

Reasoned document of draft specification no. MP-0.41.00.07 (Rev. 01) for 'Technical specification & schedule of technical Requirements for long life spring pad assembly used in side buffers of BG locomotives

Draft specification no. MP-0.41.00.07 (Rev. 01) 'Technical specification & schedule of technical Requirements for long life spring pad assembly used in side buffers of BG locomotives as per ISO procedure was uploaded on RDSO website for one month for comments/ suggestions. The draft specification was also sent to Zonal Railways, production units for comments and suggestions.

M/s Prag Industries, Lucknow & M/s Surlon Durel springs pvt. Ltd., New Delhi submitted comments on draft specification. No any other approved/ developmental vendor submitted their comments. No comments have been received from zonal Railways, production units and any other party so far. Reasoned Statement based on comments received by M/s Prag & M/s Surlon Durel (except Noted and complied) on draft spec is tabulated below:

Clause of Spec.	Clause as mentioned in draft specification	Comments by M/s Surlon Durel springs, New Delhi	Comments by M/s Prag Industries, Lucknow	Stipulation in the Draft spec. with reason
2.1	Material of spring pad should be Thermoplastic Elastomer (TPE) with high damping characteristic. The design shall be in one piece sandwich type stack. Material of separating metal plates used shall conform to IS: 2062 Fe410 WA and withstand buff load of 1000 kN	Material of spring pad should be Thermoplastic Elastomer (TPE) with high damping characteristic. The design shall be in one piece sandwich type stack. Material of separating metal plates used shall conform to IS:2062 Gr- E 250 C and withstand buff load of 1000 kN.	Noted & Accepted	Agreed with M/s Surlon Durel Para 2.1 has been revised as: Material of spring pad should be Thermoplastic Elastomer (TPE) with high damping characteristic. The design shall be in one piece sandwich type stack. Material of separating metal plates used shall conform to IS: 2062 Gr- E 250 A/ E 250 C and withstand buff load of 1000 KN Reason: Gr. Fe 410 WA in IS 2062 (2006) has been Revised to E 250 A in IS 2062 (2011).

2.2	<table><tr><th>SN</th><th>Parameters (buffer spring stack)</th><th>Design Requirements</th></tr><tr><td>1.</td><td>Travel of spring pads assembly</td><td>105⁰ mm (in Compression)</td></tr><tr><td>2.</td><td>End load</td><td>1000 kN (Max.)</td></tr><tr><td>3.</td><td>Dynamic energy capacity</td><td>30 kJ (Min.)</td></tr><tr><td>4.</td><td>Energy absorption</td><td>> 60 %, as per annexure 1</td></tr><tr><td>5.</td><td>Pre-Compression load at installed height 584 mm</td><td>10 kN to 15 kN</td></tr></table>	SN	Parameters (buffer spring stack)	Design Requirements	1.	Travel of spring pads assembly	105 ⁰ mm (in Compression)	2.	End load	1000 kN (Max.)	3.	Dynamic energy capacity	30 kJ (Min.)	4.	Energy absorption	> 60 %, as per annexure 1	5.	Pre-Compression load at installed height 584 mm	10 kN to 15 kN	Pre-Compression load at installed height 584 -0/+5 mm	These design requirements should be applicable for product development and type testing for product approval	<p>Detailed study is required of the parameter. Hence at this stage para reinstated as per original specification Rev.00</p> <table><tr><th>SN</th><th>Parameters (buffer spring stack)</th><th>Design Requirements</th></tr><tr><td>1.</td><td>Travel of spring pads assembly</td><td>105⁰ mm (in Compression)</td></tr><tr><td>2.</td><td>End load</td><td>1000 kN (Max.)</td></tr><tr><td>3.</td><td>Dynamic energy capacity</td><td>30 kJ (Min.)</td></tr><tr><td>4.</td><td>Energy absorption</td><td>> 60 %, as per annexure 1</td></tr><tr><td>5.</td><td>Pre-Compression load at installed height</td><td>10 kN to 15 kN</td></tr></table>	SN	Parameters (buffer spring stack)	Design Requirements	1.	Travel of spring pads assembly	105 ⁰ mm (in Compression)	2.	End load	1000 kN (Max.)	3.	Dynamic energy capacity	30 kJ (Min.)	4.	Energy absorption	> 60 %, as per annexure 1	5.	Pre-Compression load at installed height	10 kN to 15 kN
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3.1	Capacity test, endurance test, static Characteristics & dynamic Characteristics test of TPE spring pads assembly shall be carried out in accordance with UIC 526-1/UIC 827-1 The test shall be done at the premises of the elastomer pad manufacturer or the buffer manufacturer or the 3rd party lab. The test facilities shall be certified by a reputed agency in compliance to EN/UIC/AAR or any other equivalent national/ international standard for carrying out this type of test.	Capacity test, endurance test, static Characteristics & dynamic Characteristics test of TPE spring pads assembly shall be carried out in accordance with EN 15551.The test shall be done at the premises of the elastomer pad manufacturer or the buffer manufacturer or the 3rd party lab authorized for EN testing. The test facilities shall be certified by a reputed agency in compliance to EN/UIC/AAR or any other equivalent national/ international standard for carrying out this type of test.	Capacity test, endurance test, Static Characteristics & Dynamic Characteristics test of TPE Spring pads assembly shall be carried out in accordance with UIC 526-1/UIC 827-1 as a part of type test for product approval. These tests should not be part of regular purchase inspection test.	Mechanical characteristics of buffer housing and elastic system are similar in EN 15551 and UIC-526 accordingly EN 15551 has also been included. Accordingly para 3.1 has been revised as: 3.0 Design approval shall be subjected to fulfillment of the following tests/ requirements Capacity test, endurance test, static Characteristics test of TPE spring pads assembly shall be carried out in accordance with EN 15551/ UIC 526-1/UIC 827-1 at the premises of the manufacturer /supplier of spring pads assembly in the presence of RDSO representative.																																				

3.2	<p><u>Static characteristics</u></p> <p>The following static characteristics shall be checked in compression stroke on spring pad assembly</p> <p>.Initial force: between 10 and 15 kN</p> <p>Force following a 25 mm stroke: between 30 and 130 kN</p> <p>Force following a 60 mm stroke: between 130 and 400 kN</p> <p>Force following a 100 mm stroke: between 500 and 1000 kN</p> <p>stored energy (We) for an effort not exceeding 1000 kN ≥ 12.5 kJ</p> <p>These characteristics shall be measured at an ambient temperature of approximately 15⁰ C. The compression phase shall be followed immediately by the decompression phase, and the maximum displacement speed of the plunger in both directions must be comprised between 0.01 and 0.05 m/s. When fully released the buffer must be in the same condition as initially.</p>	<p><u>Static characteristics</u></p> <p>The following static characteristics shall be checked in compression stroke on spring pad assembly. (72hr after assembly)</p> <p>Initial force: between 10 and 15 kN</p> <p>Force following a 25 mm stroke: between 30 and 130 kN</p> <p>Force following a 60 mm stroke: between 130 and 400 kN</p> <p>Force following a 100 mm stroke: between 500 and 1000 kN</p> <p>stored energy (We) for an effort not exceeding 1000 kN ≥ 12.5 kJ</p> <p>Wa ≥ 0.5 We – For 1st cycle</p> <p>Wa ≥ 0.42 We – For 2nd & 3rd cycle.</p> <p>These characteristics shall be measured at an ambient temperature of approximately 15⁰ C to 25⁰ C. The compression phase shall be followed immediately by the decompression phase, and the maximum displacement speed of the plunger in both directions (shall be less or equal 0,05 m/s) must be comprised between 0.01 and 0.05 m/s. When fully released the buffer must be in the same condition as initially.</p>	<p>The following static characteristics shall be checked in compression stroke on spring pad assembly.</p> <p>Initial force: between 10 and 15 KN (to be checked after holding at the installed height for 72 hrs. minimum.)</p> <p>Refer 2.2.1 of UIC 827-1 and 4.1 of UIC 526-1</p> <p>Force following a 25 mm stroke: between 30 and 130 KN</p> <p>Force following a 60 mm stroke: between 130 and 400 KN</p> <p>Force following a 100 mm stroke: between 500 and 1000 KN</p> <p>stored energy (We) for an effort not exceeding 1000 KN ≥ 12.5 kJ</p> <p>These characteristics shall be measured at a standard laboratory temperature of approximately 27⁰ C (In India, the ambient temperature of 15 °C is for a very short period of time). The compression phase shall be followed immediately by the decompression phase, and the maximum displacement speed in both directions must be 15+/-5 mm/minute to enable to record the load/pack height reading (As per present norm). When fully released the buffer pack must come back to same initial installed height.</p>	<p>Detailed study of the static characteristics is required. Hence at this stage this para is deleted and reverted as per Rev.00.</p>
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3.3	<p>Flexibility test</p> <p>The flexibility test shall be carried out as follows:</p> <p>i. TPE rings are stacked in such a way as to form a spring as used in service.</p> <p>ii. The stack thus formed is tested on a test bench equipped with a chart recording device. The test bench shall be calibrated at least once in a year.</p> <p>iii. The spring is compressed 20 times to the maximum stroke i.e. 105 mm and the load maintained, each time, for 30 s, up to this stroke.</p> <p>iv. The semi-static diagram is recorded. It shall comply to the static characteristics requirements given in Para 3.2</p> <p>v. After tests the rings should show no breaks, defects, signs of cracking or abrasions.</p>	<p>Flexibility testing not required for polymer springs. (Refer Annex C of EN 15551 for list of applicable test)</p>	<p>3.3 Flexibility test</p> <p>The flexibility test shall be carried out as follows:</p> <p>i. TPE rings are stacked in such a way as to form a spring as used in service.</p> <p>ii The stack thus formed is tested on a testing machine. The testing machine should be calibrated once in a year.</p> <p>iii. Load will drop at a stroke of 105 mm with time due to creep of the material.</p> <p>iv. Initial load deflection characteristic should conform to the requirements of Para 3.2.</p> <p>v. After tests the rings should show no breaks, defects, signs of cracking or abrasions.</p>	<p>Detailed study of the flexibility test is required hence at this stage this para has been deleted.</p>								
3.4	<p>Endurance testing</p> <p>In order to ascertain the satisfactory behavior of a buffer in service it is necessary to check by, carrying out an endurance test. After static characteristics test the endurance test must be performed on same assembly at impact test bench or on a press having chart recording facility.</p> <p>For endurance test a sinusoidal wave form of cyclic stroke C1 applied 3000 cycles corresponding of stored energy of 0.25 We, stroke C2 will be applied 1200 cycles corresponding of stored energy of 0.50 We and C3 will be applied 200 cycles corresponding of stored energy of 0.85 We. Frequency of compression shall be 6 cycles per minute.</p> <p>We represents the maximum value of stored energy corresponding to 30 kJ buffer spring assembly.</p> <table><tr><td>Number of compressions</td><td>Stroke</td></tr><tr><td>3000</td><td>C1</td></tr><tr><td>1200</td><td>C2</td></tr><tr><td>200</td><td>C3</td></tr></table> <p>Static characteristics test will be again repeated after completion of endurance test. The energy stored by the buffer should be 80 % of the energy stored before endurance test.</p>	Number of compressions	Stroke	3000	C1	1200	C2	200	C3	<p>Kindly refer Annex F for Endurance testing under service load for elastic system of EN 15551.</p> <p>Note: - For Prototype testing Only.</p>	<p>It should be done at the time of product approval.</p> <p>This should be part of type test and not be part of regular purchase inspection.</p>	<p>Detailed study of the endurance test is required. Hence at this stage para 3.4 has been deleted to revert as original Rev.00.</p>
Number of compressions	Stroke											
3000	C1											
1200	C2											
200	C3											

3.5	Mechanical characteristics after clamping The compression/ displacement curve after clamping of the spring assembly at designed installed height for a minimum of 72 h at 230 C \pm 20 C shall be between the limiting curves specified in firm's drawing.	Noted and complied	The load/ deflection characteristics after clamping of the spring assembly at installed height for a minimum of 72 h at 23 ⁰ C \pm 2 ⁰ C shall conform to the requirements of para 3.2 (refer 2.2.1 of UIC 827-1.	Detailed study is required in these characteristics. Hence at this stage para 3.5 has been Deleted to revert as in original Rev.00
3.6	<u>Characteristics after dynamic stresses</u> As per para 2.3.2 of UIC-827-1	Kindly refer Annex E for Dynamic characteristics and clause no. 5.5.3 as per EN 15551	This should be part of type test and not part of regular inspection.	Detailed study is required in this matter. Accordingly para 3.6 has been Deleted.

Physical Properties

S N	Property	Test Method	Units	Permissible Limit
1.	Tensile Strength	ISO 37 or Equivalent BIS standard	kg/cm ²	250 (Min)
2.	Elongation at Break	ISO 37 or Equivalent BIS standard	%	350 (Min)
3.	Modulus at 200 % Elongation at Machin speed 200mm/ min	ISO 37 or Equivalent BIS standard	kg/cm ²	150 (Min)
4.	Compression Set after 25 % compression for 24 hours at 70 ⁰ ± 1 ⁰ C	ISO 815/ ASTM D 395 or Equivalent BIS standard	%	30 Max .
5.	Compression Set after 25 % compression for 24 hours at -30 ⁰ ± 1 ⁰ C measured after stabilising for 03 minute at -30 ⁰ C	ASTM D 1229 or Equivalent BIS standard	%	55 Max .
6.	Ash Content	IS-3400 Pt.22	%	0.5 Max.

Change in properties after Accelerated Ageing at 70⁰ ± 1⁰C for 7 days

Change in Tensile Strength at Break	± 20 % Max.
Change in Elongation at Break	± 30 % Max.
Change in 200% Modulus	± 20 % Max.

As per Annex C of EN 15551 Table C.1 the test which are applicable for TPE are.

1. Shore hardness D according to EN ISO 868
2. Compression set after 25 % compression for 24 h at 50 °C according to ISO 815-1
3. Compression set after 25% compression for 24h at -30°C after stabilizing for 3min. at -30°C measured according to ISO 815-2 at ambient temperature.

As per table C.2 of EN 15551 static characteristic test is to be done only during prototype.

Physical Properties

Hardness of the material should be approved at the time of product approval.

Our approved Hardness of TPE material is

S N	Property	Test Method	Units	Permissible Limit
1.	Tensile Strength	ISO 37 or Equivalent BIS standard	kg/cm ²	250 (Min)
2.	Elongation at Break	ISO 37 or Equivalent BIS standard	%	350 (Min)
3.	Modulus at 200 % Elongation at Machin speed 200mm/ min	ISO 37 or Equivalent BIS standard	kg/cm ²	150 (Min)
4.	Compression Set after compression as applicable according to the "Hardness of the TPE material for 24 hours at 70 ⁰ ± 1 ⁰ C . In our case for a "Hardness" of 64 Shore D, the compression is 10 % as per ISO 815	ISO 815-1/ ASTM D 395 or Equivalent BIS standard	%	50 Max At present we are testing as per ASTM D 395, test method A, compression set under constant force which applicable for hard materials .
5.	Compression Set after 25 % compression as applicable according to the "Hardness of the TPE material for 24 hours at -300 ± 10C and measured after stabilising for 03 minute at -30o C In our case for a "Hardness" of 64 Shore D, the compression is 10 % as per ISO 815	ISO 815-2 or Equivalent BIS standard IS 3400 (Part 10/Sec2) :2022	%	90 Max.
6.	Ash Content	IS-3400 Pt.22	%	0.5 Max.

64+/- 5 Shore

Detailed study is required in this matter. Hence at this stage para 3.7 has been Deleted to revert as original Rev.00.

3.7

4.1	The firm has to submit Internal test results of physical properties and manufacturing processes used for manufacturing buffer TPE spring pads.	The manufacturing process is proprietary & patented that why we are not able to provide the manufacturing process. We will provide Internal test report as per EN 15551.		No change required
4.2	Firm should be either manufacturer of TPE spring pads or authorized representative of OEM (who holds IPRs / Design) having the MOU / Technology Collaboration Agreement / License Agreement which is valid for sufficient period i.e. minimum five years. Firm should submit valid authorization document /MOU to RDSO at the time of application of fresh vendor registration and at the time of renewal as the case may be.	Noted and shall be complied	Noted & Accepted	<p>Para 4.5 and 4.2 merged and revised as under:</p> <p>Firm should be either manufacturer of TPE spring pads or authorized representative of OEM of TPE spring pads (who holds IPRs / Design) having the MOU / Technology Collaboration Agreement / License Agreement which is valid for sufficient period i.e. minimum five years. Firm should submit valid authorization document /MOU to RDSO at the time of application of fresh vendor registration.</p> <p>The spring pad manufacturer shall have a suitable tie-up in the form of a written Memorandum of Understanding (MOU) with the raw material supplier covering supplies and technical support. Firm should submit the same to RDSO at the time of application for vendor registration.</p>

4.3	All metallic parts of spring pad assembly should be coated with corrosion resistant material.	Destruction tube and taper washer are spray painted. Intermediate disc is zinc plated. Spindle as machined.	Noted & Accepted	No Change required.
4.4	The surface of the elastomer parts shall be smooth and shall free from cracks, air bubbles, surface streaks, splash marks, pinholes, crazing, blistering, bulges or burrs. All the edges shall be neatly finished and free from flash.	Nil	Noted & Accepted	No Change required.
4.5	In the time of application for vendor registration, the spring pad manufacturer shall have a suitable tie-up in the form of a written Memorandum of Understanding (MOU) with the raw material supplier covering supplies and technical support. Firm should submit the same to RDSO.	Noted and shall be complied	Noted & Accepted	Merged with para 4.2 above.
4.6	Use of regenerated / re constituted material is not permitted.	Noted and complied	Noted & Accepted	No Change required.

6.1	Marking on TPE spring pads shall be in an area not subjected to wear or stress concentration, if possible, where they can be readily seen without removal of pads. Marking on all components of spring pad assembly shall have manufacturer initials, serial number, month & year of manufacturing. The manufacturer shall ensure that marking details are legible and are of good quality, which shall remain legible throughout the entire service life of spring pad assembly and its components.	Noted and complied	Marking on TPE spring pads shall be in an area not subjected to wear or stress concentration. Marking on the spring pad assembly shall have manufacturer initials, serial number, month & year of manufacturing	Para 6.1 has been revised as under: Marking on TPE spring pads shall be in an area not subjected to wear or stress concentration, if possible, where they can be readily seen without removal of pads. Marking on the spring pad assembly shall have manufacturer initials, serial number, month & year of manufacturing. The manufacturer shall ensure that marking details are legible and are of good quality, which shall remain legible throughout the entire service life of spring pad assembly and its components.
8.0	PREFERENCE TO MAKE IN INDIA The Govt. of India policy on „Make in India“ shall apply.	Noted and complied	All components of our Buffer Pad Assembly are manufactured in INDIA.	No change required.
9.0	VENDOR CHANGES IN APPROVED STATUS All the provisions contained in RDSO's ISO procedures laid down in document no. QO-D-8.1-11(latest), dated 07.07.2023 (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.	Noted and complied	Noted & Accepted	ISO document date has removed and latest word added because RDSO ISO document revised regularly VENDOR CHANGES IN APPROVED STATUS All the provisions contained in RDSO's ISO procedures laid down in document no. QO-D-8.1-11(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.
Section B Para 1.0	The firm shall be ISO 9001 certified organization	Noted and complied	We are ISO certified organization	No Change.
9.0	<p>The polymer pad manufacturer should have at least the following testing facilities installed in the laboratory with controlled temperature and humidity for carrying out various tests specified under Para 3:</p> <ul style="list-style-type: none"> a) At least one injection moulding machine and one set of mould. b) Tensile Testing Machine of adequate capacity c) Load Compression Testing Machine of suitable capacity d) Equipment for humidity control of laboratory e) Hardness tester f) Melting Point Apparatus g) Muffle Furnace h) Melt Flow Index Tester i) One Rheometer 	Not Applicable	Rheometer is not required for TPE materials	<p>Agreed that Rheometer is not required for TPE materials. Requirement of injection molding has been removed as it is not a testing facility.</p> <p>Accordingly para 9.0 has been revised as: The polymer pad manufacturer should have at least the following testing facilities installed in the laboratory with controlled temperature and humidity for carrying out various tests specified under Para 3:</p> <ul style="list-style-type: none"> a) Tensile Testing Machine of adequate capacity b) Load Compression Testing Machine of suitable capacity c) Equipment for humidity control of laboratory d) Hardness tester e) Melting Point Apparatus f) Muffle Furnace g) Melt Flow Index Tester

Annexure-2

Prototype Inspection test Plan of long life spring pad assembly (SK.DL-4726)

SN	Items	Material	Specified Value	Observation	Remark	
1.	Washer	IS:2062 Gr-E 250 C C=0.20 % max, Mn=1.50 %max Si=0.40 max,S=0.040%max P=0.040 %max	In house testing/ WTC to be checked from NABL approved Laboratory			
2.	Destruction Tube	IS:1030 Gr- 280-520 W C=0.25 % max, mn=1.20 %max Si=0.60 max,S=0.035%max P=0.040 %max				
	Intermediate Disc	IS:2062 Fe410 WA. Given in RDSO Spec.no. MP.0.41.00.07				
3.	Spindle	IS:1875 CL- 4 C=0.40 % - 0.50% Si=0.15 % - 0.35% Mn = 0.60 % - 0.90% S=0.04 % max, OR EN8 C=0.35 % - 0.45% Si = 0.05%- 0.35% Mn = 0.60 % - 1.00% S = 0.06% max, P=0.06 %max				
4.		-		Ø170±2.5 mm		

Intermediate Disc:
IS:2062 Gr-E250 C
(Approved from RDSO)

SN	Items	Material Specified	Material approved in our product drawing
1.	Washer	IS:2062 Gr-E 250 C C=0.20 % max, Mn=1.50%max Si=0.40 max,S=0.040%max P=0.040% max	IS:2062 Gr-E 250 Quality A Our drawing is approved
2.	Destruction Tube	IS:1030 Gr- 280-520 W C=0.25 % max, mn=1.20%max Si=0.60 max,S=0.035%max P=0.040%max	IS:2062 Gr-E 250 Quality A Our drawing is approved
	Intermediate Disc	IS:2062 Fe410 WA. Given in RDSO Spec.no. MP.0.41.00.07	IS:2062 Gr-E 250 Quality A Our drawing is approved
3.	Spindle	IS:1875 CL- 4 OR EN8	IS:1875 CL- 4
4.	Buffer spring assembly	Ø170±2.5 mm	Ø170±2.5 mm
5.		R15 mm	R15 mm
6.		R10 mm	R10 mm
7.		Ø87±2.5 mm	Ø87±2.5 mm
8.		R6 mm	R6 mm
9.		Ø170±2.5 mm	Ø170±2.5 mm
10.		G = Ø101(+01 /-0.0)mm	G = Ø101(+01 /-0.0)mm
11.		Preload: 10-15 kN	
12.	Polymer pad: TPE pads assembly as per approved firm drawings	Our Polymer Pad drawing approved.	

Agreed with M/s Prag & M/s Surlon Durel. Materials (of firms) already approved by RDSO for washer, destruction tube & intermediate disc has been included in check sheet. Title of check sheet has been changed in order to use check sheet for prototype and regular inspection both.
Regular/ Prototype Inspection test Plan of long life spring pad assembly (SK.DL-4726)

SN	Items	Material	Specified Value
1.	Washer	IS:2062 Gr-E 250 A/ E 250 C	WTC to be checked from NABL approved Laboratory
2.	Destruction Tube	IS:1030 Gr- 280-520 W/ IS:2062 Gr-E 250 A	
	Intermediate Disc	IS:2062 E 250 A/ E 250 C	
3.	Spindle	IS:1875 CL- 4 OR EN8	
4.	Buffer spring assembly	-	Ø170±2.5 mm
5.		-	R15 mm
6.		-	R10 mm
7.		-	Ø87±2.5 mm
8.		-	R6 mm
9.		-	Ø170±2.5 mm
10.		-	G = Ø101(+01 /-0.0)mm
11.		Length	H=584 (00/±5) mm
12.	Preload	10-15 kN	

<div>5.</div> <div>6.</div> <div>7.</div> <div>8.</div> <div>9.</div> <div>10.</div> <div>11.</div> <div>12.</div> <div>13.</div>	Buffer sprin g pad asse mbly	-	R15 mm		
		-	R10 mm		
		-	Ø87±2.5 mm		
		-	R6 mm		
		-	Ø170±2.5 mm		
		-	-1 G = Ø101(+01 /-0.0)mm		
		Length	H=584 (00/+5) mm		
		Preload	10-15 kN		
		Polymer pad	TPE pads assembly as per approved firm drawings	P.O. No. and quantity to be matched with WTC of firm	
		G = Ø101(+01 /-0.0)mm			

13		Polymer pad	TPE pads assembly as per approved firm drawings.	
14	Visual	All components of spring pad assembly	The surface of elastomer parts shall be smooth and having no cracks,pitting, bulges, slits or burrs. All metal parts of spring pad assembly should be free from cracks, sharp edges, burrs & coated with corrosion resistant material.	
Agreed and corrected as G = Ø101(+01 /-0.0)mm Typographical error Reason:				

S N	Property	Test Method	Sample Size	Permissible Limit
1.	Visual	Eye	10Nos.	The surface of elastomer parts shall be smooth and having no cracks, pitting, bulges, slits or burrs. All metal of spring parts pad assembly should be free from cracks, sharp edges, burrs & coated with corrosion resistant material.
2.	Tensile Strength	ISO 37 or Equivalent BIS standard	02 Nos.	250 (Min)
3.	Elongation at Break	ISO 37 or Equivalent BIS standard	%	350 (Min)
4.	Modulus at 200 % Elongation at Machin	ISO 37 or Equivalent BIS	02 Nos.	150 (Min)

S N	Property	Comment		
1.	Visual	Noted &complied		
2.	Tensile Strength	Not acceptable for elastomeric pad. Kindly refer Annex C of EN 15551 standard		
3.	Elongation at Break	Not acceptable for elastomeric pad. Kindly refer Annex C of EN 15551 standard		
4.	Modulus at 200 % Elongation at Machin speed 200mm/ min	Not acceptable for elastomeric pad. Kindly refer Annex C of EN 15551 standard		
5.	Compression Set after 25 % compression for 24 hours at 70 ⁰ ± 1 ⁰ C	Compression Set after 25 % compression for 24 hours at 50 ⁰ ± 1 ⁰ C Kindly refer Annex C of EN 15551 standard		
6.	Compression Set after 25 % compression for 24 hours at -30 ⁰ ± 1 ⁰ C measured after stabilising for 03 minute at -30 ⁰ C	Compression Set after 25 % compression for 24 hours at -30 ⁰ ± 1 ⁰ C measured after stabilizing for 03 minute at -30 ⁰ C Kindly refer Annex C of EN 15551 standard		
7.	Ash Content	Not acceptable for elastomeric pad. Kindly refer Annex C		

S N	Property	Test Method	Sample Size	Permissible Limit
1.	Visual	Eye	10Nos.	The surface of elastomer parts shall be smooth and having no cracks, pitting, bulges, slits or burrs. All metal of spring parts pad assembly should be free from cracks, sharp edges, burrs & coated with corrosion resistant material.
2.	Tensile Strength	ISO 37 or Equivalent BIS standard	From 1 Nos. Test Slab	250 (Min)
3.	Elongation at Break	ISO 37 or Equivalent BIS standard	From 1 Nos. Test Slab	350 (Min)

Detailed study is required in this matter. Hence at this stage this para has been revised as under:				
“Type Tests: As per para 3.0(Section A) of this specification”				

	<table><tr><td></td><td>speed 200mm/ min</td><td>standard</td><td></td><td></td></tr><tr><td>5.</td><td>Compressi on Set after 25 % compressi on for 24 hours at 70⁰ ± 1⁰C</td><td>ISO 815/ ASTM D 395 or Equivale nt BIS standard</td><td>02 Nos.</td><td>30 % Max.</td></tr><tr><td>6.</td><td>Compressi on Set after 25 % compressi on for 24 hours at - 30⁰ ± 1⁰C measured after stabilising for 03 minute at - 30⁰ C</td><td>ASTM D 1229 or Equivale nt BIS standard</td><td>02 Nos.</td><td>55 % Max</td></tr><tr><td>7.</td><td>Ash Content</td><td>IS-3400 Pt.22</td><td>02 Nos.</td><td>0.5 Max.</td></tr></table> <p>Physical Properties</p>		speed 200mm/ min	standard			5.	Compressi on Set after 25 % compressi on for 24 hours at 70 ⁰ ± 1 ⁰ C	ISO 815/ ASTM D 395 or Equivale nt BIS standard	02 Nos.	30 % Max.	6.	Compressi on Set after 25 % compressi on for 24 hours at - 30 ⁰ ± 1 ⁰ C measured after stabilising for 03 minute at - 30 ⁰ C	ASTM D 1229 or Equivale nt BIS standard	02 Nos.	55 % Max	7.	Ash Content	IS-3400 Pt.22	02 Nos.	0.5 Max.	<table><tr><td></td><td></td><td>of EN 15551 standard</td></tr></table> <p>Physical Properties</p>			of EN 15551 standard	<table><tr><td>4.</td><td>Modulus at 200 % Elongation at Machin speed 200mm/ min</td><td>ISO 37 or Equivale nt BIS standard</td><td>From 1 Nos. Test Slab</td><td>150 (Min)</td></tr><tr><td>5.</td><td>Compressi on Set after 10 % compressi on for 24 hours at 70⁰ ± 1⁰C</td><td>ISO 815- 1/ ASTM D 395 or Equivale nt BIS standard</td><td>From molded Test Button 1 Test</td><td>50 Max.</td></tr><tr><td>6.</td><td>Compressi on Set after 10 % compressi on for 24 hours at - 30⁰ ± 1⁰C measured after stabilizing for 03 minute at - 30⁰ C</td><td>ISO 815- 2 or Equivale nt BIS standard IS 3400 (Part 10/Sec2) :2022</td><td>From molded Test Button 1 Test .</td><td>90 Max.</td></tr><tr><td>7.</td><td>Ash Content</td><td>IS-3400 Pt.22</td><td>02 Nos. from test sample</td><td>0.5 Max.</td></tr></table> <p>Physical Properties</p>	4.	Modulus at 200 % Elongation at Machin speed 200mm/ min	ISO 37 or Equivale nt BIS standard	From 1 Nos. Test Slab	150 (Min)	5.	Compressi on Set after 10 % compressi on for 24 hours at 70 ⁰ ± 1 ⁰ C	ISO 815- 1/ ASTM D 395 or Equivale nt BIS standard	From molded Test Button 1 Test	50 Max.	6.	Compressi on Set after 10 % compressi on for 24 hours at - 30 ⁰ ± 1 ⁰ C measured after stabilizing for 03 minute at - 30 ⁰ C	ISO 815- 2 or Equivale nt BIS standard IS 3400 (Part 10/Sec2) :2022	From molded Test Button 1 Test .	90 Max.	7.	Ash Content	IS-3400 Pt.22	02 Nos. from test sample	0.5 Max.						
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	4.	Endurance test	Type test	Para 3.4	1. Static characteristics again repeated after completion of endurance test. Energy stored by buffer should be at least equal to 80% of energy stored before endurance test. 2. After the tests the rings shall show no breaks, defects, signs of cracking or abrasions.	
	5.	Mechanical characteristics after clamping	01 Nos./lot	Para 3.5	Compression curve to be within limit as specified in para 3.2	
	6.	Characteristics after dynamic stresses	Type test	Para 3.6	UIC-827	
	7	dynamic Characteristics	Type test	UIC-526	UIC-526	

	4.	Endurance test	Type test to be done at the time of product approval	Para 3.4	Static Characteristics again repeated after completion of endurance test. Energy stored by buffer assly should be at least equal to 80% of energy stored before endurance test. After the tests the rings shall show no breaks, defects, signs of cracking or abrasions.	
	5.	Mechanical characteristics after clamping	01 Nos./lot	Para 3.5	Load deflection Characteristics as specified in Para 3.2	
	6.	Characteristics after dynamic stresses	Type test to be done at the time of product approval	Para 3.6	UIC-827	
	7.	dynamic Characteristics	Type test to be done at the time of product approval	UIC-526	UIC-526	

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