



**ISRAEL RAILWAYS LTD.
INFRASTRUCTURE DIVISION
TRACK AND RIGHT OF WAY DEPARTMENT**

Technical Specification

for

**ELECTRIC AND SOLAR
TRACKSIDE RAILS
LUBRICATOR**

for

Various Types of Rails

No. E-01-0032.1

February 2017

**AMENDMENTS:**

This technical specification differs from version No. E-01-0032 May 2016 as follows:

- i. Section 1.1 has been revised;
- ii. Section 1.4 has been added;
- iii. Section 5.3 has been revised;
- iv. Section 5.4.1 has been revised;
- v. Section 5.7 has been revised;
- vi. Section 5.8 has been withdrawn;
- vii. Section 5.9 has been revised;
- viii. Section 5.11 has been revised;
- ix. Section 5.12 has been revised;
- x. Section 5.13.3 has been withdrawn;
- xi. Section 5.15 has been revised;
- xii. Section 5.16 has been added;
- xiii. Section 6. has been revised;
- xiv. Section 10.4 has been revised;
- xv. Section 10.5 has been revised;
- xvi. Section 10.7 has been revised;
- xvii. Section 10.8 has been revised;
- xviii. Section 10.9 has been revised;
- xix. Section 10.11 has been added;
- xx. Section 11 has been revised;
- xxi. Section 13. has been revised;
- xxii. TECHNICAL APPENDIX D – LUBRICANT REQUIREMENT has been revised;
- xxiii. The technical specification has been editorially revised.



ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR

For Various Types of Rails No. E-01-0032.1 February 2017

CONTENTS

1. SCOPE	4
2. REFERENCE DOCUMENTS (*)	4
3. DEFINITIONS	4
4. ISR SUPERSTRUCTURE AND LOCAL CONDITIONS	5
5. ELECTRIC AND SOLAR TRACKSIDE LUBRICATOR - REQUIREMENTS	5
6. MANUFACTURE'S TECHNICAL DRAWINGS	7
7. INSTALLATION MAINTENANCE AND SAFETY INSTRUCTIONS	7
8. MARKING LABELING	7
9. MANUFACTURING QUALITY MANAGEMENT	8
10. LIST OF DOCUMENTS TO BE SUBMITTED WITH BIDDER'S PROPOSAL	8
11. LIST OF DOCUMENTS TO BE SUBMITTED BEFORE SIGNING THE AGREEMENT (Precedent Documentation)	9
12. PACKING	9
13. WARRANTY AND TRAINING	10
TECHNICAL APPENDIX A – ISRAEL CLIMATE AND ENVIRONMENTAL CONDITIONS	11
TECHNICAL APPENDIX B – DSB 82-1 WHEEL PROFILE DRAWING	12
TECHNICAL APPENDIX C - RAIL HEAD PERMISSIBLE WEAR.....	13
TECHNICAL APPENDIX D – LUBRICANT REQUIREMENT	14
TECHNICAL APPENDIX E – ISR LOADING GAUGE	15

***ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR******For Various Types of Rails No. E-01-0032.1 February 2017***

1. SCOPE

1.1 This technical specification described the technical requirements for manufacturing and supply of Electrical and Solar Trackside Rails Lubricators ("TRL"). To reduce friction and wear at wheel/rail interface by lubricant the rail gauge side corner and rail gauge side face.

The Lubricators shall be install mainly before entering into stations with big amount of turnouts divergent to the left and to the right.

1.2 The TRL power source shall be Electrical and/or Solar depend on ISR order details.

1.3 The TRLs first order shall be supplied with 10 sets of installation and adjustment tools to enable assembling the TRLs to the rails efficiently.

1.4 The bidder shall define the requirements for placing the TRL's (e.g. distance from the closest rail, TRL installation base size requirements including any relevant instructions to build it (the base installation shall be carried out by ISR), etc.)

2. REFERENCE DOCUMENTS (*)

EN 15427 Railway applications – Wheel/rail friction management - Flange lubrication;

EN 16028 Railway application – Wheel/rail friction management - Lubricants for trainborne and trackside applications;

EN 13674-1 Railway applications - Track - Rail - Part 1 Vignole railway rails 46 kg/m and above;

UIC 510-2 Trailing stock: wheels and wheelsets. Conditions concerning the use of wheels of various diameters;

EN 13715 Railway applications - Wheelsets and bogies - Wheels - Wheels tread;

ISO 9001 Quality management systems – Requirements.

(*) latest edition of the referenced document

3. DEFINITIONS

3.1 Gauge side face (Area "A") as defined in EN15427, section 3.

**ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR***For Various Types of Rails No. E-01-0032.1 February 2017*

- 3.2 Gauge side corner (Area "B") as defined in EN15427, section 3.
- 3.3 ISR Israel Railways Ltd.
4. **ISR SUPERSTRUCTURE AND LOCAL CONDITIONS**
- 4.1 Nominal track gauge – 1435 mm
- 4.2 Minimum curve radius - 140 m.
- 4.3 Maximum track gradient - 30‰.
- 4.4 Israel climate and environmental conditions as specified in Technical Appendix A.
- 4.5 The TRL shall be designed for installation on rail types: 60E1, 60E2, 54E1 (rail types in accordance with EN13674-1).
- 4.6 Wheel dimensions:
ISR using the following wheel profiles:
- According to EN 13715 S1002, h=28, e=32.5, reverse slope 15%;
 - According to UIC 510-2, Technical Appendix B1;
 - Wheels of Ø850 with profile DSB 82-1 in accordance with Technical Appendix D - Drawing DSB 2A 17409 – DBS82-1 wheel profile, hereinafter.
- 4.7 Rail head permissible wear – see Technical Appendix C.
- 4.8 Maximum track load - 22.5 ton/axle.
- 4.9 Maximum on-track vehicle speed - 160km/h.
5. **ELECTRIC AND SOLAR TRACKSIDE LUBRICATOR - REQUIREMENTS**
- 5.1 The TRL shall be designed to operate properly and efficiently with lubricant which its properties described in Technical Appendix D, and with ISR Superstructure and Local Conditions described in section 4.
- 5.2 The TRL shall have a robust waterproof cabinet with a lubricant reservoir and a high-pressure pump which shall supply defined sequence intervals of uniform amount of lubricant to each one of the lubricant distribution units.
- 5.3 The TRL shall be designed with four long lubricant distribution units (two per rail), it could be applied in area: "A" only, or "B" only or

***ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR******For Various Types of Rails No. E-01-0032.1 February 2017***

"A" and "B" of the rail throughout the intended length of the rail to be lubricated.

5.4 POWER SOURCE

- 5.4.1 The TRL shall be available operating with 220-230 VAC 50 Hz power supply equipped with AC\DC convector to produce 12 VDC or 24 VDC power for the digital control and the motor. Fuse and surge protection with lightning strike indicator and safety breaker shall be included.

or

The TRL shall be available operating with solar panel/s to produce DC power for the digital control and the motor.

The solar system panel shall be designed to perform in extreme temperatures and low-light conditions maximizing up time. With a life cycle of 20 years of life without significant degradation.

The solar system shall be design to guarantee its continuous operation in night and on cloudy days with the same efficiency as on sunny days.

- 5.5 The TRL shall be installed to the track without rail drilling and shall be conformed to ISR nominal track gauge.

- 5.6 The TRL cabinet shall be on a safe distance from the on-track vehicles, in such a way that it cannot be damaged as a result of rail maintenance work. (See ISR Loading Gauge – Technical Appendix E).

It would be possible to place it in serviceable locations away from or even below track level to reduce required track maintenance time.

- 5.7 All parts which are non-metallic shall be made of hot weather resistant materials, suitable for use at temperature of up to 70°C and under high corrosion conditions. Plastic parts shall be UV protected. All metallic parts shall be corrosion protected. Israel climate condition should be considered (see Technical Appendix A).

The bidder statement approving it shall be submitted.

The corrosion process (zinc, paint, etc.) and in accordance to which relevant EN standards or equivalent standards it comply with shall be submitted.

- 5.8 Withdrawn.

- 5.9 The lubricant reservoir shall have a capacity of 30-100 liters

***ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR******For Various Types of Rails No. E-01-0032.1 February 2017***

- 5.10 The lubricant reservoir lid opening provides easy access with manual pail-fill methods with minimum hands dirty. No lubricant leak will be possible from the lubricant reservoir.
- 5.11 The TRL shall include non-contact wheel sensor to determine the number of axels with the possibility to apply lubricant on wheel in a defined interval.
- 5.12 The TRL total pumping lubricant quantity shall be equal or greater than 0.2 cm³, with consistent output in all temperatures. The lubricant shall be spread (by the wheels) through a distance longer than 900 meters after the lubricator.
- 5.13 **DIGITAL CONTROL SYSTEM**
- 5.13.1 The Digital Control System shall enable to precisely control the amount of lubricant applied to the rail. The exact volume of lubricant dispensed can be measured and recorded.
- 5.13.2 The TRL proper operation can be checked from the Digital Control System with a self-test feature.
- 5.13.3 Withdrawn.
- 5.14 The means of adjusting the height of the lubricant distribution unit shall be separate from the means of installing it to the rail.
- 5.15 The TRL shall be design to operate efficiently near high voltage electrical wire line, on electrified track with 25k VAC and on non-electrified track with CWR and jointed track. A statement approving it shall be submitted.
- 5.16 The bidder shall define the requirements for placing the TRL's (e.g. distance from the closest rail, TRL installation base size requirements including any relevant instructions to build it (the base installation shall be carried out by ISR), etc.
6. **MANUFACTURE'S TECHNICAL DRAWINGS**
- 6.1 The drawings required in the agreement section 5A.
7. **INSTALLATION MAINTENANCE AND SAFETY INSTRUCTIONS**
- 7.1 The TRL installation, operating, maintenance and safety instructions shall be submitted.
8. **MARKING LABELING**
- 8.1 Each TRL shall be inscribed with at least the following marks:

***ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR******For Various Types of Rails No. E-01-0032.1 February 2017***

- The manufacturer mark;
 - The last two figures of the manufacturing year;
 - The product identification type.
- 8.2 Installation and adjustment tool shall be inscribed with at least the following marks:
- The manufacturer mark;
 - The last two figures of the manufacturing year;
 - The product identification type.
9. **MANUFACTURING QUALITY MANAGEMENT**
- 9.1 The supplier shall have quality management system for the TRL manufacturing processes based on ISO 9001 standard. The manufacturing process procedure shall be submitted.
10. **LIST OF DOCUMENTS TO BE SUBMITTED WITH BIDDER'S PROPOSAL**
- 10.1 The bidder shall submit reference list of the TRLs which have been manufactured and supplied.
- 10.2 The bidder shall submit technical information regards lubricant spread affectivity per wheel (including lubricant distance along area "A" and area "B").
- 10.3 SPARE PART LIST for a 5 year maintenance cycle.
- 10.4 The TRL with electric power source technical description, installing operating, maintenance and safety instructions, including working on and near electrified track with 25k VAC shall be submitted.
- 10.5 The TRL with solar power source technical description, installing operating, maintenance and safety instructions, including working on and near electrified track with 25k VAC shall be submitted.
- 10.6 The manufacturer shall declare in a signed document the estimate for the TRL and it components life cycle.
- 10.7 The bidder shall submit statement that the nature and main characteristics of the non-metallic and metallic materials comply with the requirements of section 5.7.
- 10.8 The bidder shall submit the corrosion process (zinc, paint, etc.) and in accordance to the relevant EN standards or equivalent standards it comply with.

**ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR***For Various Types of Rails No. E-01-0032.1 February 2017*

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- 10.9 The bidder shall submit a statement approving the use near high voltage electrical wire line, on electrified track with 25k VAC and on non-electrified track with CWR and jointed track and the relevant technical documents.
- 10.10 The bidder shall submit quality management system process for TRL manufacturing in accordance with all the requirements in this technical specification and quality management system based on ISO 9001 or equivalent.
- 10.11 The bidder shall submit requirements for placing the TRL's (e.g. length from the closest rail, TRL installation base size dimensions requirements including any relevant instructions to build it, etc.)
11. **LIST OF DOCUMENTS TO BE SUBMITTED BEFORE SIGNING THE AGREEMENT (Precedent Documentation)**
- 11.1 As detailed in Section 5A to the Agreement.
12. **PACKING**
- 12.1 The TRL components shall be packed in wooden boxes and will put in container. The wooden box arrangement shall enable easy and safe unpackaged and storage the goods.
- 12.2 The dimensions of the wooden shall be according to EN standard, to enable maximum effective storage capacity in containers.
- It shall be possible to put at least 3 wooden boxes one on the other.
- Each package gross weight shall not exceed 1 tone.
- Each package shall be labeled with the following details:
- Component name and type;
 - Production batch number;
 - Date of manufacture;
 - Component barcode;
 - Component quantity in box;
 - Gross and net weight;
 - Manufacturer recognition number or name;
 - ISR recognition number;
 - ISR order number;
 - Ordinal number on the packing list.



ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR

For Various Types of Rails No. E-01-0032.1 February 2017

The labeling shall be with black letters and shall be on 3 spots on the package (one on top of the package and the two others on the sides).

12.3 The installation and adjustment tools shall be packed separately.

13. **WARRANTY AND TRAINING**

13.1 As described in the agreement.

**TECHNICAL APPENDIX A – ISRAEL CLIMATE AND ENVIRONMENTAL CONDITIONS****A.1 Climate and Environmental Conditions**

Max. ambient temperature	50 °C (shade)
Min. ambient temperature	-5 °C
Relative humidity	10 to 90 %
Altitude	-400 to +800 meter
Sunny	3300 hours per year
UV Radiation	360 to 600 MJ/m ² per year
Rainfall	400 to 800 mm/year

A.2 Dust Conditions in the atmosphere

	Maximum Half Hour Value*	Maximum Daily Value*	Average
NO _x	1064	560	71
SO ₂	780	260	21
O ₃	312	143	84
Suspended Dust	-	350	100

*(Microgram per m³ atmosphere)**A.3 Suspended Particulate Matter (SPM)**

Particle size to 0.5-1 micron

A.4 Sea Salt Concentrations in the Atmosphere

Salt Element	Na*		Cl*		SO ₄ *	
	Dry	Wet	Dry	Wet	Dry	Wet
Sea Air at Coast Line	7.3	16.0	12.0	22.0	5.3	7.0
600 m from Shore	3.1	4.8	4.2	7.9	1.9	2.0
6000 m from Shore	1.1	1.4	1.5	1.7	1.3	1.4

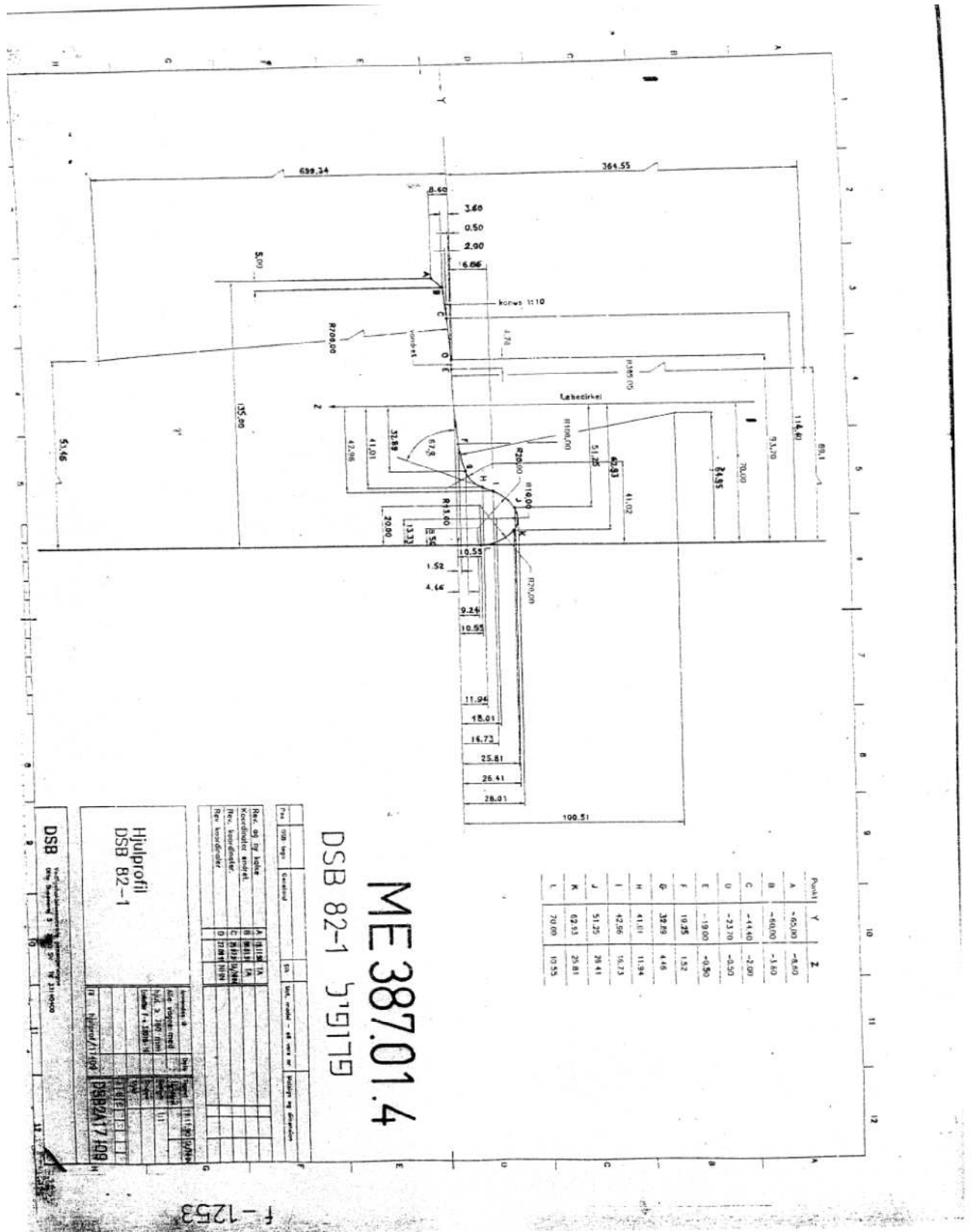
* (Micrograms per m³ atmosphere)



ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR

For Various Types of Rails No. E-01-0032.1 February 2017

TECHNICAL APPENDIX B – DSB 82-1 WHEEL PROFILE DRAWING



**ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR***For Various Types of Rails No. E-01-0032.1 February 2017***TECHNICAL APPENDIX C - RAIL HEAD PERMISSIBLE WEAR**

Maximal horizontal wear [mm]	Maximal vertical wear [mm]	Minimal height of the rail [mm]	Height of the new rail [mm]	Type of rail (EN 13674-1)
16	13	140	153	50E6 (U-50)
17	14	145	159	54E1 (UIC-54)
18	17	155	172	60E1 (UIC-60), 60E2

**TECHNICAL APPENDIX D – LUBRICANT REQUIREMENT**

Lubricant requirements are in accordance with EN16028, Annex A, table A.1:

property	unit	Test method	values
Appearance	-	Visual	Homogenous
Color	-	ISO 2049 or equivalent	Homogenous
Consistency (NLGI)	-	ISO 6743-99	1 or 1.5 or 2
Worked grease penetration 60 stroke @ 25°C	0.1 mm	ISO 2137 or equivalent	290-340
Drop point	°C	ISO 2176 or IP 396 or equivalent	≥150
Flash point	°C	EN ISO 2592 or equivalent	≥200
Water content	% mass	ISO 760 or DIN 51777-2 or ISO 3733 or equivalent	≤ 1.0
Water resistance @ 40 °C	Level	DIN 51807-1 or equivalent	1
Adhesion to sheet steel (0.05 mm, 24 h @ 60 °C)	Stage	EN16028, Annex D	1
Volatile components	% mass	EN16028, Annex E	≤ 10
Oil separation/ "bleeding" (168 h [7 days] @ 40 °C)	% mass	DIN 51817 or its equivalent standard	5 % maximum by weight for NLGI No.2 grease & 7% maximum by weight for NLGI No. 1 grease
Corrosion test – steel	Rating	ISO 11007 using water or its equivalent standard	0; 0
Corrosion test - copper	Grade	DIN 51811 or equivalent	1
Compatibility with elastomers (60 °C for 168 h) – change in volume for NBR1	%	ISO 6072 or its equivalent standard	+15/-0
Compatibility with elastomers (60 °C for 168 h) – change in hardness for NBR1	IRHD	ISO6072 or its equivalent standard	± 8
Identity testing: Using Infra-red, or X-ray fluorescence, or Inductively coupled plasma		Standard laboratory method: DIN 51418-1, DIN 51418-2, DIN 51451, DIN 51820-1 or its equivalent standard	
Apparent viscosity (1° cone, s-300 s, D=1000 s ⁻¹) @ 25 °C	mPa·s	DIN51810-1 or its equivalent standard	≥150
Apparent viscosity (1° cone, s-300 s, D=1000 s ⁻¹) @ 0 °C	mPa·s	DIN51810-1 or its equivalent standard	≥400
Apparent viscosity (1° cone, s-300 s, D=1000 s ⁻¹) @ -25 °C	mPa·s	DIN51810-1 or its equivalent standard	≥4000
Four ball test – wear test rating (300 N, 1 h @ 1500 r/min)	mm	DIN 51350-5; Method D or its equivalent standard	≤0.8
Four ball test – Extreme pressure	kg	DIN 51350-4	Weld load not less than 315kg
Effect of water (water wash-off test)	visual	EN16028, Annex B	No corrosion after 72 h
Biodegradability	%	OECD suite or its equivalent standard	>60 after 28 days



ELECTRIC AND SOLAR TRACKSIDE RAILS LUBRICATOR

For Various Types of Rails No. E-01-0032.1 February 2017

TECHNICAL APPENDIX E – ISR LOADING GAUGE

