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

RAJA+

SIEMENS

# Contents:

# Direct On Line
# Controller with WLC

## 4.1: Product description

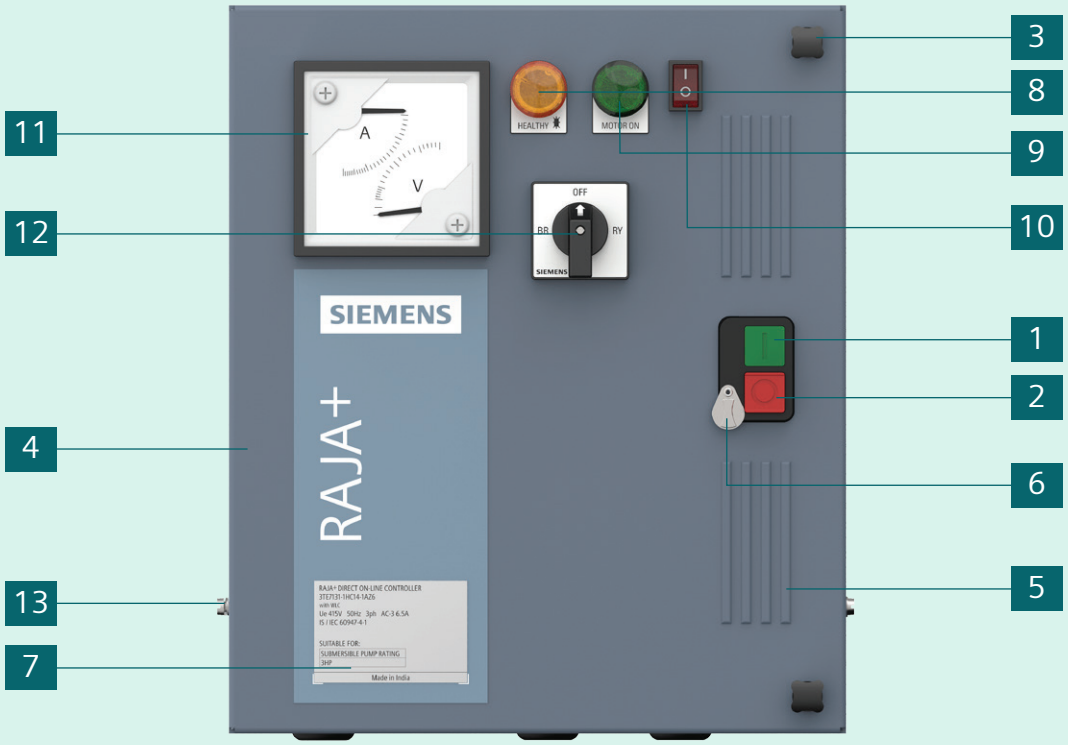
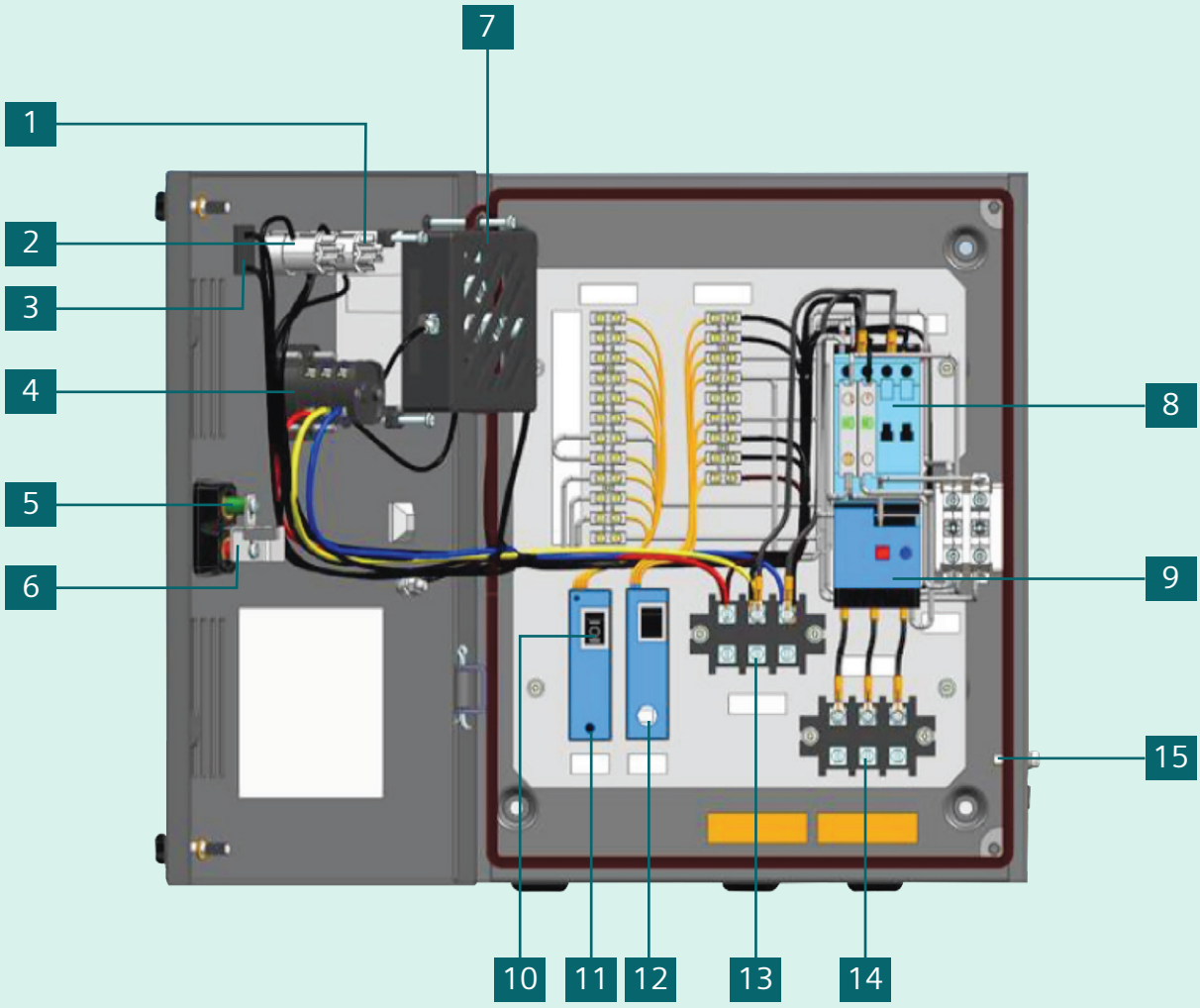



Fig. 9: DOL Controller with WLC

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 Starter
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

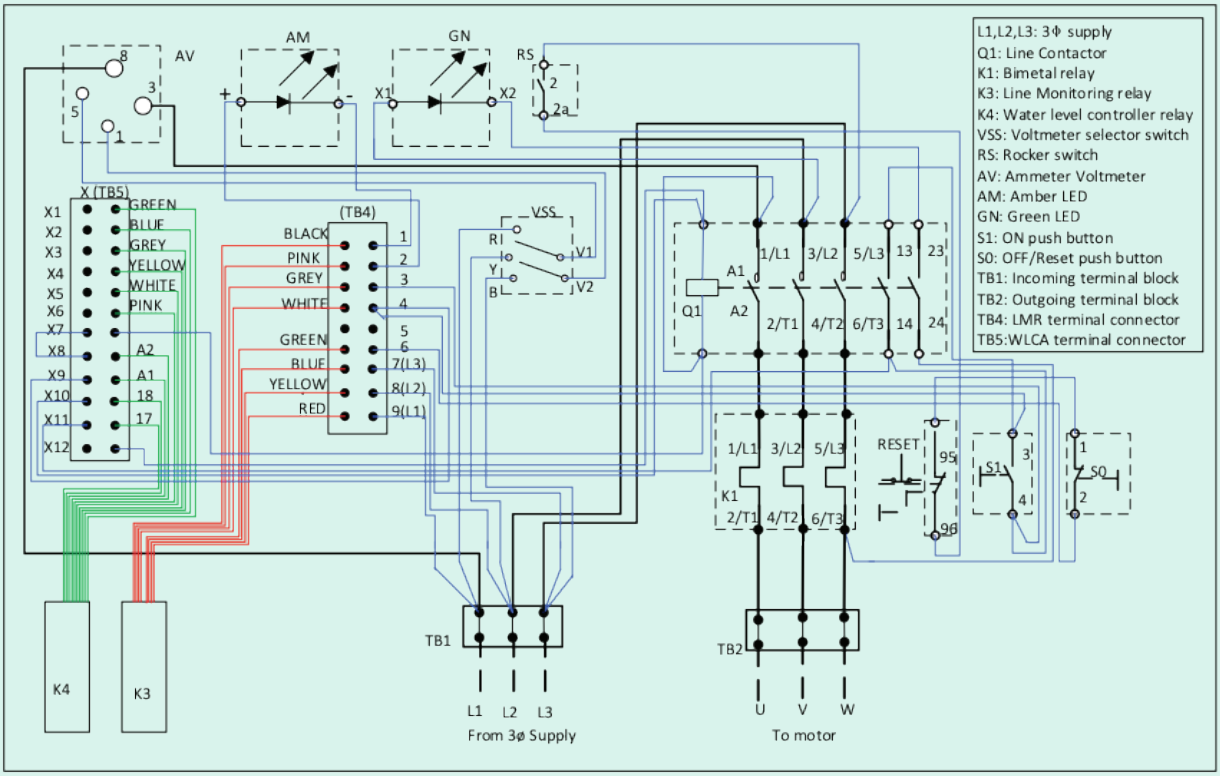
## Inside view of Direct On Line Controller with WLC



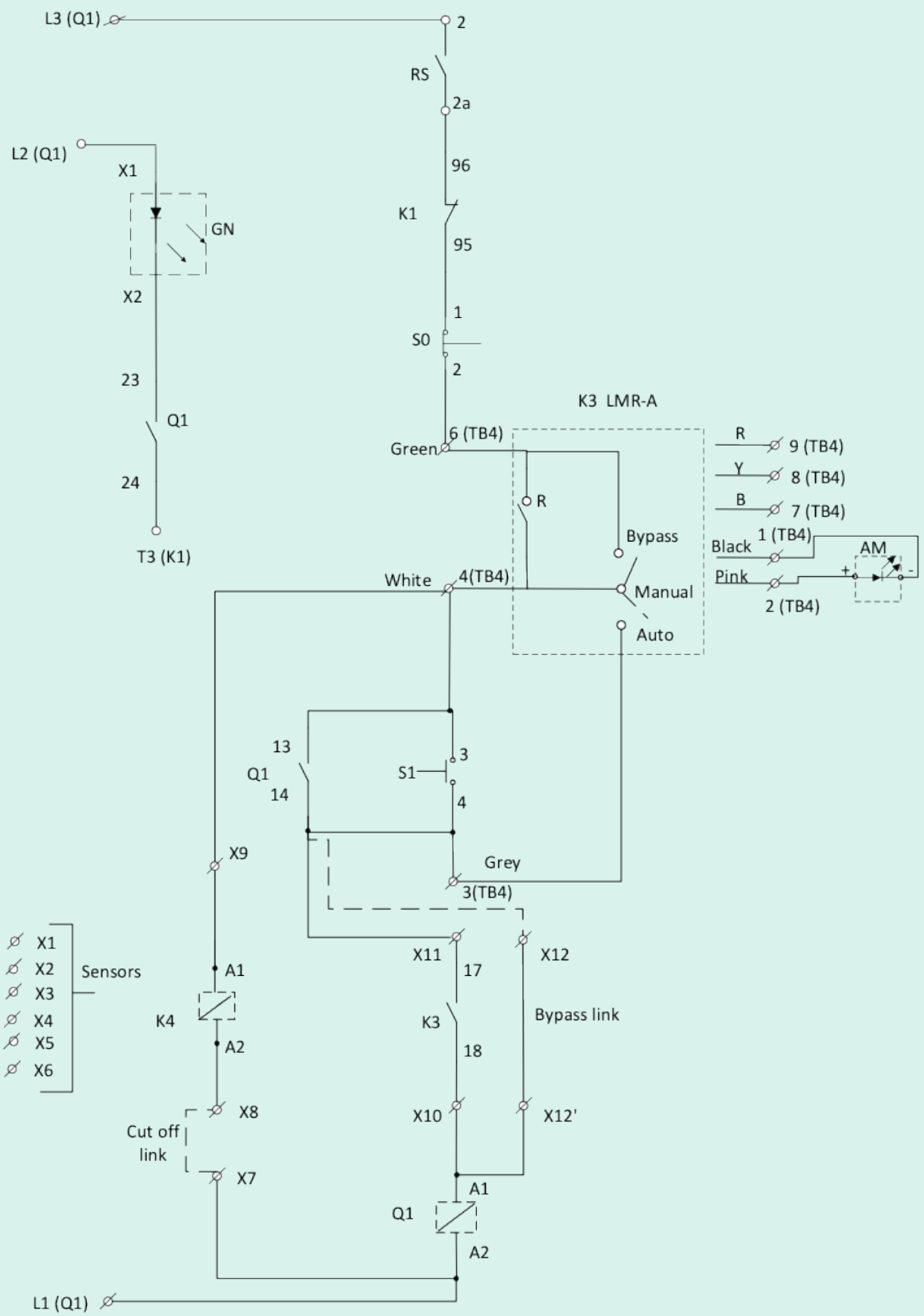

1: Amber LED
2: Green LED
3: Rocker Switch
4: Phase Selector switch
5: ON push button
6: OFF push button
7: AV meter
8: Contactor
9: Thermal Overload Relay
10: Starter Operating Modes
11: Line monitoring relay
12: Water Level Controller
13: Terminal Block TB2
14: Terminal Block TB1
15: Earthing Screw

Fig.10

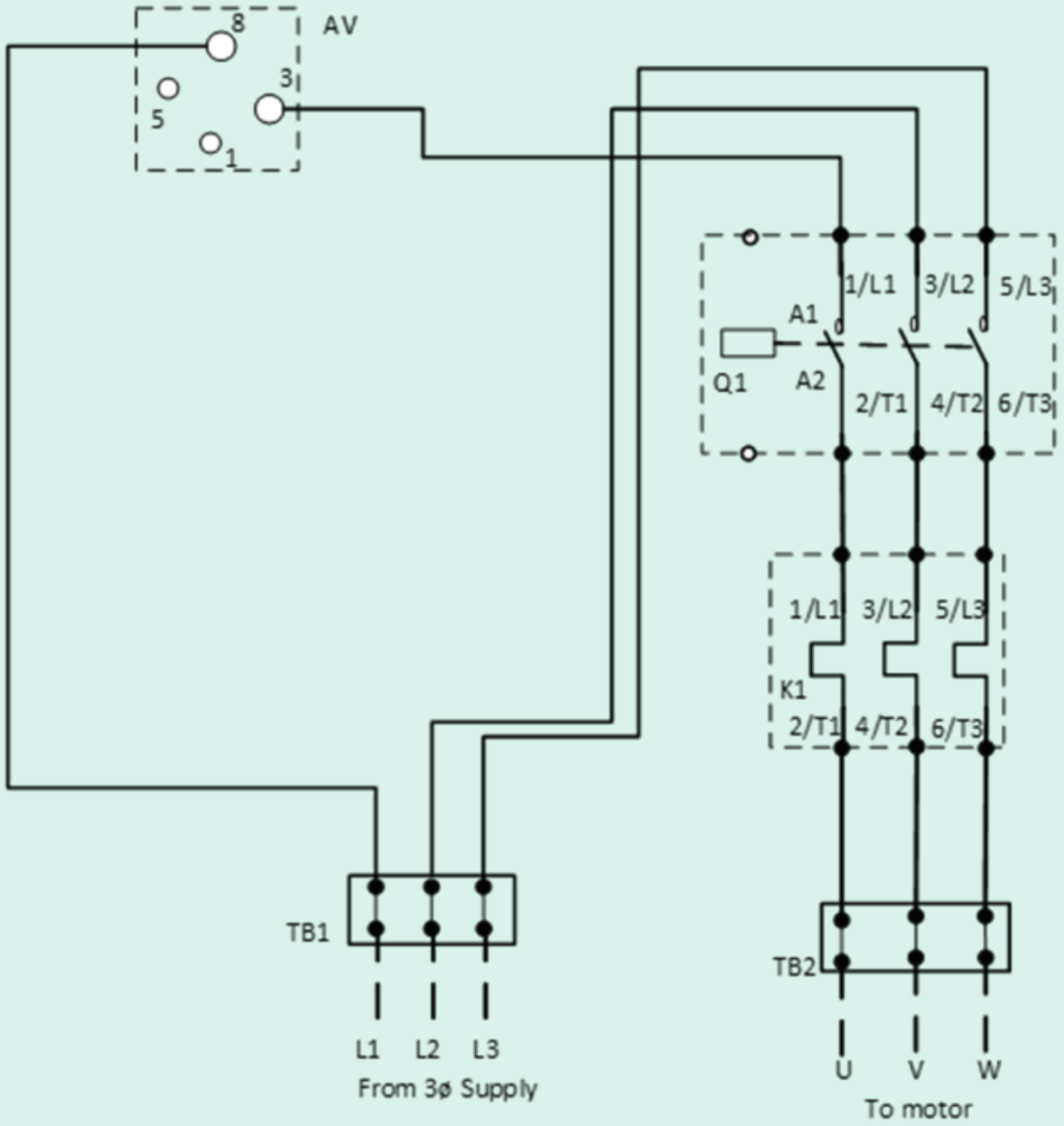
# 4.2: Wiring Diagram: DOL Controller with WLC



# 4.21 Control logic diagram



## 4.22 Power circuit diagram



# 4.3: Technical details

**Table: 20 Technical details of DOL Controller with WLC**

| Type | (HP / kW) | Ie (A) | Contactor | Relay | Range (A) | Line Monitoring Relay | Recommended Max. Back-up HRC Fuse rating, SIEMENS Make type 3NA7 – 500V* | Max. Recommended Cu cable size (sq:mm) |
|---|---|---|---|---|---|---|---|---|
| 3TE7131-1HC14-1Axx | 3 / 2.2 | 6.5 | 3TS3010-0Axx-08K | 3US5000-1H8K | 5-8 | 7UG0613-0yy20 | 20A/500V | 1.5 |
| 3TE7131-1KC16-1Axx | 5 / 3.7 | 10 | 3TS3110-0Axx-08K | 3UW5102-1K | 8-12.5 | 7UG0613-0yy20 | 25A/500V | 1.5 |
| 3TE7131-2AC17-1Axx | 6 / 4.5 | 12 | 3TS3210-0Axx-08K | 3UW5102-2A | 10-16 | 7UG0613-0yy20 | 25A/500V | 1.5 |
| 3TE7131-2BC18-1Axx | 7.5 / 5.5 | 14.5 | 3TS3210-0Axx-08K | 3UW5102-2B | 12.5-20 | 7UG0613-0yy20 | 25A/500V | 2.5 |
| 3TE7131-2CC21-1Axx | 10 / 7.5 | 19.5 | 3TS3311-0Axx-08K | 3UW5202-2C | 16-25 | 7UG0613-0yy20 | 32A/500V | 2.5 |

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

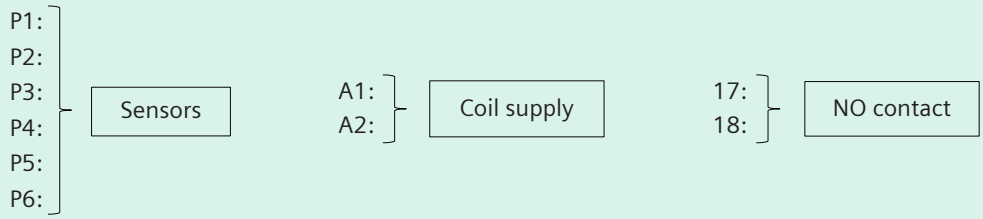
*Type 1 coordination as per IS/IEC 60947-4-1 Standard.

**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:**

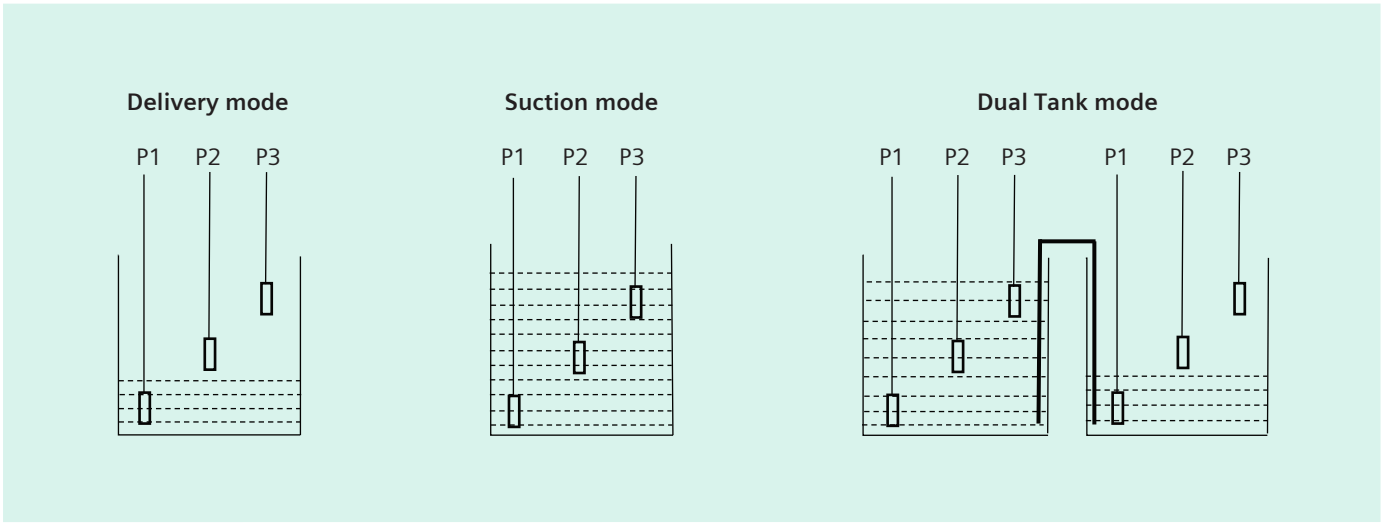



Fig.11

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

# 4.4: 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. 10)
- Connect incoming and outgoing cables as follows (Refer Fig. 10):
  - Use proper cable glands to ensure dust proofing. For conduit entry use packed washers.
  - Select correct size of cables from Table 20
  - 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 (Tightening torque -Refer table 20B)

    NOTE: LMR-A 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.

## Commissioning :

For exact setting of overload relay, follow the instruction given below:
**Before switching ON recheck all external connections.**

- **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.**
- **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. 7)
- 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. 7)

**Reset Operation**

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

**Note:** For detail operation of WLCA , refer Installation, Maintenance & troubleshooting guide

**Table: 20A Mounting torque values**

| Sr. No | Location | Size | Torque |
|---|---|---|---|
| 1 | Earthing screw (cover to body) | M5 | 1.2-1.6 Nm |
| 2 | Contactor 3TS30..33 | M4 | 0.8-1.1Nm |
| 3 | LMR-A | M4 | 0.8-1.1Nm |
| 4 | Terminal block 30A | M4 | 0.8-1.1Nm |
| 5 | WLC | M4 | 0.8-1.1Nm |
| 6 | ON & OFF / Rest link | ST4.2x9.5 | 0.8-1.2Nm |
| 7 | Dual VA Meter | M4 | 0.2-0.3Nm |
| 8 | Selector Switch 3LD4 | M4 | 0.8-1.1Nm |

**Table: 20B Terminal torque values**

| Sr. No | Type | Size | Torque |
|---|---|---|---|
| 1 | 3TS30..32 | M4 | 0.8-1.4Nm |
| 2 | 3TS33 | M4 | 1.0-1.5Nm |
| 3 | Terminal block 30A | M4 | 0.8-1.4Nm |
| 4 | Contact block 3SB5 | M3.5 | 0.8-1.2Nm |
| 5 | Coil Terminals A1/A2 | M3.5 | 0.8-1.2Nm |
| 6 | Aux. terminals of all Relays | M3.5 | 0.8-1.2Nm |
| 7 | 3UW51/52,3US50 | M4 | 1.0-1.5Nm |
| 8 | 3TX4010-2A | M3.5 | 0.8-1.4Nm |
| 9 | Indicating light – Amber/Green | M3 | 0.8Nm |
| 10 | Dual VA Meter 30A – Current terminals | M4 | 1.2Nm |
| 11 | Dual VA Meter 30A – Voltage terminals | M4 | 1.2Nm |

# 4.5: Operating procedure in normal condition

**Table: 21 DOL Controller with WLC operating sequence in normal condition**

| 10A | 10B | 10C | 10D | 10E | 10F | 10G | 10H | 10I | 10J | 10K |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 | NA | 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 | NA | ON | ON | ON | ON |
| | Dual Tank | ON | ON | Blink (On-delay duration) | 0.5-5min | ON | ON | 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 | NA | ON | ON | ON | ON |
| | Dual Tank | ON | ON | Blink (On-delay duration) | 0.5-5min | ON | ON | ON | ON | ON |
| **ON operation** | | | | | | | | | | |

| 10L | 10M | 10N | 10O | 10P |
|---|---|---|---|---|
| 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 | OFF | ON | OFF | OFF |
| OFF | OFF | ON | OFF | OFF |
| OFF | OFF | ON | OFF | OFF |
| 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**

10A : Keep the LMR-A in Manual mode.
10B : Keep the WLC-A in Delivery mode.
10C : Switch ON 3-Phase incoming main supply.
10D : Turn ON the rocker switch
10E : Amber LED will start blinking for a period of min 0.5 min.
10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.
10G : 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.
10H : Press the green push putton for switching ON the starter.
10I : Starter gets switched ON
10J : Green LED turns ON indicating that the starter is ON.
10K : Delivery tank gets filled till the water touches the level of P3 sensor.
10L : Starter switches OFF automatically after water tank level reach P3 sensor level.
10M : Green LED turns OFF indicating that the starter is OFF.
10N : Amber LED indication remains continous ON.
10O : Switch OFF the 3-phase incoming main supply.
10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Manual mode

**b. WLCA- Suction mode**

10A : Keep the LMR-A in Manual mode.
10B : Keep the WLC-A in suction mode.
10C : Switch ON 3-Phase incoming main supply.
10D : Turn ON the rocker switch
10E : Amber LED will start blinking for a period of min 0.5 min.
10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.
10G : 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.
10H : Press the green push putton for switching ON the starter.
10I : Starter gets switched ON
10J : Green LED turns ON indicating that the starter is ON.
10K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.
10L : Starter switches OFF automatically after Water level of the suction tank goes below P2 sensor.
10M : Green LED turns OFF indicating that the starter is OFF.
10N : Amber LED indication remains continous ON.
10O : Switch OFF the 3-phase incoming main supply.
10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Manual mode

**c. WLCA- Dual tank mode**

10A : Keep the LMR-A in Manual mode.

10B : Keep the WLC-A in Dual tank mode.

10C : Switch ON 3-Phase incoming main supply.

10D : Turn ON rocker switch

10E : Amber LED will start blinking for a period of min 0.5 min.

10 : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Press the green push putton for switching ON the starter.

10I : Starter gets switched ON.

10J : Green LED turns ON indicating that the starter is ON.

10K : 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.

10L : Starter switches OFF automatically after the above step '1K'

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Auto mode

**a. WLCA- Delivery mode**

10A : Keep the LMR-A in Auto mode.

10B : Keep WLC-A in delivery mode.

10C : Switch ON the 3-Phase incoming main supply.

10D : Turn ON the rocker switch.

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Not applicable (No need to press ON push button)

10I : Starter gets switched ON automatically.

10J : Green LED turns ON indicating that the starter is ON.

10K : 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.

10L : Starter switches OFF automatically after the above step '1K'

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Auto mode

**b. WLCA- Suction mode**

10A : Keep the LMR-A in Auto mode.

10B : Keep the WLC-A in suction mode.

10C : Switch ON the 3-Phase incoming main supply.

10D : Turn ON the rocker switch.

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Not applicable (No need to press ON push button)

10I : Starter gets switched ON automatically.

10J : Green LED turns ON indicating that the starter is ON.

10K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

10L : Starter switches OFF automatically after the above step '1K'

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Auto mode

**c. WLCA- Dual tank mode**

10A : Keep the LMR-A in Auto mode.

10B : Keep the WLC-A in Dual Tank mode

10C : Switch ON the 3-Phase incoming main supply.

10D : Turn ON the rocker switch.

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Not applicable (No need to press ON push button)

10I : Starter gets switched ON automatically.

10J : Green LED turns ON indicating that the starter is ON.

10K : 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.

10L : Starter switches OFF automatically after the above step '1K'

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply

## LMR-A: Bypass mode

**a. WLCA- Delivery mode**

10A : Keep the LMR-A in Bypass mode.

10B : Keep the WLC-A in Delivery mode.

10C : 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).

10D : Turn ON the rocker switch.

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Press the green push putton for switching ON the starter.

10I : Starter gets switched ON.

10J : Green LED turns ON indicating that the starter is ON.

10K : Delivery tank gets filled till the water touches the level of P3 sensor.

10L : Starter switches OFF automatically after delivery tank water level reach P3 sensor level.

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Bypass mode

**b. WLCA- Suction mode**

10A : Keep the LMR-A in Manual mode.

10B : Keep the WLC-A in suction mode.

10C : 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).

10D : Turn ON the rocker switch

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Press the green push putton for switching ON the starter.

10I : Starter gets switched ON

10J : Green LED turns ON indicating that the starter is ON.

10K : Water gets drawn out of the suction tank till the water level goes below P2 sensor.

10L : Starter switches OFF automatically after Water level of the suction tank goes below P2 sensor.

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## LMR-A: Bypass mode

**c. WLCA- Dual tank mode**

10A : Keep the LMR-A in Bypass mode.

10B : Keep the WLC-A in Dual tank mode.

10C : 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).

10D : Turn ON rocker switch

10E : Amber LED will start blinking for a period of min 0.5 min.

10F : 0.5 min is the default setting which can vary from min 0.5 min to max.5min.

10G : 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.

10H : Press the green push putton for switching ON the starter.

10I : Starter gets switched ON.

10J : Green LED turns ON indicating that the starter is ON.

10K : 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.

10L : Starter switches OFF automatically after the above step '1K'

10M : Green LED turns OFF indicating that the starter is OFF.

10N : Amber LED indication remains continous ON.

10O : Switch OFF the 3-phase incoming main supply.

10P : Amber LED indication gets turned OFF indicating that there is no incoming main supply.

## DOL 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)

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

**Table: 22 DOL Controller + WLC operating sequence in fault condition**

| 12A | 12B | 12C | 12D | 12E | 12F | 12G | 12H | 12I | 12J | 12K | 12L | 12M | 12N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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], 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 4.8

# Starter Fault conditon:

## 1) LMR-A: Manual mode

**a. WLCA- Delivery mode**

12A : Check the mode of LMR-A, if it is manual mode.

12B : Check the mode of WLC-A, if it is Delivery mode.

12C : Switches ON the 3-Phase incoming main supply.

12D : Switch ON the rocker switch

12E : Amber LED will start blinking

12F : Amber LED will blink for a duration of min.30sec.

12G : After the ON delay duration, amber LED remains blinking indicating that the 3phase incoming supply is unhealthy.

[1]12H : - 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]12I : - After resuming incoming main supply to normal condition,
- Repeat the steps from 12A to 12F and then go to step no.12J

**If fault still exists, then**

212H : - 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.

212I : - 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 12A to 12F and then go to step no.12J

**If fault still exists, then**

312H : - 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.22).

312I : - 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.22).
- Repeat the steps from 12A to 12F and then go to step no.12J

**If fault still exists, then**

[4]12H : - 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.22).

[4]12I : - 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.22).
- Repeat the steps from 12A to 12F and then go to step no.12J

**If fault still exists, then**

[5]12H : - 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]12I : - 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 12A to 12F and then go to step no.12J

[6]Note: Amber LED willnot blink or provide any indication for the misplacement of sensors in the Delivery or 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]12H : - Check if the P2, P3 sensors of delivery tank are in water.

[6]12I : - If yes, then keep P2, P3 sensors out of water for operating the starter.
- Repeat the steps from 12K to 12N

12J : Amber LED will remain ON continously indicating that the fault is cleared

12K : Press the Green ON push button to switch ON the starter.

12L : Starter gets switched ON.

12M: Green LED turns ON indicating that the starter is ON.

12N : 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**

12A : Check the mode of LMR-A, if it is manual mode.

12B : Check the mode of WLCA, if it is suction mode.

12C to 12M : Follow steps from 12C to 12M of Manual & Delivery mode .Refer corrective action 1 of Table 22. (except the 6Note).

12N : 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]12H: Check if the P1,P2, P3 sensors of delivery tank are out of water.

[6]12I : If yes, then keep P1, P2, P3 sensors in water for operating the starter.

## 3) LMR-A: Manual mode

**c. WLCA- Dual tank mode**

12A : Check the mode of LMR-A, if it is manual mode.

12B : Check the mode of WLC-A, if it is dual tank mode.

12C to 12M : Follow steps from 12C to 12K of Manual & Delivery mode Refer corrective action 1 of Table 22. (except the 6Note).

[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]12H : Check if the P1,P2, P3 sensors of suction tank are out of water or P5,P6 sensors of delivery tank in water.

[6]12I : 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**

12A : Check the mode of LMR-A, if it is Auto mode.
12B : Check the mode of WLC-A, if it is Delivery mode.
12C to 12J : Follow steps from 12C to 12J of Manual & Delivery mode. Refer Table 22 (Corrective action 1)
12K : No need to press ON push button.
12L : Starter switches ON automatically.
12M to 12N : Follow steps from 12M to 12N of Manual & Delivery mode. (Corrective action 1)

## 5) LMR-A: Auto mode

**b. WLCA- Suction mode**

12A : Check the mode of LMR-A, if it is Auto mode.
12B : Check the mode of WLC-A, if it is Suction mode.
12C to 12J : Follow steps from 12C to 12J of Manual & Delivery mode. Table 22 (Corrective action 1)
12K : No need to press ON push button.
12L : Starter switches ON automatically.
12M to 12N : Follow steps from 12M to 12N of Manual & suction mode. (Corrective action 2)

## 6) LMR-A: Auto mode

**c. WLCA- Dual tank mode**

12A : Check the mode of LMR-A, if it is Auto mode.
12B : Check the mode of WLC-A, if it is Dual Tank mode.
12C to 12J : Follow steps from 12C to 12J of Manual & Delivery Tank mode. Table 22 (Corrective action 1)
12K : No need to press ON push button.
12L : Starter switches ON automatically.
12M to 12N : Follow steps from 12M to 12N of Manual & dual tank mode. (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 –

4. Phase loss
5. Incoming supply voltage less than the minimum required operational voltage of the Starter.
6. 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 [6]Note.
In the above conditions check the Starters as explained in Auto & Manual Mode.

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

**Table: 24 DOL Controller with WLC operating sequence in fault condition**

| 13A | 13B | 13C | 13D | 13E | 13F | 13G | 13H | 13I | 13J | 13K | 13L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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], 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 4.8

# Starter Fault conditon:

## 1. LMR-A: Manual mode

**a. WLCA- Delivery mode**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Manual mode.
13C : Check the mode of WLCA, if it is Delivery mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12E to 12J of LMR-A manual mode & WLCA Delivery mode, Corrective action 1 (Refer Table no.22).
13K : Motor starts running again.
13L : Delivery tank gets filled till the water touches the level of P3 sensor.

## 2. LMR-A: Manual mode

**b. WLCA- Suction mode**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Manual mode.
13C : Check the mode of WLCA, if it is Suction mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12H to 12M of LMR-A manual mode & WLCA delivery mode, Corrective action 1 (Refer Table no.22).
13K : Motor starts running again.
13L : 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**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Manual mode.
13C : Check the mode of WLCA, if it is Dual tank mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12H to 12M of LMR-A manual mode & WLCA Dual tank mode Corrective action 3 (Refer Table no.22).
13K : Motor starts running again.
13L : 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**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Auto mode.
13C : Check the mode of WLCA, if it is Delivery mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12H to 12M of LMR-A Auto mode & WLCA Delivery mode Corrective action 4 (Refer Table no.22).
13K : Motor starts running again.
13L : Delivery tank gets filled till the water touches the level of P3 sensor.

## 5. LMR-A: Auto mode

**b. WLCA- Suction mode**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Auto mode.
13C : Check the mode of WLCA, if it is Suction mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12H to 12M of LMR-A Auto mode & WLCA suction mode Corrective action 5 (Refer Table no.22).
13K : Motor starts running again.
13L : 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**

13A : Motor suddenly stops after running for some time.
13B : Check the mode of LMR-A, if it is Auto mode.
13C : Check the mode of WLCA, if it is Dual tank mode.
13D : Amber LED will start blinking
13E to 13J : Follow steps from 12H to 12M of LMR-A Auto mode & WLCA Dual tank mode Corrective action 6 (Refer Table no.22).
13K : Motor starts running again.
13L : 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.

**ββ 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 –

4. Phase loss
5. Incoming supply voltage less than the minimum required operational voltage of the Starter.
6. 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 [6]Note
In the above conditions check the Starters as explained in Auto & Manual Mode.

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