SIEMENS

RAJA+ Fully Automatic Star Delta Controller 3TE7431

For dependable service, it is of utmost importance that instructions given below are followed for selection, inspection, installation, commissioning, operation and maintenance.

RAJA+ Fully Automatic Star Delta Controller 3TE7431

Selection of Controller

- Refer Table 1 for recommended selection of 3TE7 FASD Controllers.
- 3TE7431 Controllers are available from 15HP/11kW to 30HP/ 22kW suitable for Submersible pump application motors.

Installation, Operation & Maintenance Instructions

Please read and understand these instructions before installing, operating or maintaining the equipment. Keep for future reference.

Danger
Hazardous voltage can cause death or serious injury. Disconnect power before working on equipment.

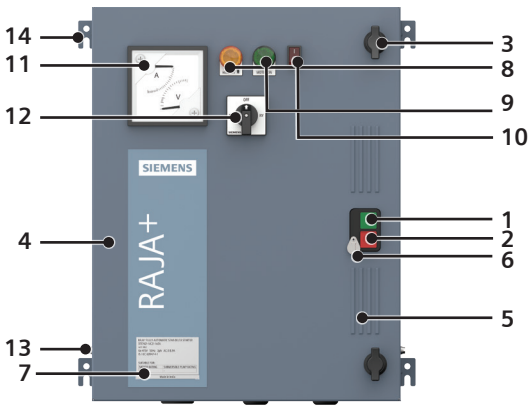
Warning
Automatic Motor Restart

LMRA has "Auto" mode selection. Use this function with caution, Motor will restart automatically when healthy power is restored back.

Reliable functioning of the equipment is only ensured with certified components. Commissioning and maintenance by qualified personnel only.

NOTICE
This product has been designed for environment A. Use of this product in environment B may cause unwanted electromagnetic disturbances in which case the user may require to take adequate mitigation measures.

Complies to standard : IS/IEC 60947-4-1



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 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

Fig. 1: FASD Controller

Fig. 2: FASD Controller inside view

Installation:

- Open the door by rotating the door locks anticlockwise.
- Mount the controller on a vertical wall / plate free from vibrations with proper nuts and bolts. Refer Fig. 6 for mounting dimensions.
- Remove the rubber grommets for the incoming and outgoing cable connections. (Refer Fig. 2)
- Connect incoming and outgoing cables as follows (Refer Fig. 2):
  - Use proper cable glands to ensure dust proofing. For conduit entry use packed washers.
  - Select correct size of cables from Table 1.
  - Connect line and motor cables exactly as per wiring diagram pasted inside the cover of the controller.
  - Terminate the incoming supply cables on terminal block TB1 & outgoing cables to motor on terminal block TB2, TB3 (Tightening torque - Refer table 2).

  NOTE: LMRA is set in Manual mode (Factory setting)
  WLC is set in Delivery mode (Factory setting)
  - Connect the earthing conductor to terminals marked (earth) on the controller body with torque 1.2 to 1.6Nm.

  The Controller 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 name plate.

  If it is not available, then set the dial to approximately 6-8secs.
- Close the door by rotating the door locks clockwise.

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 Controller:
  - First Switch ON the Rocker switch (Control On/Off).
  - Start the motor by pressing the 'ON' button shown in Fig. 1.
  - 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 by OFF button shown in fig. 1.
  - Open the door & Set the timer to this measured value by rotating the dial shown in Fig. 3.

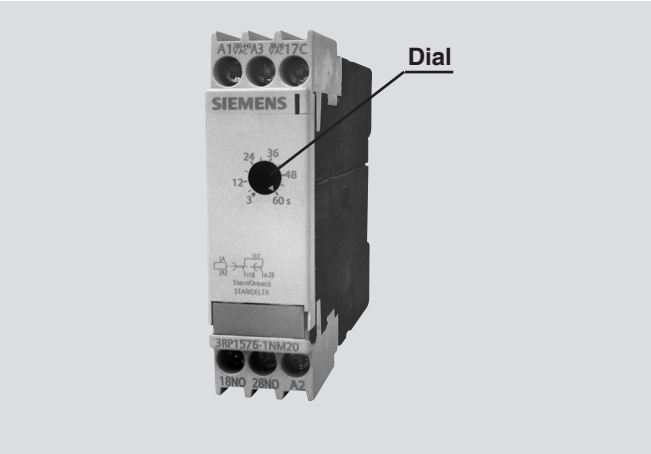


Fig. 3 Timer Adjustment

- 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 (Refer service manual A5E50797230A) 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:

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

Procedure for connecting WLC sensors & terminations:

- These sensors need to be routed from left side of Base plate through cable gland (Please ensure due care to avoid damage to the sensors.)

Mode	For Single Tank application (Delivery or Suction mode)	For Dual Tank application (Dual tank mode)	For by passing WLC
Connection Procedure	Connect sensors P1, P2 & P3 to Terminal X1, X2, X3 of Terminal block TB5	Connect sensors P1, P2 & P3 to Terminal X1, X2, X3 of Terminal block TB5 & sensors P4, P5 & P6 to Terminal X4, X5, X6 of Terminal block TB5	Remove connection between X7-X8 of Terminal block TB5. Remove connection from X11 of TB5 & Connect it to X12 of TB5.

Operation:

- Ensure the door is locked.
- Rotate the Mechanical 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. 1).
- Line current of R phase is indicated by Dual VA meter.
- Motor is ON when green LED is ON.
- For stopping the motor press Red push button marked 'O' (Fig. 1).
- For LMRA Auto / Bypass modes refer troubleshooting guide A5E50797230A.
- For WLC Delivery / Suction / Dual tank modes, refer troubleshooting guide A5E50797230A.
- Reset Operation
  - If the overload relay trips, Reset manually. (Allow a reset time of approx. 4 min.)

Maintenance:

- Switch off the controller and Put Latch on the OFF push button, (marked 'O'). **Disconnect the main supply by switching the main switch & Rocker Switch Off before doing any maintenance.**
- Keep the interior dust free.
- Re-tighten the terminal screws from time to time as per specified torque in table 2.
- No maintenance is needed for overload relay. Please do not open the relay.
- Replace contacts of the contactor if they were severely pitted or when only 40% of the original contact tips remains.
- Replacement of Overload Relay (Refer Fig. 4):
  1. Select a proper relay exactly as per the original.
  2. Slightly loosen the outgoing terminal screws of the relay.
  3. Disconnect the wires connected to the relay terminals.
  4. Slightly loosen the outgoing terminal screws of the line contactor
  5. Follow instructions given in Fig. 4 for removal of relay.
  6. Ensure that new relay hook is engaged in the slot on contactor.
  7. Connect the relay terminals (L1, L2, L3) to (T1, T2, T3) of Q1 line contactor

     Care should be taken to fix the relay terminals & relay to contactor in the exact position shown in Fig. 2.
  8. Tighten the contactor terminal (T1, T2, T3) screws.
  9. Connect the relay terminals to Terminal block TB2.
  10. Re-connect all the disconnected wires and check connections by referring to the wiring diagram. (Fig. 5)

For more Technical details like LMR-A, WLC wiring, operating sequence, mounting details etc., refer Installation & Troubleshooting guide no. A5E50797230A.

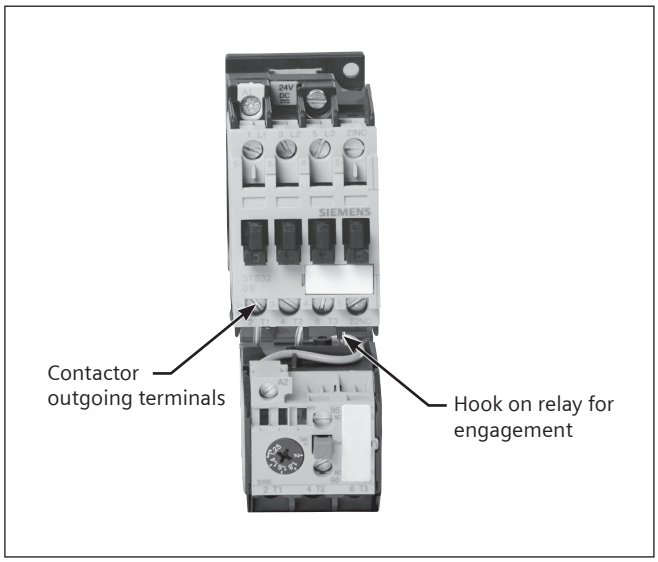
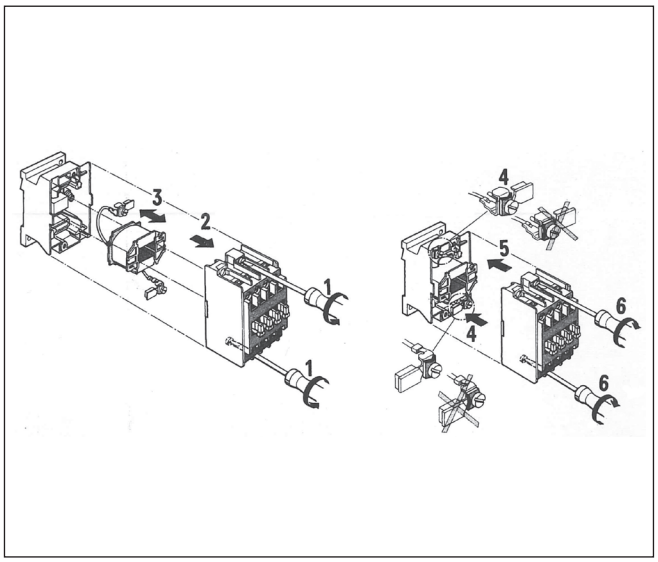


Fig. 4: Representative fig. for Contactor - Relay Connection



Replacement of coil

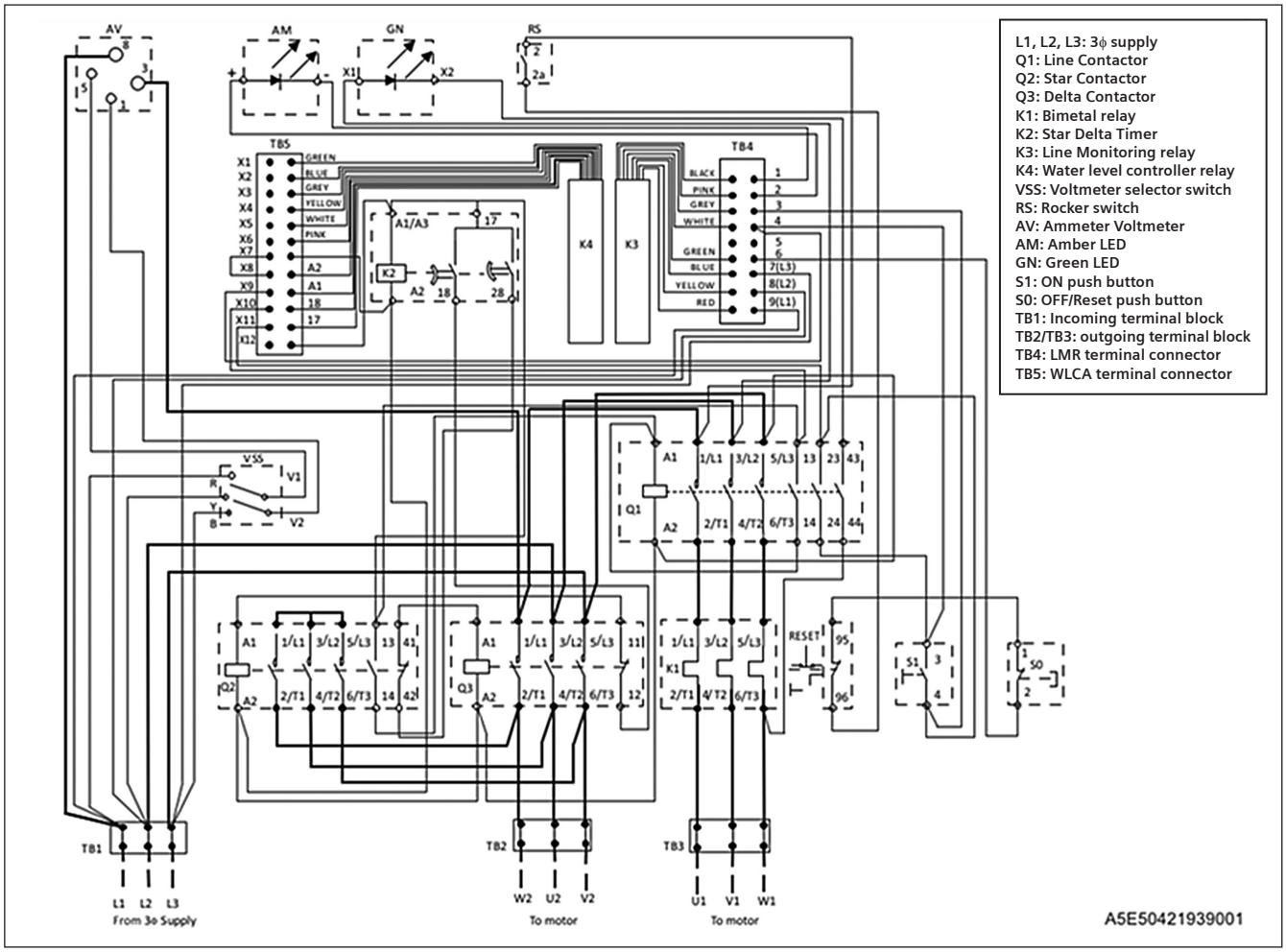


Fig. 5: Wiring Diagram

Table 1:

Motor / Submersible Pump Rating At 415V 3ph 50Hz HP/ kW	Starter MLFB	Line/Delta Contactor MLFB	Star Contactor MLFB	Thermal Overload Relay MLFB	Relay range (A)	Max. Full Load Current (Amp) for Motor / Submersible Pump	Recommended Max. Back-up HRC Fuse rating Siemens Make type 3NA7 – 500V	Recommended Cu Cable with lugs (mm^2)	
								Incoming From Supply	Outgoing To Motor
15 / 11	3TE7431-2BC24-1A**	3TS3300-0A**-08K	3TS3110-0A**-08K	3UW5202-2B	12.5-20	29 / 16.7	32	6	2.5
17.5 / 13	3TE7431- 2CC25-1AZ8	3TS3500-0AZ8-08K	3TS3300-0AZ8-08K	3US5600-2C8K	16-25	34 / 19.6	50	10	2.5
20 / 15	3TE7431-2DC26-1AZ8	3TS3500-0AZ8-08K	3TS3300-0AZ8-08K	3US5600-2D8K	20-32	39/22.5	63	10	4
25 / 18.5	3TE7431-2DC27-1AZ8	3TS3500-0AZ8-08K	3TS3400-0AZ8-08K	3US5600-2D8K	20-32	48/27.7	63	10	6
30 / 22	3TE7431-2RC28-1AZ8	3TS3500-0AZ8-08K	3TS3400-0AZ8-08K	3US5600-2Q8K	25-36	57/32.9	80	16	10

Selection of contactor coil and LMRA

Contactor coil voltage code **	Coil voltage (VAC)	Line Monitoring Relay	Timer
Z6	200 – 400	7UG0613-0FE20	3RP1576-1NP208K
Z8	260 – 460	7UG0613-0FF20	3RP1576-1NM208K

Table 2: Terminal torque values

Sr. No.	Type	Size	Torque (Nm)
1	Terminal block 30A	M4	0.8–1.4
2	Terminal block 60A	M5	1.5–2.1
3	Dual VA Meter 30A – Current terminals	M4	1.2
4	Dual VA Meter – Voltage terminals	M4	1.2
5	Selector Switch 3LD4	M3	0.5
6	Multiway strips	M3	0.4 to 0.6
7	Dual VA Meter 60A – Current terminals	M6	2.5
8	Indicating light – Amber/Green	M3	0.8–0.9

Table 3 : Spares list

Sr. No.	Description	Order No.
1	Contactor	3TS3300-0AZ6-08K
2	Contactor	3TS3110-0AZ6-08K
3	Contactor	3TS3300-0AZ8-08K
4	Contactor	3TS3110-0AZ8-08K
5	Contactor	3TS3500-0AZ8-08K
6	Contactor	3TS3400-0AZ8-08K
7	Thermal Overload Relay	3UW5202-2B
8	Thermal Overload Relay	3US5600-2C8K
9	Thermal Overload Relay	3US5600-2D8K
10	Thermal Overload Relay	3US5600-2Q8K
11	Coil for 200-400V	3TY7403-0AZ6
12	Coil for 260-460V (Z8)	3TY7403-0AW415
13	Coil for 260-460V (Z8) for 3TS35	3TY7443-0AW415
14	1NO Contact Block	3SB5420-0B
15	1NC Contact Block	3SB5420-0C
16	Green LED	3SB5285-6HE06
17	Amber LED	3SB5285-6HL33
18	Timer	3RP1576-1NM208K
19	Timer	3RP1576-1NP208K
20	Add on block	3TX4010-2A
21	Add on block	3TX4001-2A
22	WLC 415V	7UG0685-0FJ21
23	Sensor for WLC_set of 3	7UG0985-0YY00
24	LMRA for 415V	7UG0613-0FF20
25	LMRA for 200-400V	7UG0613-0FE20
26	Phase selector switch	3LD4001-4DC30-0RC0

NOTE: Contact sales for ON & OFF Push Button, Terminal block 30A/60A, Dual VA meter, Door knob, Rocker switch, Current transformer (200/5A).

For more Technical details like LMR-A wiring, operating sequence, mounting details etc.,
refer Installation & Troubleshooting guide no. A5E50797230A.

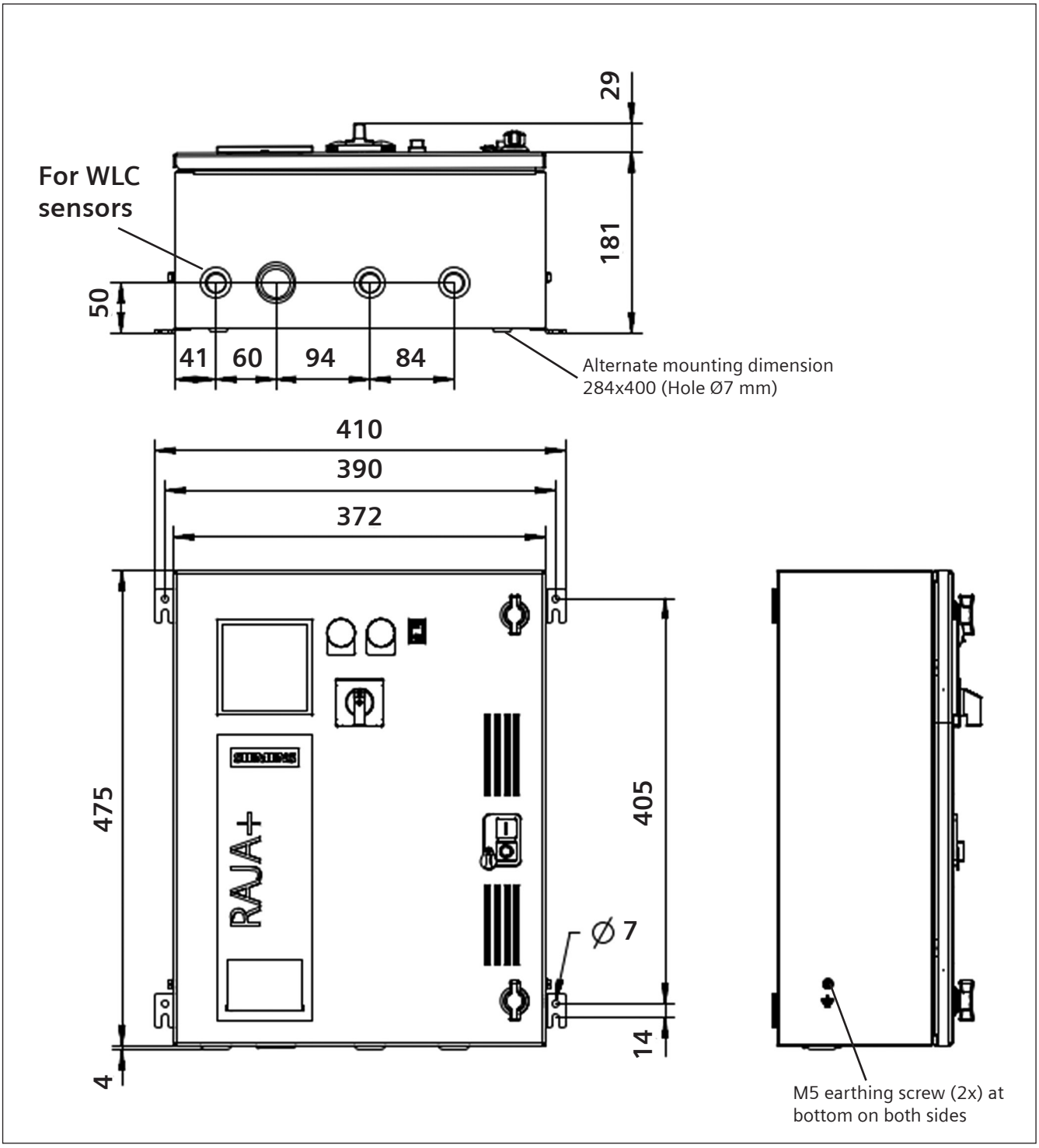


Fig. 6: Dimensional Drawing

Disposal

Siemens products are environment friendly, which predominantly consist of recyclable materials.

For disposals we recommend disassembling and separation into following materials:

METALS: Segregate into Ferrous types for recycling through authorized dealer.

PLASTICS: Segregate as per material type for recycling through authorized dealer. Because of the long lifetime of Siemens Products the disposal guidelines may be replaced by other national regulations when taking the product out of service. The local customer care service is available at any time to answer disposal-related questions.