Check the mode of WLCA, if it is Delivery mode.
16D : Amber LED will start blinking
16E to 16G : Follow steps from 15H to 15J of LMR-A Manual mode & WLCA Delivery mode (Refer Table no.27, Corrective action 1)
16H : No need to press ON push button
16I : Starter switches ON automatically.
16J : Green LED turns ON indicating that the starter is ON.
16K : Motor starts running again.
16L : Delivery tank gets filled till the water touches the level of P3 sensor.

5. LMR-A: Auto mode

b. WLCA- Suction mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Auto mode.
16C : Check the mode of WLCA, if it is Suction mode.
16D : Amber LED will start blinking
16E to 16G : Follow steps from 15H to 15J of LMR-A Manual mode & WLCA delivery mode (Refer Table no.27, Corrective action 1)
16H : No need to press ON push button
16I : Starter switches ON automatically.
16J : Green LED turns ON indicating that the starter is ON.
16K : Motor starts running again.
16L : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

6. LMR-A: Auto mode

c. WLCA- Dual tank mode

16A : Motor suddenly stops after running for some time.
16B : Check the mode of LMR-A, if it is Auto mode.
16C : Check the mode of WLCA, if it is Dual tank mode.
16D : Amber LED will start blinking
16E to 16G : Follow steps from 15H to 15J of LMR-A Manual mode & WLCA Delivery mode (Refer Table no.27, Corrective action 1)
16H : No need to press ON push button
16I : Starter switches ON automatically.
16J : Green LED turns ON indicating that the starter is ON.
16K : Motor starts running again.
16L : Delivery tank gets filled from the suction tank till the water in the delivery tank touches the level of P3 sensor or till the water level in the suction tank reaches below P2 sensor.

λλ LMR-A: Bypass mode

a. WLCA- In any 3x mode (Delivery, Suction, Dual Tank)

As in Bypass mode there is no protection from the incoming supply faults, however there may be 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.....

Also check the WLC-A faults which may arise due to the sensor misplacement in the tank.Refer 6Note
In the above conditions check the Starters as explained in Auto & Manual Mode.

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