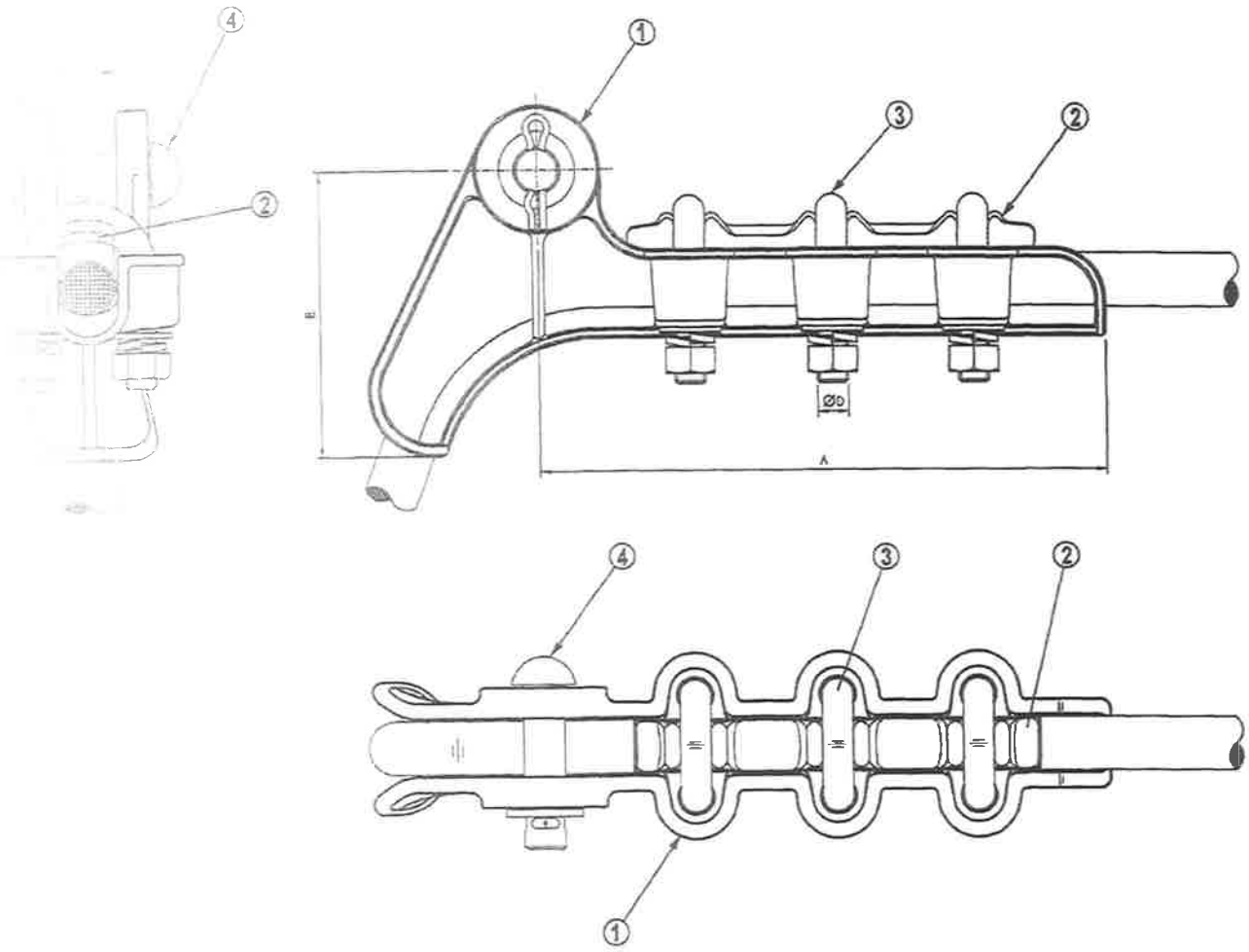
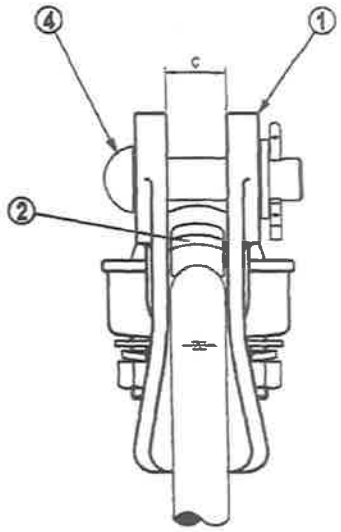
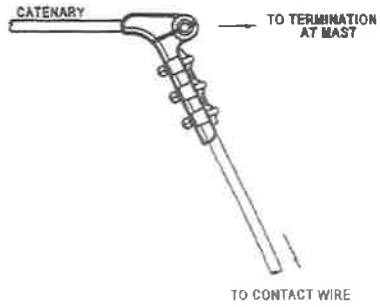
ANNEXURE G

CLAMP, ELECTRICAL CONDUCTOR, STRAIN; DRAWING NO: BBB1790, 2; EQUIPMENT USED ON OHTE PISTOL GRIP TYPE 5 MM DIA. TO 20.5 MM DIA. USERS INTEREST FOR USE ON ALUMINIUM WITH 3 BOLTS	BBB 1790
CLAMP, ELECTRICAL CONDUCTOR, STRAIN; DRAWING NO: CEE-TZ9-0039; EQUIPMENT USED ON CID 5400000 540 5200 5405202 OHTE HOOK JOINT FOR 31 TO 34 MM DIAMETER TUBE	CEE-TZ9-0039
CLAMP, ELECTRICAL CONDUCTOR, STRAIN; CATENARY WIRE FOR 80 - 160 SQ MM, MIN DIA: 8 MM MAX DIA: 18 MM. STRANDED COPPER AND ALUMINIUM CONDUCTORS; 3 U BOLTS	
CLAMP, ELECTRICAL CONDUCTOR, STRAIN; P/N GVT 3 506 825, BBC; DRAWING NO: CEE-TZ-9/43, 0; EQUIPMENT USED ON CID 5400000 540 5200 5405202 OHTE HOOK CONNECTION. 42 MM DIAMETER TUBE	CEE-TZ9-0043
ADAPTOR, INSULATOR, TYPE: STEADY ARM EYE CLAMP, DIMENSIONS: OD 50,8/57 MM, APPLICATION: OVERHEAD TRACK EQUIPMENT; DRAWING NO: CEE-TZ9-0035, 0; HOLDER TUBE DIAMETER	CEE-TZ9-0035
ADAPTOR, INSULATOR, TYPE: STEADY ARM, DIMENSIONS: OD 42 MM, APPLICATION: OVERHEAD TRACK EQUIPMENT; DRAWING NO: CEE-TZ9-0027, 0; HOLDER, STEADY ARM EYE; TUBE DIAMETER	CEE-TZ9-0027
SPLICE, CONDUCTOR, TYPE: PREFORMED, EQUIPMENT USED ON OHTE; FULL TENSION SPLICE SUITABLE FOR USE ON CONDUCTOR WITH 30/7/2,36 STRANDING ACSR WIRE (TIGER WIRE) DIA 16.52	
ASSEMBLY, TYPE: WIRE ENDING CONE, APPLICATION: CONTACT WIRE; DRAWING NO: CEE-TNB-0036, LA; EQUIPMENT USED ON OHTE	CEE-TNB-0036
WIRE, ELECTRICAL, TYPE: BONDING, CONDUCTOR DIAMETER: 97 MM2, INSULATION COLOR: BLACK, POTENTIAL RATING: 25 KV, OVERALL DIAMETER: 13 MM, CONDUCTOR MATERIAL: STEEL, CONDUCTOR FINISH: GALVANIZED, SPECIAL FEATURES: INSULATION POLYVINYL CHLORIDE/SHEATHED, PACKAGE TYPE: REEL; SPECIFICATION: SANS182 PART 5, LASANS1507 PART 3, LA; MATERIAL NUMBER: 8010365, STRANDED GALVANIZED STEEL WIRE STRANDING 49/1,6MM	SANS182 PART 5
TERMINAL, LUG, TYPE: CRIMPING, WIRE SIZE ACCOMMODATED: 95 MM2, HOLE QUANTITY: 1, TERMINAL MATERIAL: TINNED COPPER, SPECIAL FEATURES: M16 STUD; DRAWING NO: BBH 1332 SHEET 1, LA	BBH 1332 SHEET 1
CLIP, BOND CONNECTOR WEDGE, APPLICATION: BONDING, DRAWING NO: BBC 7864, LA; SPECIFICATION: BBB 6017, LA; EQUIPMENT USED ON OHTE: RAIL BONDING	BBC 7864, BBB 6017
INSULATOR, TYPE: SINGLE ROD SECTION, POTENTIAL: 25 KVAC; SPECIFICATION: CEE-0055, LA; FOR 107 SQ MM CONTACT WIRE	CEE-0055,
SWITCH ASSEMBLY, TYPE: TRACK SWITCH, POTENTIAL RATING: 25 KVAC, SPECIAL FEATURES: SINGLE POLE; DRAWING NO: BBC 8743, LA	BBC 8743,
ASSEMBLY, TYPE: BLADE SET, APPLICATION: SWITCH, TRACK, 25 KVAC; DRAWING NO: BBD 7601, LA	BBD 7601
SWITCH, TRACK, TYPE: OPEN/CLOSE OPERATION, APPLICATION: TRACK SWITCH; DRAWING NO: BBB 2688; EQUIPMENT USED ON 5400000 5405902 TRACK 25 KV AC COMPLETE, WITHOUT OPERATING ROD	CEE-TZ1-0121 SHEET 52 BBB 2688
WIRE, ELECTRICAL, TYPE: JUMPER, CONDUCTOR DIAMETER: 96 MM2, INSULATION COLOR: NONE, DIMENSIONS: LG 500 M, CONDUCTOR MATERIAL: COPPER ANNEALED, PACKAGE TYPE: REEL, WOOD; SPECIFICATION: SANS182 PART1, 0; STRAND 37///0.686 MM	SANS182 PART1,
ASSEMBLY, TYPE: CLAMP, APPLICATION: EARTH WIRE; DRAWING NO: CEE-TN-0371, LA; CLAMP USED ON 160MM2 ALUMINIUM CONDUCTOR	CEE-TN-0371
WIRE, ELECTRICAL, TYPE: EARTH, CONDUCTOR DIAMETER: 160 MM2, INSULATION COLOR: NONE, CONDUCTOR MATERIAL: ALUMINIUM HARD DRAWN, PACKAGE TYPE: WOOD DRUM 2 KM; SPECIFICATION: SANS182 PART2, 0, SABS182 PART2; USED ON OHTE; CODE NAME: HORNET; STRAND 19/3.25 MM	SANS182 PART2







INSTALLATION POSITION

TABLE								
	NO OF U BOLTS	CONDUCTOR DIA. (mm)		A mm	B mm	C mm	D mm	ULTIMATE STRENGTH(kg)
		FROM	TO					
	4	9.75	15	145	105	18	12	3000
	4	14	21	220	120	22	12	7000

NOTES
1. IDENTIFICATION: BODY AND SADDLE MUST BE PERMANENTLY MARKED WITH MAKERS IDENTIFICATION AND MONTH AND YEAR OF MANUFACTURE.
2. THESE ARTICLES MUST BE MANUFACTURED UNDER THE MARK OF THE SABS

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
4	CLEVIS PIN, ø16 COMPLETE WITH WASHER & SPLIT PIN	1	-	-
3	U-BOLTS, M12 COMPLETE WITH NUTS & WASHERS	SEE TABLE	-	BBB1791 ITEM 3
2	SADDLE	1	-	BBB1791 ITEM 2
1	BODY	1	-	BBB1791 ITEM 1

SCALE 1 : 2
ITEM NO -
"PROTOTYPE" REMOVED

DO REF : CDO/1945
ECP REF : 2002-039
DRAWN : JR Anthony
DESIGNED: Eberhardt-Martin cc
CHECKED : JD van Dyk

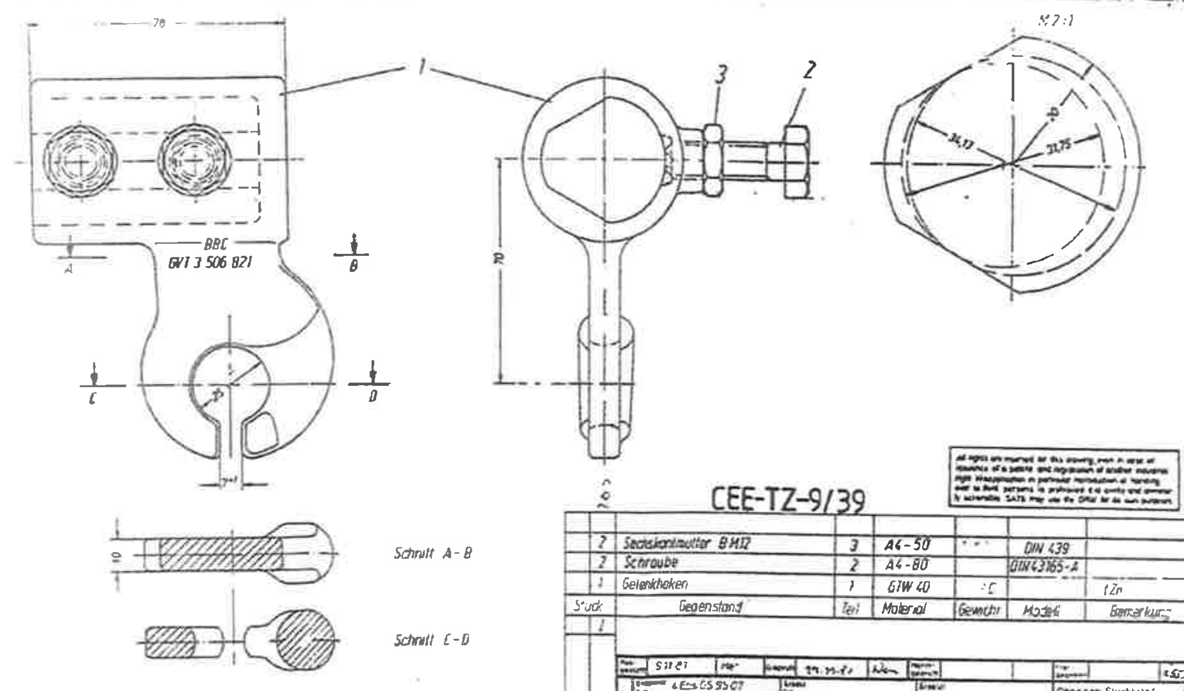
DATE: 25/11/2002
APPROVED
AUTHORISED

CENTRAL DRAWING OFFICE

STRAIN CLAMP (PISTOL GRIP) ASSEMBLY, ACSR CONDUCTORS.

SPOORNET

BBB1790
VERSION 2
A3



CEE-TZ-9/39

Stück	Gegenstand	Teil	Material	Gewicht	Modell	Bemerkung
2	Sechskantmutter BM12	3	A4-50		DIN 439	
2	Schraube	2	A4-80		DIN 43165-A	
1	Gelenkhaken	1	GTW 40			tZn

Regelausführung

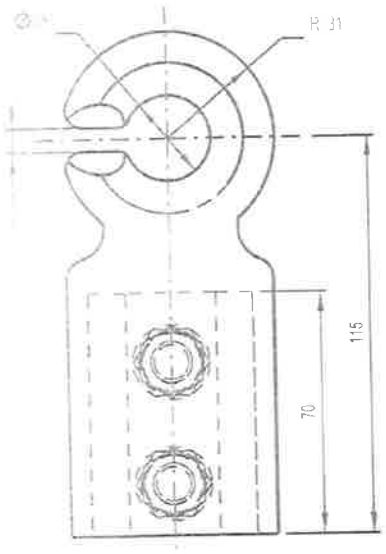
BBC BROWN BOVERI

Titel: Gelenkhaken für Rohr-Seitenhalter Ø 31,75 - Ø 34,13

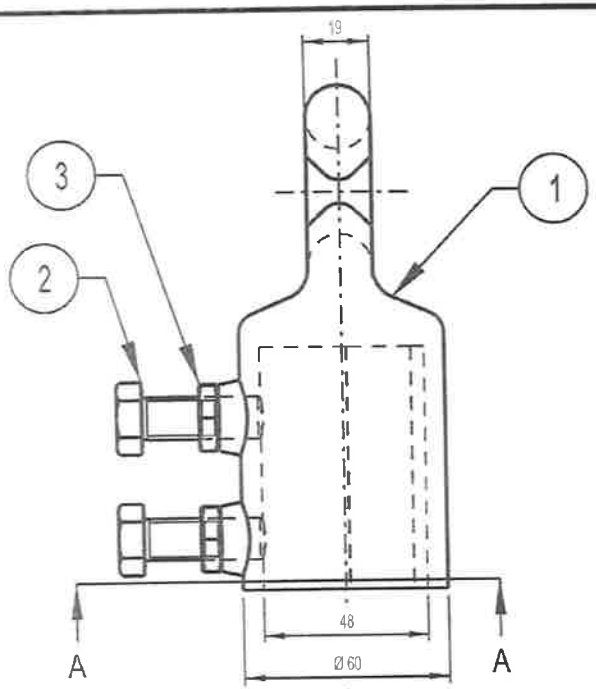
Maßstab 1:1, 2:1

Format 3

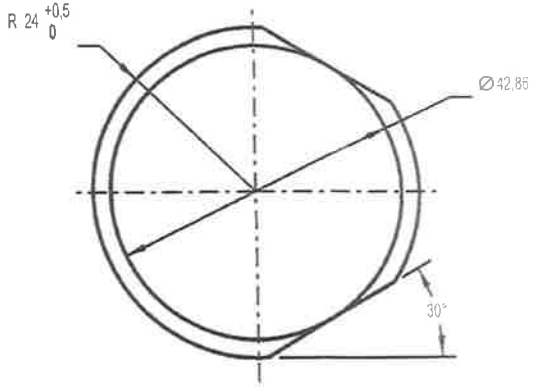
GVT 3 506 821



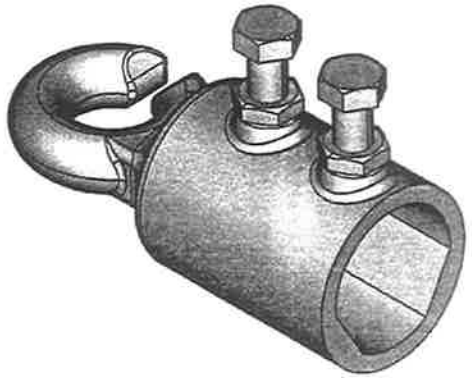
ITEM 1



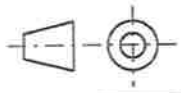
SECTION A-A



PROFILE
SCALE 2:1



MARKING
THE FOLLOWING PERMANENT MARKINGS MUST APPEAR ON THIS ARTICLE
a) TRANSNET LOGO
b) MAKER'S IDENTIFICATION
c) BATCH NUMBER
d) FINISH: ITEM 1 HOT DIP GALVANISED TO SANS 121



ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
3	LOCKNUT HEX, GALVANISED STEEL M12	2	-	-
2	SCREW HEX, GALVANISED STEEL M12 x 35 LG	2	-	-
1	HOOK CONNECTION BODY, SPHEROIDAL GRAPHITE IRON TO SANS 963 GRADE SG40	1	-	-

PROTECTED: PREPARED BY CENTRAL DRAWING OFFICE

SCALE 1 : 2
ITEM NO 54009933

+ 2018-04-13
APPROVED

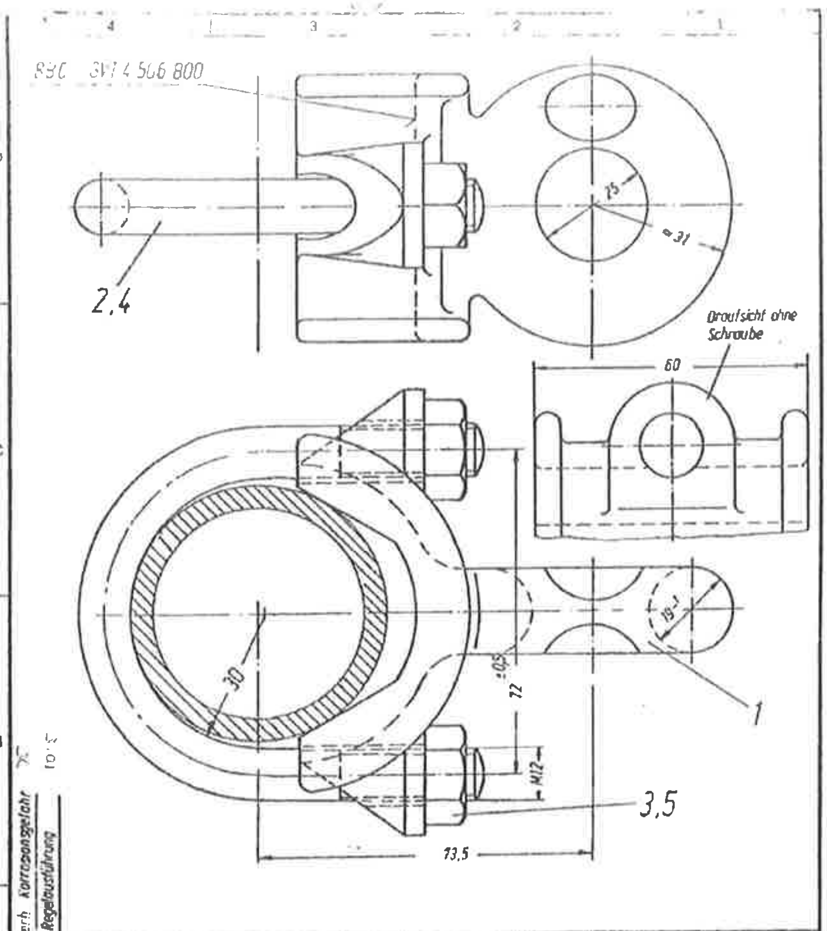
+ 2018-04-13
AUTHORISED

HOOK CONNECTION FOR Ø42mm REGISTRATION TUBE

TRANSNET freight rail

CEE-TZ9-0043
VERSION 2
A4

DRAWN D HATTINGH
DESIGNED -
CHECKED: H VAN VUUREN



Stück		Gegenstand	Teil	Material	Gewicht	Modell	Bemerkung
2	–	Sechskantmutter M 12	5	Cu Ni Si		DIN 934	
1	–	Bügelschraube M 12 gestr. Länge 210	4	Cu Ni Si			
–	2	Sechskantmutter M 12	3	5		DIN 555	tZn
–	1	Bügelschraube M 12 gestr. Länge 210	2	3.6			tZn
1	1	Klemmkörper mit Öse	1	GTW40			tZn

II | I

ITEM NO 0141 (NORMAL AREA)
0318 (COASTAL ...)

CEE-TZ-9/35

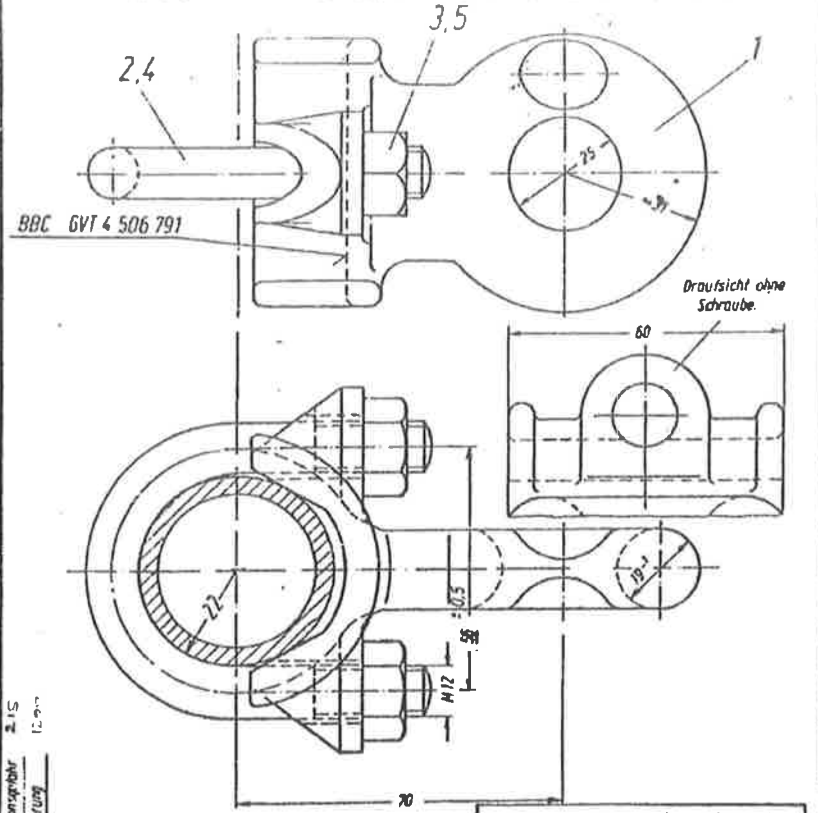
Maßstab	Gezeichnet	3.9.81	Hér	Änd. Nr	Format	Gruppen-Nr.	Ersatz/Ersetzt
1 : 1	Geprüft	24.9.84	Ne...	Erstmals verwendet für	A 4		4 Ebs 05 93 09
	Normgepr.				Char. Schl		
Abt. VKIF	Gesehen		15.5.82				

EYE CLAMP FOR 51/57⌀ TUBE

BBC BROWN BOVERI

Ösenschelle für Rohr Φ50,8 u Φ57,15

Zeichnungs Nr: **GVT 4 506 800**



Stück		Gegenstand	Teil	Material	Gewicht	Modell	Bemerkung
2	–	Sechskantmutter M 12	5	Cu Ni Si		DIN 934	
1	–	Bügelschraube M12 gestr. Länge 172	4	Cu Ni Si			
–	2	Sechskantmutter M 12	3	5		DIN 555	fZn
–	1	Bügelschraube M12 gestr. Länge 172	2	3.6			fZn
1	1	Klemmkörper mit Öse	1	GTW 40			fZn

CEE-TZ-9/27

Eye clamp 03/3.

Maßstab 1:1 | Gezeichnet 25.8.81 | Geprüft 24.9.81 | Normgepr. | Gesehen | Abt. VKIF

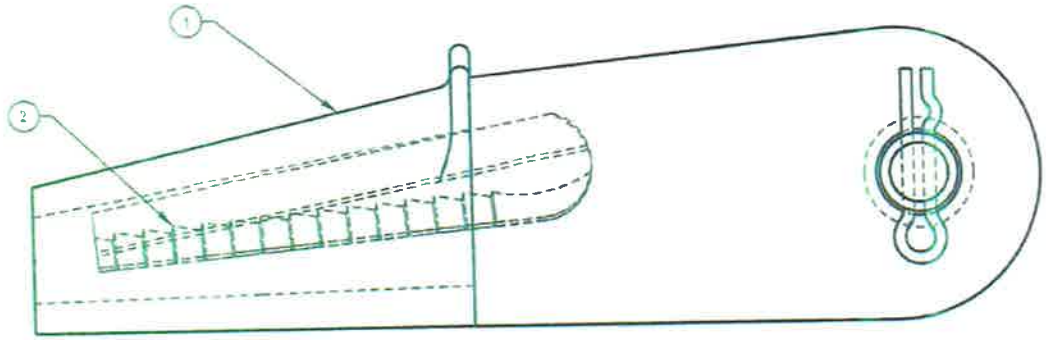
Format A 4 | 4 Ebs 05 93.08

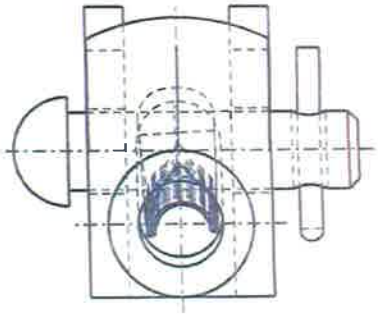
BBC BROWN BOVERI

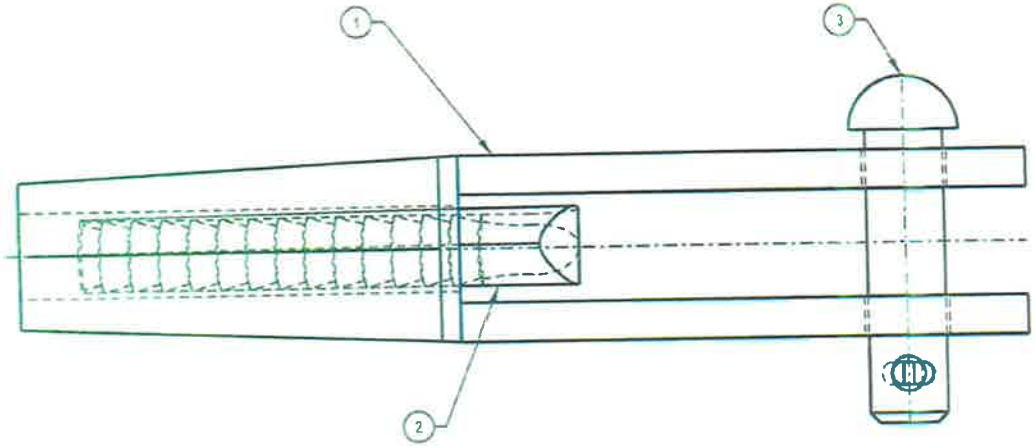
EYE CLAMP FOR 42 ϕ TUBE

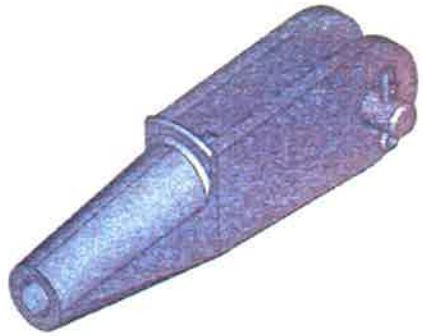
Ösenschelle für R ϕ42,86

GVT 4 506 791









NOTES
1 MINIMUM ULTIMATE TENSILE = 90kN
2 TEST SAMPLES OF EACH BATCH SHALL BE ROUTINE TESTED IN TENSION WITH A STEEL BAR TO 63kN

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
3	CLEVIS PIN, Ø16 x 60 LONG COMPLETE WITH LOCKING SPLIT PIN	1	54004020	CEE-TX-0056
2	CONE BODY	1	-	CEE-TNB-0036 Sht 2
1	WEDGE	1	-	CEE-TNB-0036 Sht 1

DIMENSIONS mm SCALE 1 : 1
TOLERANCE LIN± - ANG± - ITEM NO 54004978
MATERIAL -
VERSION INFO REDRAW AND UPDATE

+ 2019-08-16
APPROVED S. SMIT

+ 2019-8-16
AUTHORISED L. BORCHARD

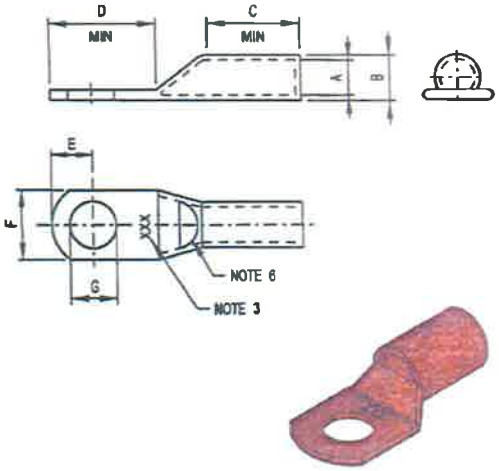
WIRE ENDING CONE ASSEMBLY
107mm² / 161mm² Cu CONTACT WIRE

TRANSNET freight rail
CEE-TNB-0036
VERSION 2
A3

DO REF CDO/9132 ECP REF DRAWN: MP SAKO DESIGNED: - CHECKED: D HATTINGH

STORES ITEM NO	CABLE mm²	STUD Ø (G)	DIMENSIONS A	B	C	D	E	F
-	1,5	3	1,9	3,8	7	9	4,5	7
-		4				12	4,5	7
-		5				12	4,5	8
-		6				13	5,5	9
-	2,5	3	2,4	3,9	7,3	8,5	4,5	7
-		4				12	4,5	7
-		5				12	4,5	9
-		6				13	5,5	9,5
-		8				15	7,5	12
-	4	3	2,8	4,7	8	9	4,5	7
-		4			8	12	4,5	7
-		5			8	12	4,5	8,5
-		6			8	13	5,5	10
-		8			8	17	8,5	13
-		10			11	19	7,5	14
-	6	4	3,4	5,3	8,5	12	4,5	7,5
-		5			8,5	12	4,5	8,5
-		6			8,5	13	5,5	9,5
-		8			9,3	17	7	13
-		10			11	19	7,5	15
-	10	5	4,4	6,3	10,5	12	4,5	9
-		6			10,5	13	6	10
-		8			11	17	7,5	13
-		10			11	19	7,5	15
-		12			12	20	10	19
-	16	5	5,5	7,6	12	13	5,5	10,5
-		6				13	5,5	11
-		8				18	7,5	13
-		10				20	7,5	15
-		12				25	10,5	18
-		16				27	13	24
-	25	6	6,9	9	15	16	6	14
-		8				17	8	14
-		10				18	8	16
-		12				21	11	18
-		16				27	13	24
-	35	6	8,2	10,7	15	18	8	16
-		8			15	18	9	16
-		10			15	19	9	16
-		12			15	22	10	18
-		16			16	30	13	24

STORES ITEM NO	NORMAL LUG SIZE mm²	STUD Ø (G)	DIMENSIONS A	B	C	D	E	F
-	50	6	10	12,8	16	17	8	18
-		8			16	17	9	18
-		10			17	24	10	20
-		12			18	24	10	20
-		16			18	30	13	26
-		20			18	30	13	26
-	70	8	11,7	15	20,5	20	9,5	21
-		10			21	28	11	22
-		12			21	28	12	22
-		16			22	32	14	26
-		20			22	34	15	30
-	95	8	13,5	17,4	23	24	9,5	25
-		10				28	13	26
-		12				28	13	26
-		16				32	14	26
-		20				36	16	30
-	120	10	15,5	19,8	26	26	12	27
-		12				28	12	28
-		16				32	14	30
-		20				36	16	32
-	150	10	17	22	27	31	12	31
-		12				33	16	32
-		16				35	16	32
-		20				36	16	32
-	185	10	19	24,4	29	29	12,5	34
-		12				31	16	34
-		16				34	16	36
-		20				40	19	36
-	240	10	21,5	27,7	33	36	16	40
-		12				36	16	40
-		16				36	20	40
-		20				42	20	40
-	300	10	24,5	31,3	35	35	15	45
-		12				35	15	45
-		16				45	15	45
-		20				45	18	45
-	400	16	27,5	35,6	41	47	24	51



TOLERANCES		
DIM A	SIZES UP TO 7mm	0 -0,15
	SIZES OVER 7mm	0 -0,2
DIM B	SIZES UP TO 10mm	+0,15 0
	SIZES OVER 10mm	+0,2 0
DIM E	SIZES UP TO 6mm	±0,5
	SIZES OVER 6mm	±1,0
DIM F	SIZES UP TO 6mm	±0,5
	SIZES OVER 6mm	±1,0
DIM G	STUD SIZE	+0,5 -0

NOTES
1. COPPER TO SPECIFICATION SANS 460, FULLY ANNEALED
2. LUG TO BE THOROUGHLY ELECTRO-TINNED TO SANS 2093 SN12C INTERNALLY AND EXTERNALLY
3. THE FOLLOW PERMANENT MARKINGS MUST APEAR ON THIS ARTICLE
   (a) MANUFACTURERS IDENTIFICATION.
   (b) CABLE SIZE
4. WHEN LUG IS FORMED, MATERIAL MUST NOT BE FRACTURED
5. INSPECTION HOLE TO BE PROVIDED.

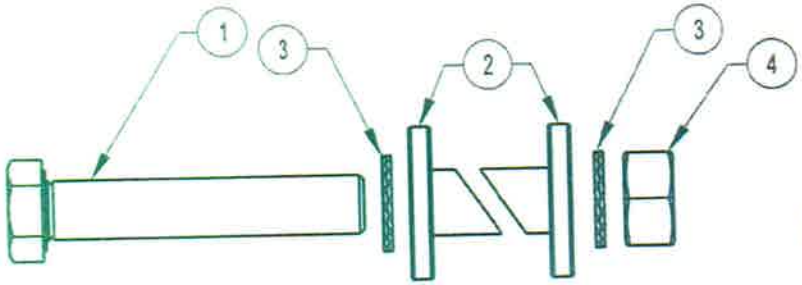
DIMENSIONS mm SCALE NTS
TOLERANCE LIN± - ANG± -
MATERIAL TINNED COPPER

DRAWN D HATTINGH CHECKED D HATTINGH

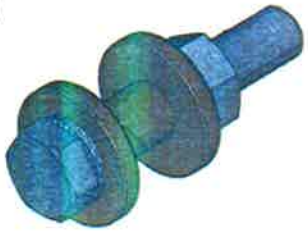
STANDARD COPPER LUGS

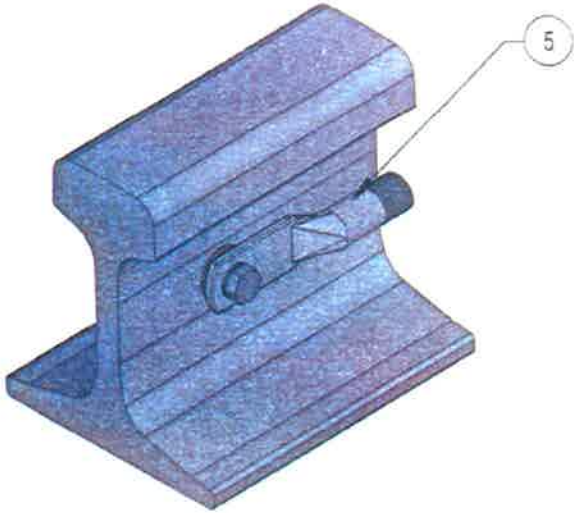
TRANSNET freight rail

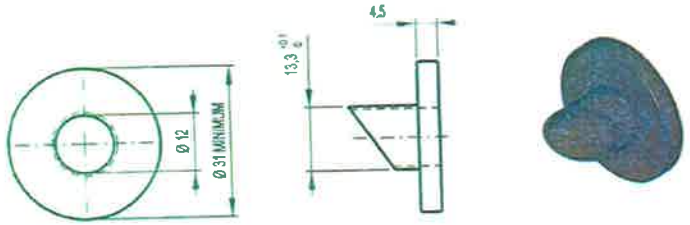
BBH1332 SHT 1
VERSION 1 A3



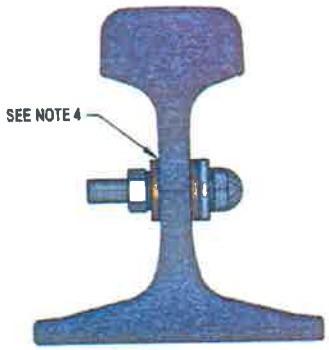
RAIL BOND CONNECTION ASSEMBLY



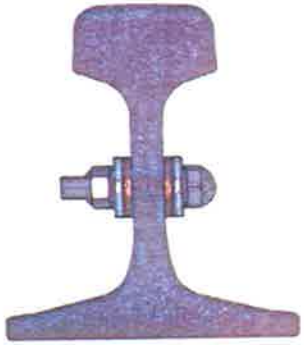




ITEM 2



SINGLE BOND
NTS



SINGLE BOND
BOTH SIDES
NTS

NOTE
1. FOR RAIL BOND FASTENERS SEE SPECIFICATION SBB6017.
2 TORQUE ASSEMBLY ACCORDING TO MANUFACTURER'S SPECIFICATION.
3 ASSEMBLY TO FIT RAIL WEB OF 11,5mm TO 19mm.
4 DRILL Ø13,5mm HOLE IN RAIL WEB.

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
5	TERMINAL LUG	1	-	CEE-TU-0136
4	NUT, HEXAGON, STAINLESS STEEL TO SPEC AISI GRADE 316, M12	1	-	-
3	WEDGE LOCKING WASHER, STAINLESS STEEL TO SPEC AISI GRADE 304, M12	1	-	-
2	TINNED COPPER COLLAR WEDGE	2	-	-
1	BOLT, HEXAGON HEAD, STAINLESS STEEL TO SPEC AISI GRADE 304, M12 x 55.	1	-	-

DIMENSIONS mm SCALE 1
TOLERANCE LIN± 0.5 ANG± 1° ITEM NO -
MATERIAL -

VERSION INFO REVISED

+ 08/07/2020
APPROVED: W SCHOEMAN

+08/07/2020
AUTHORISED : S SMIT

CONNECTION OF OHTE BONDS TO WEB OF RAIL

TRANSNET freight rail

BBC7864
VERSION 4 A3

DRAWN D HATTINGH DESIGNED: CHECKED: D HATTINGH

TRANSNET
freight rail

A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

RAIL AND MAST BOND FASTENERS

Author:	Engineering Technician Technology Management	M Masupha	
Approved	Senior Engineer Technology Management	LO Borchard	
Authorised:	Principal Engineer Technology Management	S E Sibande	SE Sibande

Date: 22 February 2021

Circulation Restricted To:
Transnet and Relevant Third Parties

LIST OF AMENDMENTS TO THE SPECIFICATION

Version No.	Date Issued	Clause No.	Page No.	Remarks
4	07/06/2019			
5	22/02/2021			
		11.2	6	Clause amended
		11.3	6	Clause amended

TABLE OF CONTENTS

1.0 SCOPE

1.1 This specification details Transnet's requirements for rail and mast bond fasteners for application on all types and sizes of rail and masts.

2.0 BACKGROUND

2.1 Transnet requires a standardized rail and mast bond fastening system based on the expanded collar fastening.

3.0 NORMATIVE REFERENCES

Unless otherwise specified all materials used, equipment developed and supplied shall comply with the latest edition of the relevant Transnet publications.

3.1 TRANSNET PUBLICATIONS:

3.1.1 BBC 7863: Connection of bonds to OHTE Steel Structures.

3.1.2 BBC 7864: Connection of OHTE Bonds to web of rail (rail methods).

4.0 SERVICE CONDITIONS

4.1 ENVIRONMENTAL CONDITIONS

Altitude:	0 - 1800 m above sea level
Relative humidity:	10% to 90%
Ambient temperature:	-10° C to +55° C
Wind pressure:	750 Pa
Lightning conditions:	20 ground flashes/km2 per annum
Pollution:	Heavily salt laden with industrial pollutants including diesel- electric locomotive emissions.

5.0 TECHNICAL REQUIREMENTS

5.1 MECHANICAL REQUIREMENTS

5.1.1 An expanded collar fastener with non-vibrating washers for use with bonding on rails and mast shall be provided.

5.1.2 The fastener shall be installed as per drawing BBC 7863 and BBC 7864.

5.1.3 Transnet has standardized on a 13.5 mm hole size for expanded collar fastener for bonding.

5.1.4 Both single sided and back-to-back systems shall only require a single hole.

5.1.5 The system shall be safe to use in all weather conditions.

5.1.6 The system shall be designed so that one size/length expanded collar shall be used for all rail and mast sizes.

5.1.7 The rail web thickness can vary from 11.5 to 19 mm.

5.1.8 The mast web thickness can vary from 7.5 to 10.5 mm.

5.1.9 The fastener shall comprise of and expandable tinned copper collar.

5.1.10 The area of the expandable collar in contact with the rail shall have a contact area not less than the contact area of the flange.

5.1.11 The diameter of the collar should at least be 31 mm.

5.1.12 The fastening pin shall have an M12 thread.

5.1.13 Non-vibrating wedge lock washers shall be used on both sides to prevent nut loosening.

5.1.14 Similar washers than the approved Nord Lock and Heico-Lock may be offered subjected to tests and approval by the Transnet Freight Rail, Technology Management (Electrical Technology) department.

5.2 ELECTRICAL REQUIREMENTS

5.2.1 The continuous current rating for the fastener system shall be a minimum of 100A for both AC and DC.

5.2.2 The fastener system shall not exceed a rise in temperature of more than 3 degrees Celsius in relation to the rail when exposed to the continuous rated current of the bond.

6.0 TESTING AND INSPECTIONS

6.1 Transnet reserves the right to be present at all tests and inspections as called for in this clause.

6.2 The responsibility of arranging the tests called for in this clause rests with the successful tenderer.

6.3 A Transnet Freight Rail, Technology Management (Electrical Technology) department representative may request any additional test deemed necessary to ensure compliance.

7.0 RATING PLATE AND INSTRUCTION LABELS

7.1 Each fastener shall be clearly marked on the outer surface of the flange, the identification mark of the manufacturer

7.2 The mark shall under no circumstances influence the integrity of the connection

7.3 The continuous current rating of the flange shall also be depicted on the flange

8.0 DOCUMENTATION REQUIREMENTS

8.1 Drawings and technical documentation shall be submitted with tender.

8.2 The manufacturer must provide one soft copy and two hard copies of the technical specification.

8.3 The manufacturer must provide one soft and two hard copy of the method of installation.

8.4 The manufacturer must provide design and type test certificates to verify conformance to the requirements and these must be submitted with tender documents.

8.5 Supplier shall advise how to proceed with the equipment at the end of its operating life, taking into consideration environmental requirements and regulations.

9.0 PACKAGING, STORAGE AND HANDLING

9.1 Each fastener set shall be packaged with a user instruction and the package be clearly marked with the torque value.

9.2 There shall be a maximum of 20 fasteners per box.

10.0 GUARANTEE AND DEFECTS

10.1 The appointed tenderer shall guarantee that the supplied rail and mast bond fastener conforms to Transnet's requirements.

10.2 The appointed tenderer shall accept liability for makers' defects, which may appear in design, material and workmanship.

10.3 The appointed tenderer shall provide all information regarding guarantees and warranties in writing

11.0 METHOD OF TENDERING

11.1 Tenderers shall indicate clause-by-clause compliance document with the specification. This shall take the form of a separate document listing each of the specification's clause and sub-clause numbers, indicating the individual statements of compliance or non-compliance.

11.2 Statement of non-compliance shall be motivated by the tenderer in a letter format, as per 11.1. The letter and evidence of deviation shall be submitted as part of the tender document.

11.3 Tenderer shall submit comprehensive literature consisting of detailed technical specifications in accordance to clause 5.0 (Technical Requirements), the general constructional details and principal dimensions if not indicated on the provided Transnet Drawings.

11.4 Any items offered in accordance with other standards will be considered at the sole discretion of Transnet. The tenderer shall supply full details stating where the item differs from these specifications as well as supplying a copy (in English) of the recognized standard specification(s) with which it complies. Any deviations must be approved by Transnet Freight Rail, Technology Management (Electrical Technology) department in writing.

11.5 Failure to comply with clauses 11.1, 11.2, 11.3 and 11.4 could preclude a tenderer from consideration.

11.6 In the event of any conflict between the various submitted relevant documents, the order of precedence shall be, and in consultation with Transnet Freight Rail, Technology Management (Electrical Technology) department

a) Legal and safety requirements.

b) This Specification.

END

TRANSNET
freight rail

A Division of SOC Transnet Limited

TECHNOLOGY MANAGEMENT

SPECIFICATION

SPECIFICATION FOR SECTION INSULATORS FOR 25 KV AC OVERHEAD TRACK EQUIPMENT FOR BOTH HIGH AND LOW SPEED TRAFFIC

Author:	Technician In Training Technology Management	M.R Masupha	
Approved:	Engineer Technology Management	S. Smith	
Authorised:	Senior Engineer Technology Management	L.O Borchard	

Date: 13 July 2016

Circulation Restricted To

Transnet Freight Rail

Transnet and Relevant Third Parties

INDEX

1.0 SCOPE

1.1 This specification covers the Transnet Freight Rail requirements for bi-directional 25 kV AC section insulators, excluding catenary insulation.

1.2 A section insulator is an in-line insulator inserted into the contact wire which is so designed as to electrically separate sections of OHTE and also provide a smooth transition for a pantograph current collection. Both insulator material and air clearance have an effect on insulation properties.

2.0 REFERENCES

2.1 Unless otherwise specified, all materials, equipment and testing methods shall comply with the current edition of the relevant IEC, SANS or Transnet Freight Rail publications where applicable.

2.2 The following specifications and drawings (latest edition) are referred to herein:

2.3 **AMERICAN STANDARD AND TEST METHODS (ASTM)**

ASTM D2303-97: 2004	Standard Test Methods for Liquid Contaminant, Inclined-Plane, Tracking and Erosion of Insulating Materials.

2.4 SOUTH AFRICAN NATIONAL STANDARDS (SANS)

SANS 60383-2:	Insulators for overhead lines with a nominal voltage above 1 000 V Part 2.

2.5 TRANSNET FREIGHT RAIL SPECIFICATIONS

Transnet Drawing CEE-TA-0062:	Standard Electrification Symbols.

2.6 **SIEMENS DRAWING**

Siemens Drawing No. 8WLO 119-6ZG30:	Pantograph for AC/DC locomotive.

3.0 METHOD OF TENDERING

3.1 Tenderers shall indicate clause-by-clause compliance with this specification. This shall take the form of a separate document listing all the specifications clause numbers indicating the individual statement of compliance or non-compliance. This document can be used by tenderers to elaborate on their response to a clause.

3.2 A statement of non-compliance shall be motivated by the tenderer.

3.3 Tenderers shall submit descriptive literature consisting of a detailed technical `specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

3.4 Failure to comply with clauses 3.1, 3.2 and 3.3 could preclude a tender from consideration

4.0 SERVICE CONDITIONS

4.1 ENVIRONMENTAL CONDITIONS

Wind pressure:	750 Pa
Lightning conditions:	20 ground flashes/km^2 per annum
Pollution:	Heavily salt laden with industrial pollutants including diesel- electric locomotive emission.

4.2 MECHANICAL CONDITIONS

Contact wire tension (new wire):	11 kN (min) to 19.5 kN (max.)
Required safety factor (overall):	x2 for 107 mm^2 contact wire x2.7 for 161 mm^2 contact wire.
Contact wire size:	107 mm^2 or 161 mm^2 Cu

4.3 ELECTRICAL CONDITIONS

Highest voltage of system:	30 kV AC
Lowest voltage of system:	19.9 kV AC
Maximum commutated current:	800 A
Maximum short circuit current:	8000 A
Lightning impulse withstand voltage:	95 kV

Note: The circuit breakers opening time on the occurrence of a fault is 60-150 milliseconds for 25 kV AC.

5.0 DRAWINGS AND INSTRUCTIONS

5.1 All drawings must use standard symbols as per CEE-TA-0062.

5.2 Tenderers shall provide the following information at time of tendering to enable a proper adjudication to be made. Failure to do so shall be indicated in the "Statement of Compliance" and may lead to rejection of the tender. Where feasible the information may be provided on the drawing:

5.2.1 A detailed drawing showing insulation inserts, runners, arcing horns and suspension arrangements with all relevant dimensions and in particular deviation, if any, from a plane surface after installation. (See clause 6 for design requirements.)

5.2.2 Details of insulating materials used. Resistance to Ultra-violet radiation shall be stated.

5.2.3 Detail and composition of metallic components used.

5.2.4 Minimum distance to be allowed between section insulator and catenary.

5.2.5 Details of adjusting height and level at rights angles, as well as longitudinal, to the track.

5.2.6 Gross mass.

5.2.7 Details of adjustment of arcing horns

5.2.8 Comprehensive instructions for installation and details of any special tools or equipment required.

5.2.9 List of railway organisations and service conditions where the section insulator offered, is in successful use

5.2.10 Test certificates for tests as set for in clause 7.2

6.0 DESIGN REQUIREMENTS

6.1 The section insulators shall be of durable design and shall be capable of carrying out their functions reliably under the service conditions stated. They shall be suitable for bi-directional traffic at speeds of up to120 km/h.

6.2 The overall mass of the section insulator shall not exceed 21 kg. (The mass of support droppers and fittings excluded.)

6.3 The overall width of that part of the section insulator in contact with the pantograph shall not exceed 330 mm.

6.4 The section insulator shall be provided with suitable runners of either metal or insulating material such that a smooth continuous running surface is present for the passage of a pantograph,

6.5 The design shall be such that electrical contact between pantograph and the overhead system will under no circumstances be completely broken whilst being traversed by the pantograph. Designs incorporating a gap longitudinally across the section insulator (i.e. with in-line runners) the gap width shall not exceed 300 mm such that the gap can be bridged out by the pantograph. (See Appendix 1 for a detailed drawing of a pantograph).

6.6 Allowance shall be made in the design to ensure that no obstruction shall be formed to the passing pantograph should the section insulator fail to be set perfectly level in all planes with respect to the track.

6.7 The section insulator shall preferably present a perfectly plane running surface to the pantograph, when installed at the normal tension of 14.5 kN. If not perfectly plane, or if variations in tension can result in deviations from a perfect plane, the maximum allowable deviation shall be 6 mm at any point on the running surface, within the range of operating tensions quoted in clause 4.2.

6.8 All runners or parts in contact with the pantograph shall be of rigid design such that no part shall deflect by more than that specified in clause 6.7 whilst being subjected to the upward force of the pantograph of up to 90 N.

6.9 Arcing horns shall be provided and designed such to assist in extinguishing any arc. They shall also be placed such that the insulation used will not be damaged by the arcs drawn during operation and shall be of rigid design. The air-gap between arcing horns at different potential shall not be less than 150 mm. Each horn shall have a straight length above this air gap between 120 mm to 350 mm.

6.10 The main insulating material forming the insulation between the two circuits shall have a creepage length greater than 750 mm. It shall also be able to withstand abrasion resulting from the passage of pantographs (if applicable) as well as electric arcing and ultra-violet radiation.

P.T.F.E. (Teflon) shall not be used if in direct contact with the pantograph.

6.11 Where composite insulators are used as main insulation the protective coating on the outside shall be bonded to the core such that no cavities are formed between the coating and the core. The protective coating shall be sealed at the ends to prevent the possibility of tracking along the insulator underneath the protective coating.

Each insulator of this type shall be subjected to the water immersion test described in clause 7.3.

6.12 Clause 6.11 also applies to any other protection material provided to protect the insulation against arcing/flashover.

6.13 Supporting droppers shall (if provided) be insulated to prevent any arcing between the catenary wire and the droppers. The supporting droppers shall be adjustable either by means of turnbuckles or some other means of providing fine adjustments to its length. Droppers shall be protected by thimbles or similar means to prevent wear taking place at sharp edges.

Supporting droppers must be provided if the mass of the section insulator exceeds 5 kg and its overall [illegible]

6.15 Supporting droppers shall be of material type stainless steel.

6.16 Only non-corrosive materials shall be used in the construction of the section insulator. Brass may not be used.

6.17 Means of locking all bolts and screws shall be provided. All screw threads shall be of metal.

7.0 TESTS

7.1 GENERAL

7.1.1 The first section insulator shall be subjected to type tests as specified in clauses 7.2.

7.1.2 All main insulators of the composite type shall be subjected to the routine test as specified in clause 7.3.

7.1.3 A further five samples of the main insulator material shall be subjected to the type test as specified in clause 7.2.1.

7.1.4 The responsibility for arranging these tests shall rest with the tenderer although the Transnet Freight Rail reserves the right to perform such tests independently.

7.1.5 Transnet Freight Rail reserves the right to call for further type tests.

7.1.6 Transnet Freight Rail reserves the right to be present at all tests.

7.2 TYPE TESTS

7.2.1 The insulating material (if of synthetic type) shall be tested for resistance to tracking in accordance with the test method described in ASTM D 2303. The average time to track 13 mm for five samples shall not be less than 24 hours at a constant test voltage of 2 kV with a constant contaminating flow rate as prescribed in ASTM D 2303. The cabinet in which the tracking test is performed shall be open at the top in order to create sufficient ventilation, thus limiting the relative humidity inside the chamber to a value that will not give false results. The flow rate of the contaminant should be accomplished by a gravity feed from a large reservoir mounted at a sufficient height to obtain the desired flow rate.

7.2.2 Impulse and power frequency tests shall be carried out on a complete section insulator in accordance with SANS 60383-2.

7.2.3 Mechanical load tests shall be carried out to establish whether the section insulator can withstand the maximum tension called for in clause 4.2 at a safety factor as specified in clause 4.2.

7.3 Water immersion tests shall be carried out as follows: (Routine test)

7.3.1 Immerse the sample in hot tap water (50 °C) and allow water to cool over 8 hours to approximately 20°C.

7.3.2 Repeat 7.3.1 nine times

7.3.3 After the 10th cycle, remove the sample from the water, wipe the surface dry with a paper towel and apply a DC test voltage of 25 kV/m length of insulator within 10 minutes. Measure the current after one minute on a DC ammeter capable of reading 1 nA.

7.3.4 Insulators conducting more than 100 nA have failed the test and must be rejected

8.0 SPARES

8.1 Tenderers shall quote separately for the following spares:

Arcing horns

8.1.3 Metal runners (if not integrated with arcing horns)

8.2 The following information shall be made available for spares

8.2.1 Complete ordering description

8.2.2 Name of manufacturer

8.2.3 Catalogue description number

8.2.4 Type and ordering number

9.0 TOOLS

9.1 Special tools for installation of the section insulators shall be quoted separately, but must be clearly stated in tender that the tool is required for installation.

10.0 PACKING

10.1 Each section insulator shall be packaged individually complete with arcing horns, suspension fittings, etc.

11.0 WARRANTEE/ AFTER SALES SUPPORT

11.1 Tenderers should give a warrantee on the workmanship of the manufactured items and provide a full disclosure of any warrantee conditions with the tender.

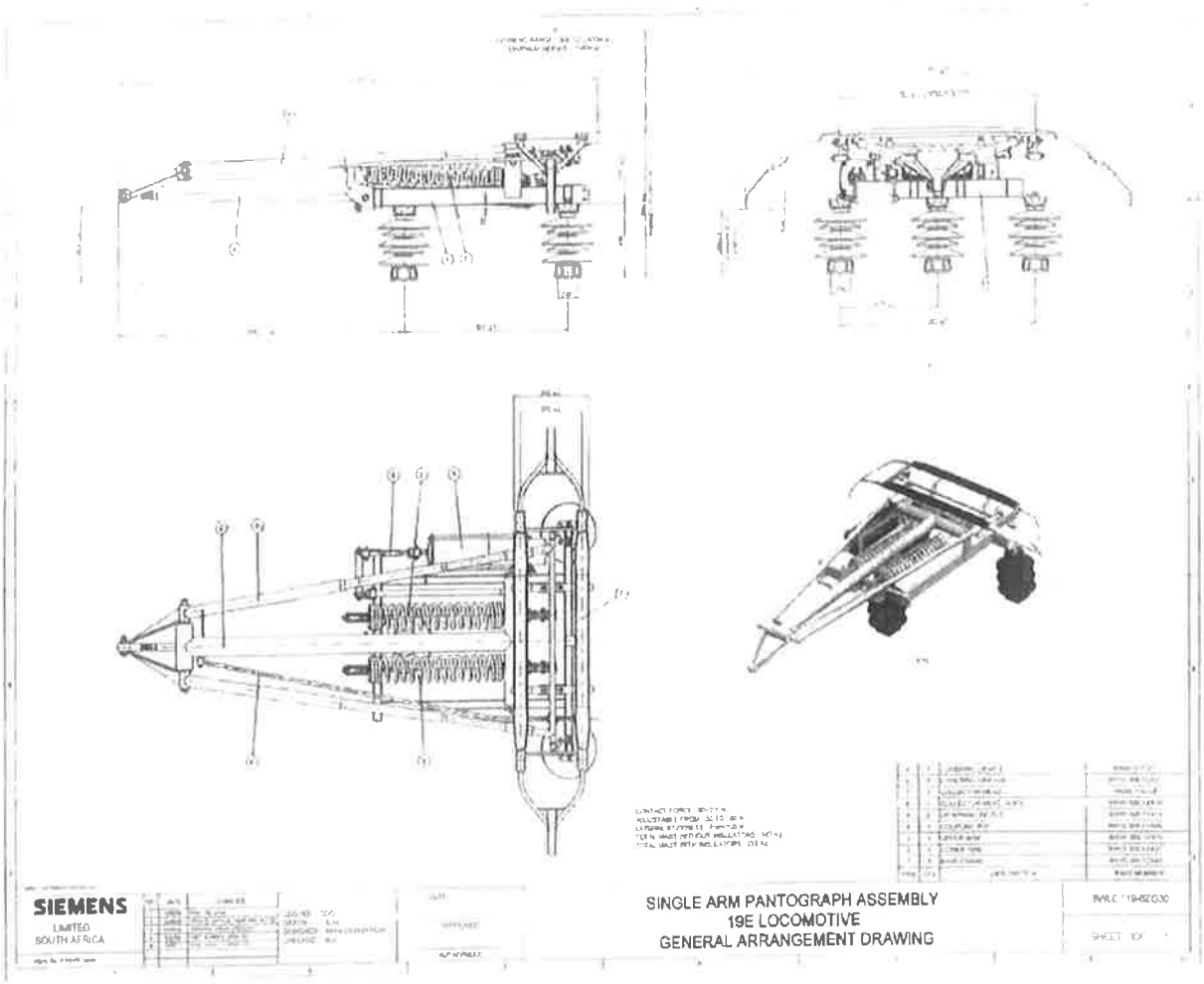
11.2 Tenderers should state the extent of after sales support provided by them.

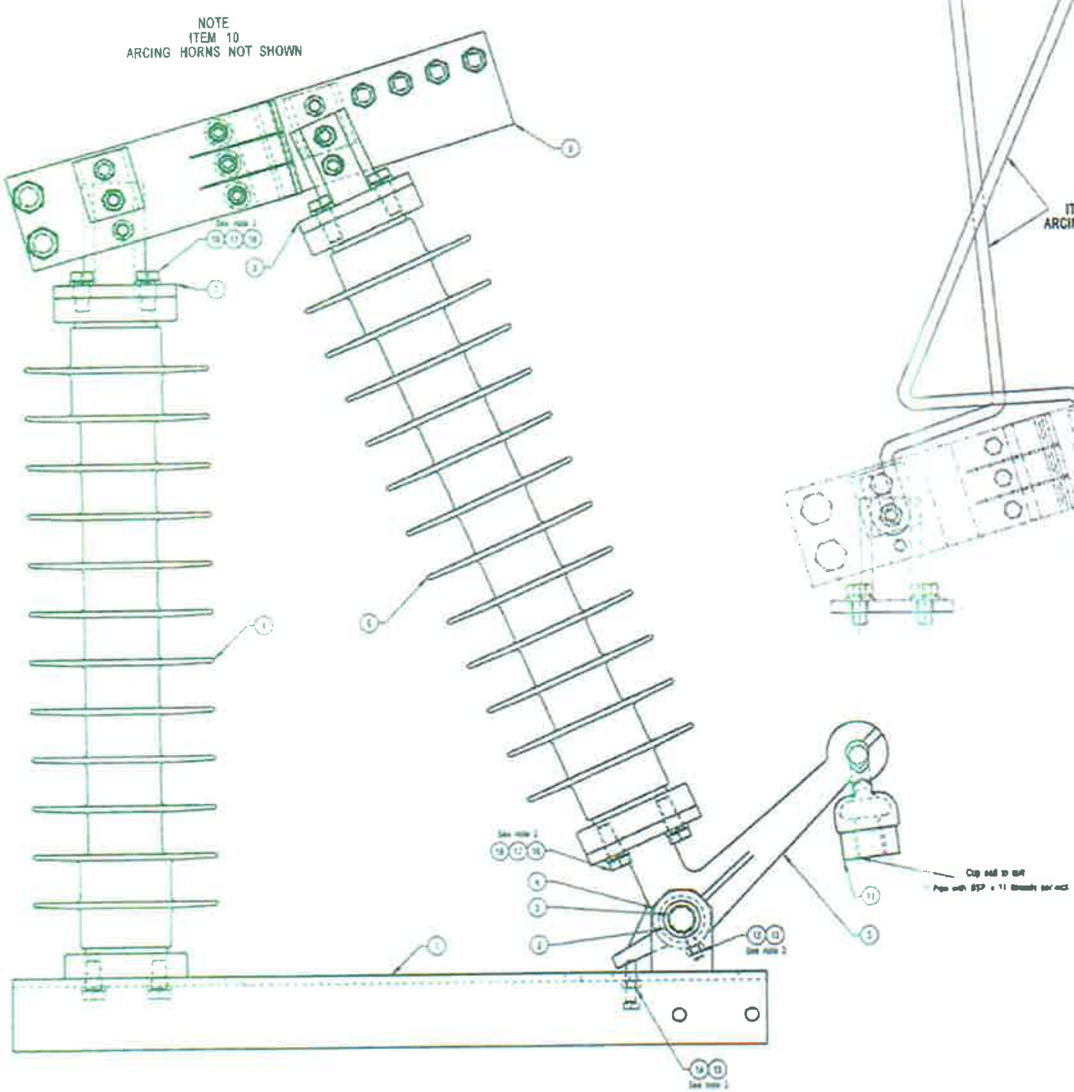
11.3 Tenderers should provide a spare parts list with contact details with each item , including the installation instructions.

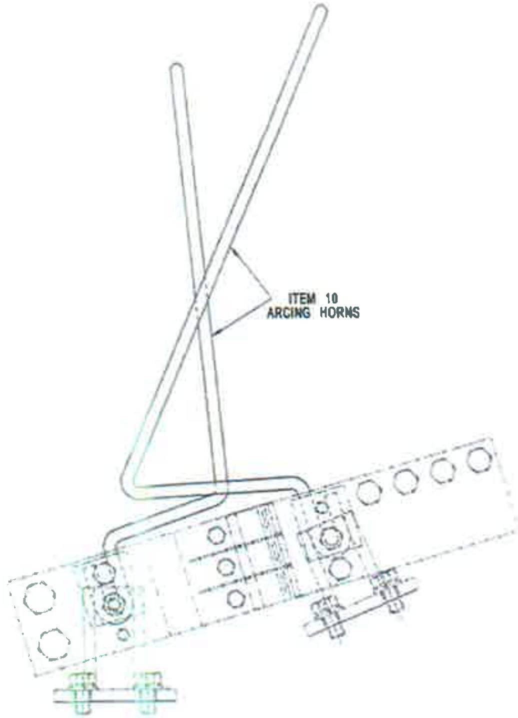
11.5 Lead time must be clearly indicated by tenderers.

END

Appendix 1


SIEMENS
LIMITED
SOUTH AFRICA
SINGLE ARM PANTOGRAPH ASSEMBLY
19E LOCOMOTIVE
GENERAL ARRANGEMENT DRAWING





NOTES

1. DRAWING TO BE READ IN CONJUNCTION WITH SPECIFICATION CEE 0040
2. TO PREVENT "FREEZING" OF STAINLESS STEEL BOLTS & NUTS ENSURE THAT THESE ARE OF DIFFERENT GRADES STAINLESS STEEL (GRADE 304 FOR BOLTS AND GRADE 316 FOR NUTS)

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
18	WASHER, SPRING STAINLESS STEEL M12			
17	WASHER, FLAT, STAINLESS STEEL ROUND M12			
16	SCREW STAINLESS STEEL GRADE 304 HEX HEAD M12 x 25 LONG			
15	NUT STAINLESS STEEL GRADE 316 HEX M12			
14	SCREW STAINLESS STEEL GRADE 304 HEX HEAD M12 x 35 LONG			
13	NUT STAINLESS STEEL GRADE 316 HEX M8			
12	GRUB SCREW HEX SOCKET STAINLESS STEEL GRADE 304 M8 x 25 LONG			
11	OPERATING ROD CAP			
10	MALE AND FEMALE ARCING HORNS			
9	SWITCH BLADE SET		[illegible]	[illegible]
8	MOVING SWITCH BLADE ATTACHMENT			
7	FIXED SWITCH BLADE ATTACHMENT			
6	VANDAL PROOF POST INSULATOR	2	[illegible]	BBC8436
5	SWITCH BLADE SHAFT			
4	SWITCH BLADE PIVOT WASHER			
3	OPERATING ROD LEVER			
2	SWITCH BLADE BUSH	2		
1	SWITCH BASE ASSEMBLY			BBC7904

DIMENSIONS	mm	SCALE	1 : 2
TOLERANCE	LIN ± - ANG ±	ITEM NO	54014836
MATERIAL			
VERSION INFO	Redrawn acc updated		

DO REF	CDO/8225
ECP REF	
DRAWN	D A Bakaba
DESIGNED	
CHECKED	

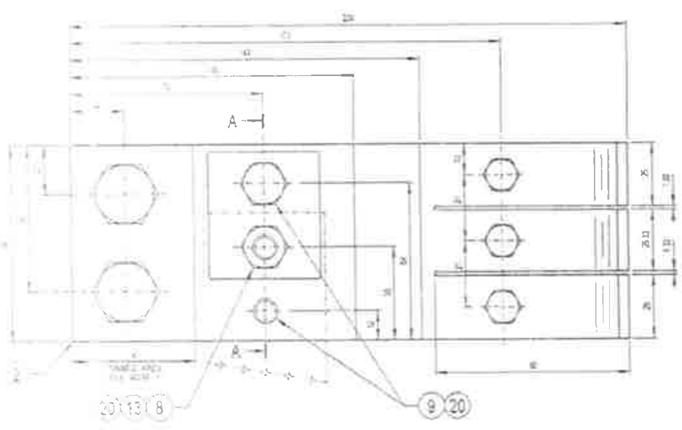
APPROVED S. Bak
AUTHORISED L. Barnhard

25kV AC TRACK SWITCH ASSEMBLY

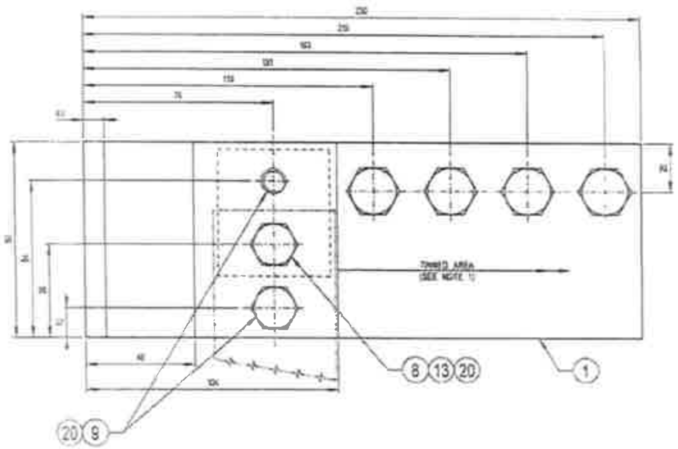
TRANSNET freight rail

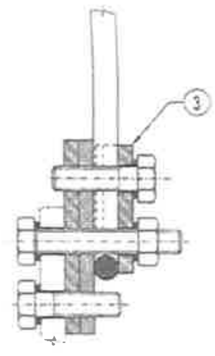
BBC8743

FEMALE CONTACT

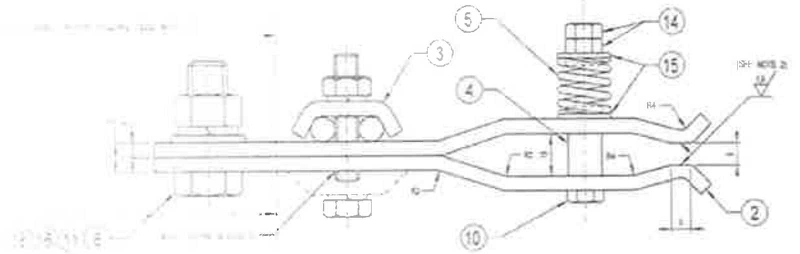


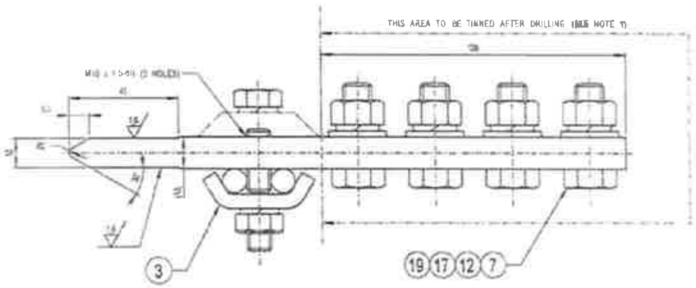
MALE CONTACT

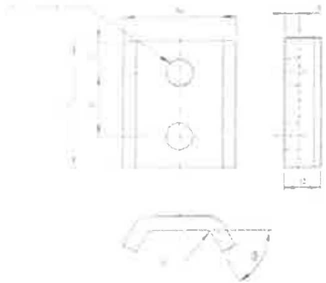




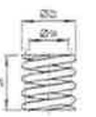
SECTION A-A



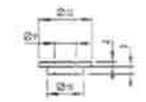




ITEM 3



ITEM 5



ITEM 15

NOTES
1) MINIMUM TIN PLATING THICKNESS µ13
2) THESE SURFACES TO BE MACHINED TO FORM A LEVEL CONTACT AREA WHEN MATED WITH ITEM 1
3) ELECTROPLATE ITEMS 4 & 15 TO SANS 2081
4) HOT DIP GALVANISE ITEM 3 TO SANS 121 AFTER DRILLING

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
20	WASHER, SPRING, STAINLESS STEEL, ROUND, GALV M10	[illegible]		
19	WASHER, SPRING, STAINLESS STEEL, ROUND, GALV M12	[illegible]		
18	WASHER, SPRING, STAINLESS STEEL, ROUND, GALV M16	[illegible]		
17	WASHER, FLAT STAINLESS STEEL, ROUND, GALV M12	[illegible]		
16	WASHER, FLAT STAINLESS STEEL, ROUND, GALV M16	[illegible]		
15	SPRING BUSHING - BAR ROUND STEEL Ø22 x 5L (SEE NOTE 3)	[illegible]		
14	NUT, STAINLESS STEEL, HEX HEAD, GALV M8	[illegible]		
13	NUT, STAINLESS STEEL, HEX HEAD, GALV M10	[illegible]		
12	NUT, STAINLESS STEEL, HEX HEAD, GALV M12	[illegible]		
11	NUT, STAINLESS STEEL, HEX HEAD, GALV M16	[illegible]		
10	BOLT, STAINLESS STEEL, HEX HEAD, GALV M8 x 75L	[illegible]		
9	BOLT, STAINLESS STEEL, HEX HEAD, GALV M10 x 30L	[illegible]		
8	SCREW, STAINLESS STEEL, HEX HEAD, GALV M10 x 50L	[illegible]		
7	BOLT, STAINLESS STEEL, HEX HEAD, GALV M12 x 25L	[illegible]		
6	BOLT, STAINLESS STEEL, HEX HEAD, GALV M16 x 40L	[illegible]		
5	SPRING STAINLESS STEEL, Ø2.7 OD32 x ID16 x 24L INSTALLED LENGTH	[illegible]		
4	SPACER OD14 x ID8 x 16L (SEE NOTE 3)	[illegible]		
3	CLAMPING BRACKET - FLAT BAR, STEEL 52 x 52 x 6THK (SEE NOTE 4)	[illegible]		
2	FEMALE CONTACT - FLAT BAR, COPPER 80 x 229 x 8THK	[illegible]		
1	MALE CONTACT - FLAT BAR, COPPER 80 x 230 x 12THK	[illegible]		

DIMENSIONS	[illegible]	SCALE	[illegible]
TOLERANCE	[illegible]	ITEM NO	[illegible]
MATERIAL			
VERSION INFO			

DO REF	CDO/5956
ECP REF	
DRAWN	C I BUCKLE
DESIGNED	
CHECKED	J VAN DYK

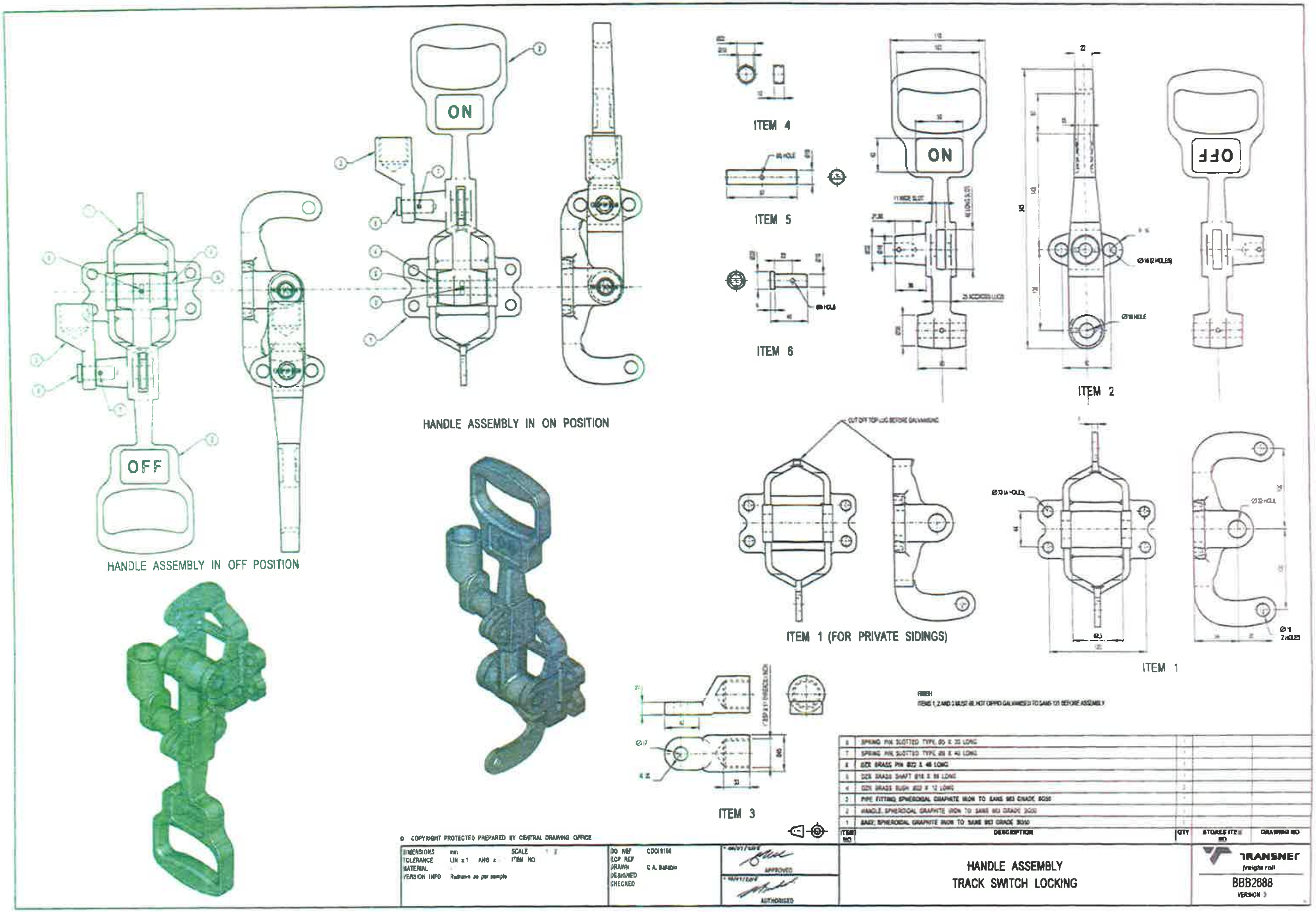
APPROVED

AUTHORISED

SWITCH BLADE SET
25kV AC TRACK SWITCH

TRANSNET freight rail

BBD7601



FINISH
ITEMS 1, 2 AND 3 MUST BE HOT DIPPED GALVANISED TO SANS 121 BEFORE ASSEMBLY

ITEM NO	DESCRIPTION	QTY	STORES ITEM NO	DRAWING NO
8	SPRING PIN SLOTTED TYPE Ø5 X 35 LONG	1		
7	SPRING PIN SLOTTED TYPE Ø8 X 40 LONG	1		
6	DZR BRASS PIN Ø22 X 46 LONG	1		
5	DZR BRASS SHAFT Ø16 X 56 LONG	1		
4	DZR BRASS BUSH Ø22 X 12 LONG	2		
3	PIPE FITTING SPHEROIDAL GRAPHITE IRON TO SANS 983 GRADE SG50	1		
2	HANDLE SPHEROIDAL GRAPHITE IRON TO SANS 983 GRADE SG50	1		
1	BASE SPHEROIDAL GRAPHITE IRON TO SANS 983 GRADE SG50	1		

DIMENSIONS mm SCALE 1:2
TOLERANCE LIN ±1 ANG ± ITEM NO
MATERIAL
VERSION INFO Redrawn as per sample

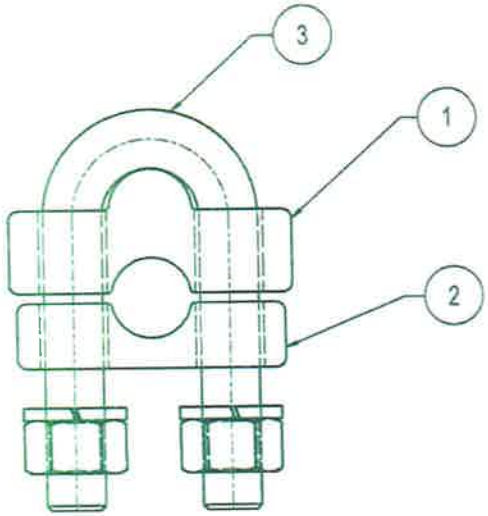
DO REF CDO/8100
ECP REF
DRAWN C A. Barbabio
DESIGNED
CHECKED

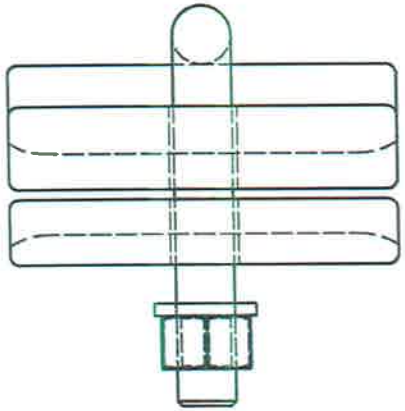
APPROVED
AUTHORISED

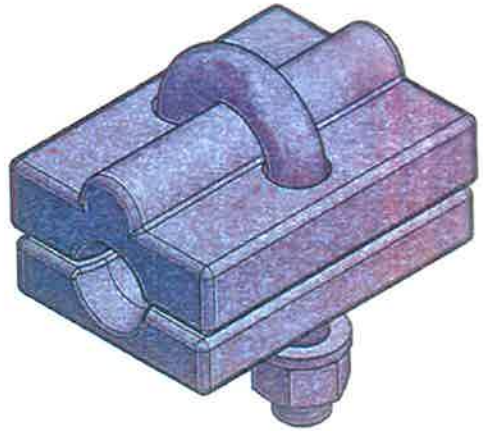
HANDLE ASSEMBLY
TRACK SWITCH LOCKING

TRANSNET freight rail
BBB2688
VERSION 3

TABLE	
STORES ITEM NO.	WIRE SIZE mm²
54002033	50mm² Al 52mm² ACSR - RABBIT
54015147	100mm² ACSR - SKUNK
54010496	161mm² ACSR - TIGER







NOTES
1. USE BRIGHT STEEL DISTANCE PIECES WHEN CHECKING HOLE SIZE.
2. THE FOLLOWING PERMAMENT MARKINGS MUST APPEAR ON THIS ARTICLE:
 (a) TRANSNET LOGO.
 (b) MANUFACTURER'S IDENTIFICATION.
 (c) DATED BATCH NUMBER.
 (d) WIRE SIZE.

ITEM	DESCRIPTION	QTY	STORES ITEM NO.	DRAWING NO.
3	U-BOLT	1	-	BBH1233 SHT 2 ITEM 6
2	ALUMINIUM CLAMP	1	-	CEE-TN-0371 SHT 1
1	ALUMINIUM CLAMP	1	-	CEE-TN-0371 SHT 1

DIMENSIONS mm SCALE 1 : 1
TOLERANCE LIN ± 1 ANG ± ° ITEM NO : -
MATERIAL -

VERSION INFO : REVISED AND REDRAWN

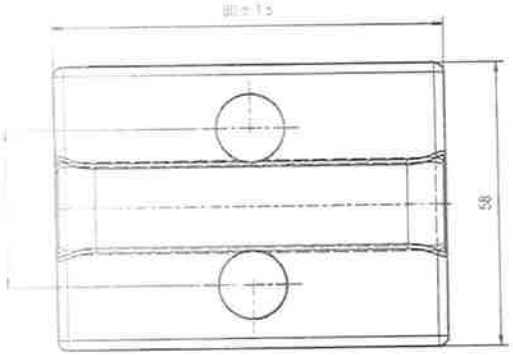
29/07/2020
APPROVED : W SCHOEMAN

29/07/2020
AUTHORISED : S SMIT

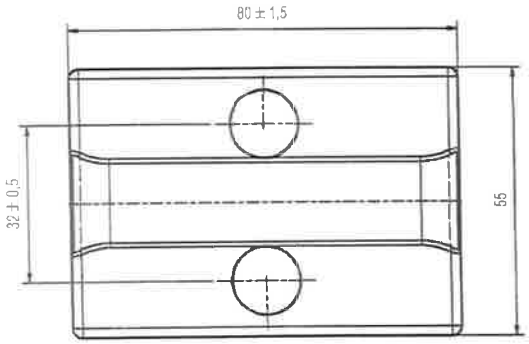
EARTH WIRE CLAMP ASSEMBLY 50/9mm², 50mm², 100mm² OR 160mm²

TRANSNET freight rail
CEE-TN-0371
VERSION 5 A3

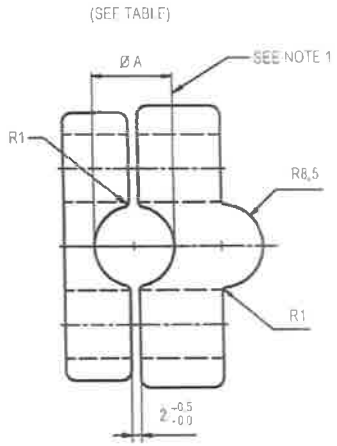
DRAWN : D HATTINGH
DESIGNED : -
CHECKED : D HATTINGH



ITEM 1



ITEM 2



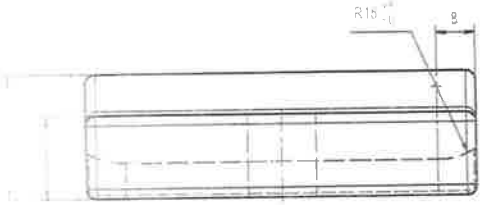
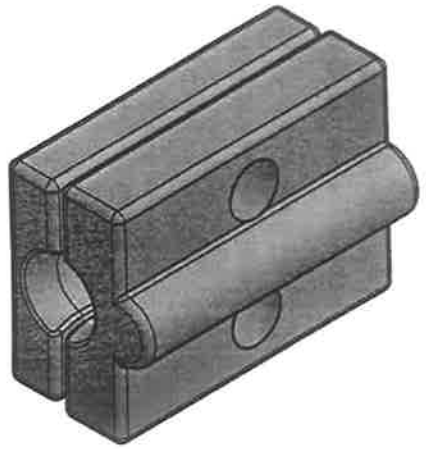


TABLE	
DIAMETER A (mm)	WIRE SIZE (mm²)
10 +0,5 -0,0	50 Al 52mm² ACSR - RABBIT
12 +0,5 -0,0	100mm² ACSR - SKUNK
16,5 +0,5 -0,0	161mm² ACSR - TIGER



DIMENSIONS	mm	SCALE 1:1
TOLERANCE	LIN ± 1 ANG ± -	
MATERIAL	ALUMINIUM GRADE 6063 OF BS EN 573-3	
DRAWN	D HATTINGH	CHECKED D HATTINGH

EARTH WIRE CLAMP

TRANSNET freight rail

CEE-TN-0371 SHT 1

VERSION 5 A3