REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: AKSPROP023

RFQ DATE : 17.08.2022

Due Date/Day: 30.08.2022 TUE
Time : 13:00 HRS
[redacted]

(address for communication) :

(for all correspondence)
Purchase Executive : ABHISHEK
Phone : 26998102
Fax : 00918026989215
E-mail: singh.abhishek@bhel.in

1)This RFQ is for entering into Rate contract (RC) with BHEL for the tendered item. Validity of the RC will be 1 year from the award of rate contract. Firm orders will be placed during the tenure of rate contract. Prices will remain firm till the validity of RC or till the completion of supplies against the Purchase Orders placed against this rate contract whichever is later. Please note that these quantities are projections based on the current business scenario and expected orders from customers. In the eventuality of business not coming through, BHEL is not obligated to exhaust the ordering of RC quantities.

2)Reverse Auction Clause: BHEL shall be resorting to Reverse Auction (RA) (Guidelines as available on www.bhel.com) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	TI0668086190 Drivers Display * HSN/SAC : 9032 Test Certificate Drivers Display (34-3A1, 34-4A1) [redacted] Drivers Display UNIT with front USB . Mating connectors for the following connectors mounted on the device has to be supplied along with the display unit. 1. Power connector (X1) 2. MVB connectors MVB 1 (X5) and MVB 2 (X6) 3. COM1 (X4) As per Specification PS4452711 Rev No 00	500	NO	500	[redacted]

Total Number of Items - 1

1.
2.

[redacted]

NOTES:
1. This RFQ is governed by:
a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**
b) Any other specific Terms and Conditions mentioned.
[redacted]
* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

ABHISHEK
Control Equipment

PREQUALIFICATION CRITERIA (PQC) FOR DRIVER DISPLAY UNIT GROUP: TRACTION ENGINEERING	**Ref:** 445/PQ_DDU/21 **Rev.** No.: 00 Page 1 of 1	

1.0 PRE QUALIFICATION CRITERIA (PQC)

1. The Bidder should be a Manufacturer/Supplier of DDU for use in rolling stock application in Indian Railways for AC locomotives/ EMU/ MEMU/ Train sets or Metro rails.
2. BHEL shall approach and submit credentials/details furnished by vendor with their offers to customer and await customer's decision for a maximum of one month from the date of tender opening. If approval is not received within the above period, BHEL shall treat the offer as "Not meeting" Pre-qualification criteria and offer shall be rejected.
3. It is preferred that the bidder is the manufacturer of this item. If the bidder is importing some portion of the components, then minimum value addition shall be 20%. Bidder to confirm this in the offer. Value addition less than 20% is not acceptable.
4. The bidder shall have the capability to develop screens for the DDU based on user requirements.
5. The vendor should be able to provide support during commissioning at User Railways/ ICF/ RCF/ CLW.

2.0 DOCUMENTS SUBMISSION

1. Bidder to submit clause by clause compliance to complete technical specification (Technical specification no. PS4452711 Rev. No.00, dated 28-01-2021) along with copy of type test report.
2. Should possess a valid type test report, not older than five years, conducted at a NABL accredited laboratory as per relevant standards mentioned in the specification with respect to time during the bid submission.
3. Proof of supply of Driver Display Unit used in traction applications directly or through any agency to Indian Railways during the last 5 years to be submitted.

3.0 REFERENCE DOCUMENTS

a) Purchase Specification No PS4452711, Rev. No. 00 for Driver Display Unit.

REVISION 00	APPROVED AGOSH CHANDRAN R S		
	PREPARED SUNITHA L	ISSUED TRACTION ENGG	DATE 28.01.2021

Revision History Sheet

Rev. No.	Date	Nature of Issue	Reasons	Prepared By	Approved By
00	28.01.2021	First issue		L Sunitha	Agosh Chandran R S

Revisions	00	Approved by: AGOSH CHANDRAN R S MANAGER/ TE		
		Prepared By:	Issue By:	Date:
		L SUNITHA DY.MANAGER/TE	TRACTION ENGINEERING	28.01.2021

1. Introduction

Purpose of this technical specification document is to give requirement information about Driver Display Unit mounted on driver's desk in AC locomotives.

The DDU is used as a modern interface from driver to train control. It displays detailed information from the equipment/sensors in the train. It also enables the user to add function control elements without hardware changes in the drivers' desk.

2. Scope

2.1 Scope of supply

Following shall be the scope of supply for each piece of Driver Display Unit.

	Item Description	Qty/DDU
1.	Driver Display Unit loaded with OS and screen software	1 No.
2.	Copy of loaded screen software in pen drive	1 set
3.	Fasteners required for mounting	1 set

2.2 Design approval and equipment commissioning

a) The design of the equipment as offered shall be finally approved by RDSO/ICF/IR. Supplier shall provide all necessary documents, drawings, software related documents required towards approval of design.

b) Supervision of installation, commissioning and interfacing (hardware + software) of DDU with complete system shall be in scope of supplier. Supplier to depute team of skilled staff for commissioning and interfacing at User Railways.

c) Supplier shall provide continuous support after supply which may include updation of screens or any other requirement till acceptance by user railways without price implication to BHEL.

3. Equipment Testing

Type tests, as mentioned in clause 8 of this document, are to be done on one number of unit at accredited labs in India or abroad. Type test certificates to be submitted along with supply.

If type tests have been done on similar item, then certificates to be submitted along with techno-commercial bid.

4. Specifications

Major parameters are as follows:

	Parameter	Value
1	Power Supply:	a) 77V DC to 137.5V DC b) Reverse polarity protection c) Thermal shutdown protection d) Over-voltage protection e) Under-voltage protection
2	Display:	a) 10.4” TFT, 640x480 Pixel (VGA) or higher. b) Resistive touch screen with anti-reflective coating and calibration feature c) Brightness: 350 cd/m2 d) Automatic and/or manual illumination control e) Viewing angle horizontal: -50 / +70 degrees; vertical: -60 / +70 degrees f) Backlight lifetime > 50.000 h until half brightness
3	Operating system:	Latest Windows, or Linux based OS
4	CPU:	Low power type, because of the high ambient temperature
5	Memory:	RAM: Min 1 GB, Compact Flash: Min. 1 GB
6	Electrical Interfaces:	Refer to clause 5
7	Construction:	a) Casing and connector panel: High-grade steel, matt pickled b) Heat sink: Aluminium c) Front plate: Black anodised
8	IP Rating	IP-65 from front
9	Reliability, Maintainability, Lifetime:	a) MTBF > 50,000 hours b) Lifetime > 15 years c) Spare parts > 15 years (form, fit and function compatible)
10	Keypad:	a) Rugged membrane keypad. b) Following function keys required on the front side: Home, Back, Up, Down, Enter c) Following brightness control function keys required on the front side: Brightness Increase, Brightness Decrease, Brightness Auto
11	PCBs:	Printed Circuit Boards must have conformal coating as relative humidity > 95%, and during 3-4 months of rainy season per year frequent condensation can occur.
12	Applicable standards:	EN 50155, EN 50121-3-2, IEC-60571

5. Interfaces

5.1 Connector and interfaces details:

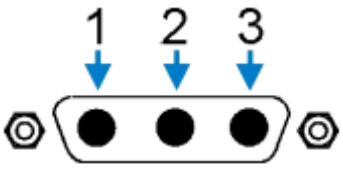
	Interface	Connector	Function and Description
1.	X1	FCT 3W3	Power
2.	X3	9 pin D-Sub Male	COM3. RS422 / RS485, Isolated, default setting is RS485
3.	X4	9 pin D-Sub Male	COM1. RS232, preferably isolated
4.	X5	9 pin D-Sub Female	MVB. MVB communication with an internal MVB-EMD board (preferably Duagon D113 LT-P4A)
5.	X6	9 pin D-Sub Male	
6.	X7	9 pin D-Sub Male	Audio line-output. Output level symmetric 1V rms, 2 channels (stereo), preferably short circuit proof.
7.	X8	9 pin D-Sub Female	Ethernet 10/100 Base T
8.	X9	USB	USB 2.0. Accessible from front side.
9.	X10	USB	USB 2.0.
10.	X11	USB	USB 2.0.
11.	X12	CF Type I	Compact Flash memory slot
12.	X13	CF Type I	Compact Flash Memory slot

Note: Connectors shall be parallel to the back side of the unit to allow for easy cabling in very restricted space available in driver's desk.

5.2 Pin details of connectors/interfaces

5.2.1 X1 – Power Supply Connector

The supply voltage is to be connected via pins A1 and A2.



Pin	Description
1	+V
2	-V
3	NC

5.2.2 X3 – COM3 / RS485

The RS485-Interface is electrically isolated through opto-couplers. Switching between sending and receiving and inversely is controlled by the -DTR-register of COM3.

Pin	Signal	Description
1	Data+	Data+
2	Data-	Data-
3	SGnd	Signal Ground

5.2.3 X4 – COM1 / RS232-C

The interface is electrically isolated through opto-couplers and designed for the V.24/RS-232-C standard.

Pin	Signal	I/O	Remark
1	DCD	I	Data Carrier Detect
2	RxD	I	Receive Data
3	TxD	O	Transmit Data
4	DTR	O	Data Terminal Ready
5	SGnd	-	Signal Ground
6	DSR	I	Data Set Ready
7	RTS	O	Request To Send
8	CTS	I	Clear To Send
9	RI	I	Ring Indicator

5.2.4 X5, X6 – MVB Interfaces

Pin	signal ESD / EMD
1	A.Data_P
2	A.Data_N
3	VN_RSV1
4	B.Data_P
5	B.Data_N
6	A.Bus_GND / A.Term_P
7	B.Bus_GND / A.Term_N
8	A.Bus_5V / B.Term_P
9	B.Bus_5V / B.Term_N

5.2.5 X7 – Audio Output

The line out shall be two channel (stereo) and symmetrical audio output signal. The audio line-output shall be short circuit protected.

Pin	Signal	Description
1	Gnd	Ground
2	L+	Left channel (+)
3	Gnd	Ground
4	R+	Right channel (+)
5	Gnd	Ground
6	Gnd	Ground
7	L-	Left channels (-)
8	Gnd	Ground
9	R-	Right channel (-)

5.2.6 X8 – Ethernet

Pin	Signal	Description
1	reserved	
2	reserved	
3	RxD-	Receive Data B
4	Reserved	
5	TxD-	Transmit Data B
6	reserved	
7	n.c.	
8	RxD+	Receive Data A
9	TxD+	Transmit Data A

5.2.7 X9, X10, X11 – USB

Standard 4 pin USB Type A connector

5.2.8 X12, X13 – Compact Flash Memory

Standard CF Type I Compact Flash memory slot.

6. DDU Input/output port mapping details

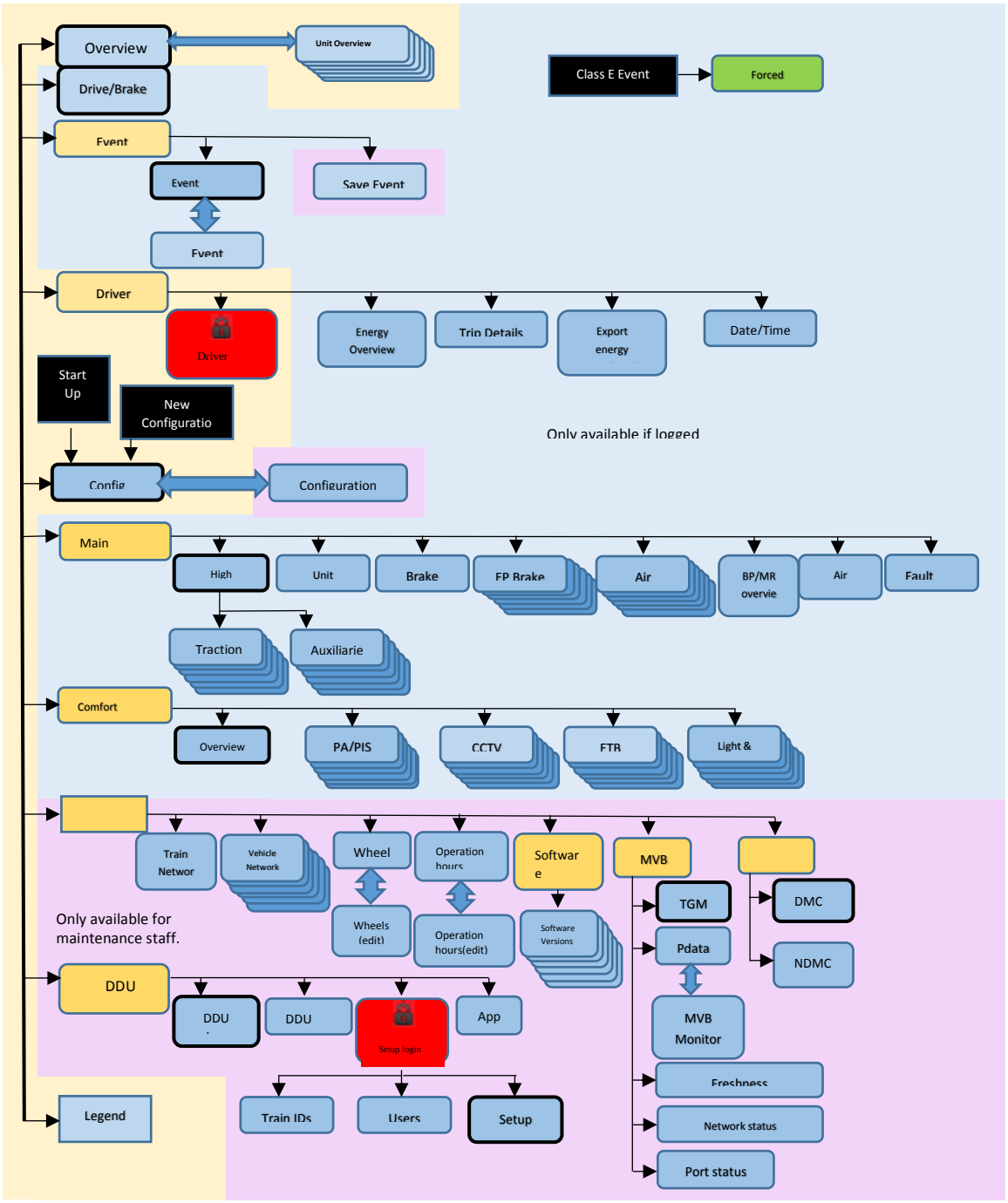
Signal details shall be provided in the port mapping. Port Number, Cycle time, Byte offset, Bit offset shall be finalised during detailed design stage.

Port mapping details and signal list will be finalised during detailed design stage.

7. Menu tree and legend of screen

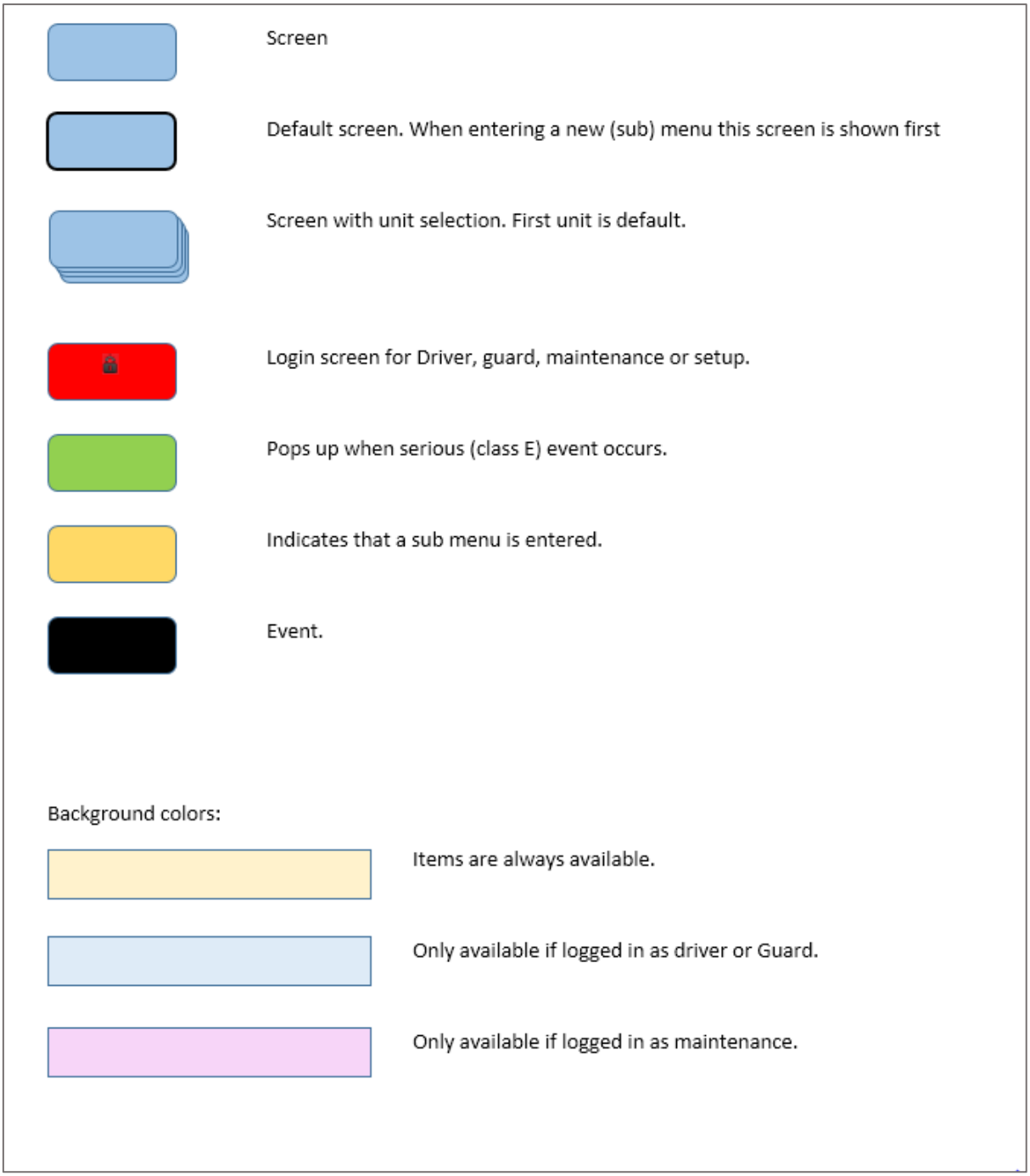
Menu Tree provided below is tentative. Final menu tree will be provided during detailed design stage.

7.1 Screen Menu Tree



7.1.1 **Estimated (approximate) number of screens= 120**

7.1.2 **Legend for the menu tree**



7.2 List of legends

Symbols shown below are tentative. Final List will be finalised during detailed design stage.

7.2.1 Symbol color definition

Symbol colour is an important part of easy recognition of problems in specific parts of train. Each symbol has a default background colour, white which indicates that specific system part is ready. By changing the background colour of a symbol different states can be identified. Below the different colour states are described.

Symbol	Explanation	Symbol Color	Back Color
SYM	Ready, released for operation + OFF	Black	White
SYM ?	Fault Communication	Yellow	Red
SYM	Not ready	Black	Light gray
SYM	Power Supply OFF; MCB tripped	Yellow	Gray
SYM	Device isolated	Yellow	Black
SYM	Alarm, defect of service.	Black	Red
SYM	Warning	Black	Yellow
SYM	ON or pressure OK	Black	Aqua
SYM	Brake applied	Black	Purple
	Empty space	n.a.	Light gray

7.2.2 Monitoring Symbols

7.2.2.1 Cabin Symbol

	No information available.
	Cab is not occupied.
	Vehicle has the master cabin.
	Fault, multiple cabins are manned.

7.2.2.2 Unit status symbol

	No information available.
	Unit OK, no category A, B or E fault active.
	Category B fault active but no A or E fault.
	Category A or E fault active.
	Unit is isolated.

7.2.2.3 Neutral section symbol

	No information available.
	
	Neutral section.

7.2.2.4 Pantograph symbol

	No information available.
	Pantograph is down.
	Pantograph is up.
	Pantograph is up and OHE is available.
	Pantograph is faulty, does not rise after command.
	Unit is isolated.
	Emergency off.

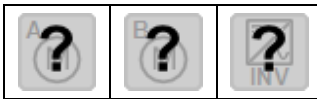
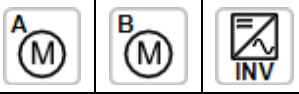
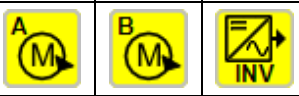
7.2.2.5 VCB symbol

	No information available.
	VCB is open.
	VCB is closed.
	VCB is faulty, does not close after command.
	Unit is isolated.

7.2.2.6 APC symbol

	No information available.
	Automatic Power Control receiver not triggered.
	Automatic Power Control receiver triggered.

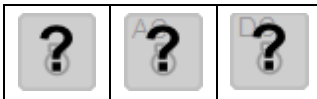
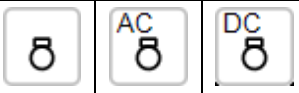
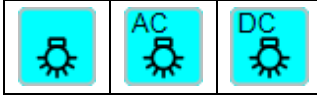
7.2.2.7 Traction power symbols

	No information available.
	Traction power is off.
	Running and OK.
	Running and warning.
	Fault.
	Status unknown.
	Fault in communication with device.
	Device isolated.

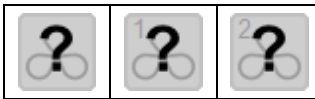
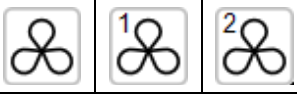
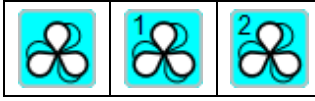
7.2.2.8 Emergency off symbol

	No information available.
	Emergency off not active.
	Emergency button pushed.

7.2.2.9 Interior lighting symbol

	No information available.
	Lights are OFF.
	Lights are ON.

7.2.2.10 Fans symbol

	No information available.
	Fans are OFF.
	Fans are ON.

7.2.2.11 Passenger information system symbol

	No information available.
	Passenger information system not ok.
	Passenger information system ok.

7.2.2.12 Main Air Compressor

This symbol shows two background colors, the outside color gives the status of the compressor and pressure, the inside color indicates whether the compressor is running or not.

	No information available.
	MAC: released.
	MAC: running +pressure low.
	MAC: running +pressure ok.
	MAC: is OFF+ pressure ok.
	MAC: running in Manual Mode or isolated mode (bypass)
	MAC: fault.

7.2.2.13 Aux Air Compressor symbol

This symbol shows two background colors, the outside color gives the status of the compressor and pressure, the inside color indicates whether the compressor is running or not.

	No information available.
	AAC: released.
	AAC: running + pressure low
	AAC: running + pressure ok
	AAC: is OFF+ pressure ok
	AAC: running, run time too long

7.2.2.14 Passenger Alarm Symbol

	No information available.
	Passenger alarm not active.
	Passenger alarm active.

7.2.2.15 ABC brake symbol

	No information available
	Auto brake released
	Auto brake applied

7.2.2.16 Brake symbol

	No information available.
	Brake release
	Brake applied.
	AWS brake active and brake applied
	Emergency brake applied
	AWS emergency brake active and brake applied.
	Device isolated.

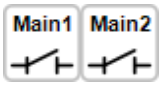
7.2.2.17 Parking brake symbol

	No information available.
	Parking brake released.
	Parking brake applied.
	Device isolated.

7.2.2.18 GEBA brake symbol

	No information available
	Guard emergency brake released
	Guard emergency brake applied

7.2.2.19 Contactor symbol

	Contactor 110Vac from adjacent unit
	Contactor 110Vac supply
	Contactor compressor supply from adjacent unit
	Contactor compressor supply
	Contactor main supply 1,2
	Contactor 415Vac from adjacent unit
	Contactor 415Vac supply
	Contactor 415Vac compressor supply
	Contactor 415Vac redundant supply
	Contactor 415Vac main supply
	Battery isolating switch
	Battery main contactor

Possible states of contactors:

	No information available
	Contactor open
	Contactor closed

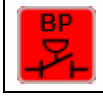
7.2.2.20 Traction FQC symbols F1, F2

		No information is available.
		Traction power is off.
		Running and OK.
		Running and warning.
		Fault.
		Status unknown.
		Fault in communication with the device.

7.2.2.21 Down chopper symbol

	No information available.
	Off.
	Running and OK

7.2.2.22 Governor symbols

			No information available
			Off
			Pressure OK
			Pressure OK and warning.
			Fault.

7.2.2.23 Auxiliary/ Compressor inverter symbol

		No information available.
		Power is off.
		Running and ok.
		Running and warning.
		Fault.
		Status unknown.
		Fault in communication with device.

7.2.2.24 Battery charger symbol

	No information available.
	Power is off
	Running and OK
	Running and warning
	Fault
	Status unknown
	Fault in communication with the device.

8. Tests to be performed on DDU

Following tests shall be carried out as per IEC-60571 [Edition 3, 2012-09].

	Name of test	Clause no of IEC-60571	Type	Routine
1.	Visual Inspection	12.2.2	☑	☑
2.	Performance Test	12.2.3	☑	☑
3.	Dry Heat Test	12.2.5	☑	
4.	Damp Heat Test, Cyclic	12.2.6	☑	
5.	Supply Over Voltages	12.2.7	☑	
6.	Surges, Electrostatic Discharge and Transient Burst Susceptibility Test	12.2.8	☑	
7.	Radio Frequency Emission Test	12.2.9.2	☑	
8.	Insulation Test	12.2.10	☑	☑
9.	Salt Mist Test	12.2.11	☑	
10.	Vibration, Shock and Bump Test	12.2.12	☑	
11.	Water Tightness Test (test for IP65 compliance)	12.2.13	☑	
12.	Equipment Stress Screening [as per RDSO's stress screening procedure]	12.2.14	☑	

Type test shall be witnessed by BHEL and/or User railways.

9. Test Protocol

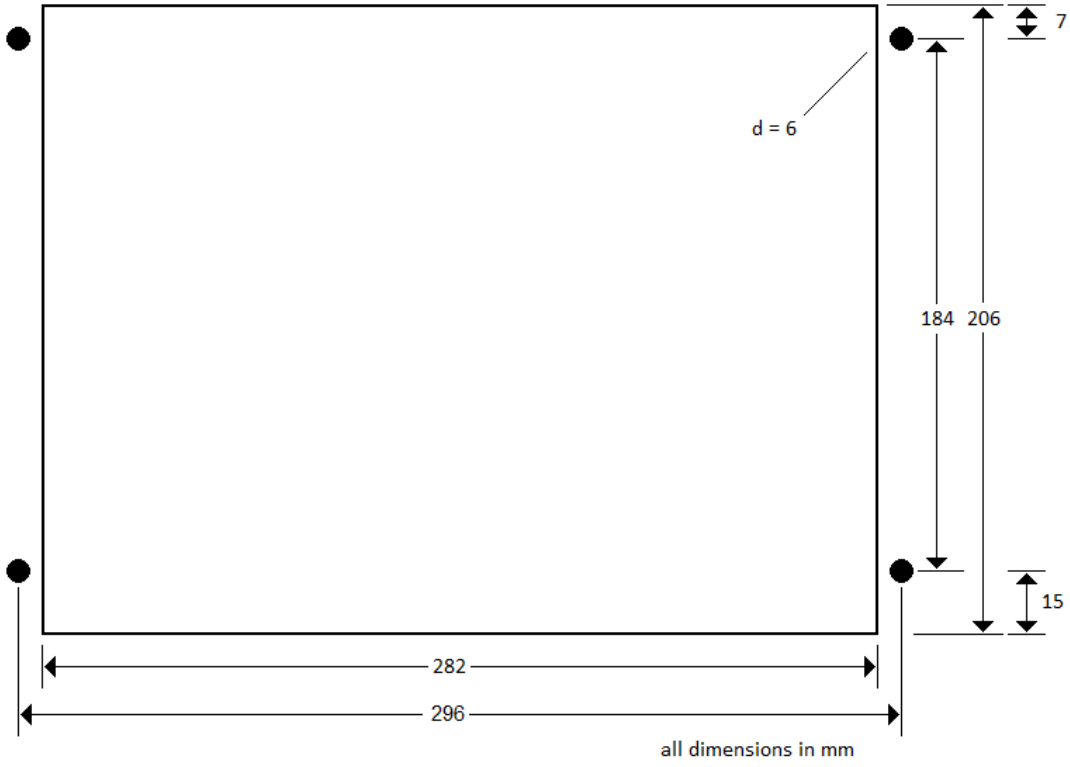
Supplier shall submit immediately after the receipt of the order, test protocol for Routine and Type tests as per clause 8 of this specification for BHEL approval.

10. Pre-shipment Inspection

Pre-shipment inspection will be carried out by BHEL engineers as per the approved test protocol. BHEL engineers will witness Routine tests before dispatch.

11. Mechanical dimension

Image below shows the dimensions of the cut-out required on Driver's Desk for mounting of the DDU unit. The offered DDU should match this footprint.



Mounting footprint of DDU.

12. Documentation

12.1 Information required along with techno commercial offer without which offer is liable for rejection.

12.1.1 Technical datasheet

12.1.2 Outline General Arrangement (OGA) and dimensional and mounting details.

12.1.3 Type test reports, if already conducted.

12.1.4 Supplier shall furnish clause wise confirmation/comments to the technical specification. Deviation, if any, shall be clearly brought out indicating the clause number, original specification, deviation sought with proper technical backup (catalogue, technical brochure, international standards, calculations etc.

12.1.5 If no deviations required, then supplier shall furnish certificate indicating “NO DEVIATION REQUESTED” and we comply fully with all the technical requirements of this specification no. PS/445/2711”.

12.1.6 Supplier shall take a copy of this specification and sign on each page and submit the signed copy along with offer to confirm that the supplier has understood the specification and will comply with all clauses of this technical specification.

12.2 Information required after placement of order

12.2.1 Dimensional drawing for BHEL approval. Vendor to start manufacture only after obtaining BHEL approval.

12.2.2 Test protocol for BHEL approval.

12.3 Information required along with material supply

12.3.1 Two sets of Routine Test report.

12.3.2 User Manual.

13. Acceptance

a) Dimensions as per approved drawings.

b) Type test certificates (for first time supply)

c) Routine test certificates (for regular supplies, along with valid Type test reports).

14. Rating plate details

Rating Plate with following information shall be fixed at a suitable position.

a) Manufacturer's name
b) Item type designation or number
c) Item serial number
d) Date and place of manufacturing
e) Power rating

15. Environmental conditions

1.	Ambient Temp.	55°C
2.	Max. Temperature	75°C (when locomotive standing dead under sun) 60°C (when locomotive working)
3.	Avg. Temperature	47°C
4.	Humidity	Up to 100% during rainy season
5.	Altitude	up to 1776 m above mean sea level
6.	Atmosphere during hot weather	Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6mg/cub meter