SIEMENS

Operating Instructions

Direct-On-Line and Automatic Star – Delta Starter

Our new series of DOL and ASD starters complies to latest standard IS/IEC 60947-4-1

⚠ Warning:

Hazardous Voltage can cause Electric Shock and burns.
Disconnect Power before proceeding with any work on this equipment

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

Fig. 1 New series of Starters

Selection:

- Refer Table 1 for recommended selection of DOL Starters and Table 2 for ASD Starters.
- DOL and ASD Starters are supplied without relays. Relays are to be fitted at site.
- Select the suitable range of relay as per recommendation given in Table 1 and 2.
- Select back-up fuse rating for different starters from the selection tables. The recommendation of the fuses and fuse switches is according to Type-2 co-ordination as per IS/IEC 60947-4-1.

Inspection:

- Remove the housing cover.
- Check the coil voltages so that, the coil voltage corresponds to actual supply voltage.
- Inspect interior for breakage.
- If you find a serious defect, do not use the product but have it checked by an authorized Siemens dealer or an electrician.

Fig. 2 Direct-On-Line Starter (DOL)

Fig. 3 Automatic Star Delta Starter (ASD)

Installation:

- As soon as you open the starter, you will see a sticker "K1 BIRELAY" showing the location at which the relay should be mounted. Refer Table 5 for the procedure to be followed for fitting the relay.
- Complete the wiring by connecting the wires having ferrules '95' and '96'. Wiring should be exactly as per the circuit diagram label shown on inside of the front cover.
- Back up fuse ratings and cable sizes are also recommended on the label. Also for your future reference, space is provided on the label inside the front cover to write the coil voltage and the relay range selected by you.
- In case of starters having resetting cord, attach the resetting device on the holes provided on the relay surface. (ref. fig. 4) Adjust the end of the reset cord using the adjustment screw (fig. 4) so that clearance between blue knob and reset cord metallic end is about 2mm.

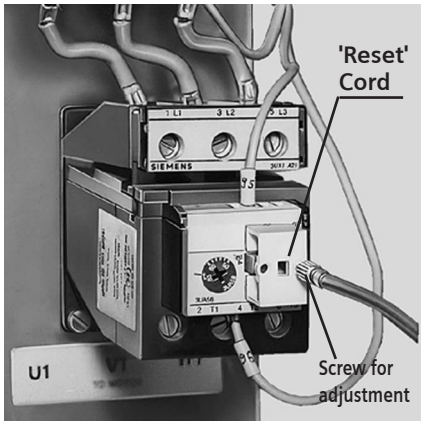


Fig. 4 Reset Cord connections

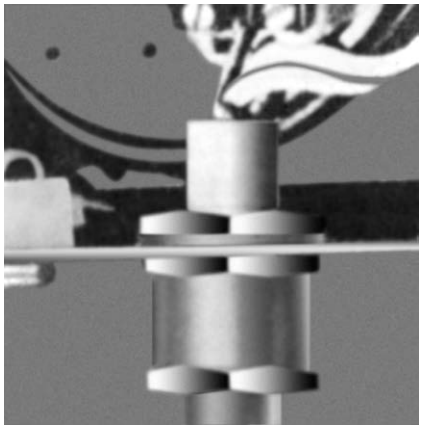


Fig. 6 Cable connections

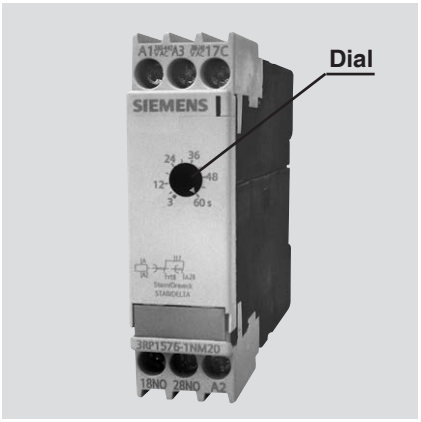


Fig. 7 Timer Adjustment

- Mount starter on a vertical wall / plate free from vibrations, with proper nuts and bolts. Refer fig. 11 for mounting dimensions, and also fig. 5 for permissible displacement.

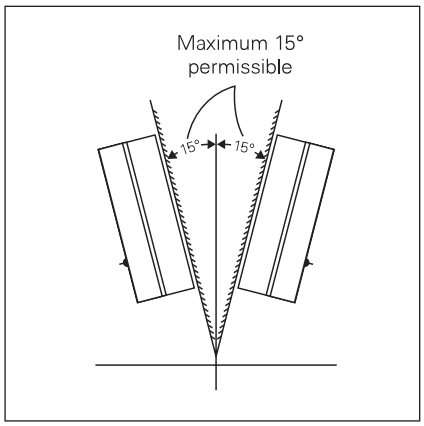


Fig. 5 Maximum permissible displacement from vertical plane

- Select correct sizes of cable as specified in selection Table 1 and 2.
- Depending upon location of incoming and outgoing cables remove corresponding rubber grommets. Ensure dust proofing by using proper cable gland. (fig. 6)

a. For contactors up to 3TS36, remove approx. 10mm of insulation of the conductor, loosen terminal screws and push cable end under the SIGUT terminal of the contactor.

b. For contactors above 3TS36, select proper lugs for conductor termination depending upon cable size specified in Table 1 and 2. Remove required length of insulation and using the hardware connected at the contactor terminals, fix the incoming and outgoing cables.

c. In case, the power and control circuits are of different voltages, connect the desired supply to the control circuit, using the connector. Follow the instructions given on wiring diagram label stuck on inner side of front cover.

d. Tighten the screws firmly.

e. Check that the line and motor connections are done exactly as per wiring diagram pasted inside the front cover.

f. Remove any wire cutting fallen into the starter.

- Connect earthing conductor to terminals marked ⏚

Commissioning:

Read the caution note carefully before commissioning.

- Remove the front cover.
- Before switching ON, re-check external connections.
- Set overload relay to 0.58 times the rated motor current.
- Set the dial of the timer (fig. 7) to an approx. value of starting time of your motor (preferably more than 6 sec.).
- Star-Delta Timer setting (for ASD only):

a. First start the motor by pressing the 'ON' button as indicated in fig. 8.

b. Measure time taken for it to reach nearly rated speed or steady state current (indicated when motor hum reaches a steady pitch).

c. Stop the motor. Set timer to this measured value, by rotating the dial shown in fig. 7.

- **Overload relay setting:**

a. For closer protection set the overload relay to actual line current (DOL) or actual phase current (ASD) as measured by an Ammeter.

- In the absence of an Ammeter, use procedure as given below:

a. Start the motor and let it run for ½ an hour. Then gradually reduce relay setting till it trips. Set relay at a slightly higher value of this setting.

b. Allow reset time of approx. 4 min. Press the blue knob on the relay completely to reset the relay.

c. Re-start motor after some time. If the relay does not trip, consider it to be properly set. If it trips, follow step b with setting at a little higher value and recheck.

d. Overload relay characteristics given in fig. 10 can be used to estimate the average tripping time at different multiples of set current.

Caution:

- **Switch off the starter and disconnect the main supply by switching off the main switch before doing any maintenance.**

- **In case of DOL starters under no circumstances should the relay be set higher than the rated current on the motor name plate.**
- **In case of ASD starters under no circumstances should the relay be set higher than phase current i.e. 0.58 times the rated current on the motor nameplate.**
- **If the relay trips even when set at the 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. 10) are average values of all ranges and sizes of bimetal relays and are mainly intended to indicate the inverse time current characteristics 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 values obtained from the characteristics.

Operation:

- For starting the motor, press green push button, marked 'I' (fig. 8).
- For stopping the motor, press red push button, marked 'O' (fig. 8).
- In case of hand reset type overload relay, press blue push button, marked 'R' (fig. 8) for resetting, after the relay has tripped due to overload. In this case you can restart the motor only if you reset it.
- In case you want the starter to be in 'Self Reset' mode, the blue knob on relay (fig. 9) is to be pressed and rotated in anticlockwise direction; so that it comes in position 'A', and its edge flush with the relay surface. In this mode even if the relay trips on overload, it will be automatically reset in max. 4 minutes. The motor can be restarted only after the relay is reset.

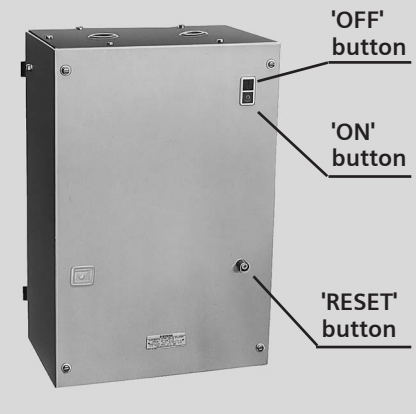


Fig. 8 Starter front view

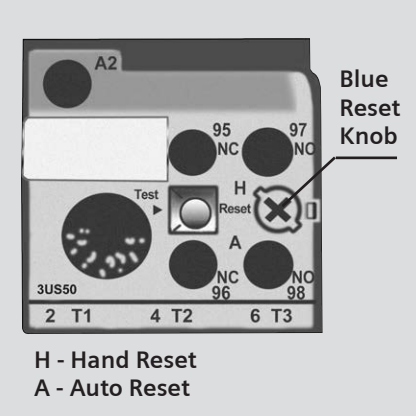


Fig. 9 Relay front view

Maintenance:

- Keep the interior dust free.
- Re-tighten terminal screws from time to time.
- No maintenance is required for overload relay and push button. Do not open them.
- Blackening of silver coated / alloyed contacts does not affect operational life. If necessary, clean the contacts of contactor with CRC 2-26. Remove globules with scrapper or screw driver with minimum force. Under no circumstances the contact should be filed or dressed as it will reduce the electrical life drastically.
- If the contactor hums, clean the magnet pole faces with soft cloth.
- Replace contacts of the contactor if they are severely pitted or when only 40% original contact tip remains. For details of contactor maintenance refer to our 'Guide to Contactor Installation & Maintenance'.

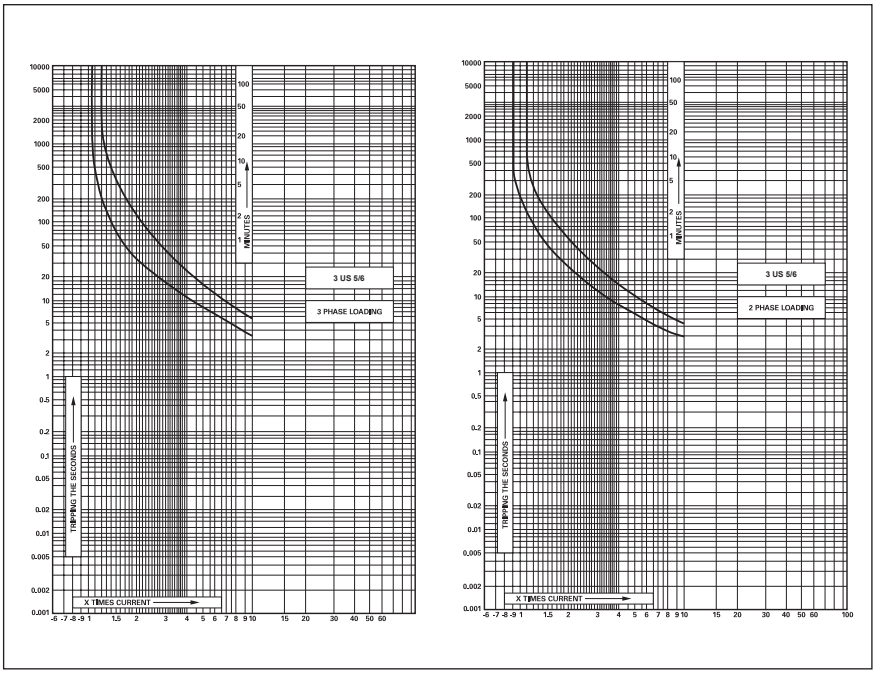


Fig. 10 Operating characteristics of 3US 5/6 relays

Selection Table 1: Direct-On-Line Starters

Motor Output at 415V, 3ph, 50Hz	I(fl) 4 Pole motor	Size	DOL Starters	Contactor	Recommended Over-load Relay 50°C		Recommended Fuse-Switch		Recommended Cu cable size
			Type Reference[1)]	Type Reference[1)]	Type	Range	Type	Max. Backup HRC Fuse Rating	
(kW/HP)	(A)					(A)		(A)	(mm^2)
11/15	20.8	DOL-1	3TW7493-2A..	3TS3400-0A..	3US5200-2C8K	16-25	3KL815	40	6
15/20	28	DOL-2	3TW7494-2A..	3TS3522-0A..	3US5600-2D8K	20-32	3KL815	50	6
18.5/25	34		3TW7495-2A..	3TS3622-0A..	3US5600-2Q8K	25-36	3KL815	63	10
22/30	40	DOL-3	3TW7496-2A..	3TS4722-0A..	3US5800-2F8K	32-50	3KL821	80	16
30/40	53		3TW7497-2A..	3TS4822-0A..	3US5800-2T8K	40-57	3KL821	100	16
37/50	65		3TW7498-2A..	3TS4822-0A..	3US5800-2V8K	57-70	3KL822	125	25
45/60	78	DOL-6	3TW7499-2A..	3TS5122-0A..	3US5800-8Y8K	70-95	3KL822	125	35
55/75	96		3TW7590-2A..	3TS5122-0A..	3US5800-5C8K	85-105	3KL823	160	35

[1)] 10^{th} and 11^{th} place in the type reference is for coil voltage code, refer Table 3.

Selection Table 2: Automatic Star-Delta Starters

Motor Output at 415V, 3ph, 50Hz	I(fl) 4 Pole motor line current	I(fl) 4 Pole motor phase current	Size	ASD Starters	Contactor Main	Contactor Star	Contactor Delta	Recommended Over-load Relay 50°C		Recommended Fuse-Switch		Recommended Cu cable size	
				Type Reference[1)]	Type Reference[1)]	Type Reference[1)]	Type Reference[1)]	Type	Range	Type	Max. Backup HRC Fuse Rating	Incoming (from supply)	Outgoing (to motor)
(kW/HP)	(A)								(A)		(A)	(mm^2)	(mm^2)
22/30	40	23.2	ASD-2	3TE7493-2A...	3TS3522-0A..	3TS3511-0A..	3TS3511-0A..	3US56 00-2C8K	16-25	3KL815	50	16	10
30/40	53	30.6		3TE7494-2A...	3TS3522-0A..	3TS3511-0A..	3TS3511-0A..	3US56 00-2D8K	20-32	3KL815	63	16	10
37/50	65	37.5		3TE7495-2A...	3TS3622-0A..	3TS3511-0A..	3TS3611-0A..	3US56 00-2R8K	32-40	3KL821	80	16	10
45/60	78	45	ASD-3	3TE7496-2A...	3TS4722-0A..	3TS3522-0A..	3TS4722-0A..	3US58 00-2F8K	32-50	3KL821	100	35	16
55/75	96	55.4		3TE7497-2A...	3TS4822-0A..	3TS3522-0A..	3TS4822-0A..	3US58 00-2T8K	40-57	3KL821	100	35	25

[1)] 10^{th} and 11^{th} place in the type reference is for coil voltage code, refer Table 3.

Selection Table 3

Coil Voltage	10^{th} - 11^{th} digit in MLFB
24V	B0
110V	F0
230V	P0
240V	U0
415V	R0
All other voltages	Upon enquiry

Selection Table 4

Star-Delta Timer	
Input Voltage	**MLFB**
24/100 - 127V	3RP1576-1NQ308K
200 - 240V	3RP1576-1NM208K
380 - 440V	3RP1576-1NM208K

Timer to be selected according to contactor coil voltage.

Spares List

Type of spares	MLFB
ON/OFF Actuator	3SX155-21YA
ON/OFF Contact (DOL 2 & ASD 2)	3SX155-11YA
Reset cord for ASD3	3UX1015
Accessory for 3US58 independent mounting	3UX1421
Contact Block (1NO)	3SB5420-0B
Contact Block (1NC)	3SB5420-0C
Contactor Spare Contact Kit	Refer Siemens Price List
Electronic Star-Delta Timer	Refer Table 4
Relay	Refer Table 1 & 2
Contactor	Refer Table 1 & 2
Aux. contact block for 3TS34	3TX4010-2A

Tightening Torque

DOL & ASD Starter	Incoming terminal	Tightening Torque	Outgoing Terminal	Tightening Torque
DOL 1	M4	1.0-1.5Nm	M4	1.0-1.5 Nm
DOL 2	M4	1.0-1.5 Nm	M5	2.5-3.0 Nm
DOL 3	M6	3.0-4.0 Nm	M5	2.5-3.0 Nm
DOL 6	M6	3.0-4.0 Nm	M5	2.5-3.0 Nm
ASD 2	M4	1.0-1.5 Nm	M4	1.0-1.5 Nm
ASD 3	M6	3.0-4.0 Nm	M6	3.0-4.0 Nm

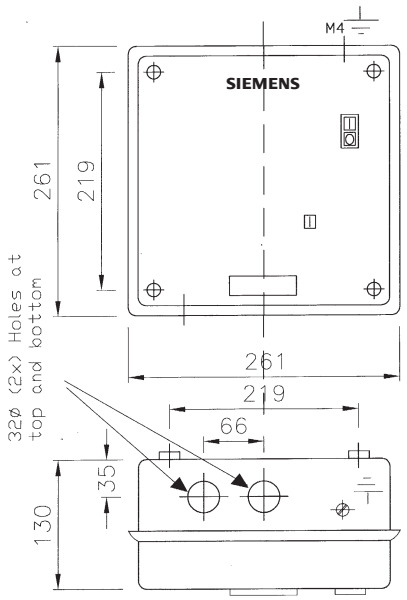
Cover fixing torque 1.5-2.1Nm.

Table 5: Installation

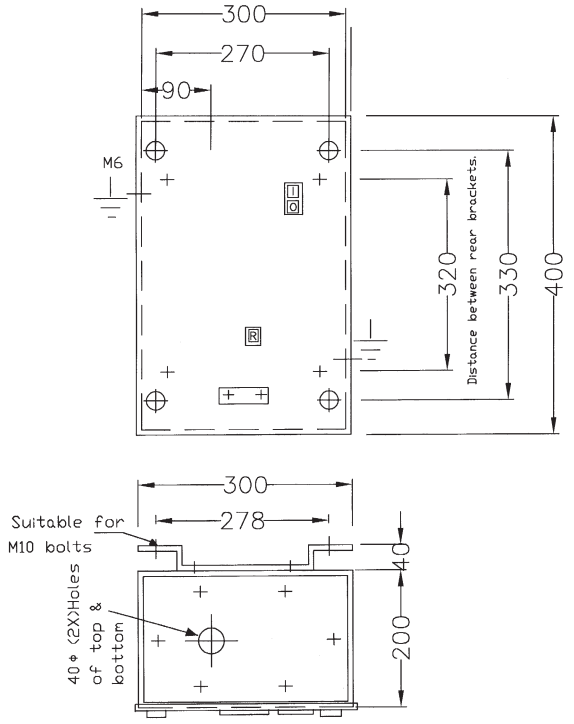
Starter	MLFB	Mode of Relay mounting	Procedure
DOL 1/2	3TW7493-2A..	Direct mounting on contactor	1. Unscrew contactor terminals and put the relay terminals under contactor terminals.
	3TW7494-2A..		2. Engage the relay hook in contactor slot.
	3TW7495-2A..		3. Push the relay towards contactor as much as possible, so that the relay edge is flush with the contactor ribs.
ASD 2	3TE7493-2A..		4. Tighten the contactor terminal screws.
	3TE7494-2A..		
	3TE7495-2A..		
DOL 3	3TW7496-2A..	On the terminal carrier	1. Replace the terminals of relay by those provided in the hardware kit along with the starter.
	3TW7497-2A..		2. See the diagram given in the Operating Instructions of accessory for independent mounting.
	3TW7498-2A..		3. Loosen the screws of accessory for independent mounting.
ASD 3	3TE7497-2A..		4. Put the relay terminals below the pin type lugs of the cable terminations.
			5. Hold the relay the way it is shown in the Operating Instructions of terminal carrier and engage the relay hook in the slot of the terminal carrier.
			6. When the relay edge is flush with terminal carrier edge, clamp the relay with terminal carrier using the clamps in the hardware kit.
			7. Tighten the terminal carrier screws.
DOL 6	3TW7499-2A..	Direct mounting on contactor	1. Engage the relay hook in contactor slot.
	3TW7590-2A..		2. Align the contactor terminal holes to relay terminal holes.
			3. Fix the relay to the contactor using the hardware already fitted at the contactor terminals.
			4. Fix the terminals provided along with the relay to the other side (outgoing side) of the relay and use the hardware provided for cable connections.

Fig. 11: Dimensional Details

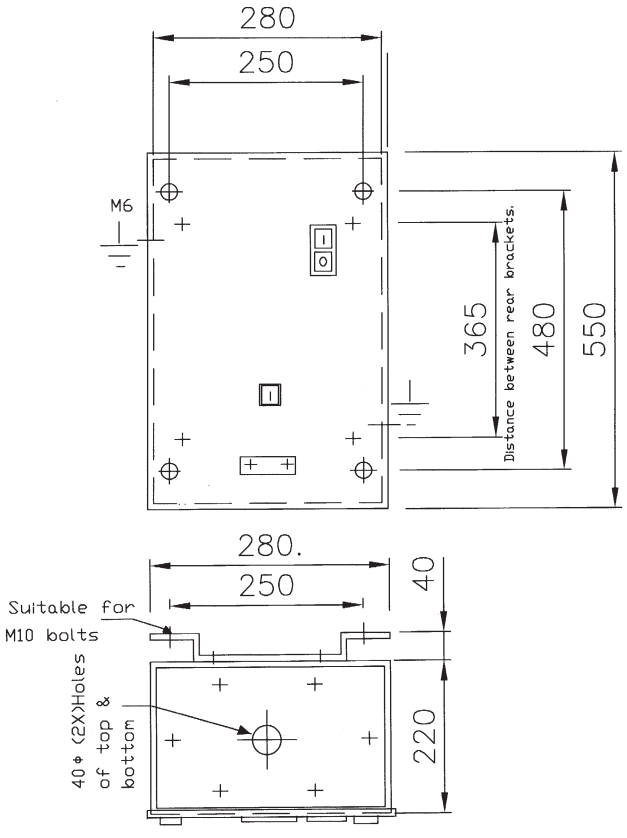
DOL 1/2
3TW7493-2A..
3TW7494-2A..
3TW7495-2A..



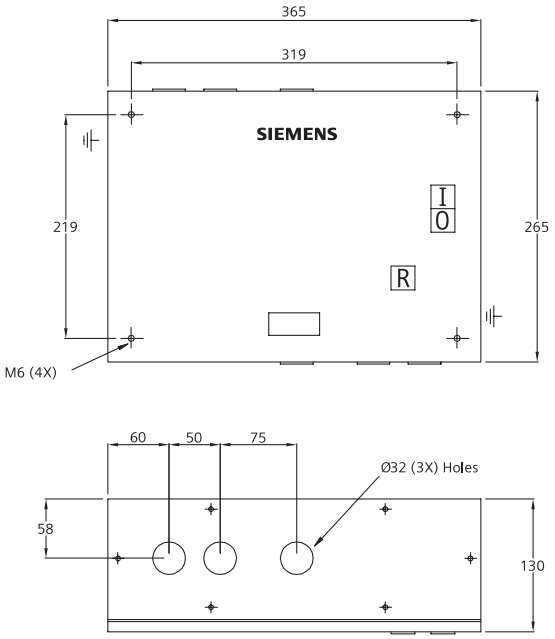
DOL 3
3TW7496-2A..
3TW7497-2A..
3TW7498-2A..



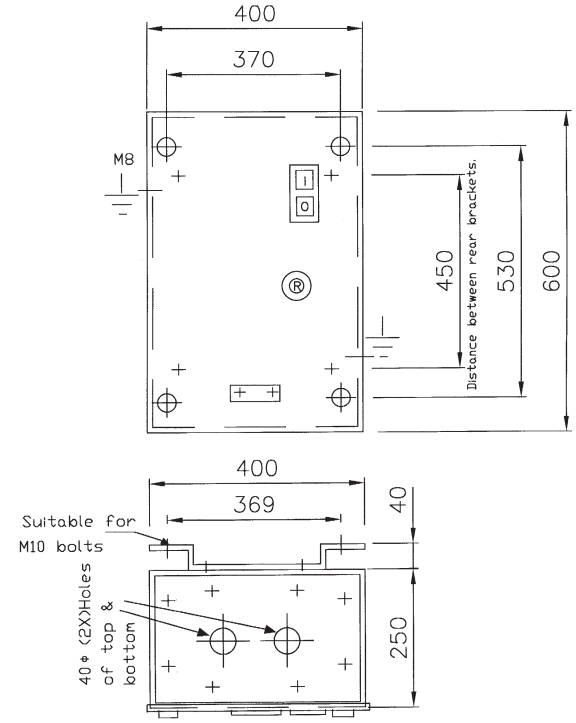
DOL 6
3TW7499-2A..
3TW7590-2A..



ASD 2
3TE7493-2A..
3TE7494-2A..
3TE7495-2A..



ASD 3
3TE7496-2A..
3TE7497-2A..



Disposal

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

For disposal we recommend disassembling and separation into following materials:

METALS : Segregate into Ferrous & Non Ferrous types for recycling through authorised dealer.

PLASTICS : Segregate as per material type for recycling through authorised 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

Customer Care Toll free no. 1800 220 987 Email: adscs.india@siemens.com

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This replaces SGR-01-115-029

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