

**BEML LIMITED**

(A Govt. of India Mini Ratna Company under Ministry Of Defence)
BANGALORE COMPLEX, POST BOX: 7501, NEW THIPPASANDRA POST,
BANGALORE-560075

NOTICE INVITING TENDER

BEML SRM E-Tender No: 6300040472 dated 08/04/2026 ; Due date 18/04/2026 @ 17:00 HRS

Subject: Procurement of "SIGNALING EQUIPMENT" for Standard Gauge High Speed Train Project (Chair Car - Design/Operating Speed 280/249 kmph).

This Tender consists of the following documents:

- (a) Notice Inviting Tender (NIT)**
- (a) Non-Disclosure Agreement**
- (b) BEML Drawings & TDC**

Bidders may submit their queries on the NIT document, if any, by email to ravikumar.adepu@bemltd.in / Prasanna.n@bemltd.in or contact on 080-25022639 / 080-25022634

Quotations are invited from Original Equipment Manufacturer (OEM) for Railway Rolling stock having experience in design, manufacturing, testing and commissioning in accordance with the enclosed terms and conditions by the due date mentioned below"

Quotations should be submitted in Two-Bid system in SRM PLATFORM portal as below:

- 1) Technical Bid**
- 2) Commercial Bid**

Enclosure : As above.

Note: - The tender consists of 46 no. of pages including this page.

No representation would be entertained on any errors if found in the NIT. However, vendors to bring such errors/omissions to the notice of BEML for necessary corrective action.

TABLE OF CONTENTS

S No.	Description	Page Nos.
1	Notice Inviting Tender	1
2	Table of Contents	2
3	Details of Tender	3-5
4	Submission of Technical Bid	6
5	Submission of Commercial Bid	7
6	Annexure – VI: General Terms & Conditions	8-25
7	Appendix A : Integrity Pact agreement	26-31
8	Appendix B: Compliance for submission of Non-Disclosure Agreement	32
9	Appendix C: Compliance report of General Terms & Conditions & Annexure-X	33-35
10	Appendix D: Performance Bank Guarantee	36-37
11	Appendix E: Confidential Agreement	38
12	Appendix F: MII (Make in India), Local content declaration	39
13	Appendix G: Compliance to Land Border Certificate Clause	40
14	Appendix H: Compliance to Qualification / Eligibility Criteria	41-42
15	Appendix I: Compliance to PTS /TDC & Drawings	43
16	List of documents attached with the tender	45

DETAILS OF THE TENDER

1. This "Notice Inviting Tender" hereinafter referred to as the 'NIT' is designated as the tender for **Procurement of "SIGNALING EQUIPMENT" for Standard Gauge High Speed Train Project (Chair Car - Design/Operating Speed 280/249 kmph).**
2. The Bidders are advised to carefully go through the General Terms and Conditions that has been enclosed along with this NIT.
 - a. All entries in the NIT shall be in English either typed or written legibly. Erasing, over-writings and use of correction fluids are not permitted. All cancellations and insertions if any should be duly signed / attested by bidder concerned.
 - b. All the documents shall be uploaded in BEML SRM Platform.
 - c. In case, it comes to the knowledge of BEML that the bidder has submitted false information before awarding of contract then the offer would be rejected.
 - d. In the event, it comes to the knowledge of BEML that the successful bidder has submitted false information, subsequent to the award of contract, the contract shall be cancelled/short closed by the company and shall invoke Risk purchase clause with liabilities on such bidder for the entire contract quantity.
3. In case any person/persons, Company, firm, Associations having any litigation, arbitration cases between themselves and BEML Ltd, pending before any court of law/ Arbitrator shall not be eligible to participate in this tender.
4. Non-compliance with any of the tender conditions, incomplete offers, conditional and ambiguous offers are not acceptable and liable for rejection.
5. BEML reserves the right to accept or reject all tenders or any tender in part or full without assigning any reasons thereto, which is final & binding on the Bidder.
6. Bids of firms having any history of pending litigations, default in and Risk purchase against previous orders of BEML (including all Divisions) are liable for rejection at any stage if found at later stage. Hence, Bidders are requested to cross-check at their end before participation in the Tender.
7. **The tender consists of two parts as indicated below:**

Sl. No.	Nature of Bid	Mode of Submission	Details
1	Technical Bid	BEML SRM platform	<ul style="list-style-type: none"> • Integrity pact. Bidders should upload duly filled, signed & stamped with two witnesses in Integrity Pact if the bid submission value is more than Rs 1 Cr. If the bid submission value is less than 1 Cr, Self-declaration has to be submitted on Bidder's letter head by the bidder stating "Integrity Pact is not submitted as the bid submission value is less than 1 Cr". • Non-Disclosure Agreement as per prescribed format provided by BEML • Clause by Clause Compliance to BEML Drawings & TDC • Detailed BoM to be provided/submitted against each tendered line item along with technical bid

			<ul style="list-style-type: none"> • Clause by Clause compliance to General terms & conditions of NIT. • Clause by Clause compliance to Annexure-X. • Confidentiality agreement • MII (Make in India) declaration. • Compliance to Land Border Clause
2	Commercial Bid	BEML SRM platform	Price details in specified field on BEML SRM platform.

8. Details of Items, Services & Required Delivery Schedules:

TABLE-1								
S/n	Part No	Description	Uom	Qty for 1 Train Set	Qty for 2 Train Set	Unit Exchange Spares (UES)	Total Qty for 2 Train Set + UES	Remarks
1	84321270	JURIDICAL RECORDING UNIT (JRU)	SET	1	2	1	3	One Set in DTC1
2	----	NRC for JURIDICAL RECORDING UNIT	AU	-	-	-	1	One Time Development efforts
3	84421271	MEGABIT ETHERNET REPEATERS	SET	12	24	4	28	---
4	84421273	MVB REPEATERS	SET	1	2	1	3	One Set in one of the MC2

Non-Recurring Cost (NRC) scope includes Non-Recurring activities of TDC requirements such as Type Tests, Documentation for design documents, O&M manuals & Training etc...

TABLE - 2**Tentative delivery schedule**

Supply Scope:	1st Train Set - Jul 2026 2nd Train Set - Oct 2026
Non-Recurring Cost (NRC) scope includes Non-Recurring activities of TDC requirements such as Type Tests, Documentation for design documents, O&M manuals & Training etc...	Immediately on finalization / placement of order.
Unit Exchange Spares (UES)	Order will be placed only after the confirmation / acceptance from ICF. Supply of UES shall be before 3 months of start of revenue operation of cars. Tentative Delivery Schedule is Oct 2026

TABLE - 3	
SL No.	Description
1	All necessary spares, consumables and any other material for preventive maintenance as per Operation and Maintenance Manual(s) required till the completion of DNP shall be supplied at free of cost and shall be kept on site at his own cost.
2	Defect Notification Period: DNP starts from date of supply of materials and ends after 30 months from the date of placement of trains into revenue service.
3	<p>There will be additional requirement of SIGNALING EQUIPMENT for repair/replacement during CAMC period (15 Years) of revenue service. The supplier has to give concurrence for the additional requirement & support on as & when required basis.</p> <p>CAMC will start after successful completion of Defect Notification Period (DNP).</p>

SUBMISSIONS OF TECHNICAL BID

<p>Technical Bid submission Conditions</p>	<p>TECHNICAL BID (Without Price/Price Details) shall be uploaded and submitted in the BEML SRM Platform, wherein only technical Bid /technical information in BEML SRM Platform shall be uploaded as indicated below:</p> <ol style="list-style-type: none"> a. Bidders should upload Integrity Pact (duly filled, signed & stamped with two witnesses) [Appendix – A]. b. Bidders to refer (BEML Drawings & TDC) enclosed along with this tender document. <p>Bidders should upload the following documents duly filled, signed & stamped under technical bid.</p> <ol style="list-style-type: none"> c. Compliance to BEML Drawings [Appendix – H] d. Clause by Clause Compliance to Technical Delivery Conditions (TDC) [Appendix – I] e. Detailed BoM to be provided/submitted against each tendered line item along with technical bid f. Bidder to upload enclosures related to technical & other information deemed appropriate in respect of this tender on the letter head of the company, if any. g. Photographs / Drawings if any, may be uploaded. h. Bidders to refer “GENERAL TERMS AND CONDITIONS (GTC)” enclosed along with this tender document and upload following documents duly filled, signature & stamped under technical bid. <ol style="list-style-type: none"> a. Clause by clause compliance of GTC duly filled, signed & stamped along with the supporting documents as specified therein. [Appendix – C] & Annexure-X b. Confidentiality agreement filled & signed in plain paper [Appendix – E] c. MII (Make in India), Local content declaration [Appendix – F] d. Compliance to Land Border Certificate Clause [Appendix – G] e. Compliance to Submission of Non-Disclosure Agreement. [Appendix-B]. i. BEML at its sole discretion reserves the right to seek the hard copies of the documents which are already been uploaded in BEML SRM, through Courier / post pertaining to technical bid of this tender enquiry at a later date, if required. j. In such cases, only the documents uploaded in BEML SRM Platform in original has to be couriered at the request of BEML. Any irrelevant documents furnished through courier will not be considered.
--	---

SUBMISSIONS OF COMMERCIAL BID

The price bid to be submitted through BEML SRM Portal. The following details are to be entered in the BEML SRM Portal.

S/n	Part No	Description	Uom	Total Qty for 2 Train Set + UES	Commercial Evaluation	Unit Price	Extended Value
1	84321270	JURIDICAL RECORDING UNIT (JRU)	SET	3	Together		This is Format for reference only. Commercial bid document should not be enclosed during Technical Bid Submission. If uploaded the Quotation submitted by bidder will be liable for rejection without any discretion.
2	----	NRC for JURIDICAL RECORDING UNIT	AU	1			
3	84421271	MEGABIT ETHERNET REPEATERS	SET	28	Individual		
4	84421273	MVB REPEATERS	SET	3	Individual		

Note:

- Reverse Auction shall be conducted if Minimum 2 technically accepted firms received & Reverse auction will be as per BEML SRM norms. (refer document **ReverseAuction_Terms**)
- The commercial bids of the vendors will be opened subject to technical acceptance based on Technical bid evaluation.

[ANNEXURE – VI]**GENERAL TERMS & CONDITIONS (GTC) FOR PROCUREMENT OF MATERIALS:****1. DEFINITIONS & INTERPRETATIONS**

- 1.1 The Purchaser' means "(include company name and address)" (A Government of India Undertaking) incorporated under the Companies Act having its registered office at "BEML Soudha, No 23/1, 4th main, S.R. Nagar, Bengaluru – 560027" and shall be deemed to include its successors and assignee.
- 1.2 Supplier' means a person having been included in a contract as a Contractor and also means a firm or company with whom the order for supply/execution of work is placed and shall be deemed to include the supplier's successors, (approved by BEML Ltd.,) representatives, heirs, executors and administrators. The supplier may also be referred to as the supplier, Contractor or vendor.
- 1.3 Parties to the Contract' shall mean the Supplier and the Purchaser as named in the main body of the Purchase Order.
- 1.4 Tender' means and includes quotation, invitation to tender and all other documents like drawings, specifications, quality plan, etc that form part of the tender document.
- 1.5 Acceptance of Tender' Means the letter of memorandum communicating supplier, the acceptance of the Tender and includes advance acceptance of this tender.
- 1.6 Purchase Orders / Contract' means and includes the invitation to tender, instruction to Tenderers, acceptance of tender, Letter of intent / letter of award, the general terms and conditions of Purchase Order / contract, special conditions of Purchase Order /contract, particulars, descriptions, specifications, schedule of prices, quantities, quality plan, drawings enclosed and other condition specified in the acceptance of tenders and includes the repeat order which has been accepted or acted upon by / for the supplier for the supply of stores and includes an order for performance of service and includes amendments, if any, that may take place subsequent to the discussions, negotiations, mutual agreement if any.
- 1.7 Stores / Materials / Services' means the goods or services as described in Procurement Technical Specification (P.T.S.) and in the Purchase Order which the supplier has agreed to supply under the Purchase Order.
- 1.8 Specification means technical specifications of the Equipment / Material as set forth in Procurement technical specification (PTS) / technical drawings, which is part of tender
- 1.9 End-Customer / End-user means: ICF / Indian Railways / Rolling Stock Corporations.
- 1.10 Words in singular include the plural & vice-versa.
- 1.11 Words imparting the masculine gender shall be taken to include the feminine gender and words imparting persons shall include any firm, company or associations or body of individuals whether incorporated or not.

1.12 The heading of these conditions shall not affect the interpretations or construction thereof of the contract.

2. SUBMISSION OF THE TENDER:

Tender is in TWO-BID system (Technical & Commercial Bid)

Bids should be submitted online mode only as follows:

a) Submission of Technical bid (without price):

- i. The Bidder should upload all the requisite technical documents along with respective supporting documents and other information deemed appropriate in respect of the Tender.
- ii. The price details/commercial bid details should not be given in the Technical bid. If any of the bidder have given any price/commercial details in the Technical bid, their offer is liable for rejection and will not be considered.
- iii. Technical Bid will be opened on (date and time of bid opening) and the commercial Bids of those bidders whose technical bid is accepted only will be opened later.

b) Submission of Commercial bid:

- i. The commercial bids of the vendors will be opened subjected to technical acceptance of offers only.
- ii. Price details in specified field on BEML SRM Platform to be submitted.
- iii. If dealers are submitting the bids in place of OEM, Dealer should submit Authority letter from manufacturer.
- iv. BEML reserves its right to reject a tender due to unsatisfactory past performance in the execution of a contract at any of BEML projects / units.
- v. Bidders participating in the tender should declare in their offer that whether they have been black-listed / kept on hold for a specified period / given Business holiday for a specified period by any Public sector undertaking or Government departments. The reasons for such action with details and the current status of such hold shall be furnished to BEML.
- vi. In case any person/persons, Company, firm, Associations having any litigations, arbitration cases between themselves and BEML Ltd, pending before the Court / Arbitrator or initiated litigations/arbitrations in connection with any contract / tender issued by BEML Ltd and any contractor has defaulted against the BEML's orders are not eligible to participate in this tender.
- vii. BEML may decide to scrap the tender/refloat the tender without assigning any reasons thereof before LOI/PO is committed. BEML reserves the right to accept, split, divide, negotiate, cancel or reject any tender or reject all tenders at any time prior to the award of the contract without incurring any liability to the affected tenderers or any obligation to inform affected tenderer, the grounds of such action.
- viii. BEML reserves the right to verify, in its sole discretion, any information given by the bidders independently through any third party agencies. During this process, if it is found that any of the information given by the bidder is false / misleading, offers of such bidders would be out rightly rejected.

- ix. BEML also reserves the right to independently assess the capability and capacity of the bidder for execution of the order/contract. BEML's decision on any matter regarding short listing of bidders shall be final.
- x. The RFx / Notice Inviting Tender is not an offer or a contract.
- xi. Bidders will not be compensated or reimbursed for the costs incurred in preparing Proposals. Proposals shall become BEML property.
- xii. BEML's decision is final for Evaluation of the offers.

3. PURCHASE PREFERENCES:

Preference to Make in India products: Preference shall be given to Class-I local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products.

The 'Class-I local supplier (Local content more than 50%) / Class-II local supplier (Local content more than 20% less than 50%) at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for Class-I local supplier / Class-II local supplier, as the case may be. They shall also give the details of the location(s) at which the local value addition is made.

In cases of procurement for a value in excess of Rs.10 crores, Class-I local supplier / Class-II local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving percentage of local content. Bidders to upload signed & sealed [**Appendix - F**]

4. **SUPPLIERS SHARING LAND BORDER WITH INDIA:** Public Procurement Division order vide F.No. 6/18/2019-PPD dated 23.07.2020 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products, shall be applicable for bidders / suppliers sharing land border with India. Bidders to upload signed & sealed [**Appendix - G**], in compliance to Annex- III of the said Order.

5. DELIVERY TERMS:

- i) F.O.R (Free on Road), BEML Bangalore complex for supply scope. Freight & transit insurance to supplier's account.
- ii) For Spares / Comprehensive Annual Maintenance Contract (CAMC):
F.O.R (Free on Road), Customer Nominated Site / Depot (or) BEML Bangalore complex for supply scope. Freight & transit insurance to supplier's account.

6. PAYMENT:

Category	Payment Terms
<p>Supply Scope (Materials)</p>	<p>1) Supplier will raise GST invoice for 100% value. BEML will pay 80% of Invoice Value with 100% GST in 60 days / 45 days (MSE firms) from the date of receipt of material at BEML subject to material acceptance by BEML.</p> <p>2) Balance 20% payment in 60 days / 45 days (MSE firms), from the date of successful completion of testing & commissioning activities as per BEML requirement duly certified by BEML R&D /BEML NOMINATED AGENCY/ICF/ICF NOMINATED AGENCY.</p> <p>In case of MSE Firms, The firm may also opt for 20% payment to be released immediately along with 80% payment in which case, Firm has to submit BANK GUARANTEE for 20% of the payment/amount to fulfil the contractual obligations.</p> <p>"For MSME vendors, payments after 01.04.2026 will be made through TReDS platform only as per Government guidelines." Hence, Firms have to complete registration formalities in TReDS Platform as applicable and submit the registration details.</p>
<p>Non-Recurring Activities (Type Tests, Documentation for design documents, O&M manuals, Training & any other activities as per PTS etc...)</p>	<p>1) Firm will raise separate GST Invoice for 50% of the value after completion of NRC activities and after delivery of materials for 1st Train set. Payment will be made within 60 days / 45 days from the date of receipt & acceptance of materials & submission of all the design documents related to NRC duly certified by BEML R&D/BEML Nominated Agency/ICF/ICF Nominated Agency.</p> <p>2) Firm will raise GST Invoice for balance 50% after successful completion of testing & commissioning of 1st Train Set. Payment will be made within 60 days / 45 days from the date of Invoice.</p>

Bidders to indicate the category of their firm under Micro/Small/Medium/Major industries with necessary documentary proof of evidence for purpose of evaluation and our data updation.

The payment is further subject to the following:

- a) The Invoice shall be compliant with GST laws.
- b) GST liability is to be discharged and ensure filing of outward supply details on GSTN portal within timeline prescribed.
- c) Any debit note/supplementary invoice if any, is to be raised within September month following the respective financial year of filing of annual return by BEML, whichever is earlier.
- d) Any loss of tax credit due to the reason attributable to supplier shall be recovered from supplier along with applicable interest and penalty.
- e) Bidders to indicate the GST and other levies applicable. GST shall be paid only after confirmation of payment of GST by vendors on GST Website.
- f) Relevant TDS / TCS as applicable shall be deducted as per prevailing Income Tax / GST / GOI notifications.

- 7. PRICE BID VALIDITY:** The Bid should be valid as per the details provided in below Table. BEML's acceptance of the tender at the quoted / negotiated rates will be binding on the tenderer during the tenure of contract.

SL No	Category	Price Bid Validity Should be Up to
1	i) Supply Scope (Mock Up & 2 Train Sets Materials) ii) Non-Recurring Costs (NRC)	180 days from the date of tender opening.
2	Unit Exchange Spares & Consumables	30 Jun 2027

8. FIRM PRICE

The prices remain firm for the entire supplies of the purchase order and no escalation shall be entertained under any circumstances. The prices are to be firm & no increase in finalized price will be entertained after awarding contract during the period of Contract for any reasons whatsoever.

9. INSPECTION: By BEML/BEML NOMINATED AGENCY/ICF/ICF NOMINATED AGENCY

10. WARRANTY:

- a) The supplied goods/stores to the purchaser under the contract shall be of the highest grade, free of all the defects & faults in material and of the best quality, manufacture and workmanship and consistent with the established and generally accepted standards for materials of the type ordered and in full conformity with the contract specification, drawing or sample, if any and shall, if operable, operate properly throughout warranty period.

Any defect/fault & non-conformance to standards & descriptions as aforesaid, found during warranty period shall be rectified /repaired/replaced free of cost & at supplier's risk to the complete satisfaction of BEML / End user, within reasonable time at the ultimate destination.

The said goods/stores shall be warrantied /guaranteed **from date of supply of materials and ends after 30 months from the date of placement of trains into revenue service.**

In case of any contradiction in the terms and condition with respect to warranty appearing in Indian Railway standard (IRS) condition of contract and specifications, the later will prevail

b) Guarantee / Warranty replacement:

Guarantee / Warranty replacement shall be dispatched on “F.O.R – BEML Stores / designated destination” basis for replaceable items during warranty period.

- c) The provisions of this Warranty shall be without prejudice to and shall not be deemed or construed so as to limit or exclude any rights or remedies which the BEML may have against the supplier, whether in tort or otherwise.
- d) If any defect or damage is one requiring immediate attention from safety / environmental view point / operational viewpoint, the BEML has the authority to proceed with rectification in any manner suitable and deduct such sums from the suppliers Bill or purchase order whichever is active.

11. PERFORMANCE BANK GUARANTEE (PBG):

- a) Firm shall submit Performance Guarantee for amount equivalent to **10%** of the Contract value. This performance guarantee shall be in the form of Bank Guarantee executed and submitted through any scheduled commercial Bank authorized by RBI. The Performance bank guarantee shall be valid up to Warranty period plus 6 months claim period. Format for PBG is attached as Appendix- D for reference.
- b) PBG shall be returned back only after completion of warranty period from date of last supply and if there is no defect /failure/negligence on part of contractor, complaints and / or any claims notified to the contractor within expiry of such date.
- c) The performance bank guarantee has to be furnished by the supplier as per prescribed format covering the entire supplies to be made against this order within 60 days from the date of receipt of purchase order from BEML but not later than 30 days before commencement of supplies pertaining to first delivery schedule indicated in the purchase order.
- d) In the absence of performance bank guarantee to be submitted by the supplier as per contract terms, BEML will not open Letter of Credit (LC) in the cases of LC in favor of supplier pertaining to the shipment / stores to be supplied as per first delivery schedule indicated in the purchase order. Any delay in submission of performance bank guarantee by the supplier, the subsequent delay in opening in Letter of Credit by BEML and supplies to be effected by the supplier are to the account of the supplier, which attracts liquidated damage charges as per contract terms.
- e) No claim shall lie against BEML Ltd., in respect of interest on cash deposits or Govt. Securities depreciation thereof.
- f) BEML shall be entitled to and it shall be lawful on its part to encash the Bank Guarantee in whole or in part in the event of any default, failure or neglect on the part of the supplier in the fulfillment or performance in all respect of the Purchase Order.

- g) The Bank Guarantee shall be established through **Structured Financial Messaging System (SFMS)** mode from a Scheduled Commercial Bank authorized by RBI in India as defined by RBI.
- h) A separate copy of the BG has to be sent by the issuing bank to the Purchaser's bank through SFMS. The details of Purchaser's bank are as under:

STATE BANK OF INDIA
Overseas Branch, No.65,
St. Marks Road,
Bangalore – 560001
IFSC Code: SBIN0006861

- i) Following codes are to be used by issuing bank for the purpose of Confirmation and amendment in Bank Guarantees:

Code	Purpose
MT760	Confirmation of Bank Guarantee
MT767	Amendment in Bank Guarantee

- j) Bank Guarantee issued on the SFMS platform with any other code other than mentioned above for the purpose shall not be acceptable to the Purchaser.
- k) The Bank Guarantee validity shall be extended as required till the completion of all contractual and warranty obligations in Full.
- l) In case BEML is constrained to extend the Performance Bank Guarantee beyond the warranty period submitted to its customer due to the failure of aggregates attributable to the supplies made by the bidder then the costs involved to BEML for such PBG extensions shall be borne by the supplier.
- m) E-PBG to be executed digitally through NeSL platform.
- n) UIN Number of BEML, Bengaluru Complex for executing E-PBG is **NCTGC2534P**

12. RIGHT TO VARY QUANTITIES &-QUANTITY OPTION CLAUSE:

- a) *Purchaser shall be entitled to increase the order quantity by 50 percent anytime during the currency of the contract, such that the contractor has reasonable time/notice for executing such increase.*
- b) BEML reserves the right to increase or decrease the quantity specified in the schedule of requirements without any change in the unit price or other terms and conditions within the agreed delivery schedule.

13. LIQUIDATED DAMAGES CLAUSE:

If the contractor fails to deliver the stores or any consignment thereof with in the period prescribed for such delivery, BEML shall be entitled at their option to accept the delayed supply and to recover from the supplier as agreed liquidated damages, and not by way of penalty, a sum of 0.5% of the price of any stores per week subject to a maximum of 10% of the value of the purchase order which the supplier has failed to deliver as aforesaid for each week or part thereof during which the delivery of such stores may be in arrears.

The LD will be charged on the value of the affected delivery schedule excluding statutory levies, freight and insurance wherever not included in the price.

14. RISK PURCHASE CLAUSE:

The time and the date of delivery of the stores stipulated in the PO shall be deemed to be the essence of PO and delivery must be completed not later than the date specified therein. Shall the supplier fail to deliver the stores or any consignment thereof within the period prescribed for such delivery, BEML shall be entitled at their option either;

- a. To purchase elsewhere, without notice to the supplier on the account and at the risk and cost of the supplier the stores not delivered or other of a similar description (where stores exactly complying with the description and readily procurable) without cancelling the PO in respect of consignment not due for delivery

or

- b. To cancel the purchase order.

In the event of action being taken under clause (a) or (b) above, the supplier shall be liable for any loss, which BEML may sustain on that account but the supplier shall not be entitled to any gain or purchases made against default. As soon as it is apparent that the scheduled dates cannot be adhered to, an application shall be sent by the supplier to BEML, well before the expiry of the delivery period specified in the purchase order. Without prejudice to the foregoing rights, if such failure to deliver in proper time as aforesaid shall have arisen from any cause which BEML may admit as a reasonable ground for an extension of the time (and their decision shall be final) they may allow such additional time as they may consider justified by circumstances of the case. Delivery required to be made in lots shall be made in lots only and any extra deliveries involved either on account of repeated rejections or variance in supply of lots shall be liable for service charges of 5% of the purchase order value for each extra delivery.

15. SECRECY AND CONFIDENTIALITY:

- a) All the information, know-how, technical data, specification and drawing models or specimens furnished by BEML for the purpose of or in connection with the manufacture and supply of the stores hereby tendered constitute the property of BEML and the supplier shall keep them in strict confidence and he shall not divulge the same to anyone else except under the authority and for the purpose of BEML. All such documents, data, drawing, models and specimens are the property of BEML and shall be returned when done with or when demanded by BEML.
- b) The supplier shall not supply the components / spares exclusively manufactured for BEML with the Technical Data / Specifications / assistance furnished by BEML and shall not disclose my initiations, development of adaptations thereof to anyone else except with the written consent of BEML.
- c) BEML shall be entitled to prevent breach of the above and to claim damages in case of any breach. It is hereby mutually agreed that for breach of this agreement the Vendor shall pay, without actual proof of damages, a liquidated amount of Rs. 1.00 Crore (Rupees One Crore only).

Confidentiality agreement is attached as **Appendix E**.

16. AUTHORITY OF PERSONS SIGNING DOCUMENT

A person signing the tender or any other document in respect of the Purchase Order shall be deemed to have power to do so on behalf of the Supplier.

17. ACCEPTANCE OF ORDER

The supplier shall send Order Acceptance within two weeks from the date of LOI / LOA / Purchase Order or such other period as specified / agreed by the Purchaser. Purchaser reserves the right to revoke the order placed if the order confirmation differs from original Purchase Order placed and the Purchaser shall only be legally bound after it has agreed explicitly in writing to be in agreement with the deviation. The acceptance of deliveries or supplies by Purchaser as well as payments made in this regard shall not imply acceptance of any deviations. The Purchase Order in whole shall be deemed to have been accepted if supplier failing to no communicate is received within two weeks.

18. OTHER CONDITIONS

- a) The firm shall take necessary permission for their employees to enter the factory premises and the firm shall arrange ESI & PF coverage to their employees/labourers if any from their end. The firm shall indicate ESI NUMBERS for the labourers hired or employed in advance in order to prepare work permit inside the factory.
- b) BEML will not have any kind of binding towards the compensation on case of injury / death to the firms employees while working in BEML premises or other wises.
- c) BEML will not have any kind of binding on damages or loss to the tools/instruments etc. brought by the firm for commissioning purpose.

19. PRICE, INVOICING AND PAYMENT: The agreed prices are fixed prices in the currency as specified in the Purchase Order. They shall include packing, forwarding, loading and carriage to the place specified by the Purchaser and are inclusive of all applicable taxes, duties etc. except for those specifically agreed between the supplier and purchaser. The method of invoicing shall be without prejudice to the parties; agreement as to the place of performance. Invoices shall be submitted bearing the Purchase Order number & date, item number / s and supporting documents as called for in the Purchase Order.

As soon as each shipment is made in line with the delivery schedule specified in the purchase order, the supplier shall send **one set of Original documents and three (3) sets of photocopies** each of the following documents to the address indicated below by courier service.

- i. Commercial Invoice
- ii. Delivery Challan
- iii. Packing List
- iv. BEML's Inspection clearance document(s), material test certificates and other applicable quality documents pertaining to the supplies.

Postal Address

The Deputy General Manager,
BEML, Bangalore Complex,
PB No.7501, New Thippasandra post,
Bangalore, Karnataka, India,

Postal Code - 560 075

20. PROGRESS REPORT:

The supplier shall regularly inform the progress of work and in such form as may be called for by the Purchaser from time to time. The submission and acceptance of such reports shall not prejudice the rights of the Purchaser in any manner.

21. QUALITY & WORKMANSHIP

The stores supplied shall be of the best quality and Workmanship shall be in strict conformity with all the drawings and specifications furnished with the Purchase Orders and shall answer to the description in all respects. All supplies shall be accompanied by supplier's works inspections / test certificates duly certifying, the Stores are in strict conformity with the drawings / specifications. However, final acceptance will be subject to inspection and approval at BEML works. Once the materials are rejected and communicated to the supplier, no request shall be entertained for re-inspection or acceptance of the stores. However, BEML reserves the right to re-inspect the stores and consider acceptance at its discretion.

22. QUALITY, CONDITION OF DELIVERY: The Supplier shall guarantee that the delivery is of good quality and free from all defects and in the case of services rendered that they are performed by skilled personnel and that new materials are used. The Supplier shall guarantee that the delivery corresponds exactly with the provisions of the agreement, the reasonable expectations of Purchaser regarding the characteristics, quality and reliability of delivery. The Supplier guarantees that the delivery is suitable for the purpose for which it is intended by its very nature or which is evident from the specifications listed and from the order.

The Supplier shall guarantee that the delivery complies with legal requirements applicable in India and other (international) Government regulations, as applicable. The Supplier guarantees that the delivery complies with legal requirements applicable in India and other (international) Government regulations, as applicable. The supplier shall guarantee that the delivery complies with the customary norms and standards in the relevant branch of trade or industry. The supplier shall be responsible for compliance with applicable technical, safety, quality, environmental requirements and other regulations in relation to his product, packaging, and raw and ancillary materials.

23. SUPPLY OF SAMPLE: (if applicable) The Contractor shall produce samples of all materials and shall obtain approval before he places bulk order for the material for incorporation in the works. In respect of materials for which samples are not kept or detailed specifications is not given hereinafter, such materials shall comply with the latest relevant Indian Standard Specifications a published up to the date of issue of this tender. The Contractor shall on demand produce original receipts vouchers/invoices in respects of materials supplied by him.

24. INSPECTION, TESTING & CONSEQUENCE OF REJECTION:

The goods and stores shall be of approved design and each part /component may be inspected and tested by the Purchaser prior to shipment and shall fully comply with relevant requirements of purchaser.

Purchaser has the right to inspect the delivery. In the event of rejection, Purchaser shall inform the Supplier accordingly and Purchaser shall be entitled to replacement or repair at its discretion or may proceed to terminate or annul the agreement. All this does not affect Purchaser's right to compensation.

In case the goods / stores are rejected at the time of inspection at BEML or the rejections are notices at the time of further processing the supplier will be informed of these rejections. On receipt of this information the supplier shall immediately arrange to collect the rejected items at his cost and risk and arrange for the replacement of goods within the shortest possible time. Under no circumstances the supplier shall compel the Purchaser to rework the rejected goods.

Wherever the supplier has not collected the rejected items within 60 days from the date of intimation, BEML shall have the right to dispose the goods and all cost related to the cost of material, statutory levies incurred both in procurement and disposal shall be recovered from the supplier from any of the bills that are due. The supplier shall have no claims whatsoever against the Purchaser for such disposal.

Purchaser or his authorized representative shall be entitled at all reasonable times during execution to inspect, examine and test at the Supplier's premises the material and workmanship of all stores to be supplied under the Contract, and if the part of the stores are being manufactured at other premises the Supplier shall obtain Purchaser's or his authorized representative's permission to inspect, examine and test as if the said stores are being manufactured at the Supplier's premises. Such inspection, examination and testing, if made shall not release the Supplier from any obligation under the Contract.

All costs related to inspections and re-inspections shall be borne by the Supplier. The cost of inspection staff / third party specified by the Purchaser shall be borne by Purchaser, unless otherwise specifically agreed. Whether the Contract provides for tests on the premises of the Supplier or any of his Sub-contractor/s, Supplier shall be responsible to provide assistance such as, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by the Purchaser only if specifically agreed.

The supplier shall give the authorized representative of the Purchaser reasonable prior notice in writing of the date on and the place at which any stores will be ready for inspection / testing as provided in the Contract.

25. LAWS APPLICABLE

Domestic laws both substantive and procedure, for the time being in force including modification thereto shall govern contract. The competent Domestic courts shall have sole jurisdiction over the disputes between the BEML and the supplier. The making of all stores supplied must comply with the requirements of Domestic Acts relating to trade and merchandise marks and all the rules made under such acts.

26. RAW MATERIALS ARRANGEMENT

The supplier shall make his own arrangement to procure all raw materials required and BEML shall not be responsible for any assistance in such procurement or whatsoever.

27. IDENTIFICATION OF ITEMS / PIECES

The supplier shall indicate / emboss / engrave, suitable identification marks (Viz. BEML stock number, supplier code number, batch no. etc.,) on each item/piece (or) on all components at convenient non-machinable place as per drawing, wherever applicable.

Also, shall indicate BEML part number, PO No. and date in all delivery documents, invoices and correspondence, wherever applicable.

28. PACKING AND MARKING

- a) Packing to be in such a way that it should avoid transit/storage/handling damage.
- b) The supplier shall package the deliveries safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea / Air / Rail / Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures / hooks and sling marks as may be required for easy and safe handling by mechanical means.
- c) The packing, shipping, storage and processing of the delivery must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Items packed with raw / solid wood packing material shall be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitary / Fumigation certificate. If safety information sheets exist for a delivery or the packaging, the Supplier must always supply these sheets direct (at the same time).
- d) Supplier shall indicate approximate net weight, gross weight and dimension of the package to enable BEML to determine the mode of dispatch. The packing should with stand the weather conditions during transit. The packing should not damage the contents in the package while transporting and handling. The safety and handling precautions should be clearly marked on the packages. The packing should be easily transportable without any damage. Each consignment should have individual packing list.
- e) Marking shall include the following information in sequence on the frame commensurate with the size of package.

**To: M/s. BEML Limited, Bangalore Complex,
New Thippasandra,
Bangalore – 560075,
Karnataka State, India.**

Purchase order number:

Shipper's mark:

Package number:

Identification number:

Caution marks, if applicable:

Net weight, gross weight and cubic measurement, whichever is appropriate for the shipment.

- 29. APPLICABLE LAWS AND JURISDICTION OF COURTS:** Indian laws both substantive and procedure, for the time being in force including modifications thereto, shall govern Contract. The competent Indian courts of shall have sole jurisdiction over disputes between purchaser and the Supplier.
- 30. JURISDICTION:** Courts of Bangalore alone shall have jurisdiction to decide any issue / dispute arising out of the Arbitration or this Purchase Order in exclusion of all other Courts. However, jurisdiction of any other court may be accepted by mutual discussion and agreement by and between BEML and the Supplier.
- 31. ARBITRATION:** Disputes if any, arising between BEML and the supplier in connection with this Purchase Order or any other matters connected herewith, the same will be mutually discussed and settled, failing which, the disputes shall be referred to a sole arbitrator to be appointed by BEML. The arbitration / proceedings shall be in accordance with the provisions of Arbitration and Conciliation Act 1996 and Rules framed there under. The place of arbitration shall be at Bangalore or any other place mutually decided by and between BEML and the supplier and all arbitration proceedings shall be conducted in English language. The award of the sole arbitrator shall be final and binding on all the parties.

DURING ARBITRATION: “Supplies under this Purchase Order, if reasonably possible, may continue by mutual agreement during the dispute / Arbitration proceedings”

- 32. INTELLECTUAL PROPERTY RIGHTS; LICENSES:** If any Patent design, trademark or any other intellectual property rights apply to the delivery or accompanying documentation, Purchaser shall be entitled to the legal use thereof free of charge by means of anon-exclusive, worldwide, perpetual license. All intellectual property rights that arise due to the execution of the delivery by the Supplier and by its employees or third parties involved by the Supplier for performance of the agreement belong to Purchaser. The Supplier shall be obligated to do everything necessary to obtain or establish the above mentioned rights. The Supplier guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Supplier shall also be obligated to do everything necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties.

The Supplier shall defend and indemnify the BEML against any claims, costs or expenses incurred by reason of any infringement of alleged infringement of any letters, patent, registered design, trademarks or trade name by the use of sale of the stores / goods /material and against all costs or damages which the BEML may undergo in legal action for such infringement or for which the BEML may become liable in any such action.

The supplier shall at all times indemnify BEML and shall take all risk of accidents or damage which causes a failure of the supply. The supplier shall comply with the provisions of Contract Labour (Regulation and Abolition) Act, 1970 and the Contract Labour (Regulation and Abolition) Central Rules 1971-as modified from time to time wherever applicable and shall also indemnify the Company from and against any claims under the aforesaid Act and the Rules.

33. BRIBES AND GIFTS:

Any bribe, commission, gift or advantage given, promised or offered by or on behalf of the supplier or his partner, agent or servant or anyone on his or their behalf to any officer, servant, representative or agent of BEML or any person on his or their behalf in relation to the obtaining or to the execution of or any other contract with BEML shall in addition to any criminal liability

which the supplier may incur, subject the supplier to the cancellation of the PO and all other contracts with BEML and also to payment of any loss or damage resulting from any such cancellation to like extent as is provided in case of cancellation under **Clause-15** hereof. Any question or dispute as to the commission of any offence under the present clause shall be settled by BEML in such manner and on such evidence of information as they may think fit and sufficient and their decision shall be final and conclusive.

34. FORCE MAJEURE CLAUSE:

- a) Notwithstanding anything contained in the Contract, neither the Supplier nor the Purchaser shall be held responsible for total or partial non-execution of any of the contractual obligations, shall the obligation become unreasonably onerous or impossible due to occurrence of a 'Force Majeure' conditions which directly affect the obligations to be performed by the Purchaser or the Supplier. Such events include war, military operations of any nature, blockages, revolutions, insurrections, riots, civil commotions, insurgency, sabotage, acts of public enemy, fires, explosion, epidemics, quarantine restrictions, floods, earthquake, or acts of God, restrictions by Govt. authorities over which the Supplier or the acts on which the Purchaser has no control.
- b) The party claiming to be affected by Force Majeure shall notify the other party in writing without delay, within two weeks on the intervention and on the cessation of such circumstance. Extension of time sought by the Supplier along with supporting evidence and so granted by the Purchaser for the supply / work affected, if any, shall not be construed as waiver in respect of remaining deliveries.
- c) Notwithstanding above provisions, Purchaser shall reserve the right to cancel the order/ Contract, wholly or partly, in order to meet the overall delivery schedule and make alternative arrangements including arrangements with third party for completion of deliveries and other schedules. Purchase may takeover partly processed material at a mutually agreed price.

35. FALL CLAUSE

- a) The prices charged for the stores supplied under this P.O by the supplier shall in no event exceed the lowest price at which the supplier sells the stores of identical description to any other BEML Office / Division during the pendency of this PO.
- b) If at any time, during the said period, the supplier reduces the sale price of such stores or sells such stores to any other BEML Office / Division at a price lower than the price chargeable under this P.O and the price payable under this PO for the stores supplied after the date of coming into force of such reduction shall stand correspondingly reduced.

36. NON DISCLOSURE AND INFORMATION OBLIGATIONS:

The supplier shall provide Purchaser with all information pertaining to the delivery in so far as it could be of importance to Purchaser. The Supplier shall not reveal confidential information to its own employees not involved with the tender / Contract & its execution and delivery or to third parties. The supplier shall not be entitled to use the Purchaser's name in advertisements and other commercial publications without prior written permission from Purchaser.

37. ASSIGNMENT OF RIGHTS AND OBLIGATIONS; SUBCONTRACTING: The supplier is not permitted to sub-contract the delivery or any part thereof to third parties or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from Purchaser. Any permission or approval given by the Purchaser shall, however, not absolve the supplier of the responsibility of his obligations under the contract.

38. DIVISION OF PATRONAGE: BEML reserves the right to avail the price offered for full quantity of the tender or part thereof or ignore the offer completely without assigning any reason whatsoever.

Splitting of Quantities not applicable considering the following:

S/n	Part No	Description	Uom	Total Qty for 2 Train Set + UES	Division of Patronage	Commercial Evaluation
1	84321270	JURIDICAL RECORDING UNIT (JRU)	SET	3	Splitting of Quantities not applicable considering the following: These Signalling Equipment items to be procured from Single Source in order to maintain uniformity and to avoid additional NRC cost towards Tool development & Load Type Testing by each supplier.	Together
2	----	NRC for JURIDICAL RECORDING UNIT	AU	1		
3	84421271	MEGABIT ETHERNET REPEATERS	SET	28	Splitting of Quantities not applicable due to small quantities and to maintain uniformity	Individual
4	84421273	MVB REPEATERS	SET	3	Splitting of Quantities not applicable due to small quantities and to maintain uniformity	Individual

Preference to Micro and small Enterprises (MSEs): NOT APPLICABLE considering the fact that this being first time project in India and NRC to be paid and splitting of quantities is not applicable.

39. INTEGRITY PACT:

The bidder / contractor should upload duly signed & stamped **Integrity Pact** (if the tender value is more than or equal to Rs.1.00 crore) as per prescribed format (**APPENDIX- A**) on plain paper as part of technical bid.

The bidder should put their authorized signature in the Integrity pact as a Contractor / bidder with their company seal along with witness's signature, name & address. **The agreement shall be in full as per format enclosed on a plain A4 size paper duly signed & stamped on all pages.**

The Integrity Pact envisages an agreement between the prospective tenderer and the buyer committing the persons/officials of both the parties not to exercise any corrupt influence on any aspect of the contract.

For the successful bidder, the integrity pact will remain valid up to 12 months after the last payment under the contract, and for all other Bidders 6 months after the contract has been awarded.

The Central Vigilance Commission (CVC) has appointed Shri Kasividyasagar & Shri Lt. Gen. Abhay Krishna as Independent External Monitor (IEM) to oversee the implementation of the Integrity Pact.

Address of IEM is as below:-

Shri Kasividyasagar, IAS (Retd.)
House no. 55,
Dream valley gated community,
Manikonda, Hyderabad – 500089.
Mobile no. +91 9771407778
Email : kasividyasagar@gmail.com

Shri Lt. Gen. Abhay Krishna , (Retd.)
4A-902, Gurjinder Vihar,
AWHO Township, Sector CHI-1
Greater Noida, UP - 201310
Mobile no: +91 9871234353
Email: abhayabk@gmail.com

40. GST TERMS & CONDITIONS:

1. The Supplier is required to comply with all the applicable provisions of the GST Laws/Rules/Notifications/Circulars and to furnish required documents/details within the prescribed time limit to enable BEML to claim the benefits of GST Input Tax Credit or any other benefit.
2. The Supplier is required to furnish proper Invoice/Supplementary Invoice/Debit Note/Credit Note in the form and manner prescribed under GST Laws/Rules/Notifications/Circulars containing all the particulars mentioned therein and within the prescribed time limit as per prevailing GST Laws/Rules/Notifications/Circulars. In case of non-compliance by the Supplier, BEML shall not make any payment towards GST against such invoice until it is complied with within the timeline prescribed under GST Laws/Rules/Notifications/Circulars, and also subject to BEML being in a position to avail GST Input Tax Credit as per applicable GST Laws/Rules/Notifications/Circulars.
3. In case of discrepancy in the data uploaded by the Supplier in the GSTN portal or in case of any shortages or rejection in the supply, BEML will notify the Supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue Credit note (details to be

uploaded in GSTN portal) for the shortages or rejections in the supplies, within the prescribed time limit to enable BEML to avail GST Input Tax Credit.

4. In case, the availment of GST Input Tax Credit by BEML is delayed for any reason other than those attributable to BEML, interest at applicable rate as prescribed under GST Laws/Rules/Notifications/Circulars for such delays shall be recovered from the Supplier.
5. In case Supplier delays declaring such invoice in his GST Return and GST Input Tax Credit availed by BEML is denied or reversed subsequently as per GST Laws/Rules/Notifications/Circulars, GST amount paid by BEML towards such reversal as per GST Laws/Rules/Notifications/Circulars shall be recoverable from Supplier along with applicable interest

If BEML has not paid/short paid to the Supplier for any invoices within the time limit prescribed under GST Laws/Rules/Notifications/Circulars due to non-compliance of GST Laws/Rules/Notifications/Circulars by Supplier or any other reason attributable to Supplier and leads to any GST Input Tax Credit reversal by BEML, any losses/expenses/cost/penalty, etc incurred by BEML shall be recoverable from the Supplier.

6. Wherever applicable, BEML will have the right to deduct “Tax Deducted at Source” at the rate prescribed under the GST Laws/Rules/Notifications/Circulars and to remit the same to the Government
7. In case of supplies made under Reverse Charge Mechanism, the Supplier needs to comply with the provisions under the GST Laws/Rules/Notifications/Circulars in terms of supply of Goods/Services and raising of invoice, so as to enable BEML to remit applicable GST to Govt., within the prescribed time limit and avail GST Input Tax Credit on the same. If the Supplier fails to comply with the above and as a result if BEML incurs any losses/expenses/cost/penalty, BEML shall be entitled to recover the same from the Supplier. Further the Supplier has to mention that “the liability of payment of GST amounting to Rs is on the Recipient of Service” in the invoice raised on BEML.
8. The Supplier is required to comply with the E-Way Bill Provisions under GST Laws/Rules/Notifications/Circulars. If the Supplier fails to comply with the said provisions and as a result if BEML incurs any losses/expenses/cost/penalty, BEML shall be entitled to recover the same from the Supplier.
9. In case of materials/goods issued to Supplier for Job Work, the Job Work Supplier is required to return the goods within the time limit prescribed in the Purchase Order. If the Job Work Supplier fails to return the goods as above, BEML will be entitled to raise a GST Supply Invoice on the Job Worker Supplier with applicable interest as per the provisions of GST Laws/Rules/Notifications/Circulars. In such cases, BEML will be entitled to recover all such GST/interest on GST /losses/expenses/cost/penalty, etc. incurred by BEML along with interest from the Job Work Supplier. Further in such cases where the GST invoice has been raised by BEML, on return of such goods after the prescribed time limit, the Job Work Supplier needs to return the same under GST invoice.
10. The Supplier have the option to give one Bank Guarantee of appropriate value after considering his estimated value of GST involved in invoices raised on BEML instead of Bank Guarantee for each Contract/Invoice. In case of payment through LC, suitable provisions/clause will be inserted while opening LC to ensure compliances of above conditions. However, if at any point of time value of such Bank Guarantee falls short of GST plus interest thereof, Supplier will have to either furnish Bank Guarantee for Differential value or such shortfall value of Bank Guarantee vis-à-vis GST plus interest thereof shall be withheld till Suppliers fulfils its obligations specified under above clauses.

BEML will be entitled to recover all losses/expenses/cost/penalty, etc. incurred by BEML along with applicable interest from the Supplier due to reasons other than those attributable to BEML.

11. If the Supplier is a Composition/Unregistered Dealer, the Supplier needs to comply with the provisions under the GST Laws/Rules/Notifications/Circulars in terms of supply of Goods/Service and raising of invoice. In case, the Supplier fails to comply with the above and as a result if BEML incurs any losses/expenses/cost/penalty, BEML shall be entitled to recover the same from the Supplier along with applicable interest.

41. TDS clause:

Applicability of TDS under Income Tax Act 1961:

- a) Tax deduction at source will be applicable on the supplies made by domestic vendors against service purchase orders at the rate as applicable and will be deducted from invoice at the time of accounting of invoice (or) at the time of payment, whichever is earlier as per Income Tax Act, 1961.
- b) Tax deduction at source will be applicable on the supplies made by foreign vendors against service purchase orders at the rate as applicable and will be deducted from invoice at the time of accounting of invoice (or) at the time of payment, whichever is earlier as per Income Tax Act, 1961 or as per law of land as well as Double Taxation Avoidance Agreement (DTAA) between the countries.

Under Income Tax Act, Sec "194Q - Deduction of tax at source on payment of certain sum for purchase of goods" has been introduced effective from 01-07-2021

Extracts of the new provision is brought out below:

1. Any person, being a buyer who is responsible for paying any sum to any resident year, shall, at the time of credit of such sum to the account of the seller or at the time of payment thereof by any mode, whichever is earlier, deduct an amount equal to 0.1 per cent of such sum exceeding fifty lakh rupees as income tax.
- 2) If seller does not have PAN, rate of TDS applicable in such cases is 5%. In such cases income tax return filed u/s 139.
3. Provisions of this section shall not apply to a transaction on which (a) tax is deductible under any of the provisions of this act; and (b) tax is collected under the provisions of section 206C other than a transaction to which sub-section (iH) of section 206C Applies.

To meet the above compliance the below points will be followed by BEML:

- TDS at applicable rate will be deducted on all purchase of goods in line with Sec 194Q of the Income Tax Act, effective from 01-07-2021.
- Rate of TDS as per the extant Govt notification is 0.1% of sum exceeding Rs.50 lakhs during the year
- Wherever PAN details are not furnished, TDS at 5% will be recovered. In such cases income tax return filed u/s 139.
- The seller shall furnish PAN details immediately if not furnished earlier.

Note: For the purpose of arriving at Rs 50lakhs as at 2 above, value inclusive of GST combining purchases made by all units of BEML will be considered.

- 42. PRODUCT LIABILITY:** Supplier shall assume full responsibility for, indemnify and hold BEML and BEML's sub-contractors harmless from and against any liabilities, product liabilities, action, demand arising out of death of or injury to any person or damage to any property to have resulted from the defects of the ordered parts which are installed in BEML and BEML sub-

contractors' rolling stocks either as original facility or as spare parts and replacement parts under the control of this agreement. The total liability of the bidder to BEML under the purchase order shall not exceed the total purchase order value including Service Purchase Order, if any. However, this shall not limit the liability of the contractor under any other provisions of the contract which expressly impose a greater liability.

43. REVERSE AUCTION RFQ: Reverse Auction shall be conducted if Minimum 2 technically accepted firms received & Reverse auction will be as per BEML norms. (refer document **ReverseAuction_Terms** for details)

BEML LIMITED

PPENDIX- A

(To be executed on plain paper and applicable for all tenders of value _ Rs. 1 Crore and above)

INTEGRITY PACT

Between

BEML Limited (BEML) hereinafter referred to as “The Principal”

And

..... **hereinafter referred to as “The Bidder/Contractor”**

Preamble

The Principal intends to award, under laid down organizational procedures, contract/s for

.....
The Principal values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness / transparency in its relations with its Bidder(s) and / or Contractor(s). In order to achieve these goals, the Principal will appoint an independent External Monitor (IEM), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1 – Commitments of the Principal

- (1) The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:
 - a) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
 - b) The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
 - c) The Principal will exclude from the process all known prejudiced persons.
- (2) If the principal obtains information on the conduct of any of its employees which is a criminal offence under the IPC/PC Act, or it there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

Section 2 – Commitment of the Bidder(s)/ contractor(s)

- (1) The Bidder(s)/ Contractor(s) commit themselves to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

- a) The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
 - b) The Bidder(s)/ Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.
 - c) The Bidder(s)/ Contractor(s) will not commit any offence under the relevant IPC/PC Act; further, the Bidder(s) / Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or documents provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - d) The Bidder(s)/ Contractor(s) of foreign origin shall disclose the name and address of the Agents/ Representatives in India, if any. Similarly, the Bidder(s)/ Contractor(s) of Indian Nationality shall furnish the name and address of the foreign Principals, if any. Further, as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s)/Contractor(s). Further, as mentioned in the Guidelines all the payments made to the Indian agent/representative have to be in Indian Rupees only. Copy of the "Guidelines on Indian Agents of Foreign Suppliers" is placed at **Appendix (A-1)**.
 - e) The Bidder(s) / Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.
- (2) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/Contractor(s), before award or during execution has committed a transgression through a violation of Section 2, above or any other form such as to put his reliability or creditability in question, the Principal is entitled to disqualify the Bidder(s)/Contractor(s) from the tender process or act as per the procedure mentioned in the "Guidelines on Banning of business dealings".

Section 4 – Compensation for Damages

- (1) If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security.
- (2) If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages of the contract value or the amount equivalent to Performance Bank Guarantee.

Section 5 – Previous Transgression

- (1) Bidders to disclose any transgression with any other public / government organisation that may impinge on the anti-corruption principle. The date of such transgression, for the purpose of disclosure by the bidders in this regard, would be the date on which cognizance of the said transgression was taken by the competent authority. The period for which such transgression (s) is / are to be reported by the bidder shall be the last three years to be reckoned from date of bid submission. The transgression(s), for which cognizance was taken even before the said period of three years, but are pending conclusion, shall also be reported by the bidders.
- (2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as per the procedure mentioned in “Guidelines on Banning of business dealings”.

Section 6 – Equal treatment of all Bidders /Contractors /Sub-contractors

- (1) The Bidder(s)/ Contractor(s) undertaker(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.
- (2) The Principal will enter into agreement with identical conditions as this one with all Bidders, Contractors and subcontractors.
- (3) The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7 – Criminal charges against violating Bidder(s) / Contractor(s) / Subcontractor(s)

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or of the Principal has substantive suspicion in this regard, the Principal will inform the same to the Chief Vigilance Officer

Section 8 – Independent External Monitor / Monitors

- (1) The Principal appoints competent and credible Independent External Monitor for this Pact.
The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement
- (2) The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. It will be obligatory for him to treat the information and documents of the Bidders/Contractors as confidential. He reports to the CMD, BEML.
- (3) The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Subcontractor(s) with

confidentiality.

- (4) The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.
- (5) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
- (6) The Monitor will submit a written report to the CMD, BEML, within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise submit proposals for correcting problematic situations.
- (7) If the Monitor has reported to the CMD, BEML, a substantiated suspicion of an offence under relevant IPC/PC Act, and the CMD, BEML has not, within the reasonable time taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner.
- (8) The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

This pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the contract, and for all other Bidders 6 months after the contract has been awarded. If any claim is made/lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by CMD of BEML

Section 10 – Other provisions

- (1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Corporate Office of the Principal, i.e. Bangalore.
- (2) Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.
- (3) If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.
- (4) Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.
- (5) The bidder shall not approach the Courts while representing the matters to IEMs and he/ she will await their decision in the matter.
- (6) In case of joint venture, all the partners of the joint venture should sign the Integrity Pact. In

case of sub-contracting, the Principal contractor shall take the responsibility of the adoption of IP by the sub-contractor. It is to be ensured that all sub- contractors also sign IP.

- (7) In the event of any dispute between the management and the contractor relating to those contracts where Integrity Pact is applicable, in case, both the parties are agreeable, they may try to settle dispute through mediation before the panel of IEMs in a time bound manner. If required, the organization may adopt any mediation rules for this purpose.

In case, the dispute remains unresolved even after mediation by the panel of IEMs, the organization may take further action as per the terms and conditions of the contract.

The fees / expenses on dispute resolution shall be equally shared by both the parties.

- (8) In the event of any contradiction between the Integrity Pact and its Annexure, the Clause in the integrity pact will prevail

(For & On behalf of the Principal)

(For & On behalf of Bidder/Contractor)

(Office Seal)

(Office Seal)

Place-----

Place-----

Date -----

Date -----

Witness 1:
(Name & Address)

Witness 1:
(Name & Address)

Witness 2:
(Name & Address)

Witness 2:
(Name & Address)

Appendix A-1**(Applicable Agents / Suppliers to Sign, Seal & Upload / Submit)****GUIDELINES FOR INDIAN AGENTS OF FOREIGN SUPPLIERS**

- 1.0 There shall be compulsory registration of agents for all Global (Open) Tender and Limited Tender. An agent who is not registered with BEML LTD shall apply for registration in the prescribed Application-Form available on www.bemlindia.in.
- 1.1 Registered agents will file an authenticated Photostat copy duly attested by a Notary Public/Original certificate of the principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/remuneration/ salary/ retainer ship being paid by the principal to the agent before the placement of order by BEML LTD.
- 1.2 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.

- 2.0 DISCLOSURE OF PARTICULARS OF AGENTS/ REPRESENTATIVES IN INDIA, IF ANY:
 - 2.1 Tenderers of Foreign nationality shall furnish the following details in their offer:
 - 2.1.1 The name and address of the agents/representatives in India, if any and the extent of authorization and authority given to commit the Principals. In case the agent/representative be a foreign Company, it shall be confirmed whether it is real substantial Company and details of the same shall be furnished.
 - 2.1.2 The amount of commission/remuneration included in the quoted price(s) for such agents/representatives in India.
 - 2.1.3 Confirmation of the Tenderer that the commission/ remuneration if any, payable to his agents/representatives in India, may be paid by BEML LTD in Indian Rupees only.
 - 2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:
 - 2.2.1 The name and address of the foreign principals indicating their nationality as well as their status, i.e, whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents/representatives.
 - 2.2.2 The amount of commission/remuneration included in the price (s) quoted by the Tenderer for himself.
 - 2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/remuneration, if any, reserved for the Tenderer in the quoted price (s), may be paid by BEML LTD in India in equivalent Indian Rupees on satisfactory completion of the Project or supplies of Stores and Spares in case of operation items.
- 2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission /remuneration, if any payable to the agents/representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.
- 2.4 Failure to furnish correct and detailed information as called for in paragraph-2.0 above will render the concerned tender liable to rejection or in the event of a contract materializing, the same liable to termination by BEML LTD. Besides this there would be a penalty of banning business dealings with BEML LTD or damage or payment of a named sum.

Signature
(For & On behalf of Bidder/Contractor)

APPENDIX-B**COMPLIANCE FOR SUBMISSION OF NON - DISCLOSURE AGREEMENT****Bid Invitation No** :**Firm** :

Sl. No.	Clause Description	Complied / Not Complied	Remarks
01	Interested Bidders have to submit Non-Disclosure Agreement along with Technical Bid as per the prescribed format provided by BEML along with this tender (soft copy by email and original hard copy by courier / post)		

Authorized signatory with company seal / stamp

APPENDIX – C

COMPLIANCE REPORT OF GENERAL TERMS & CONDITIONS

(To be submitted along with Technical Bid)

Bid Invitation No :**Firm** :**Item details** :

Sl. No.	Terms / Clause	Complied	Not Complied	Remarks
1.	DEFINITIONS & INTERPRETATIONS			
2.	SUBMISSION OF THE TENDER			
3.	PURCHASE PREFERENCES			
4.	SUPPLIERS SHARING LAND BORDER WITH INDIA			
5.	DELIVERY TERMS			
6.	PAYMENT			
7.	PRICE BID VALIDITY			
8.	FIRM PRICE			
9.	INSPECTION			
10.	WARRANTY			
11.	PERFORMANCE BANK GUARANTEE (PBG)			
12.	RIGHT TO VARY QUANTITIES & QUANTITY OPTION CLAUSE			
13.	LIQUIDATED DAMAGES CLAUSE			
14.	RISK PURCHASE CLAUSE			
15.	SECRECY AND CONFIDENTIALITY			
16.	AUTHORITY OF PERSONS SIGNING DOCUMENT			
17.	ACCEPTANCE OF ORDER			
18.	OTHER CONDITIONS			
19.	PRICE, INVOICING AND PAYMENT			
20.	PROGRESS REPORT			
21.	QUALITY & WORKMANSHIP			

Authorized signatory with company seal / stamp

APPENDIX – C

COMPLIANCE REPORT OF GENERAL TERMS & CONDITIONS

(To be submitted along with Technical Bid)

Bid Invitation No :**Firm** :**Item details** :

22.	QUALITY, CONDITION OF DELIVERY			
23.	SUPPLY OF SAMPLE (If Applicable)			
24.	INSPECTION, TESTING & CONSEQUENCE OF REJECTION			
25.	LAWS APPLICABLE			
26.	RAWMATERIALS ARRANGEMENT			
27.	IDENTIFICATION OF ITEMS / PIECES			
28.	PACKING AND MARKING			
29.	APPLICABLE LAWS AND JURISDICTION OF COURTS			
30.	JURISDICTION			
31.	ARBITRATION			
32.	INTELLECTUAL PROPERTY RIGHTS; LICENSES			
33.	BRIBES AND GIFTS			
34.	FORCE MAJEURE CLAUSE			
35.	FALL CLAUSE			
36.	NON DISCLOSURE AND INFORMATION OBLIGATIONS			
37.	ASSIGNMENT OF RIGHTS AND OBLIGATIONS; SUBCONTRACTING			
38.	DIVISION OF PATRONAGE			
39.	INTEGRITY PACT			
40.	GST TERMS & CONDITIONS			
41.	TDS CLAUSE			
42.	PRODUCT LIABILITY			
43.	REVERSE AUCTION TERMS			

Authorized signatory with company seal / stamp

APPENDIX – X

SL No.	Description	Complied / Not-Complied	Remarks
1	All necessary spares, consumables and any other material for preventive maintenance as per Operation and Maintenance Manual(s) required till the completion of DNP shall be supplied at free of cost and shall be kept on site at his own cost.		
2	Defect Notification Period: DNP starts from date of supply of materials and ends after 30 months from the date of placement of trains into revenue service.		
3	There will be additional requirement of SIGNALING EQUIPMENT for repair/replacement during CAMC period (15 Years) of revenue service. The supplier has to give concurrence for the additional requirement & support on as & when required basis. CAMC will start after successful completion of Defect Notification Period (DNP).		

PERFORMANCE BANK GUARANTEE

Bank Guarantee No.....
 Dated
 Amount
 Valid upto
 Claim upto

The General Manager (Materials- Management)
 BEML
 Bangalore Complex
 PB No 7501
 New Thippasandra
 Bangalore 560075

1. This deed of Guarantee made this day of..... (Month& year) between Bank of..... (Hereinafter called the "Bank") of the one part, and BEML LIMITED (Hereinafter called "the Employer") of the other part.
2. Whereas BEML LIMITED has awarded the contract for..... (Name of work as per PO) (Hereinafter called the "Contract") to..... (Name of the Contractor) (Hereinafter called "the Contractor").
3. AND WHEREAS the Contractor is bound by the said Contract to submit to the Employer a Performance Security for a total amount of.....(Amount in figures and words).
4. Now, We the Undersigned.....(Name of the Bank) being fully authorized to sign and to incur obligations for and on behalf of and in the name of.....(Full name of Bank), hereby declare that the said Bank will guarantee the Employer the full amount of Rs. (Amount in figures and words) as stated above.
5. NOW THEREFORE, We hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor and we hereby unconditionally, irrevocably and without demur undertake to immediately pay to the Employer upon first written demand and without cavil or argument, any sum or sums within limits of.....(Amount of Guarantee) as aforesaid without reference to the Contractor and without your needing to prove or show grounds or reasons for your demand for the sum specified therein. The Bank shall pay to the Employer any money so demanded notwithstanding any dispute/disputes raised by the Contractor in any suit or proceedings pending before any Court, Tribunal or Arbitrator/s relating thereto and the liability under this Guarantee shall be absolute and unequivocal.
6. This Guarantee is valid till.....(The initial period for which this Guarantee will be valid must be for at least 6-months (six months) longer than the anticipated expiry date of defect liability period / Warranty period as stated in Clause 11 of Annexure IV - Notice Inviting Tenders.
7. At any time during the period in which this Guarantee is still valid, if the Employer agrees to grant a time extension to the Contractor or if the Contractor fails to complete the Works within the time of completion as stated in the Contract, or fails to discharge himself of the liability or damages or debts as stated under Para 5, above, it is

understood that the Bank will extend this Guarantee under the same conditions for the required time on demand by the Employer and at the cost of the Contractor.

- 8. The Bank agrees that no change, addition, modifications to the terms of the Contract Agreement or to any documents, which have been or may be made between the Employer and the Contractor, will in no way release us from the liability under this Guarantee; and the Bank, hereby, waives any requirement for notice of any such change, addition or modification to the Bank.
- 9. The Guarantee here in before contained shall not be affected by any change in the Constitution of the Bank or of the Contractor.
- 10. The neglect or forbearance of the Employer in enforcement of payment of any moneys, the payment whereof is intended to be hereby secured or the giving of time by the Employer for the payment hereof shall in no way relieve the bank of their liability under this deed.
- 11. The expressions "the Employer", "the Bank" and "the Contractor" hereinbefore used shall include their respective successors and assigns.
- 12. Notwithstanding anything contained herein:
 - (a) Our liability under this Bank Guarantee shall not exceed Rs.....
(Rs.....)
 - (b) This Bank Guarantee shall be valid up to.....
 - (c) We are liable to pay the Guarantee amount or part thereof under this Bank Guarantee only & only if you serve upon us a written claim or demand on or before

In witness whereof I/We of the bank have signed and sealed this Guarantee on the.....day of..... (Month & year) being herewith duly authorized.

For and on behalf of theBank.

Signature of Authorized Bank officials.

Name :.....

Designation :

Stamp/Seal of the Bank.....

Signed, sealed and delivered for and on behalf of the Bank by the above namedin the presence of:

Witness 1.

Witness 2.

Signature.....

Signature.....

Name.....

Name.....

Address.....

Address.....

CONFIDENTIALITY AGREEMENT

(To be typed on plain paper and submitted along with the technical bid)

This Confidentiality Agreement is made and entered into between M/s BEML, (hereinafter referred to as BEML), a Govt. of India Undertaking under Ministry of Defence, having its Registered Office at BEML Soudha, No.23/1, 4th Main, Sampangirama Nagar, Bangalore – 560 027 and M/s ----- (hereinafter referred as XXXX) having its Registered Office at..... M/s. BEML, has been patronizing XXXX for components / spares listed in Annexure hereto. A need has been felt to revitalize the business relationship for mutual advantage.

- 1) It is mutually, therefore, agreed that the following shall form part of the terms and conditions for continued business:
 - a) The supplier shall not divulge to anyone else except under the authority and for the purposed of BEML, all information such as technical data, specifications, drawings, models of specimens furnished / supplied by BEML for the purpose of manufacture or in connection with developmental activities, constitute the property of BEML and the supplier shall keep them in strict confidence. This has been explicitly stated in all the details to the supplier through Purchase Order / Drawings etc., released.
 - b) The supplier shall not supply the components / spares exclusively manufactured for BEML with the Technical Data / Specifications / assistance furnished by BEML and shall not disclose my initiations, development of adaptations thereof to anyone else except with the written consent of BEML.
 - c) BEML shall be entitled to prevent breach of the above and to claim damages in case of any breach. It is hereby mutually agreed that for breach of this agreement the Vendor shall pay, without actual proof of damages, a liquidated amount of Rs. 1.00 Crore (Rupees One Crore only).
 - d) **ARBITRATION:** In the event of any question or disputes arising under these conditions or any other terms and conditions of contract or in connection with this contract (except as to any matters the decision of which is specially provided for by these conditions) the same shall be referred to an award of a Sole to be appointed by BEML with the consent of the Contractor / Vendor Supplier and the Arbitration proceedings of Arbitration and Conciliation Act 1996. The Courts in Bangalore alone shall have jurisdiction to deal and decide any legal matter or dispute whatsoever arising out of this Contract.
- 2) BEML shall be entitled to prevent breach of the above and to claim damages in case of any breach.
- 3) The Signatories hereto declare that they have the sanction and power to execute and deliver this binding agreement.

IN WITNESS WHEREOF, the parties hereto have set their respective hands to this Confidentiality Agreement on written in the presence of Witness.

For BEML

For M/s. XXXX

WITNESS:

1.

1.

2.

2.

APPENDIX – F

DECLARATION TO CLAIM PURCHASE PREFERENCE UNDER PUBLIC PROCUREMENT POLICY - PREFERENCE TO 'MAKE IN INDIA' ORDER 2017

(To be executed in plain paper and to be submitted along with technical bid)

Preference shall be given to Class-I local supplier as defined in public procurement (Preference to Make in India), Order 2017 as amended from time to time and its subsequent Orders/Notifications issued by concerned Nodal Ministry for specific Goods/Products.

The Bidder shall self certify (or) provide a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving percentage of local content.

In cases of procurement for a value in excess of Rs.10 crores, Class-I local supplier / Class-II local supplier shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving percentage of local content

We, M/s _____ with its registered office at _____ claim purchase preference under Public Procurement Policy – Preference to 'Make in India' Order 2017

CONDITION	Bidder to tick (√) the respective Boxes	
	COMPLIED	NOT COMPLIED
The Goods / Items / Stores, offered meets the minimum local content of 50% . Local content means the amount of value added in India which shall be the total value of the item / Goods/ Stores procured (excluding net domestic Indirect taxes) minus the Value of the import content in the item (including all custom duties) as a proportion of the total value in Percent		
The Goods / Items / Stores, offered meets the minimum local content of more than 20% and less than 50% . Local content means the amount of value added in India which shall be the total value of the item / Goods/ Stores procured (excluding net domestic Indirect taxes) minus the Value of the import content in the item (including all custom duties) as a proportion of the total value in Percent		
Address of Location(s) at which the local value addition is made.		

Authorized signatory with company seal / stamp

APPENDIX – G

CERTIFICATE FOR LAND BORDER SHARING

(To be executed in plain paper and to be submitted along with technical bid)

Bidders to refer, GOI office memorandum No. F.No.6/18/2019-PPD of Department of Expenditure Public Procurement Division, amended time to time and its subsequent Orders/Notifications

The Bidder accordingly Certifies as below:

“ I / We, have read the clause regarding restrictions on procurement from the bidder of a country which shares a land border with India; I certify that the Bidder / Vendor is not from such a country or, if from such a country, has been registered with the Competent Authority. I here by Certify that this Vendor / Bidder fulfills all requirements in this regard and is eligible to be concerned for procurement on BEML SRM / GeM ”

[Where ever applicable, evidence of valid registration by the Competent Authority shall be attached]

Authorized signatory with company seal / stamp

COMPLIANCE REPORT FOR BEML DARWINGS & TDC

(To be submitted along with Technical Bid)

Bid Invitation No :**Firm** :

SL No	Particulars	Whether the bidder meets the requirements (Yes/No)	Details of documentary proof attached	Remarks
1	JURIDICAL RECORDING UNIT (JRU), Part No. 84321270 BEML Drawings: 843-21270_JRU TDC document ref: B28_TDC_843-21270_JRU			
2	NRC for JURIDICAL RECORDING UNIT BEML Drawings: 843-21270_JRU TDC document ref: B28_TDC_843-21270_JRU			
3	MEGABIT ETHERNET REPEATERS (84421271) BEML Drawings: 844-21271_megbit TDC document ref: B28_TDC_844-21271_Mbit_repeater			
4	MVB REPEATERS (84421273) BEML Drawings: 844-21273_MVB TDC document ref: B28_TDC_844-21273_MVB_repeater			

Authorized signatory with company seal / stamp

CLAUSE BY CLAUSE COMPLIANCE REPORT TO BEML Drawings & TECHNICAL DELIVERY CONDITIONS (TDC)

(To be submitted along with Technical Bid)

Bid Invitation No :

Firm :

Sl. No.	Clause Description	Complied / Not Complied	Remarks																														
01	The technical requirement as per the Drawings / Technical Delivery Conditions (TDC) enclosed is fully understood by the bidding firm and the firm is bidding for the same.																																
02	<p>Bidders to confirm for which of these tendered items bid is submitted for further evaluation.</p> <table border="1"> <thead> <tr> <th>S/n</th> <th>Part No</th> <th>Description</th> <th>Uom</th> <th>Total Qty for 2 Train Set + UES</th> <th>Bid submitted for this requirement / Bid Not Submitted for this requirement Please confirm in writing</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>84321270</td> <td>JURIDICAL RECORDING UNIT (JRU)</td> <td>SET</td> <td>3</td> <td></td> </tr> <tr> <td>2</td> <td>----</td> <td>NRC for JURIDICAL RECORDING UNIT</td> <td>AU</td> <td>1</td> <td></td> </tr> <tr> <td>3</td> <td>84421271</td> <td>MEGABIT ETHERNET REPEATERS</td> <td>SET</td> <td>28</td> <td></td> </tr> <tr> <td>4</td> <td>84421273</td> <td>MVB REPEATERS</td> <td>SET</td> <td>3</td> <td></td> </tr> </tbody> </table>	S/n	Part No	Description	Uom	Total Qty for 2 Train Set + UES	Bid submitted for this requirement / Bid Not Submitted for this requirement Please confirm in writing	1	84321270	JURIDICAL RECORDING UNIT (JRU)	SET	3		2	----	NRC for JURIDICAL RECORDING UNIT	AU	1		3	84421271	MEGABIT ETHERNET REPEATERS	SET	28		4	84421273	MVB REPEATERS	SET	3			
S/n	Part No	Description	Uom	Total Qty for 2 Train Set + UES	Bid submitted for this requirement / Bid Not Submitted for this requirement Please confirm in writing																												
1	84321270	JURIDICAL RECORDING UNIT (JRU)	SET	3																													
2	----	NRC for JURIDICAL RECORDING UNIT	AU	1																													
3	84421271	MEGABIT ETHERNET REPEATERS	SET	28																													
4	84421273	MVB REPEATERS	SET	3																													

1. Bids of firms having any history of pending litigations, default in and Risk purchase against previous orders of BEML (including all Divisions) are liable for rejection at any stage if found at later stage. Hence, Bidders are requested to cross-check at their end before participation in the Tender.

2. Technical offers not complying / fulfilling the above requirements are liable to be rejected.

3. The Price details/commercial bid details should not be given in Technical bid , if any bidder have given any price/commercial details in the Technical bid , their offer is liable for rejection and will not be considered.

I / We certify that to the best of my/our knowledge, the information & particulars furnished above are true. It is understood that the information furnished will be treated as confidential and will not be divulged to unauthorized persons.

Authorized signatory with company seal / stamp

LIST OF DOCUMENTS ATTACHED WITH THE TENDER

- 1) Notice Inviting Tender (NIT)
- 2) Non-Disclosure Agreement
- 3) BEML Drawings & TDC
- 4) ReverseAuction_Terms (Applicable in case Reverse Auction Event is conducted)

Contact Details:

Email ID: ravikumar.adepu@bemltd.in / Prasanna.n@bemltd.in

Phone: 080-25022639 / 080-25022634

Address Details for Sending Original Hard Copy of Non-Disclosure Agreement

Kind Attn: Mr. Prasanna N
DGM (MM B/O Rail BC)
Functional Head- Purchase- Commuter Rail
M/s. BEML LIMITED
BANGALORE COMPLEX,
POST BOX: 7501,
NEW THIPPASANDRA POST,
BANGALORE-560075

- Email ids for correspondence : ravikumar.adepu@bemltd.in / prasanna.n@bemltd.in / mahanthesh.gm@bemltd.in
- Any queries/clarifications may be sent to the above mail ids.
- It is suggested that all the interested bidders may obtain all the clarifications if any before submitting the bids.
- Any modification of tender conditions which may become necessary, shall be made by BEML and the same will be intimated in BEML SRM portal.
- All Corrigenda, Addenda, Amendments, Clarifications etc, if any issued shall be part of the Bidding documents. Prospective Bidders shall sign the same with seal and upload as a part technical bid

REVERSE AUCTION TERMS:

Reverse Auction would be conducted for the technically qualified firms (2 or more firms) with proper training on Reverse Auction process.

If reverse auction is conducted, then the start bid price in reverse auction by any vendor shall be lesser than or equal to the quote by that vendor in their commercial bid.

On completion of reverse auction, the commercial bids of technically acceptable vendors would be opened to verify the start bid price in reverse auction by any vendor is equal or less than the commercial bid by that vendor. In case it is noticed that the start bid price by any vendor is more than the commercial bid, then the vendor will not be considered for further commercial evaluation.

In case the technically accepted vendor is not participating in reverse auction, then the commercial bid of the firm would not be opened.

Interested Bidders have to submit Non-Disclosure Agreement on **Rs.500/- stamp paper** as per the prescribed format provided by BEML (soft copy by Email and Original Hard copy by courier / post) for obtaining the Technical Related Documents via Email.

NON-DISCLOSURE AGREEMENT

This Non-Disclosure Agreement (hereinafter referred to as “the Agreement”) is made on this.....day of (“Effective date”) by and between:

BEML Limited, a Govt. of India Undertaking under the administrative control of Ministry of Defence, Government of India and a company incorporated under the provisions of Companies Act 1956, having its registered & Corporate Office at BEML SOUDHA", 23/1, 4th Main, SR Nagar, Bengaluru-560 027, represented by its _____ ----- Mr./Ms. _____ (hereinafter referred to as “The Principal”/”BEML”, which expression shall mean and include its successors in interest and permitted assigns) on the First Part

AND

M/s having its registered Office at represented by its _____ Mr./Ms. _____ (hereinafter called as “The contractor”, which expression shall mean and include its successors in interest and permitted assigns) on the Other Part.

Hereinafter the Principal and the contractor shall be collectively referred as the “Parties” and individually referred to as a “Party” in reference to this agreement.

1.0 PURPOSE

Ministry of Railways (hereinafter referred to as MOR), Government of India have decided to develop indigenous trainsets for speeds of 280/249 km/h on Standard Gauge through BEML (“Project”).

The purpose of this Agreement is to enable the contractor to properly manage and maintain the confidentiality of the information being provided or disclosed by The Principal for the development of the indigenous trainset compatible with the Project.

2.0 DEFINITIONS

The following terms as used in this Agreement are defined as follows:

2.1 “Confidential Information” shall mean:

Confidential information as provided or shared by the Principal, in connection with or relating to the Project, to the contractor, any information related to the Project (such as, but not limited to technical documents and technical data, business documents, drawings and commercial data) including written information, and information contained in any form of media or device, that is

clearly identified by The Principal as ‘confidential’/’Proprietary’ at the time of its disclosure.

2.2 Notwithstanding anything else contained in this Agreement, the Confidential Information shall not include any information:

- (a) that is, at the time of its disclosure, possessed by the contractor without owing any confidentiality obligation;
- (b) with regard to the technology or knowledge that is independently developed by the contractor without use of or reference to any Confidential Information;
- (c) that is properly acquired by the contractor from a third party without owing any confidentiality obligation and such third party is not in breach of any confidentiality obligation relating to such information.
- (d) that the Principal, by prior written consent, permits the disclosure (however subject to terms and conditions of such consent from the Principal).
- (e) that is disclosed by the Principal to a third party without imposing any confidentiality obligation thereon; or
- (f) that subsequently becomes publicly known for a reason other than that attributable, directly or indirectly, to the contractor after its disclosure.

3.0 CONFIDENTIALITY

3.1 The contractor shall be obligated to keep the Confidential Information in confidence with the reasonable care of a good manager and shall not disclose or divulge the Confidential Information to any third party. Upon discovery of any breach of this Agreement or improper disclosure or misuse of the Confidential Information, the contractor shall notify the Principal and shall take all necessary actions to prevent any further breach, improper disclosure or misuse, including by causing the persons to whom the contractor disclosed the Confidential Information to agree and adhere to non-disclosure terms similar to those set forth in this Agreement.

3.2 Notwithstanding Section 3.1 above, the contractor may disclose Confidential Information:

- (i) to the extent necessary, to (a) The contractor’s officers and employees (hereinafter collectively referred to as the “Employees”) who need to know such Confidential Information for purposes of the Project, (b) lawyers, advisors and other specialists owing confidentiality obligations under applicable laws, regulations or agreements and who are engaged by the contractor to render services in connection with the Project (c) potential subcontractors/manufacturers/suppliers of the contractor and (ii) in accordance with applicable laws, rules and regulations, and any mandatory order by a court with jurisdiction or other public agency with jurisdiction; provided, however, that, if, and legally permitted to do so, the contractor shall promptly notify the Principal and take reasonable steps to assist the Principal in contesting such order or otherwise in protecting the Principal’s rights prior to disclosure, to minimize the Confidential Information which is disclosed to follow such order.

3.3 The contractor shall impose upon all of the employees who have or have had access to the

confidential information, confidentiality obligations which continue after such Employee's retirement/resignation /leave from the contractor, equivalent to those of the contractor under this Agreement and shall ensure such Employees comply there with. The contractor shall be jointly and severally responsible with such Employees (including former Employees) for any breach of such confidentiality obligations by such Employees (including former Employees).

- 3.4** The contractor shall insert the relevant clause in their agreement/contract to impose the same obligation as stipulated in this Agreement to other members, consultants, subcontractors, attorneys, manufacturers, suppliers etc. as stated at Section 3.2 above.

Provided always that for breach of the confidentiality obligation by the consultants, subcontractors, attorneys, manufacturers, suppliers etc., the Contractor shall be held liable and responsible for its consequences.

4.0 INTELLECTUAL PROPERTY RIGHTS

The Parties have expressly understood and agreed that all rights, including but not limited to those rights for property and intellectual property rights (including but not limited to patent rights, design rights, copyrights, trade secret rights and all other intellectual and industrial property rights of any sort throughout the world, the same shall apply hereinafter), regarding the Confidential Information or any other information mutually shared among the Parties will remain the exclusive property rights of the Principal.

5.0 NO WARRANTIES

The contractor has expressly understood and agreed that the Principal only have obligation under or by virtue of this Agreement to enter into furnishing, trading, development, or technology licensing agreement, or any other agreement, any products, services, or any technologies with respect to the Project.

The Principal does not warranty on the accuracy or suitability of the Confidential /Proprietary Information being exchanged under this Agreement and all Confidential Information is provided on an "As Is" basis.

6.0 EXPORT CONTROL

Parties hereby confirm and agree to adhere to the Export Control laws and regulations and perform any necessary procedures, including obtaining export permits.

7.0 DAMAGES

The Contractor agrees to indemnify, save and hold harmless the Principal from and against any and all losses, liabilities, expenses (including, legal fees and costs), claims, liens, damages

or the like (limited to common direct damages actually incurred) incurred by the Principal as a result of any breach of any provision of this Agreement.

8.0 GOVERNING LAW

This Agreement shall be governed by and construed in accordance with the laws of the Republic of India.

9.0 JURISDICTION

This NDA shall be subject to the exclusive Jurisdiction of courts at Bangalore.

10.0 DISPUTE RESOLUTION:

The Parties shall endeavor to resolve all disputes arising out of this Agreement or relation thereto, amicably through mutual discussions through their authorized representatives or by negotiation, mediation, conciliation etc.

In case of disputes between CPSE's or a Government Department(s)/Organization(s) Any unresolved disputes between the parties shall be settled by referring the same to AMRCD forum of DPE, Government of India in terms of the DPE OM No. 05/0003/2019-FTS-10937 dated 14.12.2022 and DPE OM No : 05/0002/2023-AMRCD dated 25/07/2024 in case of Government agencies.

(In case of Private firms)

Any unresolved disputes shall be referred to and resolved by arbitration with the rules of Arbitration of the India International Arbitration Centre (IIAC), New Delhi. The Arbitration shall consist of a Sole Arbitrator to be appointed in accordance with the Rules of IIAC. The arbitration proceedings shall take place/seat of arbitration shall be New Delhi, and be conducted in the English Language. The Arbitration proceedings will be administered by the India International Arbitration Centre (Conduct of Arbitration) Regulations, 2023 and all arbitration proceedings shall be conducted in English language. The award of the sole arbitrator shall be final and binding on all the parties

11.0 TERM

11.1 The effective term of this Agreement shall be for a six (6) years period from the date hereof, and thereafter automatically extended for successive period of one (1) year each, unless each party shall have otherwise notified to the other parties in writing at least one (1) month prior to the expiry of this agreement or any extension thereof.

11.2 Notwithstanding the above, the obligations of the contractor in relation to the Confidential Information shall survive after the termination of this Agreement.

11.3 Upon the termination of this Agreement, or at any time prior thereto upon the written request of The Principal, The contractor shall cease all use of and shall promptly return to The Principal

(at the expense of the contractor), or shall promptly destroy in accordance with the reasonable instructions of The Principal, all of the Confidential Information it received that is in tangible or electronic/digital form (including but not limited to originals, all summaries, copies and excerpts). In the event of its destroying, the contractor shall destroy such Confidential Information by the way of non-reusable.

12.0 MISCELLANEOUS

12.1 This Agreement constitute the entire agreement between the Parties as to the subject matter hereof and supersedes any and all previous agreements or communication, whether oral or written, as to its subject matter. It may be modified only by the written agreement of the Parties.

12.2 Any confidential information disclosed to contractor by The Principal before execution of this Agreement shall be treated subject to this agreement.

12.3 If any provision or provisions of this Agreement declared invalid or unenforceable, such invalidity or unenforceability shall not render the entire agreement invalid. Rather, this Agreement shall be construed as if not containing the particular invalid or unenforceable provision, and the right and obligations of each Party shall be construed and enforced accordingly.

12.4 No failure or delay by each Party in exercising any right, power or privilege hereunder shall operate as a waiver thereof nor shall any single or partial exercise thereof preclude any other or further exercises of any rights, powers or privileges hereunder.

12.5 This Agreement constitutes a non-disclosure agreement only and shall not be construed as a teaming, joint venture or other such arrangement. Nothing in this Agreement shall grant any Party the right to make commitments of any kind for or on behalf of the other Party without the prior written consent of the such other Party.

13 It is expressly understood and agreed by and between.....and BEML that BEML is entering into this agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights hereunder. It is expressly understood and agreed that BEML is an independent legal entity with power and authority to enter into contracts solely in its own behalf under the applicable Laws of India and general principles of Contract Law. expressly agrees, acknowledges and understands that BEML is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the contract. Accordingly,..... hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Government of India arising out of this contract and covenants not to sue the Government of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement"

"Whereof, the parties hereto have caused this Agreement to be executed on the day, month and year specified below.

For & on behalf of **The Principal**

For and on behalf of **The contractor**

Signed by
Name
Position
Date
Company
Company Stamp

Signed by
Name
Position
Date
Company
Company Stamp

WITNESSES:

1 Signed by
Name
Designation

2. Signed by
Name
Designation



**Project 67210-IN-Mumbai-Ahmedabad-
NHSRCL**

**SRS_ODRS_MAHSR_OBU
Trainguard 200 OBU**

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	1 of 13
--	-----------------------------------	--------------------------	---------------

	Name	Department	Date	Electronic signature
Released by	Jan Wiese	SMO RI ML TC BP PE	2025-10-27	
Author	Lasse Peters	SMO RI ML TC EC SE	2025-09-24	

Transmittal, reproduction, dissemination and/or editing of this document as well as utilization of its contents and communication thereof to others without express authorization are prohibited. Offenders will be held liable for payment of damages. All rights created by patent grant or registration of a utility model or design patent are reserved.
The product names used in this document may be trademarks or registered trademarks of their respective owners.

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	2 of 13
--	-----------------------------------	--------------------------	---------------

This document was exported from IBM Rational DOORS.

Module: /PCQ_CP_MAHSR/10_Requirements/CP_ReqTM_ODRS_MAHSR (2738)

Baseline: 1.0 Rev_Valid_-

Module last modified on: 2025-10-27 00:00:00

Document generated on: 2025-10-27 07:43

Language: en_UK

Configuration: MAHSR_BEML_SV2.1,MAHSR_BEML_SV2.2,MAHSR_SHI_SV2.1,MAHSR_SHI_SV2.2

Document Class: SRS_ODRS

RPE Template: GenOBU_REQ - v2.5.8

RPE Engine Version: 7.0 - 20190709_2237

gO Exporttoolversion: 2.7 (2023-03-03)

Meta Module: /PCQ_CP_MAHSR/01_References/ModMeta (2732/001300ea)

Meta Version: 0.10

VBS Module: /PCQ_CP_MAHSR/01_References/VBS (2733/001300eb)

VBS Baseline: 0.8

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	3 of 13
--	-----------------------------------	--------------------------	---------------

Contents

1 Introduction	5
1.1 General	5
1.2 Change overview	5
1.3 Purpose and Scope	5
1.4 References	6
1.5 Terms and Abbreviations	6
2 Requirements ETCS	7
2.1 General ERA-ERTMS requirements on ODRS	7
2.2 Trainguard 100/200 ETCS OBU specific requirements	7
2.2.1 Time synchronisation	7
2.2.2 Generic ETCS requirements	7
2.2.2.1 Data recording	7
2.2.2.2 Optional data transmitting from ODRS	9
2.2.2.3 Optional SDT data transmitting from ODRS	9
2.2.2.3.1 SDT Isolation information	9
2.2.2.3.2 SDT Fallback speed information	9
2.3 Interfaces	9
2.4 Download/Evaluation	9
3 Project-specific requirements	11
3.1 General requirements	11
3.2 Requirements ETCS	12
3.3 Requirements ATO	12

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	4 of 13
--	-----------------------------------	--------------------------	---------------

1 Introduction

1.1 General

This document describes the system overview, the system boundary and the interfaces to the system environment.

2738/400-025:0
INFO

This document is valid for all train types in the project MAHSR.

1.2 Change overview

Version: -

2738/400-028:0
INFO

Authors:

Lasse Peters
SMO RI ML TC EC SE

Change history:

None (first issue)

Note:

At the time of creating the version - of the SRS_ODRS, the following is known:

Train type 1: 2 units from manufacturer BEML (configuration MAHSR_BEML_SV2.1 and MAHSR_BEML_SV2.2)

Train type 2: 22 units from unknown manufacturer (no configuration given yet)

Train type 3: 2 units of Shinkansen type (configuration MAHSR_SHI_SV2.1 and MAHSR_SHI_SV2.2)

1.3 Purpose and Scope

This document specifies the requirements for the on-board data recording system (ODRS). The requirements are defined irrespective of whether they are implemented in software and/or hardware. The specification contains functional and non-functional requirements.

2738/400-030:0
INFO

The requirements specification acts as the basis for implementing all technical customer requirements with respect to the requirements of the TSI Loc&Pas.

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHRSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	5 of 13
---	-----------------------------------	--------------------------	---------------

1.4 References

Reference	Document title	Document ID / source	Version
[EN 61375-3-1]	Electronic railway equipment - Train Communication Network (TCN) - Part 3-1: Multifunction Vehicle Bus (MVB) (IEC 61375-3-1:2012) / Endorsement notice		2012-08-01
[ESBO_FFFIS_JRU]	Interface Description JRU ETCS-Systembasis OBU	A6Z00041727703	F
[SUBSET-027]	FIS Juridical Recording Index 5 (ETCS B4 R1)	A6Z00033097530	C 4.0.0
[SUBSET-140_1.1.1-w01]	ATO-OB / ORD FFFIS Application Layer version 1.1.1-w01	A6Z00060152911	- 1.1.1-w01
[SUBSET-140_PROP_DATA]	SUBSET-140 Proprietary Data Telegram Specification	A6Z00060583856	-
[TSI LOC&PAS]	Commission Regulation (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the 'rolling stock — locomotives and passenger rolling stock' subsystem of the rail system in the European Union amended by Implementing Regulation (EU) 2018/868 Implementing Regulation (EU) 2019/776 Implementing Regulation (EU) 2020/387 Implementing Regulation (EU) 2023/1694		2023-08-10

If the version status is specified as *, the current and released document status has to be taken from SAP PLM.

2738/400-032:0
INFO

1.5 Terms and Abbreviations

Terms and abbreviations that are defined in the European specification are explained in the glossary of the European specification.

2738/400-034:0
INFO

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHRS_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	6 of 13
--	-----------------------------------	--------------------------	---------------

2 Requirements ETCS

2.1 General ERA-ERTMS requirements on ODRS

The general purpose of an On-board Data Recording System (ODRS) is to record train data and driver activities, to ensure onboard physical protection of the recorded data and finally to enable the analysis of the recorded data. The recording system may be implemented by one or more onboard driving data recording units (Juridical Recorder).

2738/2326-1106:0
INFO

The data recording function is intended to be handled via TSI LOC & PAS as vehicle function, hence outside the typical scope of supply of the ETCS onboard system. For convenience the definition of the scope of responsibilities for the integration of an ODRS is therefore incumbent on the application project. Related requirements will be formulated, if needed, within the application project specific part of the specification for the ODRS.

2738/2326-115:0
INFO

The ODRS shall fulfill relevant functional requirements regarding "recording device" in chapter 4.2.9.6 with regards to the Commission Regulation (EU) No 1302/2014 of 18 November 2014, (document TSI LOC&PAS) which is amended by the Commission Regulation (EU) No 2023/1694 of 10 August 2023.

2738/2326-116:0
REQ
[TSI LOC&PAS]
Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

Justification: This requirement was selected based on a project decision.

2.2 Trainguard 100/200 ETCS OBU specific requirements

2.2.1 Time synchronisation

This chapter does not contain any content.

2.2.2 Generic ETCS requirements

2.2.2.1 Data recording

The ODRS shall fulfill ERA specification SUBSET-027 requirements according to the TSI CCS 2023 covering the Envelope of System Version

2738/2326-134:0
REQ

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	7 of 13
--	-----------------------------------	--------------------------	---------------

2.1.

[541]
[1470]
[1471]
[4428]
[4513]
[4576]
[SUBSET-027]

Valid for:
MAHSR_BEML_
SV2.1,
MAHSR_SHI_SV
2.1

The ODRS shall be interfaced with ETCS OBU via MVB interface. The requirements defined in the specification ESBO_FFFIS_JRU shall be fulfilled.

Justification: If the chosen ODRS product does not offer an MVB interface, the ODRS supplier must provide a gateway.

The [ESBO_FFFIS_JRU] corresponds to the TSI CCS 2023 and the Envelope of System Version 2.1. The requirements shall be taken into account for configurations corresponding to the Envelope of System Version 2.2 as well.

2738/2326-168:0
REQ
[1470]
[4428]
[ESBO_FFFIS_J
RU]

Valid for:
MAHSR_BEML_
SV2.2,
MAHSR_SHI_SV
2.2,
MAHSR_BEML_
SV2.1,
MAHSR_SHI_SV
2.1

The ODRS shall use for the function names defined in ESBO_FFFIS_JRU (refer to FFFIS_JRU-1723) the following function numbers (function name: function number):

- EVC_JRU: 9
- JRU_EVC: 10

Justification: If the chosen ODRS product does not offer an MVB interface, the ODRS supplier must provide a gateway.

2738/2326-1160:0
REQ
[ESBO_FFFIS_J
RU]

Valid for:
MAHSR_BEML_
SV2.2,
MAHSR_SHI_SV
2.2,
MAHSR_BEML_
SV2.1,
MAHSR_SHI_SV
2.1

The ODRS shall record the status of the ETCS isolation switch from both cabs via wired interface.

2738/2326-135:0
REQ
[519]
[525]
[4437]
[ESBO_FFFIS_J
RU]

Valid for:
MAHSR_BEML_
SV2.2,
MAHSR_SHI_SV
2.2,
MAHSR_BEML_
SV2.1,
MAHSR_SHI_SV
2.1

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	8 of 13
--	-----------------------------------	--------------------------	---------------

2.2.2.2 Optional data transmitting from ODRS

This chapter describes the generic requirements which apply to the transmission of additional optional non-safety data from the ODRS to ETCS OBU - mainly to ETCS DMI based on GEMMI 10.1 specifications.

2738/2326-705:0
INFO

2.2.2.3 Optional SDT data transmitting from ODRS

This chapter describes the generic requirements which apply to the transmission of additional optional safety related data from the ODRS to ETCS OBU - mainly to ETCS DMI based on GEMMI 10.1 specifications.

2738/2326-1139:0
INFO

2.2.2.3.1 SDT Isolation information

This chapter does not contain any content.

2.2.2.3.2 SDT Fallback speed information

This chapter does not contain any content.

2.3 Interfaces

The ODRS shall provide the MVB interface according to the standard EN 61375-3-1.

2738/2326-586:0
REQ
[EN 61375-3-1]

Justification: This requirement was selected based on a project decision.

Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

If the chosen ODRS product does not offer an MVB interface, the ODRS supplier must provide a gateway which fulfills the requirement.

The MVB interface shall be realised with transformer coupler as an electrical middle distance medium (EMD) according to the standard EN 61375-3-1.

2738/2326-926:0
REQ
[EN 61375-3-1]

Justification: This requirement was selected based on a project decision.

Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

If the chosen ODRS product does not offer an MVB interface, the ODRS supplier must provide a gateway which fulfills the requirement.

2.4 Download/Evaluation

The data analysis should allow all kind of reasonable graphical and/or

2738/2326-

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	9 of 13
--	-----------------------------------	--------------------------	---------------

table related presentation and analysis of the data so that it is possible to engineer a customer specific configuration.

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	10 of 13
--	-----------------------------------	--------------------------	----------------

3 Project-specific requirements

3.1 General requirements

The ODRS shall record the status of the redundancy switch from both cabs via wired interface.

2738/2738-319:0
REQ
Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

The ODRS shall use the same time source as the EVC and the ETCS display.

2738/2738-325:0
REQ
Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

The ODRS shall provide its operational status or diagnostic information over MVB. The MVB telegramm structure for the ODRS shall be implemented according to table "JRU_Diagnosis" Port 165 (see below).

2738/2738-327:0
REQ
Valid for:
MAHSR_BEML_SV2.2,
MAHSR_SHI_SV2.2,
MAHSR_BEML_SV2.1,
MAHSR_SHI_SV2.1

MVB data group "JRU_Diagnosis"								
group name*	sender	receiver	group size [Byte]	port size [Byte]	port	cycle time [ms]	sink time [ms]	group description
JRU_Diagnosis	ODRS mRec c50/S40/S42		4	4	165	256	1024	Port for JRU diagnosis data
signal name*	data type		offset [Bit]	size [Bit]	signal description			
F_JRU_mrecDiag	BITSET32		0	32	Bit 00: LifeSign Bit 01: LifeSign Bit 02: LifeSign Bit 03: LifeSign Bit 04: LifeSign Bit 05: LifeSign Bit 06: LifeSign Bit 07: LifeSign Bit 08: If bit value = true, diag state of Bit 9 to Bit 16 are not valid Bit 09: If bit value = false, not ready for record Bit 10: If bit value = false, storage device not correct detected Bit 11: If bit value = false, format not ok Bit 12: If bit value = false, UIC number not consistent Bit 13: Reserve Bit 14: If bit value = false, MVB-Bus data not valid Bit 15: If bit value = false, storage level > 80 % Bit 16: not used ... Bit 31: not used			

*) Global name in parenthesis if local name defined

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHRS_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	11 of 13
--	-----------------------------------	--------------------------	----------------

3.2 Requirements ETCS

The ODRS shall fulfill ERA specification SUBSET-027 requirements according to the TSI CCS 2023 covering the Envelope of System Version 2.2.

2738/2738-318:0
 REQ
 [541]
 [1470]
 [1471]
 [4428]
 [4513]
 [4576]
 [SUBSET-027]
Valid for:
 MAHSR_BEML_
 SV2.2,
 MAHSR_SHI_SV
 2.2

The ODRS shall provide storage that is large enough to record all ETCS juridical data and ensure uninterrupted operation under ETCS.

2738/2738-326:0
 REQ
Valid for:
 MAHSR_BEML_
 SV2.2,
 MAHSR_SHI_SV
 2.2,
 MAHSR_BEML_
 SV2.1,
 MAHSR_SHI_SV
 2.1

3.3 Requirements ATO

The ODRS shall fulfill requirements specified in SUBSET-140 version 1.1.1-w01.

Justification: If the chosen ODRS product does not offer a suitable interface, the ODRS supplier must provide a gateway which fulfills the requirement.

2738/2738-313:0
 REQ
 [SUBSET-
 140_1.1.1-w01]
Valid for:
 MAHSR_BEML_
 SV2.2,
 MAHSR_SHI_SV
 2.2

The ODRS shall fulfill requirements specified in Interface Specification ATO - ORD: SUBSET-140 Proprietary Data.

Justification: If the chosen ODRS product does not offer a suitable interface, the ODRS supplier must provide a gateway which fulfills the requirement.

2738/2738-314:0
 REQ
 [SUBSET-
 140_PROP_DAT
 A]
Valid for:
 MAHSR_BEML_
 SV2.2,
 MAHSR_SHI_SV
 2.2

The ODRS shall provide a LAN interface to receive data from the ATO-OB.

Justification: If the chosen ODRS product does not offer a suitable interface, the ODRS supplier must provide a gateway which fulfills the requirement.

2738/2738-315:0
 REQ
Valid for:
 MAHSR_BEML_
 SV2.2,
 MAHSR_SHI_SV
 2.2

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	12 of 13
--	-----------------------------------	--------------------------	----------------

The ODRS shall record the status of the ATO isolation switch from both cabs via wired interface.

2738/2738-316:0
REQ


[4437]

Valid for:

MAHSR_BEML_
SV2.2,

MAHSR_SHI_SV
2.2

Project 67210-IN-Mumbai-Ahmedabad-NHSRCL SRS_ODRS_MAHSR_OBU DCC: Techn. Specific. and Requirements	Status: released 2025-10-27	Int ID: A6Z01000131732/-	13 of 13
--	-----------------------------------	--------------------------	----------------

	TECHNICAL DELIVERY CONDITION	Project: TRAIN B28
Aggregate	Juridical recording unit (JRU)	Drg Nos.: 843-21270
BEML Enquiry/ RFQ Reference:		

Sl. No.	Technical Delivery Conditions	COMPLIED	NOT COMPLIED
1	The firm shall supply the items as per the technical requirements in the drawings.	<input type="checkbox"/>	<input type="checkbox"/>
2	The firm shall be OEM (or) OEM authorized dealer. Authorized dealer shall submit, the relevant authorization letter from the OEM along with the Tender.	<input type="checkbox"/>	<input type="checkbox"/>
3	The firm shall submit material test certificates as specified in the drawing.	<input type="checkbox"/>	<input type="checkbox"/>
4	The firm to provide the test reports for fire safety requirement EN45545, HL2 or above test as mentioned in the drawings along with the tender.	<input type="checkbox"/>	<input type="checkbox"/>
5	The firm shall submit relevant Type test certificates and Routine test certificates.	<input type="checkbox"/>	<input type="checkbox"/>
6	The firm shall submit data sheet with vendor part number against BEML part number along with their technical offer.	<input type="checkbox"/>	<input type="checkbox"/>
7	The item shall be packed to ensure that no damage will occur during transit & storing at BEML.	<input type="checkbox"/>	<input type="checkbox"/>
8	Shall be fully compliant to the specification and the drawing	<input type="checkbox"/>	<input type="checkbox"/>
9	<p>If the firm is an OEM's authorized dealer, then firm has to submit commitment letter/ undertaking from OEM in OEM letterhead stating</p> <ol style="list-style-type: none"> 1. "Design, interface, manufacturing process, quality control, type testing shall be responsibility of OEM. 2. We have read and understood the BEML drawing & technical delivery condition (TDC) requirement and we will supply items as per BEML requirement for bid Number: BEML BID NO: _____ for B28 project. 3. We will provide all test reports for the standard mentioned in the BEML drawings for review and approval of BEML after award of contract. <p>Also, OEM has to mention their Manufacturing plant details/address of offered item for this tender.</p>	<input type="checkbox"/>	<input type="checkbox"/>
10	Delivery Schedule: 1 st Trainset – July -2026 2 nd trainset and spares – Oct-2026.	<input type="checkbox"/>	<input type="checkbox"/>

 Signature of the Bidder with Seal
 (Name, Designation & Address)



D512

Ethernet Repeater

Data Sheet

The D512 is a compact 2-port Ethernet repeater for railway applications that is completely transparent to all Ethernet protocols and offers full 10 Mbit/ 100 Mbit bandwidth in full or half duplex mode. It allows the integration of any remote device or sub-network into an Ethernet network, and thanks to its low latency, it is ideal to bridge long distances in redundant ring topologies.

The D512 is integrated in a stainless-steel housing that can be mounted on a DIN rail or onto a wall. The device is powered directly from the vehicle battery. It is designed for the harsh traction environment (-40 °C to 70 °C) and tested against EN50155 / EN50121



duagon AG
Riedstrasse 12
CH-8953 Dietikon
Phone +41 44 743 73 00
Fax +41 44 743 73 15

www.duagon.com



LEADING THE EMBEDDED FUTURE

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

Restricted

Siemens MO; Document-ID: EN1 A6Z00051560818 000 -

duagon data sheet preamble

On having purchased products described in this data sheet, the customer acquires the right to use the products according to its specified purpose and in accordance with all operation, service and maintenance instructions. All other rights to the product, duagon's intangible assets rights, belong solely to duagon and may not be deemed to have been assigned along with the sale of the products.

All product properties are fully described in the data sheet under express exclusion of any warranty for other properties. Of decisive relevance is the data sheet valid at the time of the order being placed. duagon provides a warranty that the product properties are retained during the period of warranty. Evidence that the properties of the product have been retained will be brought, always and exclusively, on duagon premises by means of a test construction pursuant to the type test.

The customer is obliged to inspect whether the products themselves are suitable for the application intended. That inspection must include the integration of the products into the intended system configuration and a check on whether the properties as per data sheet can be fulfilled once integrated into the customer's system configuration. The customer must take appropriate safety measures to ensure that any malfunction that may occur in a system configuration with other products will be absorbed by supplementary safety measures.

The period of warranty for the products is 24 months and it begins on the date the products are shipped from the factory.

The warranty that duagon assumes for the products will, at duagon's discretion, be limited either to the repair of or the replacement of the products at the duagon factory. The warranty solely covers the products or parts thereof which, despite professional handling, have become defective or unusable and which arrive at the duagon factories for repair or replacement during the period of warranty. The extent of duagon's warranty is fully set out in this data sheet. duagon cannot be held liable for consequential damage caused by a defect or for indirect damage or for consequential damage of any kind. Therefore, the customer bears all and any costs that occur due to production downtime, for example, or due to the installation or dismantling of products or due to their transportation to duagon and back.

duagon's liability and warranty do not obtain if evidence cannot be brought that the products were being operated according to its specified purpose and in accordance with all operation, service and maintenance instructions as issued by duagon.

These provisions form an integrated part of the product properties. duagon products cannot be acquired with other or more extensive degrees of warranty and liability on the part of duagon.

This data sheet is to be evaluated in accordance with **Swiss law**. The court of jurisdiction is the **seat of the vendor**. The applicability of the UN agreement as to international sales of goods (also known as "Viennese Purchasing Convention") is herewith expressly excluded.

duagon AG, Riedstrasse 12, CH-8953 Dietikon, Switzerland

Phone: +41 44 743 73 00, Fax: +41 44 743 73 15, www.duagon.com

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

Document history:

Rev.	Creation Date	Release Date	Comments	Ident-Number
1	2013-11-07	2013-11-07	See chapter 14 "Document History"	d-006967-013249
2	2014-01-15	2014-05-27		d-006967-015552
3	2015-04-01	2015-04-02		d-006967-021018
4	2015-05-04	2015-05-04		d-006967-021556
5	2016-04-01	2016-04-27		d-006967-023275
6	2018-11-06	2018-11-16		d-006967-043332
7	2019-02-21	2019-02-21		d-006967-047517
8	2019-03-19	2019-03-26		d-006967-048210
9	2021-10-15	2021-10-22		d-006967-059647

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

Table of Contents

Table of Contents	iii
1. Preface	1
1.1. Safety Guidelines	1
1.2. Typographic Conventions	2
1.3. Abbreviations.....	3
2. Introduction	4
2.1. Product Description.....	4
2.2. Hardware Architecture	6
2.3. Software Architecture	7
3. Physical Interfaces	8
3.1. Ethernet Interfaces	8
3.2. Service Interfaces	9
3.3. Power Connector.....	11
3.4. Optional Ground Bolt	12
4. Software	13
4.1. General.....	13
4.2. Range extension	13
5. Electrical Specification	15
5.1. Absolut Maximum Ratings	15
5.2. Operating Condition.....	16
6. Mechanical Specification	19
6.1. Dimensions and Weight	19
6.2. Mounting Instructions.....	20
6.3. Thermal Considerations	22
6.4. Shielding Concept.....	22
7. Environmental Specification	23
8. RAMS Specification	25
8.1. Reliability.....	25
8.2. Maintainability.....	25
9. Application Hints	26
9.1. Diagnostic by LEDs.....	26
9.2. Status Output.....	27
9.3. Power up.....	27

9.4. Reset Mechanism	27
9.5. EMI Considerations	27
10. Compliance Summary.....	28
11. Normative References.....	29
12. Links to other duagon Documents.....	31
12.1. D512 Documentation.....	31
12.2. User's Guide.....	31
13. Ordering Information	32
14. Document History.....	33
Appendix A: Power Consumption Definitions.....	34
Appendix B: Document Numbering System	35
Appendix C: Software Licensing.....	36

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

1. Preface

1.1. Safety Guidelines

Review the following safety precautions to avoid injury and prevent damage to this product or those connected to it. To avoid potential hazards, use this product only as specified.

Safety Terms and Symbols

The following safety terms and symbols may appear in this document:



WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.

NOTE. Note statements draw your attention to particularly important information relating to the product and its handling, or to part of the documentation requiring your special attention.

Use as Intended



WARNING. Connect and disconnect properly. This data sheet contains all relevant information for connecting the device.



WARNING. Power On only with all connections made. All connectors on the device must be connected (unused connections should be covered with a dummy connector).



WARNING. Ground the product. Ground connection is located on the device.



WARNING. Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult this data sheet before making connections to the product.



WARNING. Avoid exposed circuitry. Do not touch exposed connections and components when power is present.



WARNING. Do not operate with suspected failures. If you suspect there is a damage to this product, have it inspected by qualified service personnel, or return it to duagon.

Qualified Personnel

Only qualified personnel should perform installation, maintenance and service procedures.



CAUTION. Do not service with Power On. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

1.2. Typographic Conventions

The following typographic notation is used throughout this document:

Example	Description
Bold type	Indicates that a word itself or if succeeded by a colon or period the sentence following is important and therefore, emphasized. For example, Note:
<i>Italic type</i>	Indicates folder, file and function names, for example <i>d521_conf.xml</i> , <i>target</i> or <i>ip_socket</i> .
Courier type	Courier type indicates text that must be typed exactly as shown. It is used for functions, symbols and parameters. Courier type is also used for example code.
"Subheading title"	Quotation marks indicate references to sections in a document and titles of documents referenced for further reading.
0x1F	Hexadecimal number are preceded by '0x'.
0b101101	Binary numbers are preceded by '0b'.
/IOR	indicate that this signal is either active low or that it becomes active at a falling edge
CCR[3:0], SD[7:0]	Numbers in brackets and separated by a colon represent either: <ul style="list-style-type: none"> A subset of a register's named field For example, CCR[3:0] refers to bits 3-0 that are part of the host interrupt configuration of the channel configuration register. A continuous range of individual signals of a bus For example, SD[7:0] refers to signals 7-0 of the SD bus.

Table 1: Typographic Conventions Used in this Document.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

1.3. Abbreviations

Abbr.	Definition
ECN	Ethernet Consist Network
ETB	Ethernet Train Backbone
MD	Message Data
TCN	Train Communication Network

Table 2: List of Abbreviations.

Status: released HALBMEY_HAN 02.02.2022
 DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

2. Introduction

2.1. Product Description

The D512 is a compact 2-port Ethernet repeater for railway applications that is completely transparent to all Ethernet protocols and offers full 10Mbit/100Mbit bandwidth in full or half duplex mode. It allows the integration of any remote device or sub-network into an Ethernet network, and with its low latency, it is ideal to bridge long distances in redundant ring topologies.

Optionally it is available with bypass relays. In the case of bypass relays, there is a digital status output pin available.

The D512 is intended to enable 10BASE-TX or 100BASE-TX connections of more than 100 meters (for connections with a high number of connectors and/or long patch cables the limit is even less than 100 meters). The two Ethernet ports support 10BASE-TX or 100BASE-TX, Auto-Crossover and Auto-Negotiation. They are equipped with M12 connectors to guarantee a reliable connection. The D512 is powered directly from the train battery (24V to 110V) or from PoE (IEEE 802.3af).

As an option, the repeater can be ordered with a customer defined configuration for the Ethernet ports (default: Auto- Negotiation and Auto-Crossing on).

The D512 is designed for harsh rolling stock environment and fully compliant to EN50155, IEC61375 and IEEE802.3, e.g. by:

- -40 to +70°C operating temperature
- coating against humidity
- enhanced EMI and vibration robustness

Main Features

- Completely transparent to all Ethernet protocols
- Full or half duplex communication (restriction to 2 ports)
- Full 10 Mbit or 100 Mbit bandwidth (unlike "Ethernet extenders")
- Customer specific port configurations for Auto Negotiation and Auto Crossing possible
- Battery voltage input (up to 110V) eliminates the need for an external power supply

Product Identification

This data sheet describes several different product variants and revisions of the D512 product family. To identify the exact product please refer to "Labelling and Packaging – Specification", d-000778-nnnnnn. Please provide the exact network component ID (NCID) when communicating with our support team.

Online Support

For the most recent version of this document or further public information regarding this or other products please visit www.duagon.com.

After ordering a duagon product you can sign up for a login for the www.duagon.com customer area. There you will find detailed information and documentation on how to integrate your duagon product. If you need any information earlier in the design-in process, please refer to your sales contact at duagon.

For any further technical question, you can contact our application engineering team (see www.duagon.com/contact/application-engineers):

Phone: +41 (0)44 743 73 00
Email: support@duagon.com
Skype: support.duagon

Copyright

duagon is a registered trademark owned by duagon AG.

All other product names, trademarks and registered trademarks are the sole property of their respective owners.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

2.2. Hardware Architecture

2.2.1. Interfaces

Figure 1 shows the top view of a D512 equipped with LV. See chapter 13 "Ordering Information" on page 32 for available product ordering options.

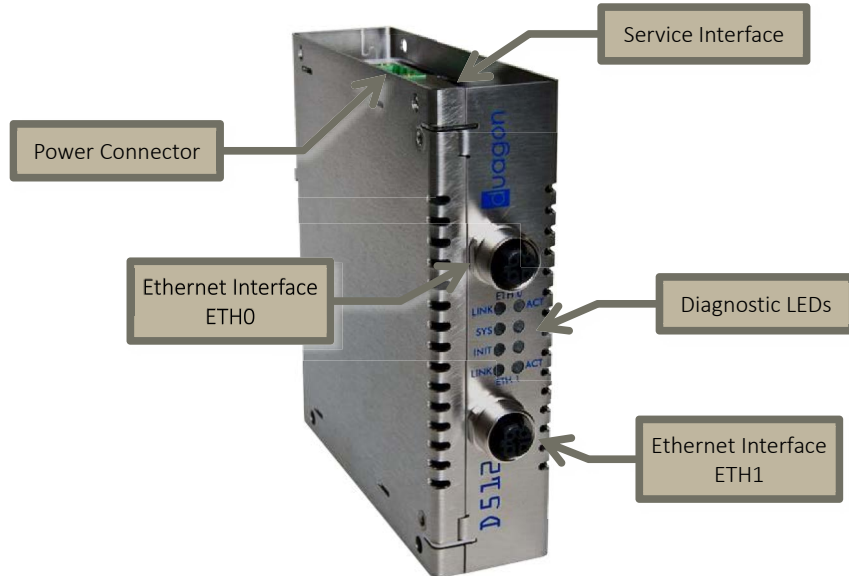


Figure 1: D512 Interfaces Overview.

For a detailed description of the interfaces see chapter 3 "Physical Interfaces" on page 8ff.

2.2.2. Function Blocks

Figure 2 and Figure 3 shows the basic function blocks of the D512 with and without bypass. For the input voltage can be chose between LV and HV. The power supply, the ethernet ports and the output are all galvanically isolated from each other.

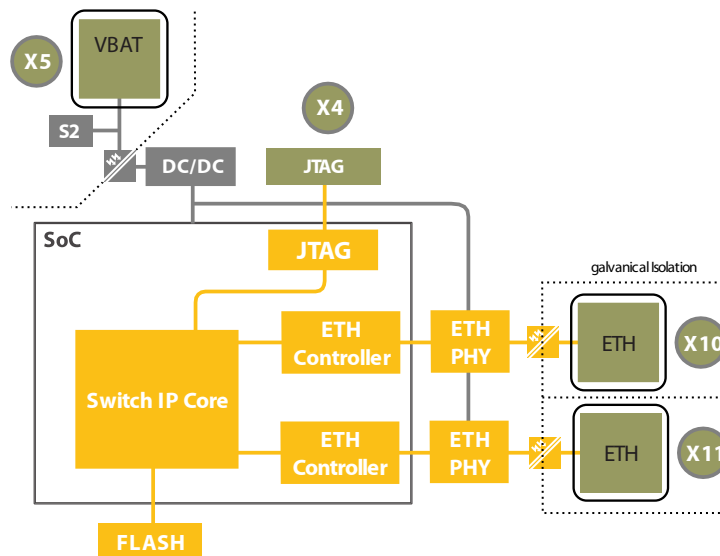


Figure 2: D512 Basic Function Blocks.

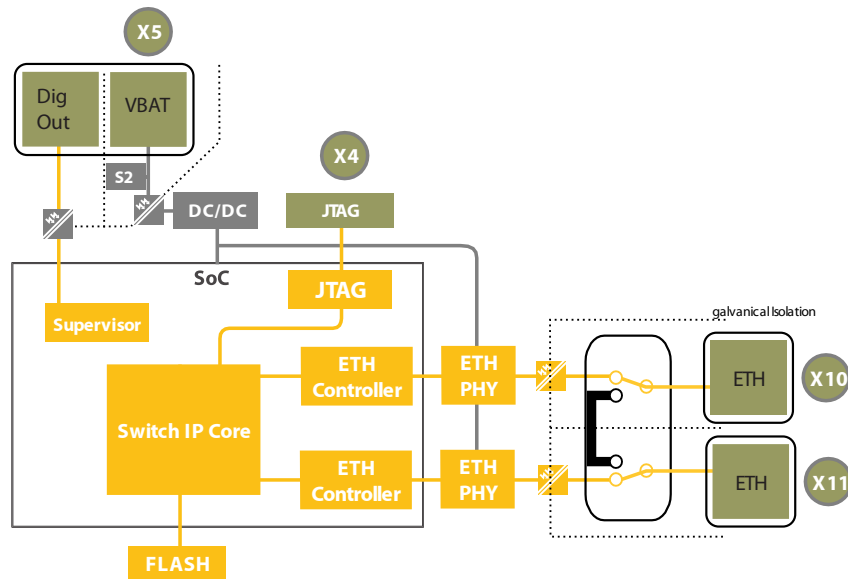


Figure 3: D512 Basic Function Blocks with Bypass

System-on-a-Chip

The "System on a Chip SoC" contains all relevant logic circuitry, like the two Ethernet MAC controller and the switching circuit. This component is implemented as a programmable logic device. This ensures the versatile change of future repeater specifications after hardware production and future portability to new silicon technologies.

Ethernet Interfaces

Two 10/100 Mb/s Ethernet interfaces are available. The interfaces are galvanically isolated from the internal logic and from each other.

Power

Power is drawn from the vehicle battery supply (or, in case of PoE, it is drawn from the PoE communication interface). This includes the supply for the two Ethernet ports as well as the internal logic.

Alternatively, the device can be powered over Ethernet (PoE) on Ethernet interface ETH0.

See "Ordering Information" on page 32 for more information about how to order PoE.

Service Interfaces

The JTAG interface is for maintenance purposes only and must not be used during regular operation. The service interface may be used to support the integration efforts or to update the devices firmware.

2.3. Software Architecture

The repeater is completely implemented in hardware (programmable logic). There is no local CPU, and, as result, no software for it.

For more information, please refer to the chapter 4 "Software" on page 13ff.

3. Physical Interfaces

3.1. Ethernet Interfaces

The D512 provides two independent Ethernet ports ETH0 (X10) and ETH1 (X11) with two female M12 connectors with screw-locking and D-coded according to IEC 61076-2-101 (shown in Figure 1).

The Ethernet interfaces are galvanically isolated to the digital logic and to each other.

The following features are supported:

- 10BASE-T and 100BASE-TX according to IEEE 802.3
- Full duplex
- Auto negotiation
- Auto-MDI-X
- Cable lengths of up to 100 m over CAT5e

When ordering the D512 it is possible to choose one of five available Ethernet link configurations (see also section "Ordering Information" on page 32):

- Auto,
- Fixed 100MBit FD,
- Fixed 100MBit HD,
- Fixed 10MBit FD,
- Fixed 10MBit HD.

In the **default "Auto" configuration** the following features are configured:

- 100Base-TX
- full duplex
- auto negotiation – On
- auto MDI/MDI-X / auto crossing – On
- Termination is 100 Ω

In the **fixed 100Mbit FD configuration** the parameters are:

- 100Base-TX
- full duplex – fixed
- auto negotiation – Off
- auto MDI/MDI-X / auto crossing – On
- Termination is 100 Ω

In the **fixed 100Mbit HD configuration** the parameters are:

- 100Base-TX
- half duplex – fixed
- auto negotiation – Off
- auto MDI/MDI-X / auto crossing – On
- Termination is 100 Ω

In the **fixed 10Mbit FD configuration** the parameters are:

- 10Base-TX
- full duplex – fixed
- auto negotiation – Off
- auto MDI/MDI-X / auto crossing – On
- Termination is 100 Ω

In the **fixed 10Mbit HD configuration** the parameters are:

- 10Base-TX
- half duplex – fixed

- auto negotiation – Off
- auto MDI/MDI-X / auto crossing – On
- Termination is 100 Ω

For more information about the availability of other customer specific configurations, please contact duagon.

Power over Ethernet (PoE)

As an option, the D512 can be powered over Ethernet. The power is carried on the signal lines (phantom powering).

See also section "Ordering Information" on page 32 for more information about how to order PoE.

Signal Assignment

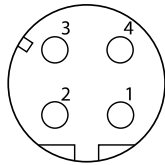


Figure 4: Ethernet M12 Connector.

Pin	Signal	PoE (optional)		Direction ¹⁾	Description
		MDI-X	MDI		
1	TX+	V+	V-	Output	Differential pair of transmit data lines (positive line)
2	RX+	V-	V+	Input	Differential pair of receive data lines (negative line)
3	TX-	V+	V-	Output	Differential pair of transmit data lines (negative line)
4	RX-	V-	V+	Input	Differential pair of receive data lines (positive line)

Table 3: Ethernet M12 Signal Assignment.

Remark:

- 1) Input and output directions are stated as seen from the D512 device.

Cabling

The employed M12 D-coded connector (socket) is compatible with IEC 61076-3-104 connector plugs. The recommended cables conform to ISO/IEC 11801 and IEC 61156-6 Class D (Category 5e) with two twisted pairs and should be shielded. For inter-car connection the wire cross section should be 0.5 mm² (AWG20). For intra-car connections a minimum wire cross section of 0.25 mm² should be used. The recommended tightening torque for the M12 connectors is 0.6 Nm.

For more information, see also the document "Material and Components for Wiring of duagon Products", d-000842-nnnnnn.



CAUTION. Applying more than the recommended tightening torque of 0.6 Nm when attaching an Ethernet cable may put strain on the socket and thus damage the printed circuit board!

3.2. Service Interfaces

3.2.1. JTAG Interface

The D512 provides a JTAG interface for developing custom application and performing firmware updates. For the location of the connector on the device please refer to Figure 1 on page 6. Figure 5 below shows a D512 with the connected JTAG adapter (USB Blaster). Note the location of pin 1.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

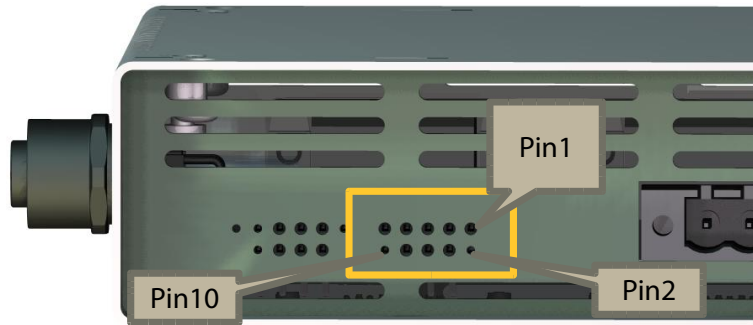


Figure 5: USB Blaster Setup.



CAUTION. Do never connect any other signal to this port. Connecting signals with a higher voltage than 3.3 V can seriously damage the device.

Signal Assignment

The JTAG connector (female header) has the following pin out:

Pin	Signal	Direction ¹⁾	Description
1	TCK	Input	Test clock
2	GND	Input	Signal ground
3	TDO	Output	Test data output
4	VTG	Output	Target power supply ²⁾
5	TMS	Input	Test mode select input
6	3V3	Input	Supply voltage V_{CC} ³⁾
7	Reserved	-	Do not use, internally connected
8	Reserved	-	Do not use, internally connected
9	TDI	Input	Test data input
10	GND	Input	Signal ground

Table 4: JTAG Signal Assignment.

Remarks:

- 1) Input and output directions are stated as seen from the D512 device.
- 2) The VTG signal is used by the JTAG programmer to adjust the signal logic levels according to the targets supply voltage.
- 3) The 3V3 signal is connected to the internal 3.3 V. This pin may be used to power the device during programming. Do not use as power supply for the external debugging devices.
- 4) All voltages are 3.3 V low voltage logic compatible.



CAUTION. If you are using your own JTAG programmer, make sure to not connect pin 7 and 8. These pins are internally connected and used for production purposes.

3.3. Power Connector

The D512 is powered directly from the vehicle battery via power connector. Alternatively, the device can be powered over Ethernet (see chapter 13 "Ordering Information" on page 32 for more information).

In the case of bypass relays, there is a digital status output pin available on the power connector.

Signal Assignment

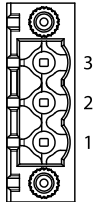


Figure 6: Power Connector – 3 poles

Pin	Signal	Description
1	-VBAT	Battery power supply; negative pole
2	CASE	Protective Earth
3	+VBAT	Battery power supply; positive pole

Table 5: Power Connector Signal Assignment – 3 poles.

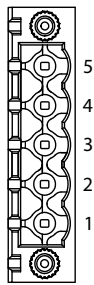


Figure 7: Power Connector – 5 poles

Pin	Signal	Description
1	Dout	High side switch status output
2	+V_Dout	Status output supply
3	-VBAT	Battery power supply; negative pole
4	CASE	Protective Earth
5	+VBAT	Battery power supply; positive pole

Table 6: Power Connector Signal Assignment – 5 poles.

Cabling

The 3-pin or 5-pin power connector with 5 mm pitch is of type Phoenix Contact MSTB 2,5 / 3-GF or MSTB 2,5 / 5-GF. The connector supports wires with a cross section of up to 2.5 mm².

Please check "Material and Components for Wiring of duagon Products", d-000842-nnnnnn for appropriate counterparts.

3.4. Optional Ground Bolt

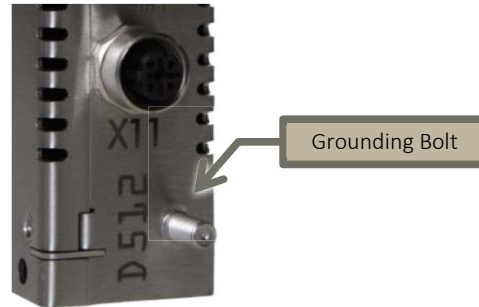


Figure 7: D512 Grounding Bolt.

The optional ground bolt (M5x11 mm) offers an alternative ground connection (default: grounding over DIN-rail).

Refer to section "Connection an Earthing Cable" on page 21 for cable mounting instructions.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

4. Software

4.1. General

The repeater is completely implemented in hardware (programmable logic). There is no local CPU, and, as result, no software for it.

The D512 repeater is completely transparent to all Ethernet protocols. Every Ethernet frame (valid or not) that is received on one of the two Ethernet interfaces will be transmitted on the other Ethernet interface regardless of the address information in the frame.

The functionality of the repeater can be described as a fast-forwarding 2-port switch (Note: Links will be established independently on the two Ethernet ports) without any MAC address learning. Because of the fast-forwarding mode (packets are already forwarded while they are received), the introduced latency is approximately 2 μ s.

4.2. Range extension

The D512 can be used to realize 10BASE-TX or 100BASE-TX connections greater than 100 meters in length. For connections with a high number of connectors and/or long patch cables the limit is considerably lower than 100 meters.

4.2.1. Range extension in redundant ring topologies

While a range extension in tree, star or line topologies could also be realized with any unmanaged switch, for redundant topologies an expensive (managed) switch that supports the used redundancy protocol, or a repeater is necessary.

In the redundant ring example below (ring with 3 ring-switches is marked yellow; RM= Ring Master; dotted line means that the connection is logically disabled by the ring master), device A sends telegram T1 cyclically to device B, and device B sends telegram T2 cyclically to device C.

With the D512 repeater, the topology can change if a ring-connection is broken (marked red in drawing), and both telegrams (T1 and T2) will still reach their destination over new routes (see second drawing):

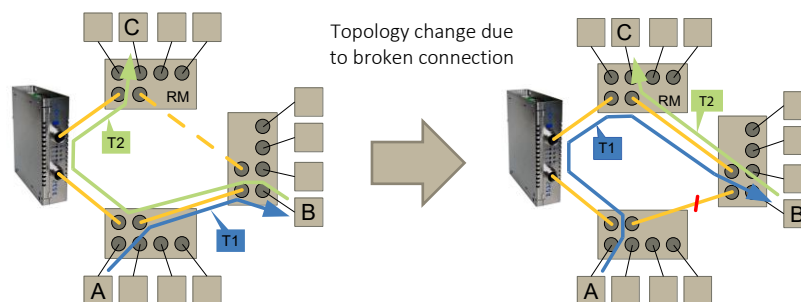


Figure 8: Topology.

If the D512 would be replaced by a switch that does not support the used redundancy protocol, communication would fail after the topology change:

In the standard topology (first drawing), the switch would learn (by forwarding telegram T2), that device B is connected to the same port as device A. If the topology would change, the switch would drop telegram T1, because it learned that the device B is connected to the port where it received the telegram. Telegram T1 would never reach

device B until the MAC table entry for device B on the switch times out (usually within some minutes), and the telegram is forwarded.

With a (managed) switch that supports the used redundancy protocol (for example MRP), communication would immediately be ok after the topology change, because the ring master issues a telegram (redundancy protocol) that causes all switches to reset their MAC tables when the topology changes.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

5. Electrical Specification

5.1. Absolut Maximum Ratings

$T_A = -40$ to $+70$ °C, typical values for $T_A = 25$ °C (unless otherwise specified).

LV-Version

This paragraph applies to the LV versions only (cf. chapter 13 "Ordering Information", page 32).

Symbol	Parameter/Conditions	Min.	Typ.	Max.	Unit
V_{BAT}	Supply Voltage, with respect to V_{BAT-}	-50.4	-	50.4	V
$V_{IN, DEBUG}$	Input Voltage Serial and JTAG pins, with respect to GND	-0.3	-	3.6	V

Table 7: D512-LV Absolute Maximum Ratings.



CAUTION. Exceeding the absolute maximum ratings stated in Table 7 may irreversibly damage the device.

HV-Version

This paragraph applies to the HV versions only (cf. chapter 13 "Ordering Information", page 32).

Symbol	Parameter/Conditions	Min.	Typ.	Max.	Unit
V_{BAT}	Supply Voltage, with respect to V_{BAT-}	-154	-	154	V
$V_{IN, DEBUG}$	Input Voltage Serial and JTAG pins, with respect to GND	-0.3	-	3.6	V

Table 8: D512-HV Absolute Maximum Ratings.



CAUTION. Exceeding the absolute maximum ratings stated in Table 7 may irreversibly damage the device.

5.2. Operating Condition

5.2.1. Power Supply

LV-Version

This paragraph applies to the LV versions only (cf. chapter 13 "Ordering Information", page 32).

Symbol	Parameter /Conditions	Nom. /			Unit	EN 50155:2017
		Min.	Typ.	Max.		
V_{BAT}	Variations, fluctuations, supply change over	0.6 ¹⁾	1	1.4 ¹⁾	$\times U_n$	5.1.1.1 5.1.1.2 5.1.1.3 5.1.3 (Class C1)
$t_{interrupt}$	Supply interruption time	10	-	-	ms	5.1.1.4 (Class S2)
γ	DC ripple factor	-	-	5	%	5.1.1.6
V_{BAT}	Supply voltage with respect to $-V_{BAT}$; operating	14.4	24 36 ($\cong U_n$)	50.4	V	Nominal value according to 5.1.1.1; outer limits include the variations, fluctuations ¹⁾ and supply changeover.
	Supply voltage with respect to $-V_{BAT}$; non-operating.	-50.4	-	50.4	V	Survives erroneous polarity reversal.
V_{UVLO1}	UVLO detector threshold; $+V_{BAT}$ falling.	-	12.2	-	V	7.2.6
V_{UVLO2}	UVLO released voltage; $+V_{BAT}$ rising	-	13.4	-	V	7.2.6
I^2t	Inrush current	-	0.36	-	A ² ms	7.2.8 @36 V
P_{idle}	Power drawn from V_{BAT} during idle operation	-	1.0	-	W	-
P_{nom}	Power drawn from V_{BAT} during normal operation	-	1.4	-	W	-
P_{max}	Absolute maximum power draw from V_{BAT} .	-	-	3	W	-

Table 9: D512-LV Power Supply Operating Conditions.

Remarks:

- 1) In extension to the standard reference, there is no limitation with respect to the duration.
- 2) For detailed definition of the inrush current and power consumption see Figure 17 in "Appendix A" on page 34.

HV-Version

This paragraph applies to the HV versions only (cf. chapter 13 "Ordering Information", page 32).

Symbol	Parameter /Conditions	Nom. /			Unit	EN 50155:2017
		Min.	Typ.	Max.		
V_{BAT}	Variations, fluctuations, supply change over	0.6 ¹⁾	1	1.4 ¹⁾	$\times U_n$	5.1.1.1 5.1.1.2 5.1.1.3 5.1.3 (Class C1)
$t_{interrupt}$	Supply interruption time	10	-	-	ms	5.1.1.4 (Class S2)
γ	DC ripple factor	-	-	5	%	5.1.1.6
V_{BAT}	Supply voltage with respect to $-V_{BAT}$; operating	28.8	48 72 96 110 ($\cong U_n$)	154	V	Nominal value according to 5.1.1.1; outer limits include the variations, fluctuations ¹⁾ and supply changeover.
	Supply voltage with respect to $-V_{BAT}$; non-operating.	-154	-	154	V	Survives erroneous polarity reversal.
V_{UVLO1}	UVLO detector threshold; $+V_{BAT}$ falling	-	24.8	-	V	7.2.6
V_{UVLO2}	UVLO released voltage; $+V_{BAT}$ rising	-	26.2	-	V	7.2.6
I^2t	Inrush current	-	1.5	-	A ² ms	7.2.8 @ 110 V
P_{idle}	Power drawn from V_{BAT} during idle operation	-	0.75	-	W	-
P_{nom}	Power drawn from V_{BAT} during normal operation	-	1.0	-	W	-
P_{max}	Absolute maximum power draw from V_{BAT}	-	-	3	W	-

Table 10: D512-HV Power Supply Operating Conditions.

Remarks:

- 1) In extension to the standard reference, there is no limitation with respect to the duration.
- 2) For detailed definition of the inrush current and power consumption see Figure 17 in "Appendix A" on page 34.

5.2.2. Outputs Operating Conditions

Symbol	Parameter /Conditions	Min.	Nom. / Typ.	Max.	Unit	Comment
$V_{DOUT, max}$	Maximum output supply voltage	-	-	154	V	Absolute maximum ratings
V_{DOUT}	Operating output supply voltage	0	-	154	V	Supplied by user
V_{high}	High output voltage	0.9	-	-	V_{Dout}	@ $I_{load}=50$ mA, $V_{Dout}=16.8-137.5$ V
V_{low}	Low output voltage	-	-	0.1	V_{Dout}	@Load=10 k Ω , $V_{Dout}=16.8-137.5$ V
I_{load}	Load current	0	-	50	mA	Absolute maximum ratings
I_{leak}	Leakage current	-	-	0.1	mA	Supplied by user

Table 11: D512 Output Operating Conditions.

6. Mechanical Specification

6.1. Dimensions and Weight

The figures below show details about the mechanical integration of the device. All measurements are given in millimeters.

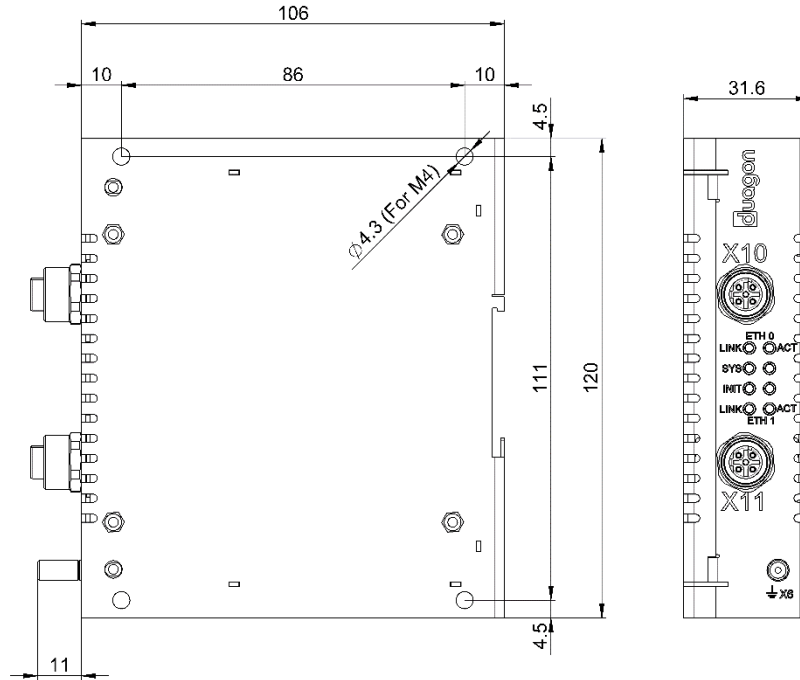


Figure 9: D512 Mechanical Dimensions.

Parameter	Value	Unit	Remarks
Height	120	mm	-
Width	31.6	mm	-
Length	106.0	mm	Without connectors
Ingress protection	IP30	-	-
Weight ¹⁾	415	g	-

Table 12: Mechanical Specification.

The material of the housing shell is stainless steel. The thickness of the sheet metal is 1 mm.

Remark:

- 1) The precise weight of the device may vary according to the selected ordering options.

6.2. Mounting Instructions

6.2.1. Mounting on Rail TH35 DIN Rail

The back wall of the D512 includes the retaining clip needed for mounting on a 35 mm top hat DIN rail (TH35). The mounting rail TH35 is available in two different thicknesses, 7.5 mm (TH35-7.5) and 15 mm (TH35-15). We recommend the more stable TH35-15, due to the omnipresent vibrations on railway vehicles. However, the D512 will also fit on the lighter mounting rail.

Follow these steps to mount the D512 to a DIN rail:

1. Align the back wall of the D512 to the DIN rail.
2. Clip the lower DIN rail guide groove onto the DIN rail. Make sure that the retaining clip is placed behind the DIN rail.
3. Firmly push the D512 towards the DIN rail until its upper DIN rail guide groove clicks into place on the rail.



Figure 10: Mounting on a DIN Rail (TH35).

6.2.2. Mounting on a Wall or a Horizontal Surface

The D512 can be mounted directly on to a wall or a horizontal surface using four M3 screws (not included in the delivery). See Figure 11 for the location of the four mounting holes.

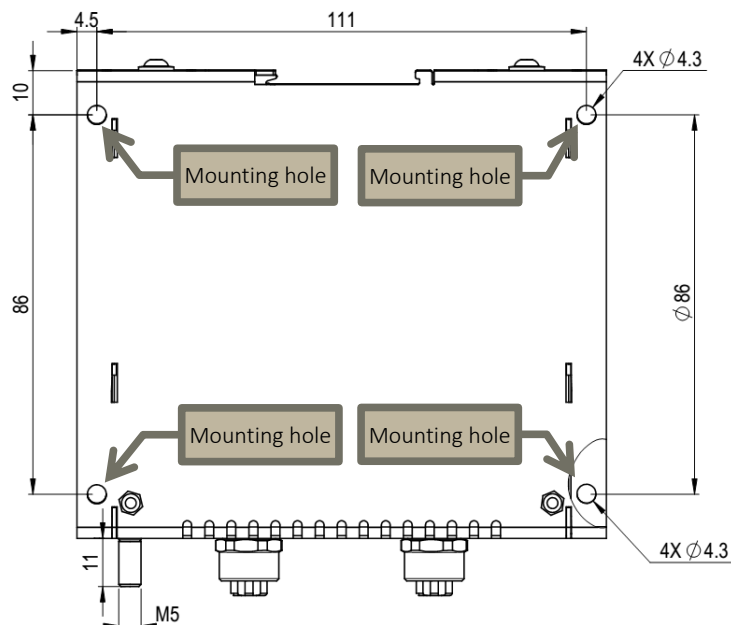


Figure 11: Mounting on a Wall or a Horizontal Surface.

It is recommended to use M3 screws with cylinder head and hexagonal socket. The tightening torque should be max 2.0 Nm.

The screws have to be placed on the internal side of the device (see Figure 12).

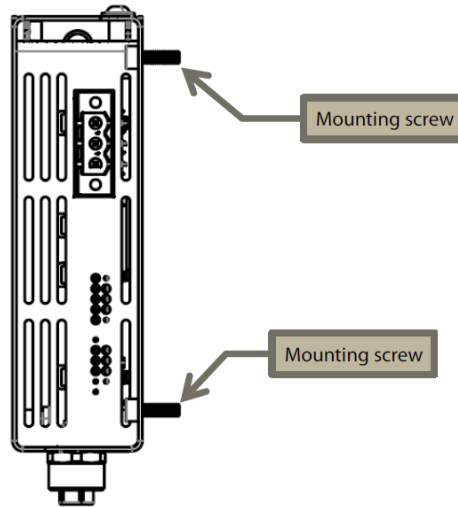


Figure 12: Top View with Mounting Screw.

NOTE. The necessary length of the M4 screws to mount the D512 depends on the structure of the surface.

6.2.3. Connection an Earthing Cable

This paragraph applies to the D512 with grounding bolt (-G) versions only (cf. chapter 13 "Ordering Information", page 32).

It is recommended to use an M5 ring cable lug for the ground connection over the grounding bolt. For the cable duagon recommends the following specifications:

- Wire cross section > 1.5 mm²
- Cable length < 30 cm
- Tightening torque ~2 Nm

To guarantee a good ground connection, two washers, a spring washer and a M5 nut are required, mounted as shown in the picture below.

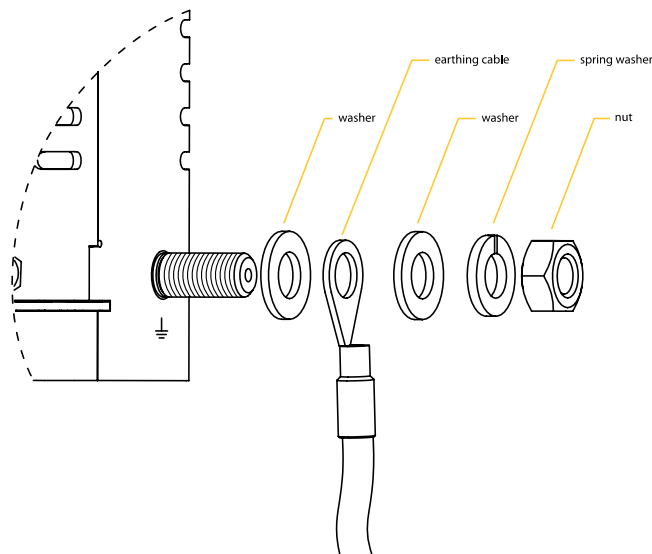


Figure 13: Mounting Instructions for Earthing Cable.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

6.3. Thermal Considerations

The power dissipation of the D512 does not raise further thermal requirements for the integration. In general, natural convection cooling is sufficient, assuming that the device's top and bottom keep-out zones have been observed see Figure 14.



CAUTION. Using the device outside of the specified operation temperature range may lead to damages to the device itself. Please refer to "Environmental Specification" for more information.

The D512 is cooled by natural convection and is designed for fan-less operation. Make sure to leave the minimum space of 5 cm around the ventilation slots marked in Figure 14 to allow for the required airflow.

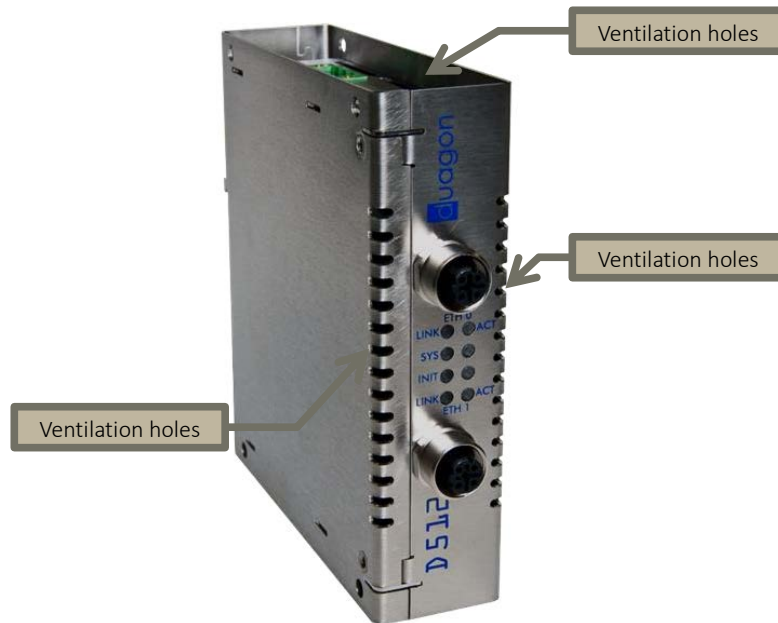


Figure 14: D512 Convection Cooling.

6.4. Shielding Concept

In general, the application of a proper shielding concept is the responsibility of the customer. This section outlines a few guidelines to support a proper shielding concept. The main properties are:

- The cable shield is connected to the device housing.
- The cable shield has in all nodes the same connection to the device housing.
- The signal lines are galvanically isolated to the D512 inner logic.

Consequently, all housings are connected. Within the vehicle concept it must be ensured, that there are no ground potential differences that may harm the cable shield or the connectors.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

7. Environmental Specification

Requirement	Min.	Typ.	Max.	Unit	EN 50155:2017
Altitude above sea level	-	-	1800	m	4.3.1: According to EN 5012-1, Table 1, Class AX. ¹⁾
Operational temperature range, "internal cubicle temperature".	-40	-	+70	°C	4.3.2: Class OT4.
Storage Temperature Range	-40	-	+85	°C	-
Switch-on extended Operating temperature	-	-	+85	°C	4.3.3: Class ST1.
Rapid temperature variations	-	-	-	-	4.3.4: Class H1.
Useful life	-	-	-	-	6.2: Unless otherwise specified the requirements of class L4 apply.
Preventive Maintenance	-	-	-	-	6.3.2: Unless otherwise specified, no periodic maintenance applies.
Pollution degree	-	-	-	-	7.2.1: Pollution degree, Class PD2
Insulation coordination	-	-	-	-	7.2.1: Unless otherwise specified, the requirements of PD2 of EN 50124-1 and this standard apply.
Protective coating class	-	-	-	-	10.7: Protective coating, Class PC2
Cooling and Ventilation	-	-	-	-	10.10: Unless otherwise specified, forced ventilation for cooling the equipment is not allowed.
Fire behavior	-	-	-	-	11.3: Test R24, Class HL3 in accordance with EN 45545-2.
Programmable component (FPGA, PLD, ASIC, etc.)	-	-	-	-	12.7.7.3: Unless otherwise specified the requirements of class M0 apply.
Relative humidity	-	<75	95	%	13.4.7: Typical value for yearly average, max value for 30 consecutive days per year. Short term moisture condensation without malfunction (EN 60068-2-30).
Vibration	-	-	2 50	mm m/s ²	13.4.11: According to EN 61373 Class B: for 5 – 20 Hz for 20 – 150 Hz decreasing by 6 dB/oct.
Shock	-	-	50	m/s ²	13.4.11: According to EN 61373 Class B: Duration 30 ms.
RoHS	-	-	-	-	European Directive 2002/95/EU.
REACH	-	-	-	-	European Regulation No 1907/2006.

Table 13: Environmental Specification.

Remark:

- 1) For derating of maximum temperature with respect to altitude levels in excess please contact duagon.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

8. RAMS Specification

8.1. Reliability

A summary of MTBF calculations can be found in the document "**D512 MTBF calculation (IEC 62380)**", d-017746-nnnnnn.

8.2. Maintainability

In general, duagon products are developed in a maintenance free manner by, where possible, not using components with limited useful life such as electrolytic capacitors. Exceptions are the usage of flash memory devices with limited data retention and RTC batteries, that are employed in certain devices.

Therefore, the D512 requires no maintenance task at maintenance levels 1 to 2. The maintenance levels are defined in accordance with EN 13306.

For maintenance level 4, duagon describes a single task, which is a preventive maintenance task described in "Preventive Maintenance".

Useful life

The D512 contains following components with a limited useful life:

- Reprogrammable components (Flash Memory). These are specified from the manufacturer with 20 years data retention at 25 °C, which fits clause 6.2. The actual "useful life" may be extended by reprogramming these devices. Please refer to paragraph "Preventive Maintenance" on page 25 for details on reprogramming devices.

The useful life of 20 years is therefore fully compliant with EN 50155, useful life class L4.

Remark: There are no other components with a limited useful life. Particularly, there are no electrolytic capacitors, which typically introduce a limitation on useful life.

Preventive Maintenance

Maintenance Level 4

Although the flash memory component employed by duagon products has a data retention of 20 years at 25 °C, duagon recommends reprogramming devices after 10 years to extend the device's useful life.

Detailed description of the programming procedure can be found in the "Programming Guide for duagon UE2G Products", d-002247-nnnnnn.

Corrective Maintenance

Maintenance Level 3

The line replaceable unit (LRU) is, in case of duagon products, the product itself. Therefore, the only corrective maintenance task performed on the vehicle is to replace the LRU.

Maintenance Level 5

Please contact the duagon support if you encounter any technical issues that require further corrective maintenance tasks.

9. Application Hints

9.1. Diagnostic by LEDs

Figure 15 shows all available diagnostics LEDs of the D512. The description follows in the paragraphs below.



Figure 15: Diagnostic LEDs (Front View).

The light guides to extend the LEDs to the exterior can be added as a product ordering option (please refer to "Ordering Information" on page 32).

9.1.1. General Purpose LEDs

A set of eight general purpose diagnostic LEDs is used for self-test purposes. When an error is encountered during self-tests, the LEDs display the test number. This can be used to troubleshoot the failure more efficiently.

9.1.2. Device Status

The status LEDs "SYS" and "INIT" display the general state of the D512.

LED	Color	Description
SYS	green	Power on, no error
	red	An error occurred (Refer to the diagnostic web page or the service serial line to find out more about the error).
	off	Device not powered.
INIT	yellow	Initialization or firmware update ongoing: Not the full functionality available.
	off	Normal operation mode

Table 14: Device Status LEDs.

9.1.3. Ethernet

Both Ethernet interfaces - ETH0 and ETH1 - have two LEDs that display the activity of the corresponding Ethernet link.

LED	Color	Description
LINK	green	An Ethernet link is available on ETH0 / ETH1.
	off	There is no Ethernet link available on ETH0 / ETH1.
ACT	yellow	The interface ETH0 / ETH1 is sending or receiving data.
	off	No activity on the interface ETH0 / ETH1.

Table 15: Ethernet Diagnostic LEDs.

9.2. Status Output

The D512 with bypass relays provides one status output, which can be used to monitor the current device status. The status output is implemented using a MOSFET output stage and is galvanically isolated to the vehicle battery, the Ethernet and the internal logic. The status output is referenced to a user-supplied supply voltage.

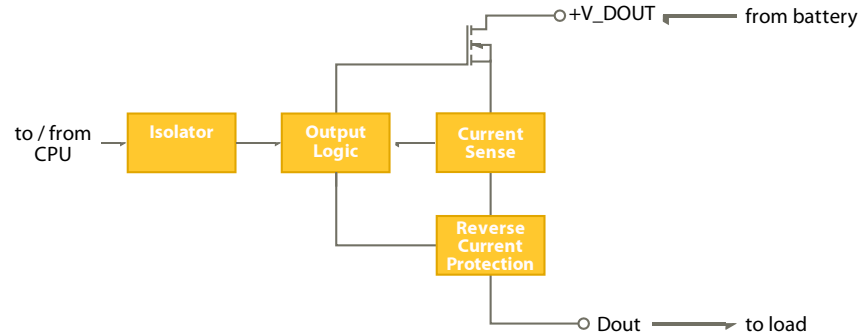


Figure 16: Status Output.

During normal operation, the output will toggle with a defined frequency of 10 Hz. Therefore, the digital output will toggle between high and off. In case of an error or power loss, the relay will keep the steady state off. In case of a male function of the relay, the steady state can also be high. This means, that the relay is not working properly, and the device needs to be repaired.

9.3. Power up

The D512 will need a certain time to start up, as the device must load the PLD before starting the actual application. This procedure takes, in typical systems, up to approx. 1 second and is automatically performed. During this process, the device is completely passive to the outside.

9.4. Reset Mechanism

The device will reset itself after power-up or when the power supply voltage drops below a certain level and comes back up again (see section 5.2 "Operating Condition" on page 16).

9.5. EMI Considerations

The D512 has been tested for compliance to applicable electromagnetic interference norms (see chapter 10 "Compliance Summary") maintaining requirements described in section 6.4 "Shielding Concept".

Furthermore, it is assumed that the following requirements for the deployment of the D512 are met:

- The signal lines attached to the device use shielded cabling.
- The device case is properly connected to protective earth using:
 - DIN rail (if the device was mounted on a DIN rail)
 - Power connector (see section Power Connector)
 - Grounding bolt (optional; see chapter 13 "Ordering Information" on page 32" for more information)

10. Compliance Summary

Test Report Compliance Summary

Table 16 lists the type and routine tests performed on the D512.

Test	Reference		Remarks
	Type	Routine	
Visual inspection	yes	yes	13.4.1 Refer to "Quality Plan for duagon Products – Specification", d-000796-nnnnnnn
Performance test	yes	yes	13.4.2 Refer to "Quality Plan for duagon Products – Specification", d-000796-nnnnnnn
Low temperature start-up test	yes	no	13.4.4 EN 60068-2-1, Test Ab, -40 °C (2 h), Criterion A
Dry heat test	yes	no	13.4.5 EN 60068-2-2, Test Bd, +70 °C (6 h), +85 °C (10 min.).
Cyclic damp heat test	yes	no	13.4.7 EN 60068-2-30, Test Db, 2 cycles at 55 °C
Supply variations and interruption test.	yes	no	13.4.3.2 13.4.3.3 13.4.3.4 Supply voltage: Steady-state operation from 0.6 Un to 1.4 Un: Criterion A Interruption test 10 ms; (Class S2), Low supply impedance, Criterion A
EMC test	yes	no	13.4.8 According to EN 50121-3-2
Insulation test	yes	yes	13.4.9 According to EN 50155 and IEEE 802.3.
Salt mist test	no	no	13.4.10 -
Vibration and shock test	yes	no	13.4.11 EN 61373, category 1, Class B
Enclosure protection test (IP code)	no	no	13.4.12 EN 60529, IP30.
Equipment stress screening	yes	yes	13.4.13 Thermal cycling only
Low temperature storage test	yes	no	13.4.6 EN 60068-2-1, Test Ab, -40 °C, 2 h

Table 16: Test Report Compliance Summary.

Remarks:

- **Type** tests are carried out to verify the specified requirement and are performed on a limited number of devices of a given design and manufacturing procedure.
- **Routine** tests are performed on each manufactured device and are carried out to verify that the devices meet the specified requirements and correspond to the results of the type test.

11. Normative References

The following document, in whole or in part, are normatively referenced in this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

Railway Applications

EN 50155:2017, Railway applications - Rolling stock - Electronic equipment.¹

EN 50129:2003, Railway applications – Communication, signaling and processing systems - Safety related electronic systems for signaling.

EN 50128:2011, Railway applications - Communication, signaling and processing systems - Software for railway control and protection systems.

Electromagnetic Compatibility

EN 50121-3-2:2016, Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus.

Environmental Conditions

EN 50125-1:2014, Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment.

Train Communication Network (TCN)

IEC 61375-1:2012, Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture.

Ethernet

IEEE 802.3:2012, IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.

Ethernet Connector

IEC 61076-2-101:2003, Connectors for electronic equipment - Part 2-101: Circular connectors - Detail specification for circular connectors M8 with screw- or snap-locking, M12 with screw-locking for low voltage applications.

Ethernet Consist Network

IEC 61375-3-4:2014, Electronic railway equipment – Train communication network (TCN) - Part 3-4: Ethernet Consist Network (ECN)

Ethernet Train Backbone

IEC 61375-2-5:2014, Electronic railway equipment – Train communication network (TCN) - Part 2-5: Ethernet Train Backbone (ETC)

TRDP

IEC 61375-2-3:2015, Electronic railway equipment - Train communication network (TCN) - Part 2-3: TCN communication profile

¹ Firmware released before the 13th October 2020 (DOW of EN 50155:2017) is considered as pre-existing and therefore not in the scope of EN 507657:2017, section 1.9.

Fire and Smoke

EN 45545-2:2013, Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Maintenance

EN 13306:2017, Maintenance. Maintenance terminology.

Shock and Vibration

EN 61373:2010, Railway applications - Rolling stock equipment - Shock and vibration tests.

Damp Heat

EN 60068-2-30:2005, Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h +12 h cycle) (IEC 60068-2-30:2005).

Low Temperature

EN 60068-2-1:2007, Environmental testing — Part 2-1: Tests — Test A: Cold (IEC 60068-2-1:1990).

Dry Heat

EN 60068-2-2:2008, Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2:1974 + IEC 60068-2-2A:1976).

Ingress Protection

EN 60529: 1991 + A1:2000, Degrees of Protection Provided by Enclosures (IP Code).

RoHS

2002/95/EU, Directive of the European Parliament and of the Council on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS compliance).

REACH

1907/2006, Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

12. Links to other duagon Documents

In general, most of the documents linked in this chapter are located on www.duagon.com, and may be downloaded from there in the most up to date version. In case of difficulties accessing the documents please contact your duagon sales representative or send an e-mail to mail@duagon.com.

12.1. D512 Documentation

D512 MTBF calculation (IEC 62380), d-017746-nnnnnn

This document contains a summary of MTBF calculations for the D512.

12.2. User's Guide

Configuration – User's Guide, d-001785-nnnnnn

This document describes the configuration options on duagon interfaces. The configuration mainly includes fieldbus and host-interface related parameters.

Programming Guide for duagon UE2G Products, d-002247-nnnnnn

This document describes how to program and update duagon UE2G products. It is also a guide on how to set up a computer to perform these actions.

Labelling and Packaging – Specification, d-000778-nnnnnn

This document describes all product labels (e.g. serial number label) used in relation with customers. It describes furthermore how duagon packs the products for shipment.

Quality Plan for duagon Products – Specification, d-000796-nnnnnn

This document is a specification about test procedures for series testing of duagon products. It is valid for all duagon products in general. For each specific product an applicable subset of the described tests is selected; according to the procedures specified here.

Product Ordering Guide, d-013426-nnnnnn

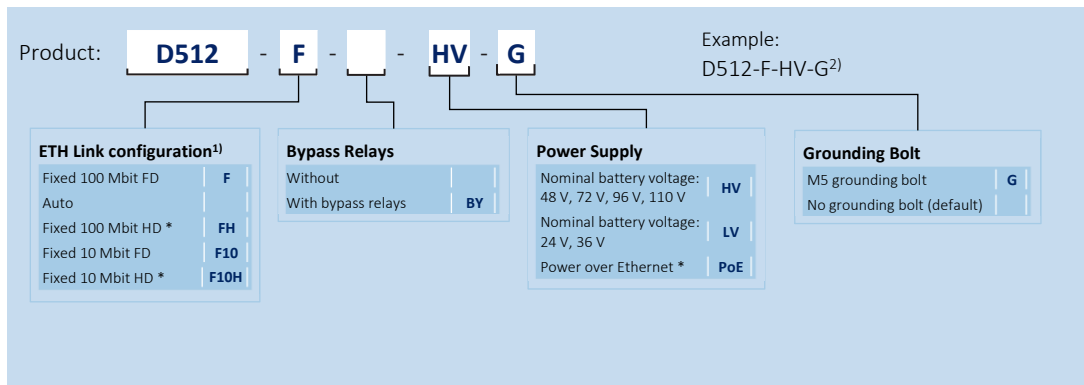
General duagon product ordering guide explaining product names including the order options and the NCID number used to identify hardware and firmware revisions.

Material and Components for Wiring of duagon Products, d-000842-nnnnnn

This document is intended for engineers to help them to select the right components used in transportation vehicles. It gives a short overview about connectors and cables suitable for the wiring of duagon products.

13. Ordering Information

The following table illustrates the different order options available for the D512 and how the order code is built. For additional information of how the complete order code is built see "Product Ordering Guide", d-013426-nnnnnn.



* contact duagon for lead times and availability

Remarks:

- 1) For a description of the two configuration options "Auto" and "Fixed" please refer to section Ethernet Interfaces on page 8.
- 2) Default ordering options

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

14. Document History

d-006967-059647

- Updated to new template
- Update according EN 50155:2017

d-006967-048210

- Section "Mounting Grounding Cable" added
- Isolation / insulation corrected
- Table / Figure description unified

d-006967-047517

- Update order option: changed F100H to FH

d-006967-043332

- Changed option Fixed (F) to Fixed 100MBit FD (F)
- Added options Fixed 100Mbit HD (F100H), Fixed 10Mbit HD (F10H), Fixed 100Mbit FD (F10D)
- Updated normative references (EMC)
- General update (minor changes) based on the new data sheet template

d-006967-023275

- Added information about product D512 with bypass relays
- Added information about X5 mating connector with status output

d-006967-021556

- Added information about X5 mating connectors
- Added figure with information about the position of the mounting holes

d-006967-021018

- Changed "auto MDI/MDI-X / auto crossing – Off, configuration" to "fixed to straight mode" (before it was: "fixed to straight mode")
- In conjunction with the above-mentioned change also adapted Ethernet pinout (RX <-> TX)

d-006967-015552

- Replaced pictures
- Added M5 grounding bolt
- Added options "Auto" or "Fixed"
- Changed Ethernet pinout (RX <-> TX)
- General update (minor changes)

d-006967-013249

- First Release

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

Appendix A: Power Consumption Definitions

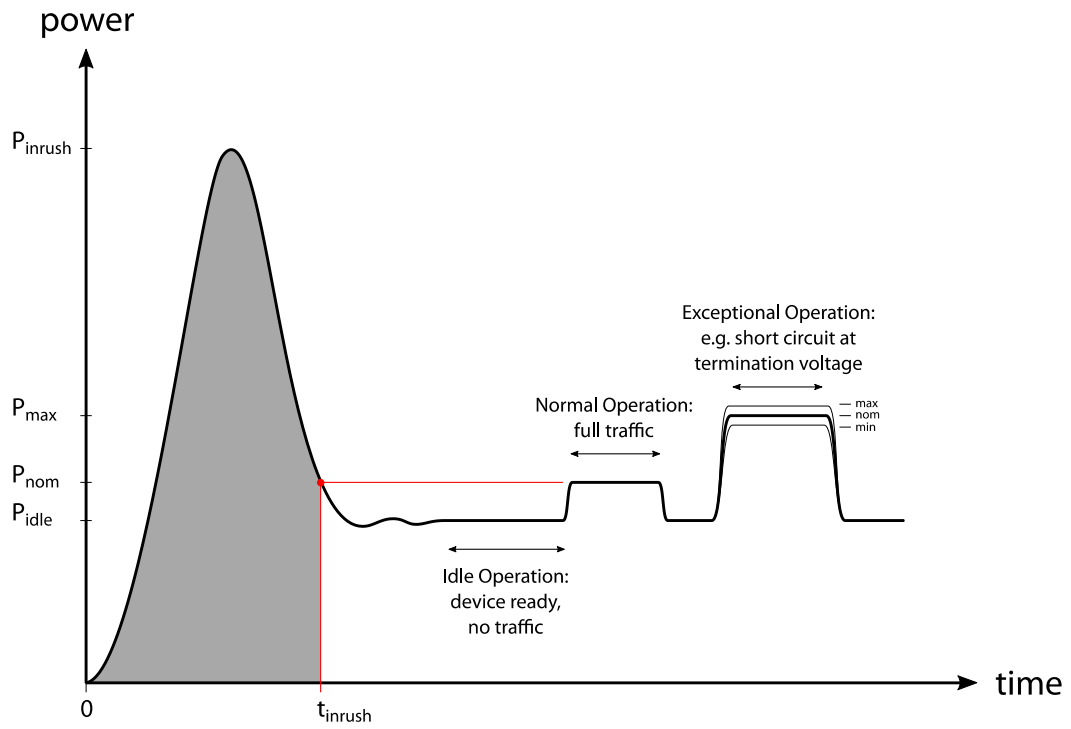


Figure 17: Power Consumption Definitions.

Status: released HALBMEY_HAN 02.02.2022
 DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

Appendix B: Document Numbering System

All duagon documents have a unique identification number. The identification number has a certain internal structure to ease the tracking of different documents. In general, there are two parts:

Prefix	Document number	Filing number
d	-000310	-001952
Always constant	<p>Specifies a certain purpose of a document with the intention to link several documents with different filing number.</p> <p>Please note, that the purpose of the document number is not stored for each document number, but can be derived from the document title, which is stored for each Filing number.</p> <p>The format is either 6 digits or not available.</p>	<p>Unique number, that identifies a document. Released in sequential manner as the documents are filed in the archive. A duagon-internal data base contains exactly one document title text for each filing number.</p> <p>Always 6 digits.</p>

Table 17: Explanation of the Document Numbering System at duagon AG.

Examples for identification numbers

Identification number	Document Title / Remarks
d-000310-001606 d-000310-001952	<p>„DXIO data sheet Rev 2.2“ „DXIO data sheet Rev 2.3“</p> <p>A document, that is updated from time to time: the document number has the purpose to link several versions of the „DXIO data sheet“ together. The filing number distinguishes between different versions.</p> <p>Please note, that the document number part is kept the same, if the basic intention of the early versions is kept, for example during revisions due to debugging or manufacturing updates.</p> <p>In case a significant change happens, another document number would be applied.</p>
d-000719	<p>„Notes from prototype meeting ...“</p> <p>A document, that is obviously not updated after release. The „document number“ part is missing, and the filing number remains the only used part for identification.</p>

Table 18: Examples for the Document Numbering System at duagon AG.

Convention:

When a document is referenced by its document number, as for example "d-000584-nnnnnn", then the "newest" version of this specific document is meant. When a specific version of a document is intended, then the full identification number i.e. "d-000584-002043" is specified.

Appendix C: Software Licensing

The following software components used on the duagon products are subject to specific license agreements. Modules not named in this section, are subject to the duagon software license.

Software Module	License	Copyright
Firmware_load	Altera License	Altera Corporation

Table 19: Software Components with Specific License Agreements.

Internal Altera Drivers

Altera driver and headers:

Copyright (c) 2003 Altera Corporation, San Jose, California, USA. All rights reserved. Permission is hereby granted, free of charge, to any person obtaining a copy of this software and associated documentation files (the "Software"), to deal in the Software without restriction, including without limitation the rights to use, copy, modify, merge, publish, distribute, sublicense, and/or sell copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

This agreement shall be governed in all respects by the laws of the State of California and by the laws of the United States of America.

duagon

DUAGON SOFTWARE LICENSE

duagon cedes the present software to the customer in source code and/or binary form exclusively in order that the customer may modify or test it for running on the customer's system containing the duagon products.

The binary form of the software or the modified software, regardless of whether the modifications to the software were made by the customer or by duagon, is ceded to the customer to be used exclusively under a run time license.

All rights, especially the intangible property rights to the software and the modified software shall belong exclusively to duagon regardless of whether the modifications to the software were made by the customer or by duagon. Also, the rights to the modified software shall belong exclusively to duagon.

The customer may not, either in source code or binary form - transmit the software or the modified software to third parties, or - use the software or the modified software for purposes other than those specifically mentioned above.


This software is provided by duagon as is and any express or implied warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose are disclaimed. In no event shall duagon be liable for any direct, indirect, incidental, special, exemplary or consequential damages (including but not limited to, procurement of substitute goods or services; loss of use, data or profits; or business interruption) however caused and on any theory of liability,

whether in contract, strict liability, or tort (including negligence or otherwise) arising in any way out of the use of this software, even if advised of the possibility of such damage.

By copying, installing or using the present software, the customer declares that it has taken cognizance of these software license regulations and has accepted them.

The general terms and conditions from duagon are an integrated part of this DUAGON SOFTWARE LICENSE.

Status: released HALBMEY_HAN 02.02.2022
DCC: EDB037 Obj.Desgn. Prod: TS_RJC51

	TECHNICAL DELIVERY CONDITION	Project: TRAIN B28
Aggregate	Megabit Ethernet Repeater	Drg Nos.: 844-21271
BEML Enquiry/ RFQ Reference:		

SI. No.	Technical Delivery Conditions	COMPLIED	NOT COMPLIED
1	The firm shall supply the items as per the technical requirements in the drawings.	<input type="checkbox"/>	<input type="checkbox"/>
2	The firm shall be OEM (or) OEM authorized dealer. Authorized dealer shall submit, the relevant authorization letter from the OEM along with the Tender.	<input type="checkbox"/>	<input type="checkbox"/>
3	The firm shall submit material test certificates as specified in the drawing.	<input type="checkbox"/>	<input type="checkbox"/>
4	The firm to provide the test reports for fire safety requirement EN45545, HL2 or above test as mentioned in the drawings along with the tender.	<input type="checkbox"/>	<input type="checkbox"/>
5	The firm shall submit relevant Type test certificates and Routine test certificates.	<input type="checkbox"/>	<input type="checkbox"/>
6	The firm shall submit data sheet with vendor part number against BEML part number along with their technical offer.	<input type="checkbox"/>	<input type="checkbox"/>
7	The item shall be packed to ensure that no damage will occur during transit & storing at BEML.	<input type="checkbox"/>	<input type="checkbox"/>
8	Shall be fully compliant to the specification and the drawing	<input type="checkbox"/>	<input type="checkbox"/>
9	<p>If the firm is an OEM's authorized dealer, then firm has to submit commitment letter/ undertaking from OEM in OEM letterhead stating</p> <ol style="list-style-type: none"> 1. "Design, interface, manufacturing process, quality control, type testing shall be responsibility of OEM. 2. We have read and understood the BEML drawing & technical delivery condition (TDC) requirement and we will supply items as per BEML requirement for bid Number: BEML BID NO: _____ for B28 project. 3. We will provide all test reports for the standard mentioned in the BEML drawings for review and approval of BEML after award of contract. <p>Also, OEM has to mention their Manufacturing plant details/address of offered item for this tender.</p>	<input type="checkbox"/>	<input type="checkbox"/>
10	Delivery Schedule: 1 st Trainset – July -2026 2 nd trainset and spares – Oct-2026.	<input type="checkbox"/>	<input type="checkbox"/>

 Signature of the Bidder with Seal
 (Name, Designation & Address)

SIEMENS

Mobility

SIBAS[®]

MVB-Repeater

Equipment Description

Order No.: A2V00001161299

Version 1.7

First edition: Jun. 07, 2004
Status: Jan. 27, 2015
Number of pages: 30

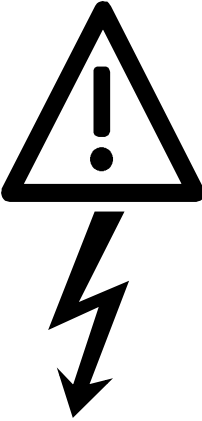
©

Transmittal, reproduction, dissemination and/or editing of this document as well as utilization of its contents and communication thereof to others without express authorization are prohibited. Offenders will be held liable for payment of damages. All rights created by patent grant or registration of a utility model or design patent are reserved.
Copyright (C) Siemens AG 2015. All rights reserved.

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Restricted

Siemens MO; Document-ID: EN1 A6Z00000668770 000 K

	WARNING
	<p>Hazardous voltages are present in this electrical equipment during operation.</p> <p>Non-observance of the safety instructions can result in severe personal injury or property damage.</p> <p>Only qualified personnel should work on the equipment.</p> <p>These personnel must be thoroughly acquainted with all the warnings and maintenance procedures described in these operating instructions.</p> <p>Satisfactory and safe operation of the equipment is also dependent on proper attention being paid to correct transport, storage, installation and assembly, as well as careful use and servicing</p>

Status: released HEID_MAN 17.11.2016
 DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Contents	Page
1 Description	1-1
1.1 Application	1-2
1.2 Principal features.....	1-4
1.3 Discrimination threshold	1-4
1.4 Construction	1-4
1.4.1 Mechanical	1-4
1.4.2 Scope of supply.....	1-8
1.5 Mode of operation	1-9
1.5.1 Block diagram.....	1-9
1.6 Interfaces	1-10
1.6.1 Power supply.....	1-10
1.6.1.1 Power supply LINE A.....	1-10
1.6.1.2 Power supply LINE B.....	1-10
1.6.2 MVB interfaces	1-11
1.6.2.1 Line interface.....	1-11
1.6.2.2 Signal flow for LINE A and LINE B.....	1-12
1.7 Screening concept.....	1-13
1.7.1 Earthing terminal	1-13
1.7.2 MVB screen.....	1-13
1.8 Technical data	1-14
1.8.1 General	1-14
2 Commissioning.....	2-1
2.1 General	2-1
2.2 Factory setting.....	2-1
2.3 Operation	2-1
2.3.1 Settings.....	2-1
2.3.2 Mechanical installation.....	2-1
2.3.3 Connections	2-2
2.3.4 Powering up	2-3
2.4 Annunciation	2-3
3 Maintenance	3-1
4 Accessories and spare parts.....	4-1
5 Appendix	5-1
5.1 Connector pin assignment	5-1
5.1.1 Power supply connections	5-1
5.1.2 MVB connections.....	5-1
5.2 Abbreviations	5-2
5.3 References.....	5-2

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Restricted

Siemens MO; Document-ID: EN1 A6Z00000668770 000 K

1 Description

The following figure shows the MVB-Repeater.

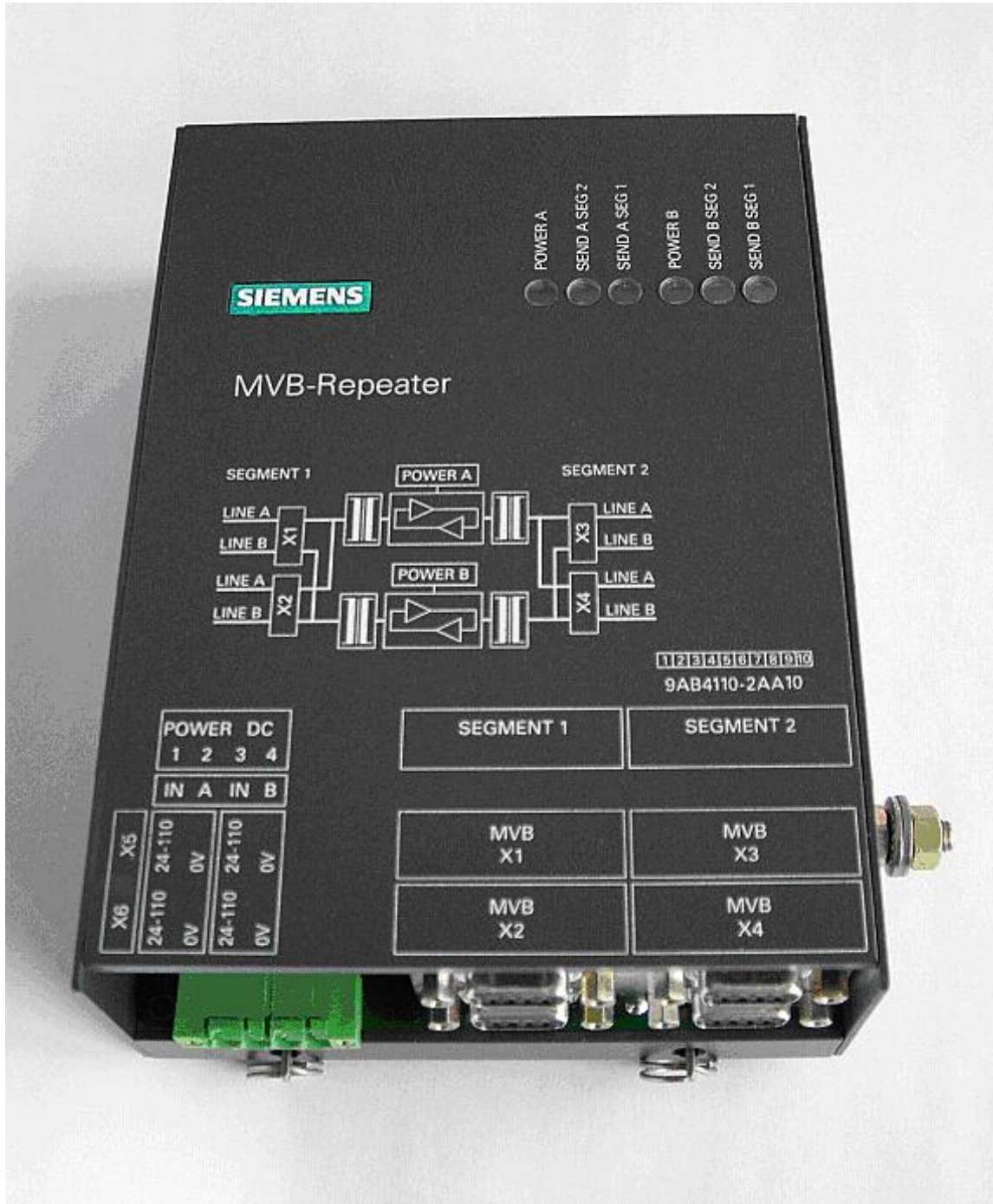


Fig. 1-1 MVB-Repeater

1.1 Application

The SIBAS MVB-Repeater provides the physical link needed between EMD MVB segments. Such Repeaters have to be used when there are more than 32 devices and/or there is a transmission distance of more than 200 m involved. For transmission reasons no more than 3 MVB-Repeaters may be connected in series in any one signalling system.

The interfaces in the MVB-Repeater are arranged so that it can be connected anywhere in the bus segments. Both the MVB line (LINE A) and the redundant MVB line (LINE B) run through the same connector.

Each bus segment must have a bus terminating connector at the ends to prevent reflections on the bus.

Figs. 1-2, 1-3 and 1-4 are examples of applications of the MVB-Repeater.

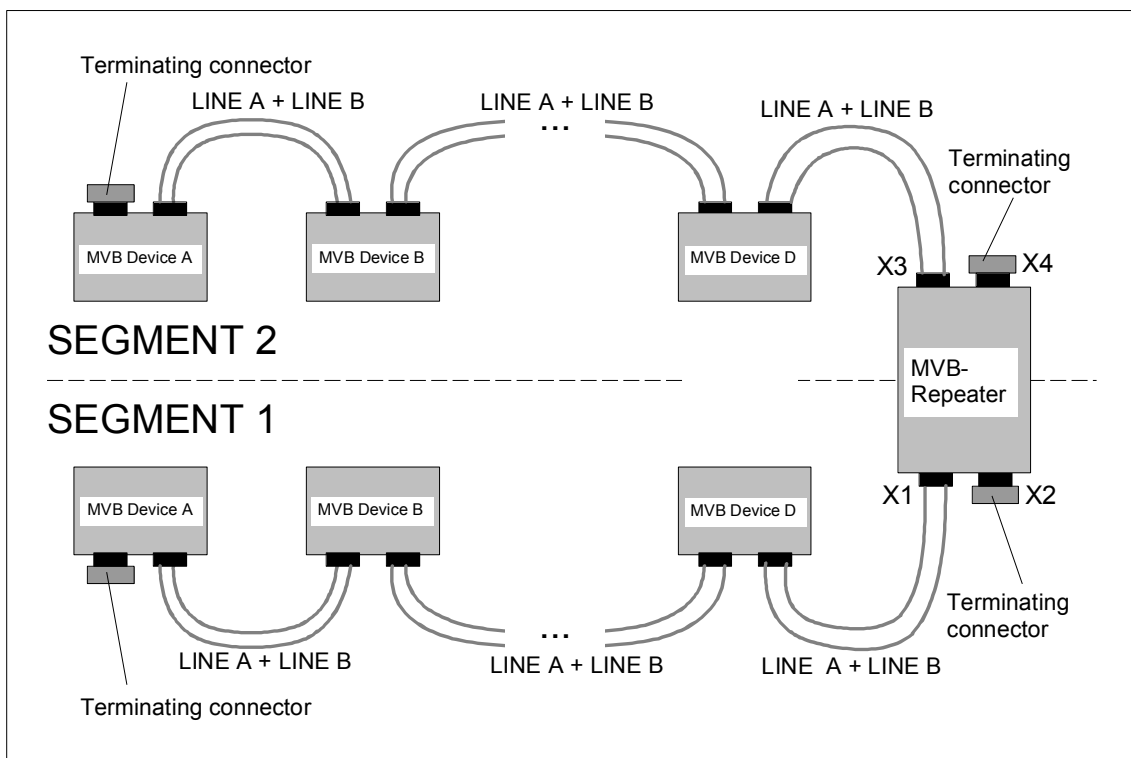


Fig. 1-2 MVB-Repeater on the MVB (MVB-Repeater at the line end)

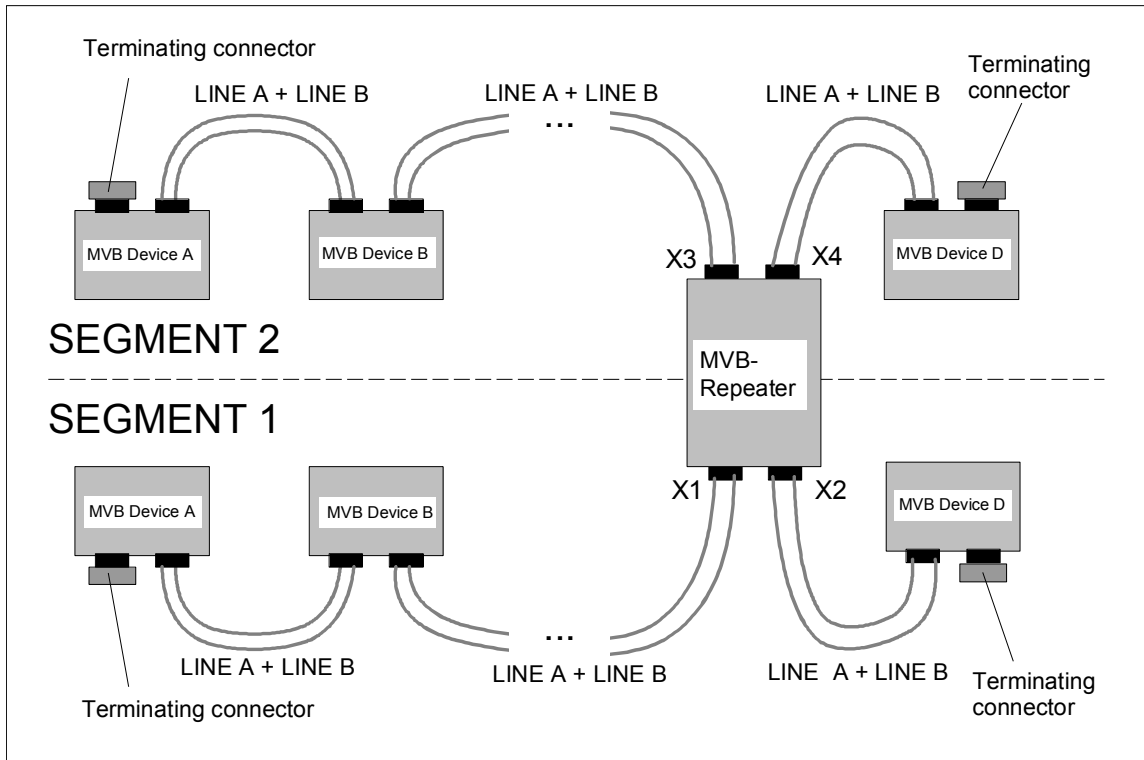


Fig. 1-3 MVB-Repeater on the MVB (MVB-Repeater not at the line end)

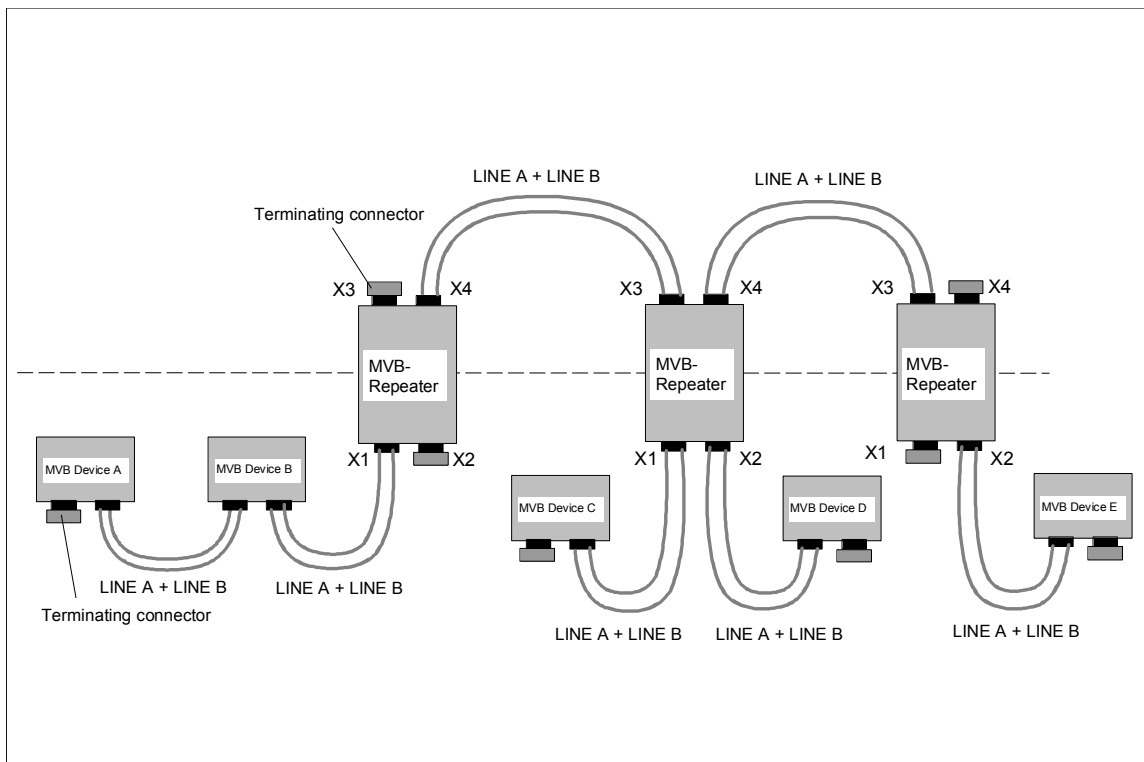


Fig. 1-4 MVB-Repeater on the MVB (MVB-Repeater for a "Backbone" arrangement)

1.2 Principal features

- For linking together two EMD segments on the MVB in accordance with [1]
- For a redundant arrangement of two entirely separate channels (line interfaces) [3], including separate power supplies
- For the electrical isolation of EMD segments by means of transformers
- Varying-voltage power supply (24 V to 110 V DC) in accordance with EN 50155 [4]
- Extruded aluminium housing for clip-fixing to top-hat rails
- Power supply connection via spring-loaded plug connectors
- MVB connection via SUB-MIN-D connectors
- Active MVB line interface [3]
- Use of an FPGA with the following features:
 - Signal regeneration (amplitude, bitcell-retiming)
 - Jabbing suppression

The FPGA is based on a compiled netlist of the ASIC MVBD113.

1.3 Discrimination threshold

The active MVB line interface [3] has significantly improved common-mode rejection.

The discrimination threshold, the minimum input level is approx. 300 mV.

1.4 Construction

1.4.1 Mechanical

Figs. 1-5, 1-6, 1-7 and 1-8 show the external construction of the MVB-Repeater. All the Repeater's electronic devices, including the connecting and indicating devices, are mounted on a printed-circuit board.

The PCB is plugged into a housing made of extruded aluminium profile sections and two protective side covers also made of aluminium.

At the rear of the housing there is a clip-fixing mounting for attachment to a 35x15 mm standard mounting rail (top-hat rail). The clip-on mounting and contact spring provide an electrically conductive connection between the housing and the top-hat rail.

On the right-hand side there is an M6 screw stud. In order to improve the electromagnetic compatibility it is important an earthing conductor (16 mm² cross section), to connect short (length max. 25 cm) to the M6 screw stud.

All the electrical connections are located on the underside of the housing and they are all of the plug-in type (see Fig. 1-8).

The main bodies of the connectors (male connector with plastic housing) are of the two-row type and are soldered to the mother board.

The female connectors with the connecting leads plug into the power supply connectors. These are always of the single-row type. The female connectors are spring-loaded.

The SUB-MIN-D connectors (female) are also soldered to the mother board. In addition, they are also screwed to a sheet-metal angle that is mounted on the mother board in order to continue the EMC link to the housing. Therefore, the SUB-MIN-D connectors have a conductive connection to the housing through the sheet-metal angle. The connecting leads with SUB-MIN-D connectors (male + body) are plugged in and secured with 4-40UNC screws.

On the front of the Repeater housing there are six LEDs for indicating operating status.

Printed on the top of the housing are instructions explaining the arrangement of the connections and the meanings of the indicating devices (see Fig. 1-5).

The dimensions of the Repeater, including the earthing stud, are 52.2 mm x 142 mm x 171 mm (H x W x D).

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

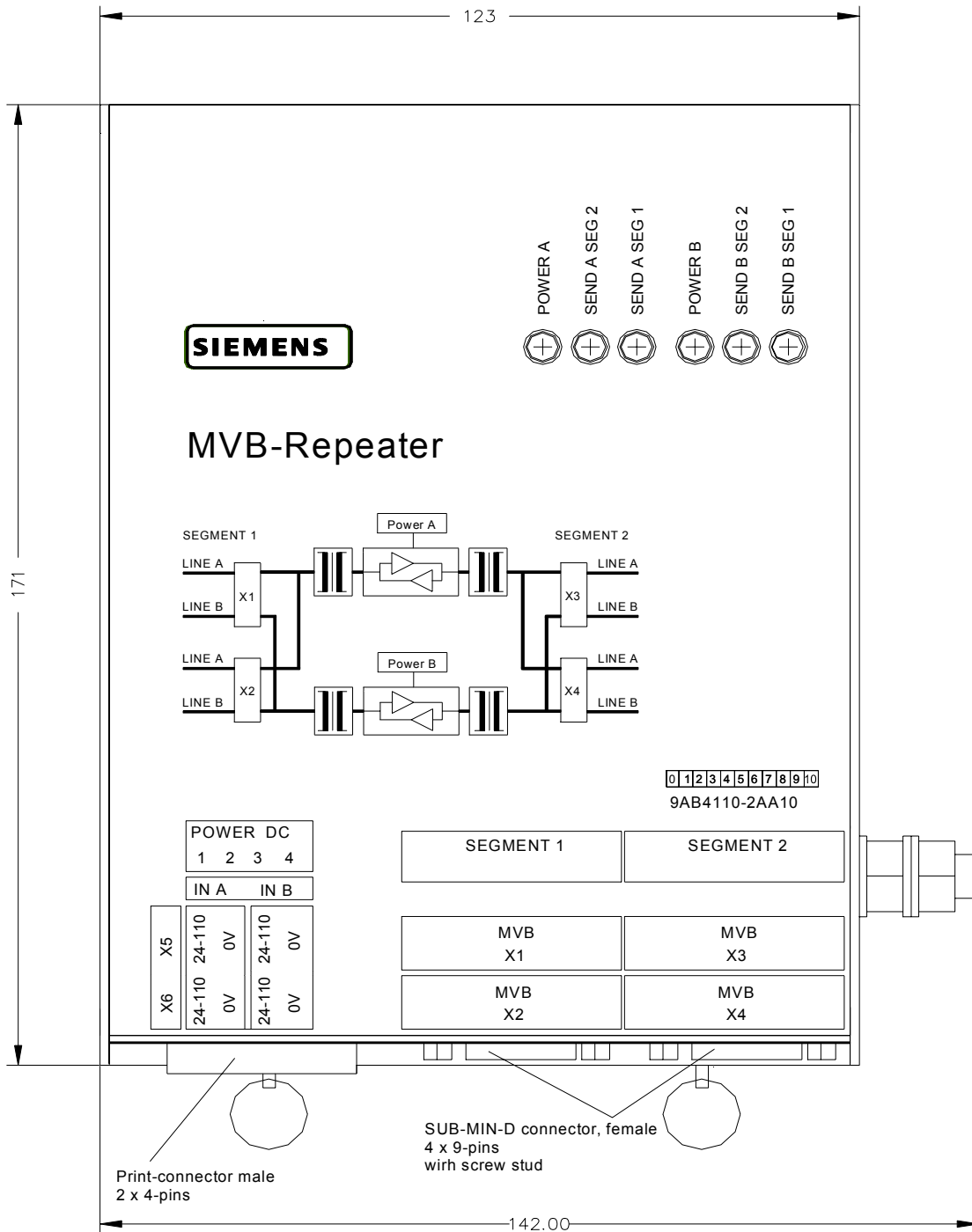


Fig. 1-5 Top view of the MVB-Repeater

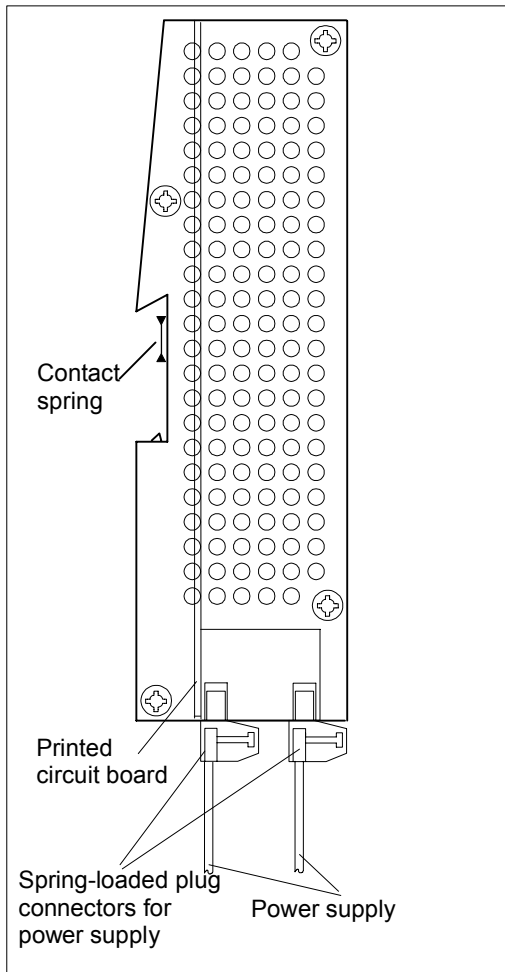


Fig. 1-6 Side view from the left

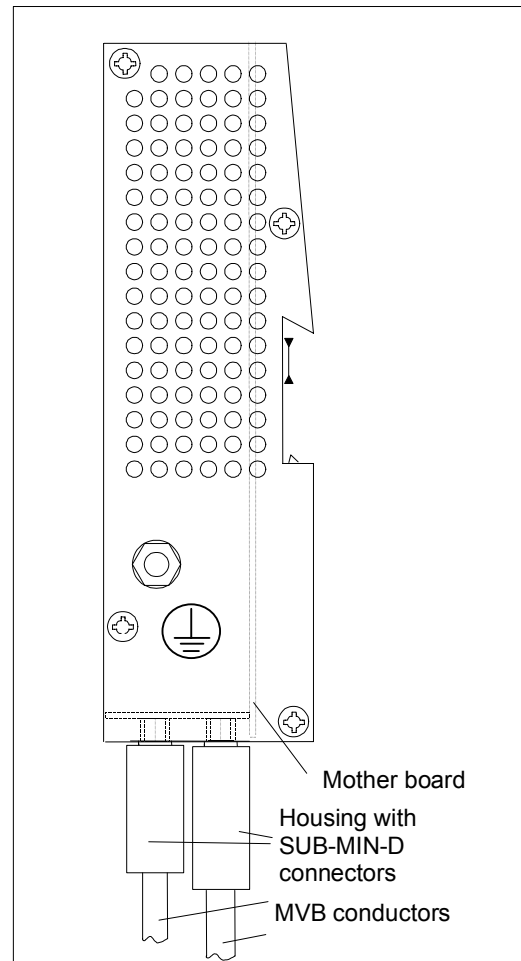


Fig. 1-7 Side view from the right

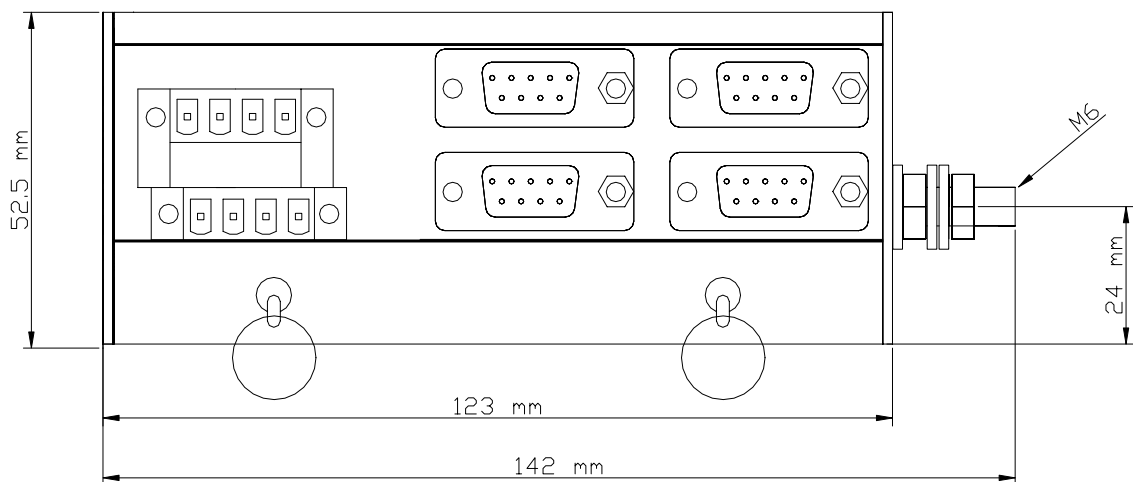


Fig. 1-8 Side view from the bottom

1.4.2 Scope of supply

The scope of supply of the MVB-Repeaters includes:

<i>Material</i>	<i>Order No.</i>	<i>SAP number</i>
MVB-Repeater 2 Spring-loaded power supply connectors ¹	9AB4 110-2AA10	A2V00001161299

¹ In the production year 2007, the connector type Phoenix FCKT is changed to the connector type Phoenix FKC with screw-in flange, s. clause 4. As well the connector with as the connector without the screw-in flange fit tho the sockets at the repeater and fulfil the standards.

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

1.5 Mode of operation

1.5.1 Block diagram

Fig. 1-9 illustrates the mode of operation of the MVB-Repeater by means of a block diagram.

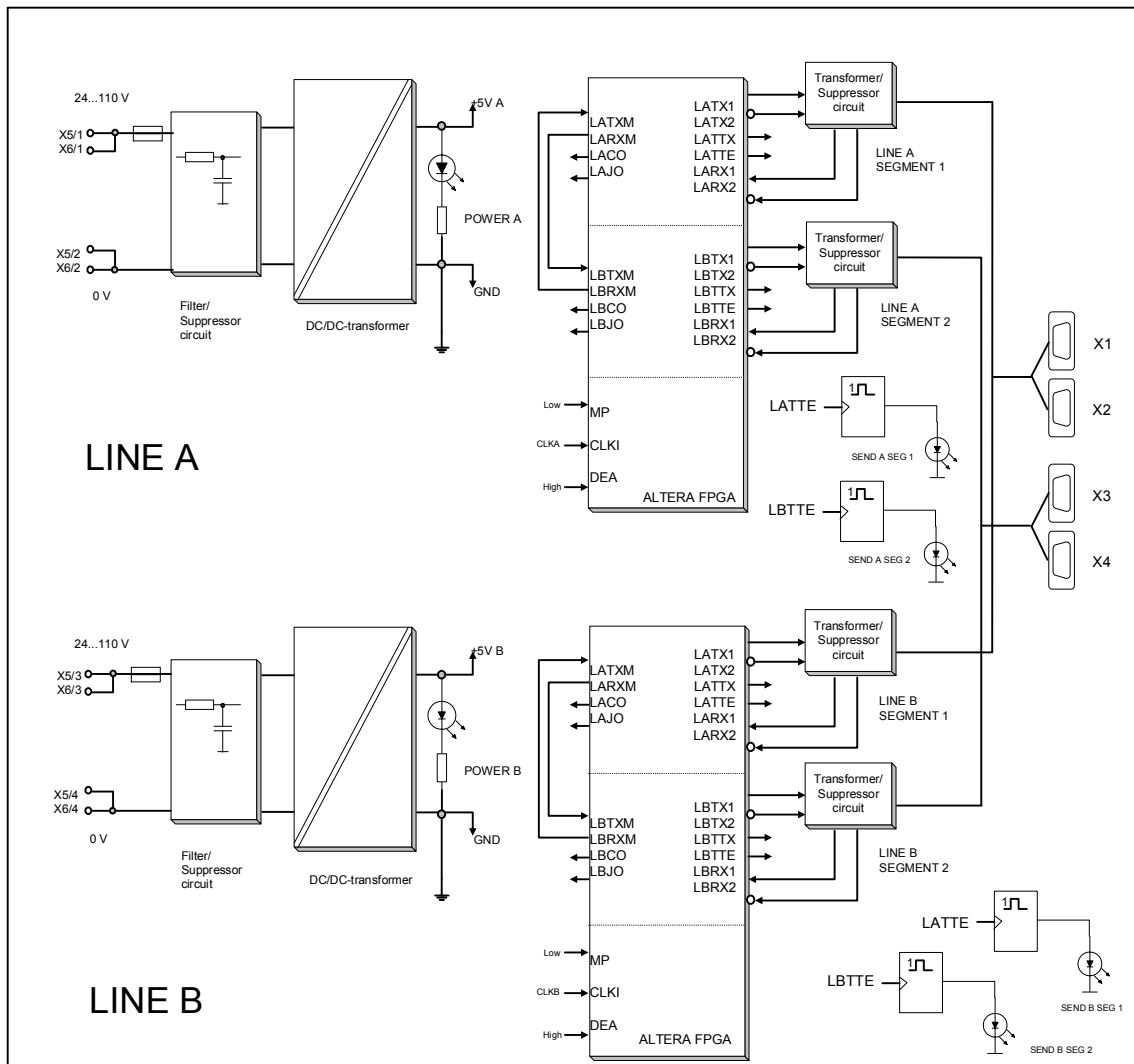


Fig. 1-9 Block diagram of the MVB-Repeater

The task of the MVB-Repeater is to provide a redundant, potential-free link between two MVB EMD bus segments. The MVB-Repeater is a two-channel device.

The incoming signals are conditioned before being passed on to the hardware in the linked MVB segments. The data from the sender are transmitted simultaneously on both LINE A and LINE B. The MVB-Repeater amplifies this data and regenerates the times and Manchester coding of the incoming bit flow.

1.6 Interfaces

The power supply and the MVB conductors are connected at the bottom of the MVB-Repeater by means of plug connectors and SUB-MIN-D connectors.

1.6.1 Power supply

The power supply connections to the module (connectors X5, X6) are Combicon plug connectors with protection against polarity reversal. The power supplies for each line (LINE A + LINE B) are isolated from each other and come from separate varying-voltage DC/DC transformers.

1.6.1.1 Power supply LINE A

Pin No.	Signalname
X5/1	24 – 110 V
X6/1	24 – 110 V
X5/2	0 V
X6/2	0 V

PCB jumpers: X5/1 to X6/1 and X5/2 to X6/2 (see also Fig. 1-9).

1.6.1.2 Power supply LINE B

Pin No.	Signalname
X5/3	24 – 110 V
X6/3	24 – 110 V
X5/4	0 V
X6/4	0 V

PCB jumpers: X5/3 to X6/3 and X5/4 to X6/4 (see also Fig. 1-9).

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

1.6.2 MVB interfaces

The MVB interfaces of each segment are connected to two 9-pin SUB-MIN-D female connectors. The MVB line interface [3] provides a potential-free link to the bus.

1.6.2.1 Line interface

The line interface [3] comprises the following items:

The MVB line-interface is based on the „Circuit Diagram MVB Line Interface“ [3].

It is essentially comprised of:

- Transformer with capacitive coupling with the MVB
- Suppressor circuit
- Differential Line Receiver and Schmitt trigger
- Differential Line Driver with preemphasis

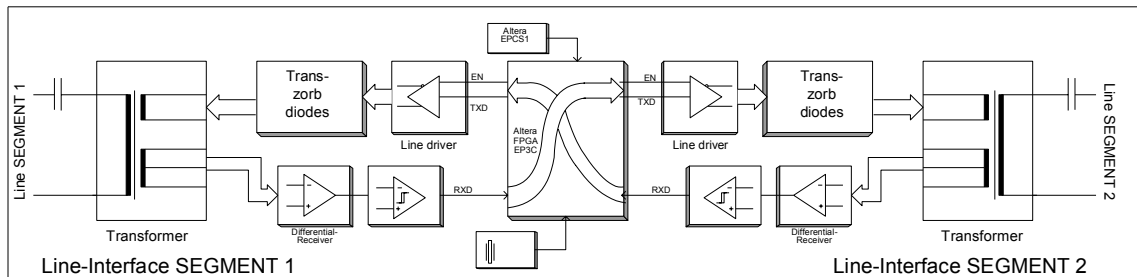


Fig. 1-10 Block diagram of the line interface for one line

1.6.2.2 Signal flow for LINE A and LINE B

Since the MVB-Repeater has been designed as a redundant system, both LINE A and LINE B are present at the MVB interfaces of the Repeater. The data is fed to both LINE A and LINE B. Due to the redundant design of the MVB-Repeater, should an open-circuit occur on one line, the other line will remain functional. The other channel that includes the still intact line will pass on the flow of data to the other segment.

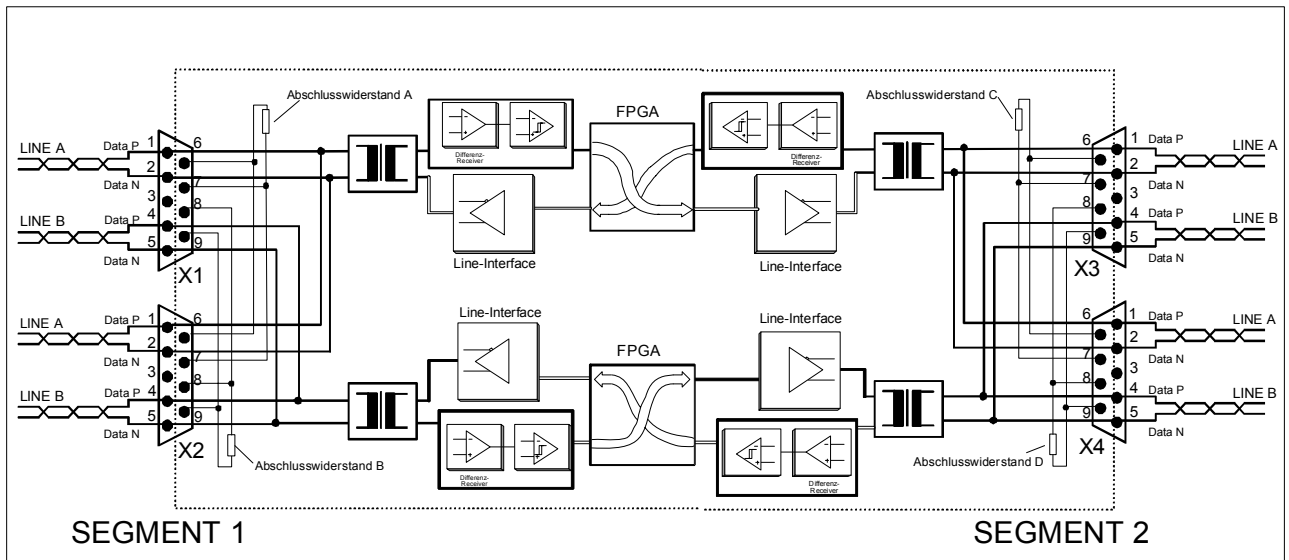


Fig. 1-11 Signal flow for LINE A and LINE B

Status: released HEID_MAN 17.11.2016
 DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

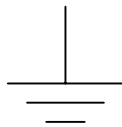
1.7 Screening concept

1.7.1 Earthing terminal

Provision is made for the connection of an earthing conductor.

The earthing screw connection on the outside of the housing will accept a 16 mm² conductor.

Designation to DIN 30600, Ref. No. 1544:



The secondary earthing of the 5 V power supply (GND) is low-resistance/large-area connected to the housing.

1.7.2 MVB screen

The screen of the SUB-MIN-D female connectors X1...X4 (MVB line screen) makes a low-impedance connection by being screwed to the mounting angle. The mounting angle is secured to the earthing connection and to the right-hand side of the housing.

The housing itself is earthed through the top-hat rail. A contact spring is used in order to ensure an optimum connection between the housing and the top-hat rail (see Fig. 1-6 and Fig. 1-7).

1.8 Technical data

1.8.1 General

Power supply

The nominal voltages specified in EN 50155 [4] (24 V, 48 V, 72 V, 96 V, 110 V) can be provided.

Nominal value	DC 110 V
Permissible range, stat.	16.8....137.5 V DC
Permissible range, dyn.	14.4....154 V DC
Current consumption per LINE, idle	
at 24 V	< = 80 mA typically 65 mA
at 60 V	< = 33 mA typically 25 mA
at 110 V	< = 24 mA typically 18 mA
Current consumption per LINE, telegram traffic	
at 24 V	< = 120 mA typically 95 mA
at 60 V	< = 40 mA typically 31 mA
at 110 V	< = 24 mA typically 19 mA
Interruption to EN 50155	Class S2 (10 ms)
Conductor cross section X5, X6	0.2 – 2.5 mm ² rigid conductor
Conductor cross section X5, X6	0.2 – 1.5 mm ² flexible conductor
Mating connector body with spring-loading	Phoenix FKCT 2,5/4-ST5,08 for lines 0.2 – 2.5 mm ²
or	Phoenix FKC 2,5/4-STF-5,08

Mechanical

Housing dimensions (H x W x D)	52.5 x 142 x 171 mm
Weight	0.70 kg
Mounting	Clips to DIN EN 50022 35 mm/15 mm high standard mounting rail

MVB interface

Interfaces to the MVB (X1...X4)	9-pin SUB-MIN-D female connectors with 4-40UNC screw sockets to DIN 41652
Type of interface to MVB	EMD transmission
Output power	typically 40 mA dynamic
Minimum input amplitude	approx. 300 mV

Insertion loss	< 0.15 dB @ 1.5 MHz
Terminating resistor	120 Ω switchable via terminating connector
Propagation delay segm./segm.	2.2 μs
Common-mode capability	>= 20 V at 1 MHz
Stub length	<= 10 cm
FPGA	ALTERA EP1C3 in 100-pin TQFP package
Memory for FPGA	ALTERA EPCS1
Surge withstand capability to DIN VDE 0804 between power supply circuit and MVB interface	U 1/U 2 = 2.5 kV

Nominal circuit voltage

Logic -- MVB	tested at U = 350 Vrms
110 V -- Logic	tested at U = 1300 Vrms
110 V – 110 V	tested at U = 1300 Vrms

Ambient conditions to EN 50155

Temperature Class Tx

– Operation	-40 ... +70 °C
– Storage/Transport	-40 ... +85 °C
Relative humidity	annual mean ≤ 75%
Barometric pressure	
– Operation	up to 2200 m above sea level
– Storage/Transport	up to 3500 m above sea level

Mechanical stress to EN 50155

– Vibration	operation
– Shock	operation

Electromagnetic compatibility (EMC) to EN 50121-3-2

– Electromagnetic fields	20 V/m
– Surge	1 KV / 2 kV
– Burst	2 KV
– HF current	10 Vrms

Emission to EN 50121-3-2 with EN55011

– Emitted interference

Class A

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

2 Commissioning

2.1 General

➔ **Note:**

Commissioning procedures may only be carried out by authorized personnel.

2.2 Factory setting

Input sensitivity: 300 mV

2.3 Operation

2.3.1 Settings

No other settings on the MVB-Repeater are needed.

2.3.2 Mechanical installation

The MVB-Repeater simply has to be clipped on to a 35 mm standard mounting rail.

Removal:

Pull out the two interlocking pins in the bottom of the housing (see Fig. 2-1) by the rings and twist the bottom of the MVB-Repeater forward away from the standard mounting rail. The module can then be lifted off upwards.

➔ **Note:**

Due to the compact design of the MVB-Repeater only the mating connectors specified in [2] may be used.

Remember to take the bending radius of the cables into account (see [2]) when ascertaining how much installation space will be needed, including the terminal connections.

2.3.3 Connections

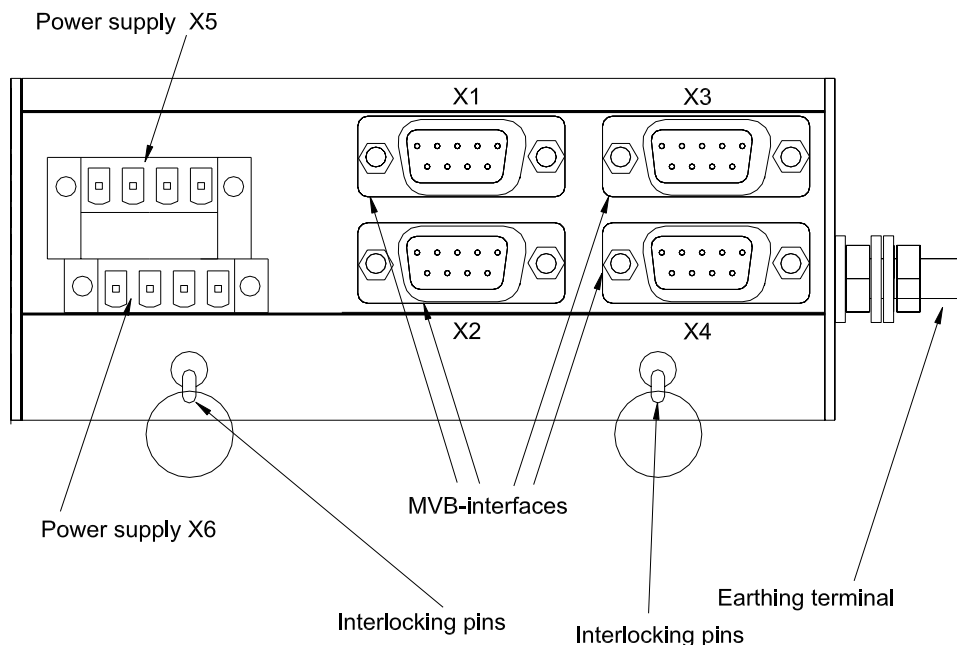


Fig. 2-1 Positions of individual connections, bottom

→ Note:

Isolate the power supply conductors before connecting.

Spring-loaded female connectors must be used for connecting the power supply conductors.

Connecting the power supply

Connect the power supply to the 4-pin female connectors provided for the purpose.

Then plug the connectors on the mating connectors of the MVB-Repeater.

When connecting the 110 V power supply both connectors X5, X6 must be plugged in order to maintain the clearances and creepage distances.

Connecting the MVB bus conductor

Plug the 9-pin SUB-MIN-D connectors of the connecting leads on the appropriate MVB-Repeater interfaces (interfaces X1, X2 or X3, X4) for the particular segment and screw-fix them.

If the MVB connection of the MVB-Repeater is at the end of a segment the terminating connector must be plugged on the spare connector of the MVB-Repeater and be screw-fixed according.

Proceed in the same way with the second segment.

Connecting the housing

Connect the earthing conductor to the earthing connection on the right-hand side of the housing.

2.3.4 Powering up

Re-check all the connections.

Then power up the MVB-Repeater, it is now ready for operation. Remember that the module possesses two completely separate power supply units which can be operated independently at between 24 V and 110 V. A failure of one power supply will only affect the particular LINE involved.

2.4 Annunciation

Annunciators

There are 6 LEDs on the front of the MVB-Repeater for indicating operating status.

LED	LED on (color)	Meaning
POWER A	yellow	LINE A power supply OK
POWER B	yellow	LINE B power supply OK
SEND A SEG 1	yellow	Bus traffic
SEND A SEG 2	yellow	Bus traffic
SEND B SEG 1	green	Bus traffic
SEND B SEG 2	green	Bus traffic

Status: released HEID_MAN 17.11.2016
 DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

3 Maintenance

General

The MVB-Repeater is maintenance-free.

It undergoes computerized inspection and dynamic testing at the factory. Repairs may only be carried out at the factory.

→ Note:

Any interference with the MVB-Repeater that goes beyond the requirements of according operation will render any and all warranty claims null and void.

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Restricted

Siemens MO; Document-ID: EN1 A6Z00000668770 000 K

4 Accessories and spare parts

<i>Material</i>	<i>Order No</i>	<i>SAP No..</i>
MVB bus conductor length	9AB4 110-0WA05 with explicit details for conductor	
MVB bus terminating connector	9AB4 110-0WA40	A2V00001027947

Spare connector for power supply

for connecting the conductors
- 4-pin, spring-loaded connection

Plug	Phoenix: FKCT 2,5/4-ST-5,08 Article No. 1902327	A2V00001435308
------	---	----------------

Required once per X5 and X6.

for connecting the conductors
- 4-pin, spring-loaded connection

Plug with screw-in flange (Preference)	Phoenix: FKC 2,5/4-ST-5,08 Article No. 1873223	A2V00001435307
---	--	----------------

Required once per X5 and X6.

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

Status: released HEID_MAN 17.11.2016
DCC: EDC030 Obj.Desgn. Prod: TS_RJC32

5 Appendix

5.1 Connector pin assignment

5.1.1 Power supply connections

The MVB-Repeater receives its power supply via interfaces X5 and X6.

Type of male connector strip on MVB-Repeater: Phoenix Contact MDSTB 2,5/4-GF-5.08

	1	2	3	4
X6	24-110 V DC	0 V	24-110 V DC	0 V
	1	2	3	4
X5	24-110 V DC	0 V	24-110 V DC	0 V

5.1.2 MVB connections

The MVB connections X1, X2 and X3, X4 are SUB-MIN-D female connectors on the MVB-Repeater.

Type of female connector strip: 9-pin SUB-MIN-D female connector to DIN 41652

1	A.DATA_P (Data line A P)
2	A.DATA_N (Data line A N)
3	Spare
4	B.DATA_P (Data line B P)
5	B.DATA_N (Data line B N)
6	A.TERM_P (R-termination, line A P)
7	A.TERM_N (R-termination, line A N)
8	B.TERM_P (R-termination, line B P)
9	B.TERM_N (R-termination, line B N)

Connectors X1, X2, X3, X4


Only plug-in conductors that conform to [2] may be used.

5.2 Abbreviations

MVB	M ultifunction V ehicle B us
EMD	E lectrical M iddle D istance
FPGA	F ield P rogrammable G ate A rray
TCN	T rain C ommunication N etwork

5.3 References

- [1] IEC61375-1:2007(E), Second Edition 2007-04
- [2] Specification for prefabricating MVB and WTB connecting leads and cables
- [3] Circuit Diagram, MVB Line Interface V1.60 of 08.07.2010
- [4] EN 50155, Electronic equipment in rail vehicles

	TECHNICAL DELIVERY CONDITION	Project: TRAIN B28
Aggregate	MVB Repeater	Drg Nos.: 844-21273
BEML Enquiry/ RFQ Reference:		

SI. No.	Technical Delivery Conditions	COMPLIED	NOT COMPLIED
1	The firm shall supply the items as per the technical requirements in the drawings.	<input type="checkbox"/>	<input type="checkbox"/>
2	The firm shall be OEM (or) OEM authorized dealer. Authorized dealer shall submit, the relevant authorization letter from the OEM along with the Tender.	<input type="checkbox"/>	<input type="checkbox"/>
3	The firm shall submit material test certificates as specified in the drawing.	<input type="checkbox"/>	<input type="checkbox"/>
4	The firm to provide the test reports for fire safety requirement EN45545, HL2 or above test as mentioned in the drawings along with the tender.	<input type="checkbox"/>	<input type="checkbox"/>
5	The firm shall submit relevant Type test certificates and Routine test certificates.	<input type="checkbox"/>	<input type="checkbox"/>
6	The firm shall submit data sheet with vendor part number against BEML part number along with their technical offer.	<input type="checkbox"/>	<input type="checkbox"/>
7	The item shall be packed to ensure that no damage will occur during transit & storing at BEML.	<input type="checkbox"/>	<input type="checkbox"/>
8	Shall be fully compliant to the specification and the drawing	<input type="checkbox"/>	<input type="checkbox"/>
9	<p>If the firm is an OEM's authorized dealer, then firm has to submit commitment letter/ undertaking from OEM in OEM letterhead stating</p> <ol style="list-style-type: none"> 1. "Design, interface, manufacturing process, quality control, type testing shall be responsibility of OEM. 2. We have read and understood the BEML drawing & technical delivery condition (TDC) requirement and we will supply items as per BEML requirement for bid Number: BEML BID NO: _____ for B28 project. 3. We will provide all test reports for the standard mentioned in the BEML drawings for review and approval of BEML after award of contract. <p>Also, OEM has to mention their Manufacturing plant details/address of offered item for this tender.</p>	<input type="checkbox"/>	<input type="checkbox"/>
10	Delivery Schedule: 1 st Trainset – July -2026 2 nd trainset and spares – Oct-2026.	<input type="checkbox"/>	<input type="checkbox"/>

 Signature of the Bidder with Seal
 (Name, Designation & Address)