



# Bharat Heavy Electricals Limited, Bhopal

## CONTROL EQUIPMENT ENGINEERING DIVISION

# TECHNICAL SPECIFICATION

## FOR

### JOY STICK TYPE MASTER CONTROLLER

## FOR

### DIESEL ELECTRIC TOWER CAR (DETC)

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Project	700 HP Twin Power Pack New Underslung DETC

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### 1.0 Scope Of Supply:

This specification covers supply of Joy stick type master controller to be used in Diesel Electric Tower Car (DETC).

### 2.0 Description:

Master Controller is a device used for selection of the direction and motion of the Diesel Electric Tower Car for traction by energizing the train line wires through the cam operated Auxiliary contacts provided in the controller. It shall comprise of one Throttle(Main) Joy Stick Type Operating Lever for selection of notches for Traction Control with Deadman's switch at the end of the lever, one Forward/Reverse/Off mode selection knob and one lock/unlock key. The key should be removable in locked position only.

### 3.0 Working Condition & applicable standards:

Master controller will be used in Diesel Electric Tower Car (DETC) operating all over India. Equipment shall be suitable for traction application and shall work under following environmental conditions: -

3.1	Humidity	100% saturation during rainy season
3.2	Ambient temperature	Max. 55 Deg. Centigrade Min. 0 Deg. Centigrade
3.3	Atmosphere condition	The equipment shall work in dry whether where the atmosphere is dusty and in coastal areas with corrosive atmosphere
3.4	Shock & Vibration	Max. vertical acceleration - 3.0 g Max. longitudinal acceleration - 5.0 g Max. train acceleration - 2.0 g
3.5	Applicable IECs	Electric equipment for Rolling - IEC-60077 Part 1 & 2, IEC 61373



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### 4.0 Technical Parameters:

#### 4.1 Applicable BHEL documents:

Master Controller shall be designed, manufactured & tested as per following OGA / Schematic Drawings and test specifications,

(i)	OGA Drawing of Master Controller	25730030102 Rev.01
(ii)	Schematic drawing	35900030175 Rev.02
(iii)	Type test and inspection spec.	865722 R00
(iv)	Routine test and inspection spec.	865721 R00

### 4.2 Operating Handles:

Master controller will have one handle, one reverser knob and one key as detailed below for selecting/operating the master controller in different mode. All these handles shall be mechanically interlocked with each other to achieve desired safe operation of DETC.

#### 4.2.1 Forward/Reverse Knob:

The Forward/Reverse knob has to be on the left side of the master controller as shown on OGA drawing. This knob will have three positions at 45° interval (total 90°). Forward/Reverse knob is used to select three positions "Forward", "Off" or "Reverse". This knob should have programmable cams with minimum three cams mounted with auxiliary switches. Forward knob shall not be operatable unless the lock/unlock key is moved to unlock position.

#### 4.2.2 Throttle Handle:

Throttle handle shall be Joy Stick type and placed at the extreme right hand side as shown in OGA Drawing. There should be Nine positions of handle - 0, 1, 2, 3, 4, 5, 6, 7 & 8.



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The angle of handle movement shall be restricted to as shown in OGA Drawing. The division of all Nine positions should be placed in such a manner that driver should feel the notch on every position without slippage of handle.

Throttle (Main) handle should be mechanically linked to the camshaft to actuate the cam switches mounted on each cam. Operating sequence of cam switches shall be as per Schematic Drawing.

Throttle (Main) handle shall be possible to move from '0' notch to other notches only in either 'Forward' mode or 'Reverse' mode of Forward/Reverse knob.

#### 4.2.3 Deadman handle:

The knob of the throttle handle at "0" position should be at 20° tilted position by default. There should be two snap switches mounted on the controller mechanically linked to the tilt of throttle handle. As the throttle handle swings between 20° tilt, these snap switches should operate. The driver will have to correct the 20° tilt to 0° and move the throttle handle from 0 to 1st notch and forward to 8 notch. In case driver's hand is removed from throttle handle the handle come back to 20° tilted default position. This is known as deadman action. In this position the snap switches shall operate. In 1st to 8th notch if the throttle handle tilts back to 20° it cannot be reset. The reset from 0° to 20° or vice versa is only possible at 0 position of throttle handle.

#### 4.2.4 Key:

A mechanical removable type key to be provided on the left of the controller. The key to be removed once the DETC is not in operation. This key has two positions 90° apart. One is "lock" and other is "Unlock" position. Key can only be inserted in "Lock" position. Once the key is inserted and moved from "Lock" position to "Unlock" position the key cannot be removed from master controller. The movement of key from "Lock" position to "Unlock" position is only possible when the reverser knob is at "0" position. With "Forward/Reverse" knob is either at "Forward" or "Reverse" position the movement of key should not be possible. The key should be designed such that it is only removable at "Lock" position.



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#### 4.3 Deadman's Control

It shall be activated by clockwise turning of main throttle handle and it shall have to be kept activated manually and consciously by the Driver and design shall be such that in case driver getting incapacitated or loosing alertness, the "Deadmans" contact should operate and emergency brake shall be applied as per control scheme of DETC. Schaltbau auxiliary make Switch shall be used with 1NO+1NC contacts to type no. S826b, 240 Vac.

#### 4.4 Auxiliary Switches

The auxiliary switch used in master controller shall be cam operated snap action switch or finger type cam auxiliary switch. Auxiliary switch shall meet the following requirement,

- (a) Thermal rating 5 Amps minimum.
- (b) Insulation level 1.5 KV AC, 50 Hz
- (c) Minimum current to carry 35 mA at 110 V DC. Contact shall be designed & suitable for carrying such low current also.
- (d) Contact shall be suitable for 2.5 Amps inductive load at 125 VDC at time constant of  $40 \pm 5$  ms and shall be suitable for 100 make and break operation at 2 min. interval.
- (e) Contacts shall be suitable for 1 lakh make/break operation at 1 Amp inductive load with time constant of  $40 \pm 5$  ms at 125 VDC with 60 operations per minute.

Cam auxiliary switch to CLW Drg. No. 3TWD.101.138 is recommended to be used.

#### 4.5 Mounting

Master Controller shall be mounted on Driver Desk with help of 4 Nos. M6 Screw Outer dimensions of master controller shall conform to BHEL OGA drawing.

#### 4.6 Bill of Material



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Materials used for manufacturing of Master Controller shall be generally in line with table below. Supplier to submit detailed BOM during submission of offer or after PO placement.

S.No.	DESCRIPTION	MATERIAL
1	TOP PLATE WITH BLACK POWDER COATING	STRUCTURAL STEEL
2	BOTTOM PLATE	STRUCTURAL STEEL
3	SIDE PLATE	STRUCTURAL STEEL
4	CAM SHAFT	STAINLESS STEEL ROD
5	SPRING	SPRING STEEL WIRE
6	HANDLE WHEEL (ANODIZED)	ALUMINIUM
7	SIDE SUPPORT PLATE	ALUMINIUM FLAT
8	CAM	ALUMINIUM
9	BUSH	GUN METAL CASTING & BRASS ROD
10	BEARING	STAINLESS STEEL BEARING
11	INTERLOCKING LEVER	STRUCTURAL STEEL
12	HANDLE ROD	STAINLESS STEEL
13	HEAT SHRINK SLEEVE	--
14	KEY	BRIGHT STEEL BAR WITH CHROME NICKEL PLATING
15	SILVER TIP (BUTTON TYPE)	SILVER
16	E-BEAM CABLE	E-BEAM CABLE as per RDSO specification ELRS/SPEC/ELC/0019 and from CLW approved vendors.
17	COVER BOX	CRC SHEET
18	CONNECTOR 19 PIN FEMALE	ALLIED MAKE MG 06F22-14S
19	CONNECTOR 19 PIN MALE	ALLIED MAKE MG 02R22-14P SQG
20	DEAD MAN SWITCH	SALTBAU PART No. S826b (1NO+1NC)
21	Aux. Switch	Cam operated snap action switch or finger type switch Or Cam Switch to CLW Drg. No. 3TWD.101.138



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#### 5.0 GENERAL CONDITIONS

- 5.1 The offered Master Controller shall be in line with the BHEL OGA drawing and shall meet all the requirement of the specification.
- 5.2 TCs for raw material to be furnished during type testing.
- 5.3 Supplier to submit quality Assurance Plan (QAP). Suppliers to adhere QAP for production after approval by BHEL.
- 5.4 The Supplier shall, at his expense, replace any part of the equipment failing or proving unsatisfactory in service and attributed to defective/faulty design, defective material or bad workmanship, within a period of 24 months from the date of its commissioning or 30 months from the date of supply of all equipment whichever is earlier. The period of warranty shall stand extended by the duration for which the device remains inoperative under exercise of this clause. Further, should any design modification be made in the equipment as a result of defect/fault/shortcoming in the original design, the period of 24 months would commence from the date the modified part is commissioned into service.

#### 6.0 Test Report:

Party to submit test report as per test schedule mentioned at clause no. 4.1.

#### Status of Revision

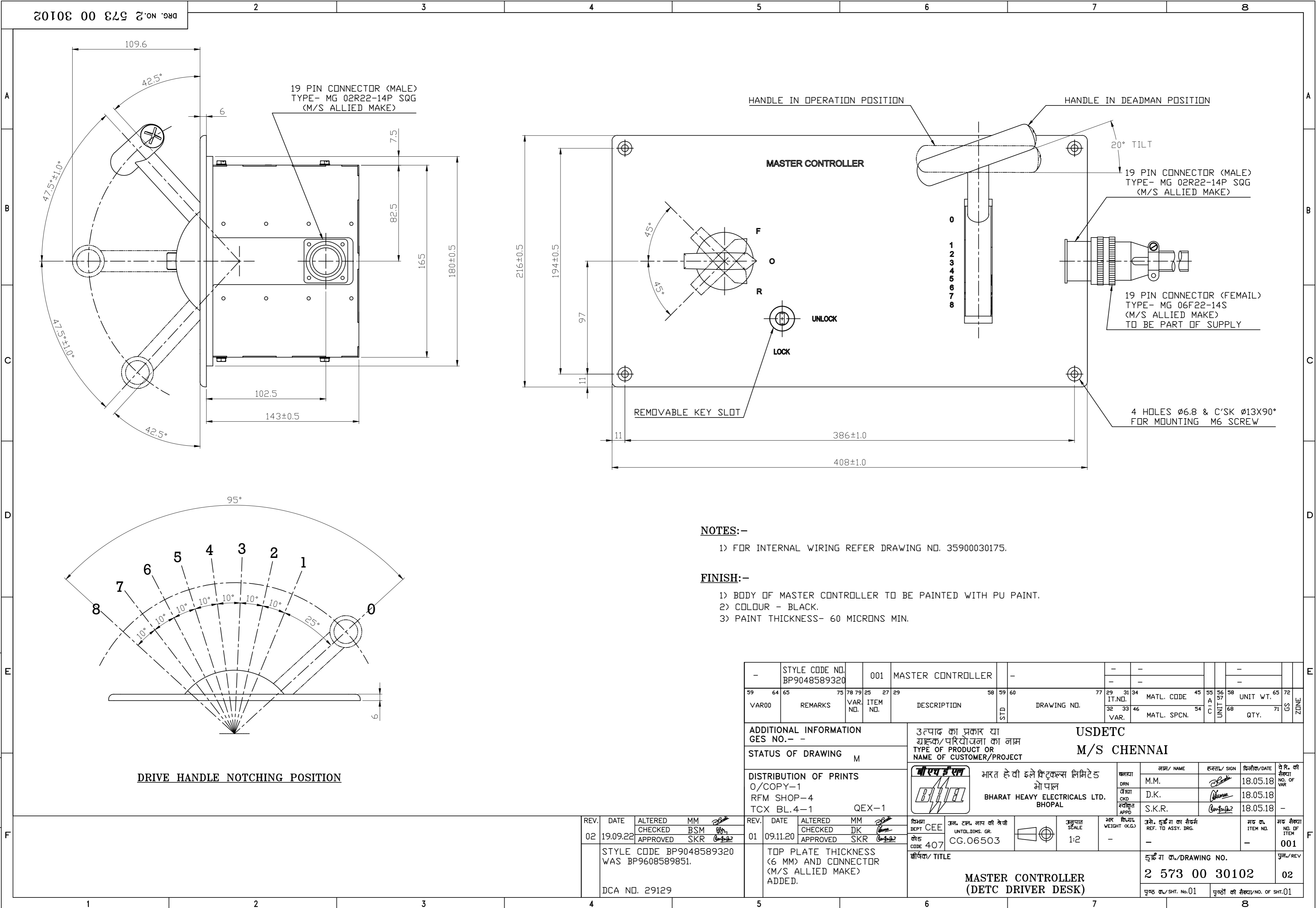
S. N.	Date of Revision	Page No.	Revision	Reasons for Revision
1.				
2.				
3.				

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

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INVENTORY NO. SIGN. & DATE REF. DRG. NO.



NOTES:-

1) FOR INTERNAL WIRING REFER DRAWING NO. 35900030175.

FINISH:-

- 1) BODY OF MASTER CONTROLLER TO BE PAINTED WITH PU PAINT.
- 2) COLOUR - BLACK.
- 3) PAINT THICKNESS- 60 MICRONS MIN.