

4368873/2025/O/o ED/CARRIAGE/RDSO

Ref: CG-WI-4.2.1-1 Ver. 1.0

Page 1 of 2

Date / Month of Issue:
October 2025RDSO/CG-18005
Rev. 02, Amendment-1GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**MASTER COPY**

Controlling Officer.....

Signature.....

Designation.....

Document Content	Technical Specification	Yes
	Schedule of Technical Requirement	Yes
Description of item	Dampers For LHB Coaches and Vande Bharat Coaches.	
Remarks	-----	

S. No.	Month / Year of Issue	Revision / Amendment	Page No	Reason For Revision/Amendment
1	May, 2019	Nil	---	New Specification
2.	April, 2023	Rev. 01	----	Technical changes
3	June, 2025	Rev. 02	----	Technical changes
4	October, 2025	Amendment 1		1) Modification of warranty period in clause 10.1, 10.2 & 10.3 2) Modification of Appendix IV in Salt Spray test. 3) Addition of Para 7.5 for VB ver.1/EMU-US/MEMU-US/Vande Metro coaches.

Issued By

**Carriage Directorate
Research Design and Standard Organisation
Manak Nagar Lucknow -226011**

Signature			
Name & Designation	Prepared By: Sanjay Kumar/ SSE/D(VDG)	Checked By: Ajay Kumar Shrivastava/ADE/VDG	Approved By: Omkar Nath Singh/Dir./VDG

4368873/2025/O/o ED/CARRIAGE/RDSO Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 2 of 2	Date / Month of issue: October 2025	RDSO/CG-18005 Rev. 02, Amendment-1
--	-------------	--	---------------------------------------

**Amendment Slip No.- 01 of October, 2025 of RDSO Specification, RDSO/CG-18005,
Rev.02 Dampers for LHB Coaches and Vande Bharat Coaches.**

1. Clause 10.1 shall be read as below:

The supplier shall ensure the efficiency of the dampers for a minimum period of 36 months from the date of supply. The warranty shall cover design, material, and workmanship.

2. Clause 10.2 shall be read as below:

The manufacturer shall furnish a warranty that each new damper supplied, shall function satisfactorily without attention and in accordance with the requirements of this specification over a minimum period of 36 months from the date of supply.

3. Clause 10.3 shall be read as below:

The warranty shall survive inspection, payment for and acceptance of the goods, but shall expire over a minimum period of 36 months from the date of supply, except in respect of complaints, defects, inefficiency and/or claims, notified to the contractor within 3 months of such date. Any approval or acceptance by the purchaser of the stores of the material incorporated herein shall not in any way limit the contractor's liability.

4. Appendix IV shall be read as below:

Salt Spray test

Salt Spray test shall be carry out as per the RDSO ISO guidelines with requirement of specification.

5. Clause 7.5: -

For Vande Bharat version-1, EMU-US, MEMU-US, Vande Metro coaches.

- Primary vertical damper shall be confirming to ICF drawing No. train 18/MC/AC-0-1-009 alt c or latest revision.
- Secondary vertical damper shall be confirming to ICF drawing No. train 18/MC/AC-0-1-010 alt c or latest revision.
- Secondary lateral damper shall be confirming to ICF drawing No. train 18/MC/AC-0-1-011 alt c or latest revision.
- Yaw damper shall be confirming to ICF drawing No. train 18/MC/AC-0-1-012 alt c or latest revision.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Ajay Kumar Shrivastava/ADE/VDG	Approved By: Omkar Nath Singh/Dir./VDG

TRAN18/MC/AC-0-5-010

NOTE:

1. DIMENSIONAL SPEED 160 kmph FOR TRAN18 / 120 kmph FOR OTHER TYPES.

2. DAMPING FORCE REQUIREMENT AND TESTING AT 274 TC.

PARAMETER	UNIT	VALUE
NO. OF REVOLUTIONS - MIN	1/min	11.6
COMPRESSION - N	N	4500 ± 150
EXTENSION - N	N	9250 ± 150

3. TEST FACTORS:

PARAMETER	UNIT	VALUE
ROTATIONAL SPEED	1/min	11.6
COMPRESSION	N	4500 ± 150
EXTENSION	N	9250 ± 150



4. SURFACE PROTECTION:

4.1.1 SURFACE PROTECTION SHALL BE AS PER RELEVANT CLASSES OF ROAD VEHICLES/RAILWAYS/INDUS (GASIT STANDARDS). COLOUR SHALL BE AS PER STANDARDS (COLOUR BLUE) WITH MAT FINISH.

4.1.2 SURFACE PROTECTION SHALL BE AS PER RELEVANT CLASSES OF ROAD VEHICLES/RAILWAYS/INDUS (GASIT STANDARDS). COLOUR SHALL BE AS PER STANDARDS (COLOUR BLUE) WITH MAT FINISH.

4.1.3 SURFACE PROTECTION SHALL BE AS PER RELEVANT CLASSES OF ROAD VEHICLES/RAILWAYS/INDUS (GASIT STANDARDS). COLOUR SHALL BE AS PER STANDARDS (COLOUR BLUE) WITH MAT FINISH.

4.2. CLAMPING SURFACES & HOLES SHALL BE ZINC PLATED AND FREE OF FLAKES.

5. MARKING REQUIREMENTS:

MARKING ON DUST COVER NAME PLATE	MARKING ON DUST COVER/COVER TUBE
NAME OF THE MANUFACTURER	NAME OF THE MANUFACTURER ON COVER
MODEL AND YEAR OF MANUFACTURING	MODEL AND YEAR OF MANUFACTURING
MANUFACTURER PART NUMBER	MANUFACTURER PART NUMBER
SERIAL NO. OF DAMPER	SERIAL NO. OF DAMPER
WORKING FORCE & NOMINAL VELOCITY	WORKING FORCE & NOMINAL VELOCITY
NAME/TYPE OF DAMPER AS MENTIONED IN PHEMO	NAME/TYPE OF DAMPER AS MENTIONED IN PHEMO

5.1. DIMENSIONAL SPEED 160 kmph FOR TRAN18 / 120 kmph FOR OTHER TYPES.

5.2. DAMPING FORCE REQUIREMENT AND TESTING AT 274 TC.

5.3. TEST FACTORS:

PARAMETER	UNIT	VALUE
NO. OF REVOLUTIONS - MIN	1/min	11.6
COMPRESSION - N	N	4500 ± 150
EXTENSION - N	N	9250 ± 150

5.4. CLAMPING SURFACES & HOLES SHALL BE ZINC PLATED AND FREE OF FLAKES.

5.5. MARKING REQUIREMENTS:

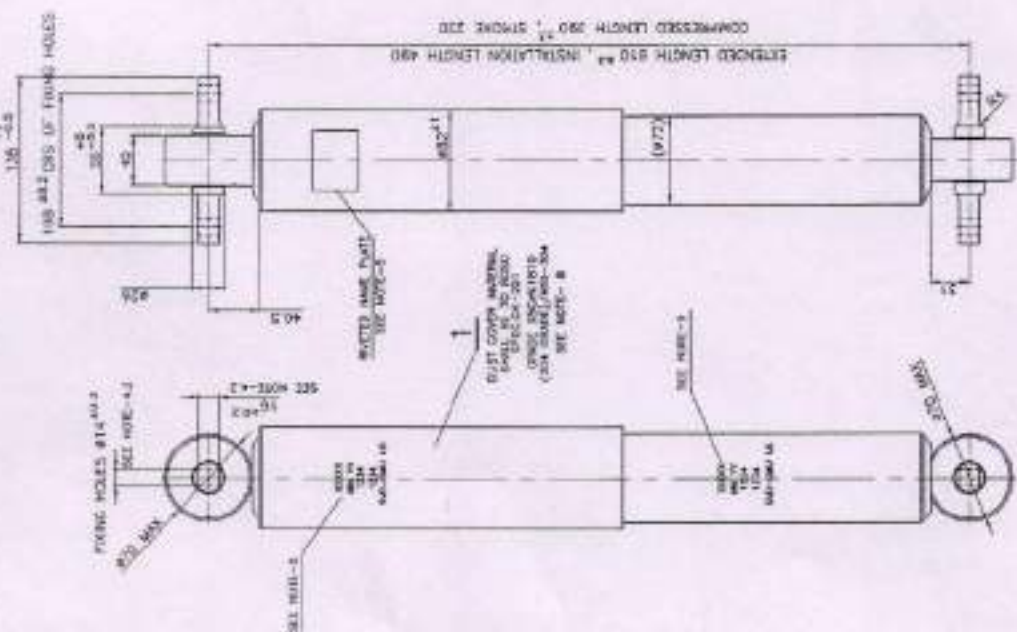
MARKING ON DUST COVER NAME PLATE	MARKING ON DUST COVER/COVER TUBE
NAME OF THE MANUFACTURER	NAME OF THE MANUFACTURER ON COVER
MODEL AND YEAR OF MANUFACTURING	MODEL AND YEAR OF MANUFACTURING
MANUFACTURER PART NUMBER	MANUFACTURER PART NUMBER
SERIAL NO. OF DAMPER	SERIAL NO. OF DAMPER
WORKING FORCE & NOMINAL VELOCITY	WORKING FORCE & NOMINAL VELOCITY
NAME/TYPE OF DAMPER AS MENTIONED IN PHEMO	NAME/TYPE OF DAMPER AS MENTIONED IN PHEMO

5.6. DIMENSIONAL SPEED 160 kmph FOR TRAN18 / 120 kmph FOR OTHER TYPES.

5.7. DAMPING FORCE REQUIREMENT AND TESTING AT 274 TC.

5.8. TEST FACTORS:

PARAMETER	UNIT	VALUE
NO. OF REVOLUTIONS - MIN	1/min	11.6
COMPRESSION - N	N	4500 ± 150
EXTENSION - N	N	9250 ± 150



6. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

7. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

8. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

9. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

10. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

11. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

12. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

13. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

14. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

PARAMETER	UNIT	VALUE
NO. OF REVOLUTIONS - MIN	1/min	11.6
COMPRESSION - N	N	4500 ± 150
EXTENSION - N	N	9250 ± 150

15. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

16. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

17. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

18. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

19. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

20. ALL DIMENSIONS - IN MM UNLESS OTHERWISE SPECIFIED.

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

MASTER COPY

Controlling Officer.....

Signature.....

Designation.....

Document Content	Technical Specification	Yes
	Schedule of Technical Requirement	Yes
Description of item	Dampers For LHB Coaches and Vande Bharat Coaches.	
Remarks	1) Para 9.4 (IRIS certification) of this specification shall come under enforcement after December 2025. 2) Para 2.1 (Sl. No.01) (EN certification EN 15085 CL-1) of Appendix-IV of this specification shall come under enforcement after December 2025. 3) Para 2.1 (Sl. No.10) (leakage testing facility for weld parts) of Appendix-IV of this specification shall come under enforcement after August 2025. 4) Para 3 (Sl. No.11 & 12) (stiffness testing machine & Millipore test) of Appendix-IV of this specification shall come under enforcement after August 2025.	

S. No.	Month / Year of Issue	Revision / Amendment	Page No	Reason For Amendment
1	May, 2019	Nil	---	New Specification
2.	April, 2023	Rev. 01	----	-----,
3	June, 2025	Rev. 02	----	1) Include drawings of dampers for LHB coaches and Vande Bharat Coaches. 2) Include the details of dampers for Vande Bharat Coaches. 3) Include priming tests of dampers and paint fire resistance test. 4) Includes testing facility & testing of critical items for dampers. 5) Including quality improvements para for dampers.

Issued ByCarriage Directorate
Research Design and Standard Organisation
Manak Nagar Lucknow-226011

Signature			
Name & Designation	Prepared By: Samcer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

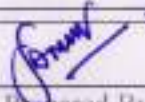
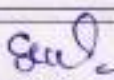
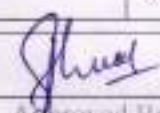
Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 2 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	--------------	-------------------------------------	--------------------------

CONTENTS

Description	Page
I FOREWORD	04
ABBREVIATION	05

II DAMPERS FOR LHB COACHES/ VB coaches

1. GENERAL	06
2. SCOPE	06
3. APPLICABILITY	6-7
4. DRAWINGS	7
5. END MOUNTINGS AND METHODS OF DAMPERS ATTACHMENT	8
6. APPLICABLE STANDARDS	8
7. PERFORMANCE SPECIFICATION AND INSTRUCTIONS FOR CONSTRUCTION	8
8. CONDITION OF USE	8
9. INSTALLATION	9
10. CLEANING OF THE BOGIE	9
11. ENDURANCE	9
12. STORAGE AND TRANSPORT	10
13. MATERIALS	10-11
14. HYDRAULIC LIQUID	11
15. MARKING	11
16. SURFACE PROTECTION/VARNISHING & COLOUR	12
17. DEMANDS ON THE CHARACTERISTICS	13-14
18. QUALIFICATION AND INSPECTION REQUIREMENTS	15-27
19. QUALITY ASSURANCE, TESTING, FINAL ACCEPTANCE	27
20. ORGANISATIONAL AND ADMINISTRATIVE PROVISIONS	27-28
21. PROCEDURE FOR TESTING OF PROTOTYPE SHOCK ABSORBERS DAMPERS.	28-30
22. REGULAR PROCEDURE FOR INSPECTION AND TESTING OF REGULAR PRODUCTION DAMPERS	30-31
23. PARTICULAR REQUIREMENTS	31-32

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 3 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	--------------	-------------------------------------	--------------------------

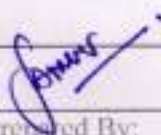
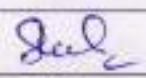
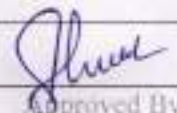
24.	GUARANTEE / WARRANTY	32
25.	GENERAL	32-33
26.	GENERAL INSPECTION	33-34
27.	TRAINING AND INFRASTRUCTURAL FACILITIES.	34
28.	PACKING	34
29.	SPECIAL CONDITIONS	34-36
30.	SUBMISSION OF OFFERS	36-37
31.	APPENDIX-I	38
32.	APPENDIX-II	39
33.	APPENDIX-III	40
34.	APPENDIX-IV	41-45
35.	APPENDIX-V	46
36.	DRAWINGS	47-56

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 4 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	--------------	-------------------------------------	--------------------------


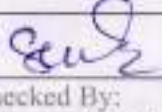

FOREWORD

1. This Specification spells out the technical requirements of Dampers for LHB coaches and Vande Bharat Coaches.
2. Specification is concerned with the Dampers for LHB coaches and Vande Bharat Coaches along with the details of the requirements and tests for same.
3. The specification shall not be altered /modified or reproduced in any form without the written permission of the Director General (Carriage), RDSO, Lucknow.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

ABBREVIATIONS

RDSO	Research Designs and Standards Organisation
IR	Indian Railways
LHB coaches	Linke Hofmann Busch coaches
VB Coaches	Vande Bharat Coaches
ISO	International Organization for Standardization

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 6 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	--------------	-------------------------------------	--------------------------

SPECIFICATION FOR MANUFACTURE AND SUPPLY OF DAMPERS FOR LHB COACHES AND VANDE BHARAT COACHES

1. GENERAL

1.1 SCOPE

This specification covers the requirements of all types of Dampers currently used in LHB coaches/ VB Coaches. Scope of this specification is related to following types of hydraulic Dampers:

Dampers for LHB coaches	Dampers for Vande Bharat Coaches
<ul style="list-style-type: none"> • Primary Vertical Dampers • Secondary Vertical Damper • Secondary Lateral Damper • Yaw Damper • Secondary Lateral Damper for Air Spring Bogie • Secondary Vertical Damper for Non AC Coaches 	<ul style="list-style-type: none"> • Primary Vertical Dampers • Secondary Vertical Damper • Secondary Lateral Damper • Yaw Damper

This specification is to define:

- Performance, envelop, qualification and inspection requirement
- Maintenance requirement
- Any other technical and quality assurance requirements in association to other technical documents (drawings, other specification etc.).

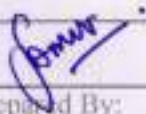
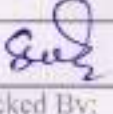
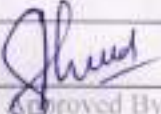
Hereafter, this part will be referred to as dampers for LHB coaches/ VB Coaches and attachment elements. The terms shock absorbers and damper can be interchangeably used in this specification.

This Specification covers the supply of damping unit with end fitting/mounting as an assembly termed as Dampers for LHB coaches and Vande Bharat Coaches.

1.2 Applicability

This specification applies when recalled by the purchaser orders and/ or by the associated drawings issued by RDSO or any other agency authorized by IR for the purpose.

When conflict arises between the requirements of this specification and the associated drawings, the drawing requirements shall apply. When conflict arises

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

between the requirements of this specification and those of other specification, discrepancies shall be solved by mutual agreement between the purchaser and supplier.

Departures from this specification will be possible only following a written agreement between the supplier and purchaser.

- 1.3** All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 Version latest (titled "Vendor-Changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

- 1.4** The Government of India policy on "Make in India" shall be apply.

1.5 DRAWINGS

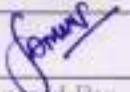
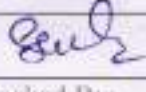
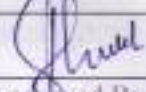
- 1.5.1** The damper shall generally conform to RDSO drawing(s) or the manufacturer's duly approved by the RDSO. RDSO's reference drawings are as under-

1.5.1.1 For LHB Coaches:

S. No.	Item	RDSO drawing no.
1	Primary Vertical Dampers for all type of LHB Coaches.	RDSO/CG/DRG/21047 Alt. 3 or latest.
2	Secondary Vertical Damper for LHB AC Coaches	RDSO/CG/DRG/21046 Alt. 3 or latest.
3	Secondary Lateral Damper for all coil FIAT Bogie	RDSO/CG/DRG/21045 Alt. 3 or latest.
4	Yaw Damper for all type of LHB Coaches.	RDSO/CG/DRG/21048 Alt. 3 or latest.
5	Secondary Lateral Damper for Air Spring Bogie	RDSO/CG/DRG/21049 Alt. 3 or latest.
6	Secondary Vertical Damper for Non AC Coaches	RDSO/CG/DRG/21018 Alt. 3 or latest.

1.5.1.2 For Vande Bharat Version – 2 Coaches:

S. No.	Item	RDSO drawing no.
1	Primary Vertical Damper	RDSO/CG/DRG/25009 or latest
2	Secondary Vertical Damper	RDSO/CG/DRG/25010 or latest
3	Secondary Lateral Damper	RDSO/CG/DRG/25011 or latest
4	Yaw Damper	RDSO/CG/DRG/25012 or latest

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 8 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	--------------	-------------------------------------	--------------------------

1.5.2 The manufacturers desirous of being considered for RDSO's approval for manufacture & supply of damper shall submit application in prescribed form along with assembly drawings and sectional drawings with installation dimensions.

1.6 End mountings and methods of dampers attachment

Dimensions, orientation and performance of end mountings are to be as per RDSO drawings. Any change in this will require RDSO approval.

1.7 Applicable standards/Reference Standards

- i) ISO 23277
- ii) ISO 23278
- iii) ISO 17638
- iv) ISO 5817
- v) ISO 2409
- vi) ISO 9227
- vii) EN 25817
- viii) EN 10204
- ix) IEC:61373
- x) EN 15085

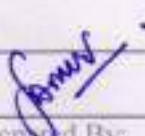
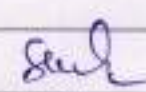
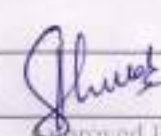
2. Performance specification and Instructions for Construction

2.1 Conditions of use

The dampers for LHB coaches/ VB Coaches. are likely to be exposed to the following operating conditions:

- Change in temperature from -40°C to +70°C
- Relative humidity from 30% to 100%
- Both acidic and basic cleaning product
- Urine, feces, and kitchen waste (restaurant cars)
- Rain, snow, ice
- Sand, brake and ferric oxide dust (abrasion of wheel and tracks)
- Damage from flying stones raised from the ballast track bed.
- Flying pieces of ice
- Salty air (coastal area)

The conditions of use appear normally in any conceivable combination (independent of weather conditions, speed, etc.)

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

2.1.1 Installation

The dampers must be designed for trouble-free operation in the assembly positions on LHB coaches and VB coaches.

In particular, for anti-yaw dampers, the supplier shall take into account each of the operation positions specified in the relative assembly drawing and anti-yaw connection to the body for a maximum negative angle and with the end shield at highest connection.

2.2 Cleaning of the bogie

The bogies and superstructure are washed following varying periods, at the most every 2-5 days. As a result, the dampers come into contact with acidic and alkaline cleaning products, against which it must be resistant for the defined service life. The appearance of under layer rust, material out breaks, leaks, changes in rigidity etc. is not allowed.

2.3 Endurance**2.3.1 Load**

The dampers shall be able to resist the forces listed below (unless otherwise specified). Appearance of fractures or leakage of oil as well as reduction of life time of the dampers is not permitted. This includes the dampers and also the attachment elements.

The complete installed dampers should resist the following static forces along the longitudinal axis.

In the compressed position 20kN (unless otherwise specified)

In expanded position 20kN (unless otherwise specified)


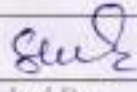
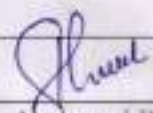
2.3.2 Acceleration

Dampers and their attachment can be temporarily exposed to very great accelerations, which affect the longitudinal axis of the shock absorber at a 90° angle.

During type test qualification the supplier has to conduct the vibration test for 1 no. of each type damper as per vibration level given in table 1.

The dampers along with end mountings have to be mounted in vibration shaker in as installed condition on vehicle.

The damper shall be subjected to a total conditioning time of 15 hrs. This shall be divided into periods of 5 hrs testing in each of the three axis i.e. in X, Y & Z axis as per IEC:61373.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 10 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

The dampers should have no loss of functionality at the end of test.

Table 1:

	dynamic
Primary dampers	+25g vertical
	+3g Longitudinal
	+3g Lateral direction
Vertical dampers	+10g Vertical
	+0.5g Longitudinal direction
	+1.5g Lateral direction
Lateral dampers	+10g Vertical
	+0.5g Longitudinal direction
	+1.5g Lateral direction
Anti-yaw dampers	+10g Vertical
	+0.5g Longitudinal direction
	+1.5g Lateral direction

2.3.3 Weight

The weight of the dampers with clamping elements (including surface protection) must be measured and recorded. A low tare weight is of great importance. The weight of damper shall be indicated on the supplier drawing.

2.4 STORAGE AND TRANSPORT

The dampers must be packaged in a way that damaging of the paint coating is not possible.

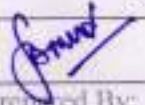
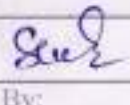
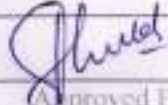
- The dampers attachment points are preserved.

On the Packaging the following indication shall be present as a minimum:

- Identification of the supplier
- Contract number or purchase order number
- Quantity of articles in the package
- Description of the articles.

2.5 Materials

In making the choice of material for the dampers components, it must be noted that at the end of their service life it must be possible to recycle or dispose of them without need for any particular measures. Should materials be used which,

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

according to valid instructions, require special disposal, these materials together with their weight proportion must be communicated in written form to the RDSO.

2.6 Hydraulic Liquid

The type/ grade of oil and its make to be specified on suppliers drawing. Supplier to submit technical data sheet stating the characteristics, quantity of the oil (per damper) and material safety data sheet (MSDS) during type test approval. Compliance to environmental and other statutory requirements should be mentioned in data sheet.

2.7 Marking

The following data is to be punched/engraving/laser printing/printing on number plate of suitable size and this number plate is to be riveted properly on bottom side of dust cover in recognizable way:

- Name of the manufacturer
- Month and year of manufacturing
- Manufacturer part number
- Serial number of the damper
- Nominal force and nominal velocity
- Name/Type of damper as mentioned in RDSO's drawing along with drawing number.

The marking should remain legible with the naked eye for the entire service life of the dampers and the manufacturer demonstrates the aging stability of the marking by a salt spray test according to ISO 9227.

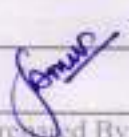
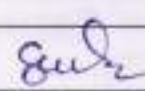
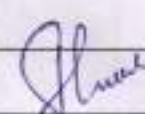
Besides above the damper shall be marked as per RDSO drawings with following details:

- Name of the manufacturer or code
- Month and year of manufacturing
- Manufacturer part number
- Nominal force and nominal velocity
- Name/Type of damper as mentioned in RDSO's drawing

Alternatively, the above information can be marked on dust cover, diagonally opposite to number plate.

Firm shall ensure traceability of damper right from raw material stage to the finished product stage with their internal system. Same shall be verified by RDSO during initial registration / periodic quality audit.

For Lateral, Anti-Yaw dampers, clear mounting indications need to be fixed as per relevant RDSO drawing on the main body (Casing tube sub assembly) to indicate the side to face the ground.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 12 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

2.8 Surface protection/varnishing

2.8.1 Dampers finishing

Non-polluting lacquer/ paint should be used for the dampers finishing. All support surfaces meant for mounting bolts and screws must be unlacquered/ unpainted and have a galvanic coating. Any lacquer/ paint on the rubber bearings will be not accepted.

All parts of the dampers which are exposed to ambient air must be protected against corrosion. The Manufacturer shall describe, and suitably document, the painting process it intends to apply for all visible parts of the dampers.

All these details shall be included in QAP which shall be submitted to RDSO for approval.

2.8.2 Resistance of the paint

To be performed at the type approval stage:

Check bond according to ISO 2409: the paint must not come off any of the squares.

2.8.3 Resistance to salt environment

The manufacturer demonstrates the aging stability of the surface protection by a salt spray test according to ISO 9227.

The testing time for all dampers must not remain under: 720 hours


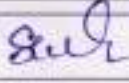
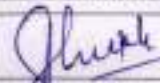
The specimen shouldn't have any "Red Rust" on the outside as well as internal surfaces exposed to air.

2.8.4 Colour

2.8.4.1 For LHB Coaches

The colour of the coating lacquer will be as under:

S. No.	Type of Damper	RDSO Drg. No.	Colour
1	Primary Vertical Dampers for all type of LHB Coaches.	RDSO/CG/DRG/21047 Alt. 3	RAL 7012: Basalt Grey
2	Secondary Vertical Damper for LHB AC Coaches	RDSO/CG/DRG/21046 Alt. 3	RAL 6027: Light Green
3	Secondary Lateral Damper for all coil FIAT Bogie	RDSO/CG/DRG/21045 Alt. 3	RAL 7012: Basalt Grey
4	Yaw Damper for all type of LHB Coaches.	RDSO/CG/DRG/21048 Alt. 3	RAL 7012: Basalt Grey
5	Secondary Lateral Damper for Air Spring Bogie	RDSO/CG/DRG/21049 Alt. 3	RAL 9005: Jet Black
6	Secondary Vertical Damper for Non AC Coaches	RDSO/CG/DRG/21018 Alt. 3	RAL 3011: Brown Red

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dic./VDG

2.8.4.2 For VB Coaches:

S. No.	Type of Damper	RDSO drawing no.	Colour
1	Primary Vertical Damper	RDSO/CG/DRG/25009 or latest	RAL 7012: Basalt Grey
2	Secondary Vertical Damper	RDSO/CG/DRG/ 25010 or latest	
3	Secondary Lateral Damper	RDSO/CG/DRG/ 25011 or latest	
4	Yaw Damper	RDSO/CG/DRG/ 25012 or latest	

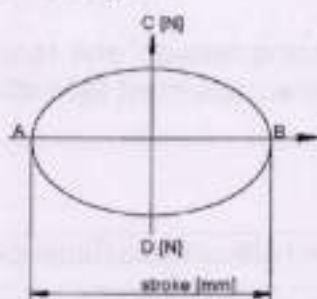
2.8.5 Thickness of the layer

Thickness of the paint layer shall be a minimum of 50 microns (DFT)

3 DEMANDS ON THE CHARACTERISTICS**3.1 Demands for Force/ Displacement characteristics**

If a damper is stimulated with a sinusoidal force, diagram looks like the following graph:

Figure 1: Force v/s displacement diagram

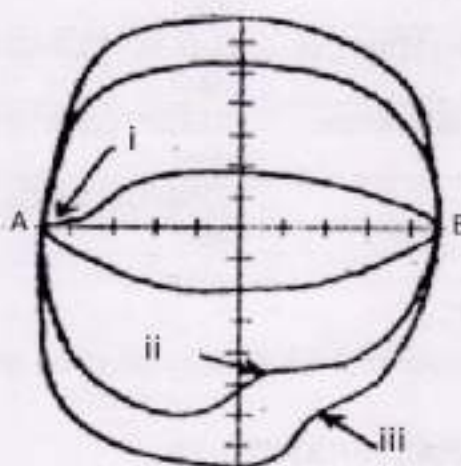


Ideal - Thoratically Perfect Curve

Correctly working dampers show the following characteristics in every diagram with different velocities:

- The curve is continuous and free from local vibrational phenomena
- The diagram should be free from jumps (angular intersection at points A or B)
- There should be no sudden changes in the shape of the curve i.e. 'i', 'ii' or 'iii' in loop below

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSU/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

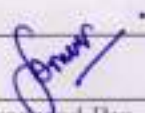
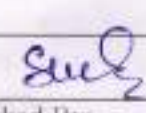
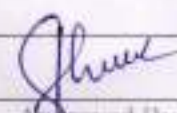


3.2 Demands for the Force/Velocity Characteristics

There are two different Damper Force/ velocity characteristic, one for each direction of travel

With this configuration compression and tension result in two different graphs. The force/velocity characteristics must fall within limits which are specified below:

S. No.	Condition	Tolerance Range from nominal
1	In new condition (without attachment elements)	$\pm 15\%$
2	In new condition (with attachment elements)	$\pm 20\%$
3	After completion of service trials as per specification during vendor development (with attachment elements)	$\pm 22\%$
4	In service condition (with attachment elements) during testing by Zonal Railways upto 4 years from date of manufacturing.	$\pm 25\%$
5	In service condition (with attachment elements) during testing by Zonal Railways beyond 4 years from date of manufacturing	$\pm 30\%$

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

4 QUALIFICATION AND INSPECTION REQUIREMENTS

4.1 Test Method

Each test has to fulfill the following conditions

4.1.1 Test Machine

- The test machine should be computer controlled capable of storing and receiving data with facility to take printouts.
- The test machine is integrated in the quality system concerning calibration
- The stiffness of the test machine must not influence the measurement conditions.
- The test machine is able to measure both the compression and the tension forces.
- The test velocity is showing the following formula:
$$V(t) = V \cdot \sin(\omega t)$$

4.1.2 Test Temperature

- All tests should be proceeded at temperature $(26 \pm 5)^{\circ} \text{C}$.

4.2 Design conditions

4.2.1 Dimension of the geometry

The manufacturer confirms at the first article testing, that the minimum and maximum lengths of the dampers are kept as specified.

Overall dimensions:

The dimensions showed in the drawings must be recorded by the manufacturer and compared with the specified dimensions.

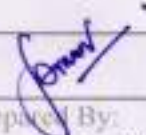
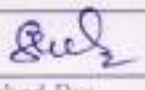
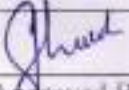
The following dimensions must be measured:

- Maximum and minimum length of the dampers
- diameter of the dust tube
- Dimension and position of the external housing if existing
- Diameter of the dampers body
- Dimensions of the dampers bearing and its attachment elements.

4.2.2 Welding seams at dampers

- Only those welding seams which are visible from outside are considered.
- The quality of welding seam has to be according to EN 15085 / EN 25817/ ISO 5817 class B with the following exception:

No. 11: Undercutting is not allowed.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 16 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

At the type approval stage, the manufacturer shall hand over to RDSO necessary documentation for records.

4.2.3 Testing of welding seams

The welding seams have to be checked by non-destructive methods via PT (Penetrant Test) or MT (Magnetic Particle Test)

PT as per ISO 23277

MT as per ISO 17638 and ISO 23278

The test has to be done with two samples per each type of dampers. The test results have to be recorded and sent to RDSO.

4.3 Testing of dampers

4.3.1 Production tests

Production test shall be carried out on every damper and record of the same should be kept. The test will be carried out at a stroke of 50 mm (unless is otherwise specified in drawing or purchase order) and at two different velocities.

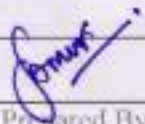
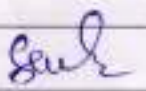
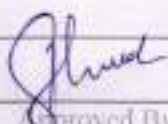
For LHB Coaches, one velocity should be the same as mentioned in RDSO's Drawings at which damping force is specified and second velocity shall be decided by manufacturer.

For Vande Bharat coaches, production test should be carried out at two velocities mentioned in RDSO's drawings at which damping force specified.

4.3.2 Visual Check

All the dampers must undergo visual inspection before they are dispatched to make sure there are no signs of:

- Failure
- Indentations
- Damages on the coating or damper itself
- Paint on Rubber bearings and support surfaces of the screws
- Detachment of laceration (deep cut or tear) of the rubber parts of the articulated joints and elastic blocks
- Fluid/oil leakages

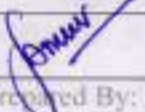
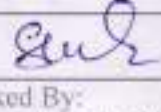
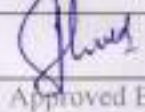
Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

4.3.3 Routine Testing

This measurement serves for drawing up the graph described in section 3.1

Table 3: Force velocity characteristics test

General conditions	The test method described in section 4.1 is to apply
Test position	The dampers must be tested in the position according to the real position in the bogie / at angle specified in RDSO's drawings.
Test length	Installation length of the damper in the bogie / mid position
Test amplitude	As mentioned in drawings.
Test velocity	According to table 4
Test conditions	<ul style="list-style-type: none"> • Measurement with and without attachment elements during first article testing / type test stage. • Measurement with attachment elements during acceptance testing (purchase inspection).
Number of cycles before measuring	10 complete cycles
Measurement	<p>The eleventh cycle is used in order to ascertain for each velocity</p> <ul style="list-style-type: none"> • The maximum extension force • The maximum compression force
Diagram	<ul style="list-style-type: none"> • A diagram (force/ displacement) must be recorded for each measurement. • According to this force/ displacement diagram a force/velocity diagram should be draw up • All relevant data must be obvious on the diagram i.e. velocity, force, stroke (amplitude) axis etc.
Analysis / Acceptance Criteria	<ul style="list-style-type: none"> • The diagram should be in compliance with section 3.1 and 3.2. • Damping forces at the particular velocity should be in tolerance limits mentioned in RDSO's drawing of particular damper.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 18 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

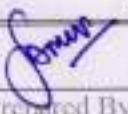
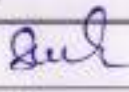
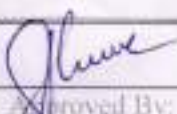
Table 4: Velocity's for the force/velocity characteristics test

	V (m/s)					
Primary dampers	0.05	0.1	0.15	0.2	0.25	0.3
Vertical dampers	0.05	0.1	0.15	0.2	0.25	0.3
Lateral dampers	0.05	0.1	0.15	0.2	0.25	0.3
Yaw damper	0.005	0.01	0.03	0.05	0.1	0.15

4.3.4 Measurement of the dynamic stiffness (For LHB damper- test is applicable for all dampers & For Vande Bharat damper-test is applicable for Yaw damper only)

Table 5: Dynamical Stiffness test (Graphical representation should not be much differ at lower amplitude & higher amplitude.)

General conditions	The test method described in section 4.1 is to apply
Test position	The dampers must be tested in the position according to the real position in the bogie / at angle specified in RDSO's drawings.
Test Length	Installation length of the damper in the bogie / mid position
Test amplitude	According to table 6-9
Test velocity	According to table 6-9
Test conditions	<ul style="list-style-type: none"> Measurement without attachment elements.
Number of cycles before measuring	10 complete cycles
Measurement	<p>The eleventh cycle is used in order to ascertain for each velocity</p> <ul style="list-style-type: none"> The maximum extension force The maximum compression force
Diagram	<ul style="list-style-type: none"> A diagram (force/ displacement) must be recorded for each measurement. According to this force/ displacement diagram a force/velocity diagram should be drawn All relevant data must be obvious on the diagram i.e. velocity, force, stroke (amplitude) axis etc.
Analysis / Acceptance	<ul style="list-style-type: none"> The diagram will be in compliance with section 3.1 and 3.2.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Criteria	<ul style="list-style-type: none"> Damping forces at amplitudes mentioned in table 6 to 9, under the velocity which is mentioned in RDSO's drawing of particular damper should be in tolerance limits mentioned in RDSO's drawing of particular damper.
----------	--

Table: 6

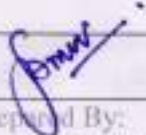
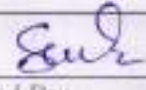
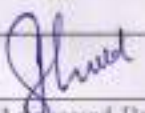
Primary dampers :								
	Frequency {Hz} at v_{damper} {m/s}							
Amplitude (mm)	0.02 m/s	0.03 m/s	0.05 m/s	0.07 m/s	0.1 m/s	0.15 m/s	0.2 m/s	0.3 m/s
2	1.59	2.39	3.98	5.57	7.96	11.94	15.92	23.87
4	0.80	1.19	1.99	2.79	3.98	5.97	7.96	11.93
6	0.53	0.80	1.33	1.86	2.65	3.98	5.31	7.95

Table 7:

Vertical dampers :								
	Frequency {Hz} at v_{damper} {m/s}							
Amplitude (mm)	0.02 m/s	0.03 m/s	0.05 m/s	0.07 m/s	0.1 m/s	0.15 m/s	0.2 m/s	0.3 m/s
2	1.59	2.39	3.98	5.57	7.96	11.94	15.92	23.87
4	0.80	1.19	1.99	2.79	3.98	5.97	7.96	11.93
8	0.40	0.60	1.00	1.39	1.99	2.99	3.98	5.96
12	0.27	0.40	0.66	0.93	1.33	1.99	2.65	3.97
16	0.20	0.30	0.50	0.70	1.00	1.49	1.99	2.98

Table 8:

Lateral dampers :								
	Frequency {Hz} at v_{damper} {m/s}							
Amplitude (mm)	0.02 m/s	0.03 m/s	0.05 m/s	0.07 m/s	0.1 m/s	0.15 m/s	0.2 m/s	0.3 m/s
2	1.59	2.39	3.98	5.57	7.96	11.94	15.92	23.87
4	0.80	1.19	1.99	2.79	3.98	5.97	7.96	11.93

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 20 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

8	0.40	0.60	1.00	1.39	1.99	2.99	3.98	5.96
12	0.27	0.40	0.66	0.93	1.33	1.99	2.65	3.97
16	0.20	0.30	0.50	0.70	1.00	1.49	1.99	2.98

Table 9:

Side motion dampers :								
	Frequency {Hz} at V_{damper} {m/s}							
Amplitude (mm)	0.005 m/s	0.01 m/s	0.02 m/s	0.03 m/s	0.05 m/s	0.07 m/s	0.1 m/s	0.15 m/s
2	0.39	0.80	1.59	2.39	3.98	5.57	7.96	11.94
4	0.20	0.40	0.80	1.19	1.99	2.79	3.98	5.97
6	0.13	0.27	0.53	0.80	1.33	1.86	2.65	3.98
20	0.04	0.08	0.16	0.24	0.40	0.56	0.80	1.19
30	0.026	0.05	0.11	0.16	0.27	0.37	0.53	0.80

4.3.5 Measurement of Series stiffness and Damping coefficient (for LHB damper only)

At the type-approval stage the manufacturer shall calculate and ensure the value of series stiffness and the damping coefficient of the damper-articulated joint system or of the dampers alone in the case of particularly flexible articulated joints.

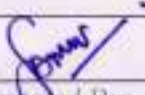
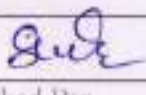
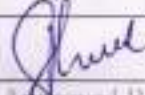
The dampers must be tested in its working position (see assembly drawing) and over the range of displacements and frequencies specified in the table 10.

Table 10

Type	Frequency {Hz}	Amplitude {mm}
Primary suspension	From 4 to 12	± 2.5
Secondary suspension	From 0.5 to 2	± 10
Anti-yaw	From 0 to 9	± 2.6

The dampers must be activated by means of sinusoidal displacements of constant amplitude (see table) and of variable frequency over the entire specified range.

The activation displacement $u(t)$ must be measured in a suitable manner in order to correct it for the components, such as Deformation of the supporting structures and the like, if any, which might alter its value.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

At the same time, measure the force delivered by the dampers $F(t)$.

Both quantities, $u(t)$ and $F(t)$ must then be subjected to a Fourier analysis in order to determine the frequency components.

For each frequency, determine the u/F ratio as imaginary number. From the real part of this ratio, determine the value of series stiffness, and from the imaginary part, determine the damping coefficient according to "receptance" theory.

$$\frac{u}{F} = \frac{1}{k} - \frac{1}{\omega d}$$

where k = series stiffness

d = damping coefficient

$\omega = 2\pi f$

$$\operatorname{Re}\left\{\frac{u}{F}\right\} = \frac{1}{k}$$

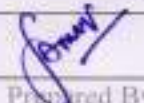
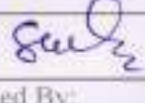
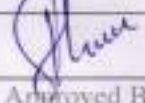
$$i\omega \operatorname{Im}\left\{\frac{u}{F}\right\} = \frac{1}{d}$$

The value of the damping coefficient over the entire frequency range specified must not deteriorate beyond 20% of the nominal value which must be observed at the lowest frequency values (1 to 2 Hz).

4.3.6 Measurement at extreme temperature

Table 11

General conditions	The test method described in section 4.1 is to apply.
Test position	The dampers must be tested in the position according to the real position in the bogie / at angle specified in RDSO's drawings.
Test length	Medium installation length
Test amplitude	According to table 12
Test velocity	To be calculated from table 12.
Test conditions	<ul style="list-style-type: none"> • Measurement with attachment elements. • The test performed after removal of dust cover.
Measurement	<ol style="list-style-type: none"> 1. Measure the dampers at room temperature according to 4.3.3. 2. Cool the complete damper to the specified temperature (-40°C) and keep it in this condition for 24h then measure the characteristic according to the table below (Table 12). 3. Fit immediately (Loading and unloading time for testing of damper should be lowest possible to minimize the temperature loss upto -30°C) the dampers onto the testing machine prepared for the execution of the test according to the amplitude listed in the

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 22 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

	<p>table 12 and a frequency corresponding to $\frac{1}{4}$ the value given in the table 12. Carry on the test until you reach a temperature of -20°C as measured on the body in the proximity of the sealing gasket.</p> <ol style="list-style-type: none"> Measure the characteristic (Damping Forces) at -20°C with the values given in the table 4. Start the test again as per s. no. 3 above until they have reached the temperature of 0°C. The cycle must be carried on at the frequency given in the table below until a temperature of 40°C is reached. The characteristics (Damping Forces) of dampers have to be measured again at this temperature as per table 4. Start the test again until a temperature of 80°C is reached or until the temperature becomes stable, if lower than 80°C Let the dampers cool down to the room temperature Measure the characteristics (Damping Forces) of dampers at the room temperature as per table 4.
Diagram	<ul style="list-style-type: none"> A diagram (force/displacement) must be recorded for each measurement. According to this force/ displacement diagram a force/velocity diagram should be drawn All relevant data must be obvious on the diagram velocity, force, stroke (amplitude) axis etc.
Analysis	<ul style="list-style-type: none"> The diagram will be in compliance with section 3.1 and 3.2 There should be no oil leakage at the dampers There shall be no damages at the rubber bearings (collar, skin) The diagrams (force/ displacement) of point 1 and point 8 above of the measurement vary only in a range of 5%. The diagrams (force/ displacement) of point 3 and point 5 above of the measurement vary only in a range of 30%.

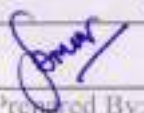
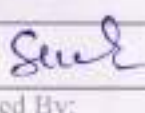

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Table 12

Type	Frequency {Hz}	Amplitude {mm}	Temperature (° C)	
			T Min	T Max
Primary suspension	7	2.5	-40	80
Secondary suspension	1.6	10	-40	80
Anti-yaw	6	2	-40	80

4.3.7 Leakage Test

Table 13

General conditions	The test method described in section 4.1 is to apply.
Test position	The dampers must be tested in the position according to the real position in the bogie / at angle specified in RDSO's drawings.
Test length	Minimum test length = Compressed Length + 5mm Maximum test length = Compressed Length + 5mm + 75 % of stroke (for information)
Test Stroke	75 % of stroke with a maximum of 100 mm.
Test velocity	Nominal velocity as mentioned in drawing issued by RDSO.
Test conditions	Measurement with attachment elements.
Number of cycles before inspection	20 complete cycles
Inspection	Remove the covers and examine for any oil leakage. There should not be any leakage of oil after completion of test.


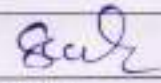
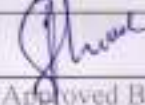
4.3.8 Fatigue Test

During the Type Test approval stage following tests shall be done-

- Static test
- Dynamic test

4.3.8.1 Static test

The damper has to be loaded (compressed and expanded) with a static force of 20KN according to section 2.3.1. No damage on the dampers and its attachment elements is allowed after this test.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

Ref: CG-WI-4.2.1-1 Ver. 1.0	Page 24 of 56	Date / Month of issue: June 2025	RDSO/CG-18005 Rev. 02
-----------------------------	---------------	-------------------------------------	--------------------------

4.3.8.2 Dynamic Testing of dampers.


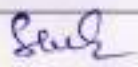
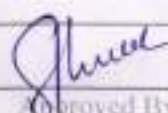
The supplier has to prove the specified life of about 1.2 million kilometers with a long-time test as specified below: -

- Test the damper according to section 4.3.3 & as per the following conditions shall be considered for dynamic fatigue test

Item	Velocity (m/s)	Amplitude	Cycles
Primary Vertical Dampers for all type of LHB Coaches.	0.30	± 9.5 mm	minimum 1×10^7 cycles
Secondary Vertical Damper for LHB AC Coaches	0.20	± 9.5 mm	minimum 1×10^7 cycles
Secondary Lateral Damper for all coil FIAT Bogie	0.30	± 9.5 mm	minimum 1×10^7 cycles
Yaw Damper for all type of LHB Coaches.	0.10	± 9.5 mm	minimum 1×10^7 cycles
Secondary Lateral Damper for Air Spring Bogie (for LHB coaches)	0.30	± 9.5 mm	minimum 1×10^7 cycles
Secondary Vertical Damper for Non AC Coaches (for LHB coaches)	0.10	± 9.5 mm	minimum 1×10^7 cycles
Primary Vertical Dampers (Vande Bharat Coaches)	0.30	± 9.5 mm	minimum 1×10^7 cycles
Secondary Vertical Damper (Vande Bharat Coaches)	0.30	± 9.5 mm	minimum 1×10^7 cycles
Secondary Lateral Damper (Vande Bharat Coaches)	0.30	± 9.5 mm	minimum 1×10^7 cycles
Yaw Damper (Vande Bharat Coaches)	0.10	± 9.5 mm	minimum 1×10^7 cycles

- The table 14 shows the offset between the dampers and the eyelet's as a example.
- The damper is tested according to the real positioning in the bogie.
- At the end of the tests the damper has to be measured according to section 4.3.3 and damping characteristics (with attachment) should be in tolerance limit of +20 % to - 30% from nominal value.

The characteristics have to be still in the specified figures. The full functionality is still guaranteed. No replacements of any parts allowed during the test.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG