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Bereich Schienenfahrzeuge

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<b>CLIENT / KUNDE</b> <b>SIEMENS SGP</b> Verkehrstechnik	<b>PROGRAMME / PROGRAMM</b> <b>SF5000 BOGIE</b>	<b>CLASSIFICATION / KLASSE</b> <b>2</b>
	<b>SPECIFICATION / SPEZIFIKATION</b>	

**TITRE / TITEL :**

**MAINTENANCE PROCEDURE TRACTION ROD**  
**REFERENCE PAULSTRA 905369 REFERENCE SIEMENS TS BG A2V00001373379**

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Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	1
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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Indice Index	Date Datum	Pages Seiten	Modifications Änderungen
A	01/08/07		First edition of the document

Référence du document / Dokumentennummer : MP.F192.D03  
Reference of the part : 905369 (Paulstra)  
A2V00001373379 (Siemens TS BG)

Indice	Date/Datum	Page/Seite
Index		
A	01/08/2007	2
		PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

# PAULSTRA



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## Table of Contents

0.1	Safety notes	5
0.1.1	General	5
0.1.2	Safety Related Terms	6
0.1.3	General Safety Regulations	6
0.1.4	General Handling Instruction for the Manual	7
1	DESCRIPTION	8
1.1	Application	8
1.1.1	Mounting position	8
1.1.2	Design	8
1.2	Operation condition / Technical data	10
1.3	Technical description	11
2	TRANSPORT / STORAGE	11
2.1	Transport	11
2.2	Storage	11
2.3	Recommissioning after storage	12
3	INSTALLATION AND CHECK BEFORE COMMISSIONING	12
3.1	Installation of the unit	12
3.2	Check before commissioning	12
4	COMMISSIONING	12
5	CONTROL AND MONITORING	12
5.1	Control	12
5.2	Monitoring	12
6	TAKING OUT OF SERVICE	13
7	PREVENTIVE MAINTENANCE	13
7.1	Maintenance schedule	13
7.1.1	Safety notes	13
7.1.2	Preparatory work	13
7.2	Maintenance instruction	14
7.2.1	First visual inspection after 3 months	14
7.2.2	Visual inspection every 6 months / 100,000 km	14
7.2.3	General Inspection every 6 years / 1,200,000 km	15
7.2.4	Cleaning instructions	15
7.3	Recommissioning and functional test	15

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	3
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

# PAULSTRA



ANTIVIBRATOIRE INDUSTRIE  
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8	CORRECTIVE MAINTENANCE	15
8.1	Troubleshooting	16
8.2	Removal of the units from the bogie	16
8.3	Dismantling	16
8.4	Repair	16
8.5	Assembly	16
8.5.1	Press fitting of the bushes in the rod	17
8.5.2	Additional painting of the bushes	19
8.6	Installation of the spherical bush on the bogie	20
8.7	Commissioning and functional test	20
9	SPECIAL TOOLS AND MATERIALS, MEASURING INSTRUMENTS AND TEST EQUIPMENTS	20

#### List of Figures


Figure 1	Location of the unit	8
Figure 2	View of the unit	8
Figure 3	Drawing of the unit	9
Figure 4	Drawing of the unit	9
Figure 5	Drawing of the bush	10
Figure 6	Drawing of the raw rod	10
Figure 7	New bush	14
Figure 8	Sketch for the press fit of the bushes in the rod	18
Figure 9	Position of the bushes in the rod	19

#### List of Tables

Table 1	Maintenance intervals	13
Table 2	Special tools	20
Table 3	Materials	20

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	4
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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## 0.1 Safety notes

### 0.1.1 General

It is assumed that only qualified personnel will be employed for operating, maintaining and repairing the existing units as well as for troubleshooting purposes.

Qualified personnel are persons who, because of their training, experience and instruction as well as their knowledge of the relevant standards, regulations, rules of accident prevention and operating instructions, have been authorized by those responsible for safety to perform whatever tasks may be needed, and who are able to recognize and avoid potential dangers associated with these tasks.

Among other things, knowledge of first aid and the local rescue facilities is also necessary.

For all maintenance and repair work only genuine spare parts as well as such overhauled parts may be used which are in good condition and ready for service operation.

Independent modifications to the vehicle exclude any liability of the manufacturer for damage occurring as a result and for its consequences.

The vehicle must not be modified, added to or adapted in such a way that safety could be impaired without the manufacturer's permission. This also applies to installing and adjusting safety equipment and valves, and to welding work on load-bearing parts.

Welding, flame cutting and grinding work can be performed on the vehicle only if the manufacturer has given written permission.

Any damage in case of non-compliance is excluded from the guarantee provisions as well as from any liability by the manufacturer!

Personnel tasked with working on the bogie must have read and understood the Manual before starting work.

No work is to be carried out on the bogie until those entrusted with the work have read and understood the instructions and regulations contained in this document and the instructions and regulations contained in all main chapters.

### 0.1.2 Safety-Related Terms

The terms DANGER, WARNING, CAUTION and NOTE will be used as signals in this manual to draw attention to particular hazards or exceptional information which warrant particular consideration:

<p>Référence du document / Dokumentennummer : MP.F192.D03 Reference of the part : 905369 (Paulstra)</p>	<p>Indice Index</p>	<p>Date/Datum 01/08/2007</p>	<p>Page/Seite 5</p>
<p>A2V00001373379 (Siemens TS BG)</p>	<p>A</p>		<p>PA TEC 017/00</p>

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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**DANGER** indicates death, severe personal injury or substantial property damage will result if proper precautions are not taken.

**WARNING** indicates death, severe personal injury or substantial property damage can result if proper precautions are not taken.

**CAUTION** shall call attention to use of materials, processes, methods, procedures or limits that must be followed precisely to avoid damage to the unit.

**NOTE** shall call attention to methods that simplify the job.

### 0.1.3 General Safety Regulations

**WARNING** PLEASE ADHERE STRICTLY TO THE GENERAL SAFETY INFORMATION IN THE CHAPTER INTRODUCTION OF THIS MANUAL AND THE NOTES ON PERMISSIBLE USES AND SPECIAL KNOWLEDGE REQUIRED FOR WORK ON ELECTRICAL POWER INSTALLATIONS ! BEFORE ANY WORK IS STARTED ON THE UNITS, MAKE SURE THAT THE INTENDED MEASURES CANNOT CAUSE ANY FAULT IN THE PLANT OR ENDANGER ANY PERSONS !

**WARNING** ALL MOUNTING, COMMISSIONING, MAINTENANCE AND REPAIR OF EQUIPMENT MUST BE CONDUCTED SOLELY BY QUALIFIED PERSONNEL.


**WARNING** AT ALL TIMES WEAR APPROPRIATE PROTECTIVE CLOTHING SUCH AS E.G. HELMETS, GLOVES, SAFETY SHOES, EYE AND EAR PROTECTION ACCORDING TO THE REGULATIONS IN THIS DOCUMENT AND ITS MAIN CHAPTERS AS WELL AS ACCORDING TO ALL LOCAL SAFETY AND WORKING REGULATIONS !

**WARNING** AS SPECIFIED IN § 20 OF THE GERMAN HAZARDOUS SUBSTANCES REGULATIONS (OR ANALOGOUS NATIONAL REGULATIONS), THE RESPONSIBLE PERSON IS OBLIGED TO INSTRUCT HIS EMPLOYEES IN SAFETY MATTERS IF THEY EVER USE SUBSTANCES INVOLVING A HAZARD TO HEALTH OR THE ENVIRONMENT (E.G. CLEANING AGENTS OR LUBRICANTS, ADHESIVES OR PAINT COATINGS ETC.) !

**WARNING** WHEN USING SUCH CHEMICAL AGENTS, STRICT ATTENTION MUST BE PAID TO THE CHARACTERISTIC VALUES STATED IN THE SAFETY DATA SHEET APPLICABLE TO THE CLEANING AGENT CONCERNED !

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	6
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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These instructions cannot claim to cover all details of possible equipment variations, nor in particular can they provide for every possible example of installation, operation or maintenance. This means that the instructions for machines for industrial applications normally include only the directions necessary to be mentioned for qualified personnel (see above) where the equipment is used for its defined purpose.

#### 0.1.4 General Handling Instruction for the Manual

For better understanding in the manual cross-references are done in the text. They are valid for drafts and figures.

The following cross-references can occur:

Cross-reference to figures      figure xxx

Cross-references to tables      table xxx

Hxx

cross-references to the information :

within this chapter, only the adequate (corresponding) point is quoted, e.g. 1.0.2

other chapters are quoted with the corresponding chapter and point, e.g. 1.1 – 7.1

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	7 PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA



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## 1. DESCRIPTION

### 1.1 Application

Unit	Drawing number	Part number
Traction rod between car body and bogie	IEX 905369	97217083

#### 1.1.1 Mounting position

The traction mechanism rod is fitted between the bogie and the car body. Its role is to transmit the longitudinal loads, especially acceleration and braking loads from the bogie to the car body, while being soft in vertical and lateral directions, to avoid any parasitic stiffness for the secondary suspension.

#### 1.1.2 Design

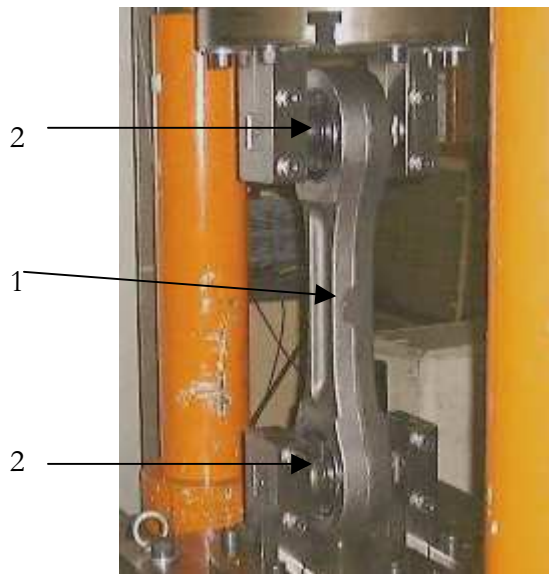


Figure 1 : View of the Unit

- 1 rod
- 2 bush

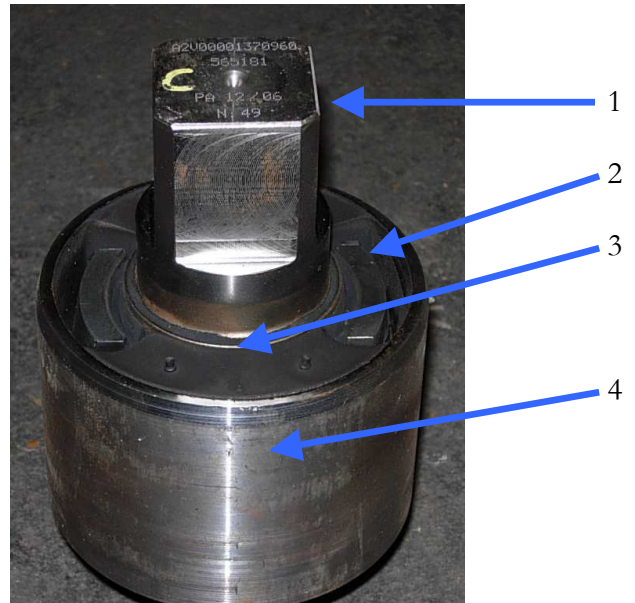


Figure 2 : View of the Bush (not painted)

- 1 axle
- 2 stop
- 3 rubber
- 4 outside tube

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	8
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA



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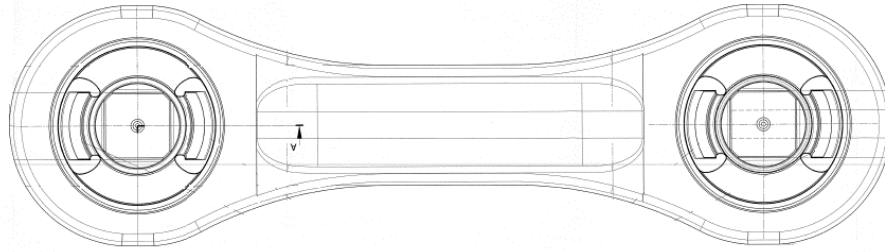


Figure 3 : Drawing of the Unit (front view)

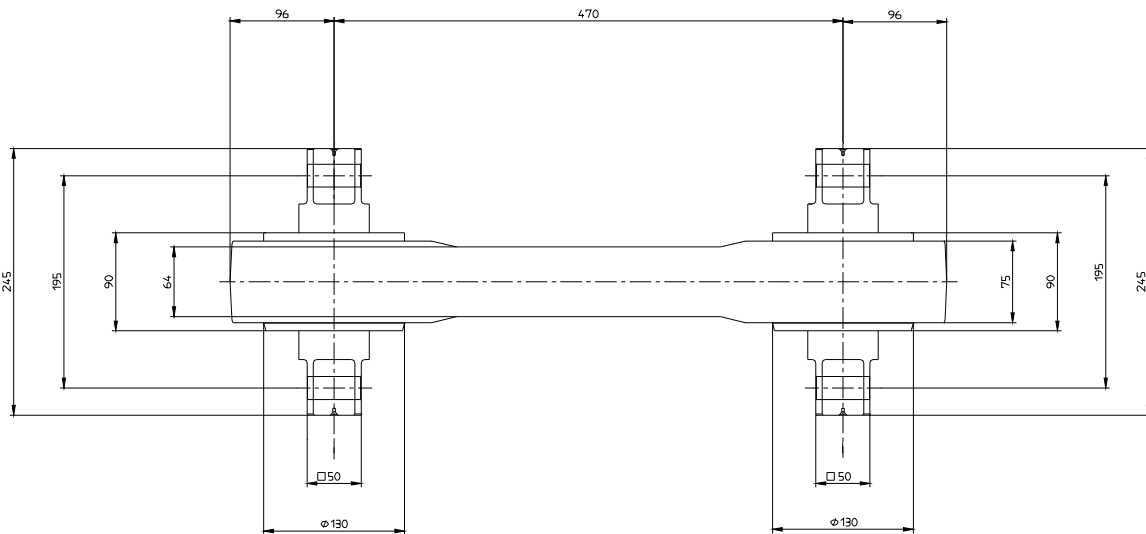


Figure 4 : Drawing of the Unit (top view)

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

Référence du document / Dokumentennummer : MP.F192.D03  
Reference of the part : 905369 (Paulstra)  
A2V00001373379 (Siemens TS BG)

Indice	Date/Datum	Page/Seite
Index		
A	01/08/2007	9
		PA TEC 017/00

# PAULSTRA



ANTIVIBRATOIRE INDUSTRIE  
Activité Ferroviaire

SCHWINGUNGSTECHNIK  
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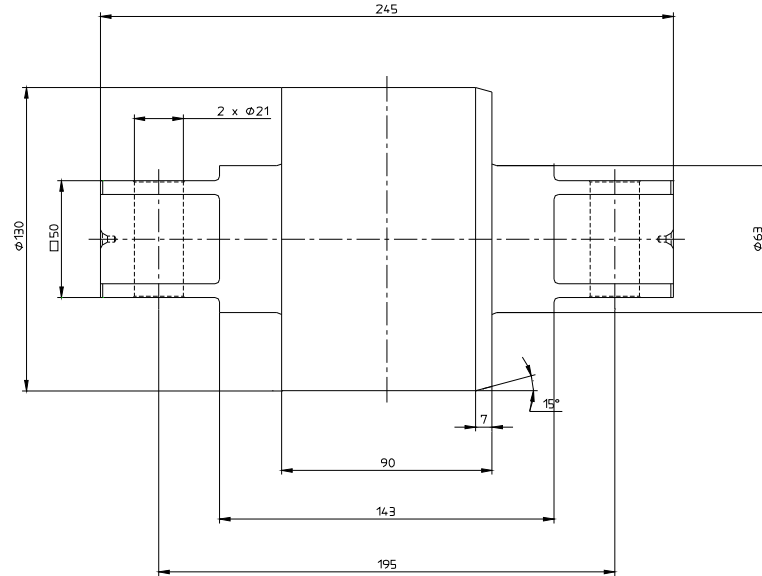


Figure 5 : Drawing of the bush

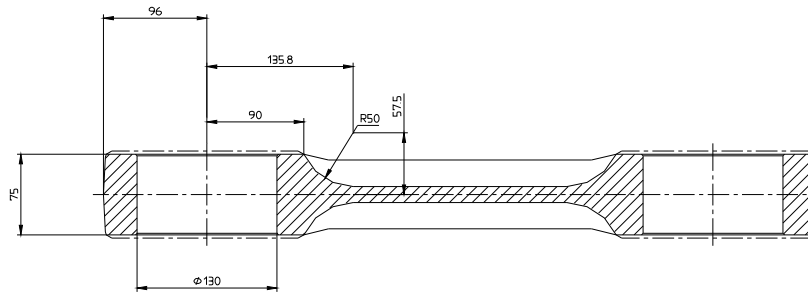


Figure 6 : Drawing of the raw Rod (top view)

## 1.2 Operation condition / Technical data

Dimensions (new part) see sketch above  
No alteration of dimensions in service

Material : steel, natural rubber

Weight : ~50 kg

Surface protection : when complete, the equipped rod is totally painted. If the bushes are removed from the rod, the inner diameters of the rod and the outside diameter have to be protected with Rustilo Aqua 750 oil.

Fire protection : part made of metal and natural rubber (weight of natural rubber : 1.1 kg per rod)

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	10
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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Temperature: maximal temperature < 80° C. To avoid ageing effects, which tend to increase the stiffnesses of the part, the service temperature shall be approximately outside temperature

### 1.3 Technical description

The traction rod is made of two voided bushes press fitted in a rod. One end of the rod is fitted in the bogie structure ; the other end is fitted in the bogie. The bushes are made of three different vulcanised elements : a voided bush, whose voids are orientated in longitudinal direction, to ensure specific properties of the parts in longitudinal direction and of two stops limiting the longitudinal displacement. These stops are moulded with the axle of the bush.

## 2. TRANSPORT / STORAGE

### 2.1 Transport

All units shall be protected from mechanical damage, humidity as well as from all other chemical and thermal influences. Parts are delivered stored in a protection net.

### 2.2 Storage

The unit shall be stored under normal 'dust-free' conditions, as well as in a cool and dry place. Furthermore they shall be protected from mechanical damage, humidity as well as from all other chemical and thermal influences.

All metal blank surfaces shall be treated with CASTROL RUSTILO AQUA 750 EMULSION [H01].

CAUTION	RUBBER SURFACES NOT TO BE COVERED WITH THIS OIL ! RUBBER UNITS SHALL BE PROTECTED FROM DIRECT SOLAR RADIATION, WHICH MAY CAUSE AN ACCELERATED AGEING PROCESS AND THUS MODIFY THE CHARACTERISTICS OF THE PART (INCREASING STIFFNESS) RUBBER UNITS SHALL BE PROTECTED FROM OZONE WHICH TENDS TO CRACK THE PARTS !
---------	---

Rubber units must be stored such that they are not suffering any deformation. (no permanent load).

### 2.3 Recommissioning after Storage

Visual inspection of the unit for damage like cracks and deformations.

All metal blank surfaces previously treated with corrosion protecting oil [H01] shall be cleaned.

In particular, examine all rubber parts for cracks and swelling.

Never use defective parts !

The storage time shall be recorded. Due to the ageing process, the stiffness of the parts tends to increase by about 2% each year. If the storage time is over 5 years, the stiffness of the parts may eventually be remeasured, to avoid installing parts which may be too stiff for the application. The

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	11
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

# PAULSTRA



ANTIVIBRATOIRE INDUSTRIE  
Activité Ferroviaire

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utilization of parts which may be out of the technical specification after ageing process is the responsibility of maintenance operator.

### 3. INSTALLATION AND CHECK BEFORE COMMISSIONING

#### 3.1 Installation of the unit

Please strictly refer to ☞ Section 8.6

#### 3.2 Check before Commissioning

Before putting the component into service for the first time a visual inspection according to the 6 months / 100,000 km interval determined in section 7 has to be performed.

### 4. COMMISSIONING

Please strictly refer to ☞ Section 8.6

### 5. CONTROL AND MONITORING

#### 5.1 Control

Not applicable

#### 5.2 Monitoring

Not applicable

### 6. TAKING OUT OF SERVICE

Please strictly refer to ☞ Section 7.1.2

### 7. PREVENTIVE MAINTENANCE

#### 7.1 Maintenance schedule

The maintenance intervals refer to an annual running of approx. 200,000 km. On the occurrence of the first interval relevant event (time period or mileage expired) the corresponding maintenance tasks must be carried out immediately. According to the service providers maintenance rules, tolerances in these intervals are possible.

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	12
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
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# PAULSTRA



ANTIVIBRATOIRE INDUSTRIE  
Activité Ferroviaire

SCHWINGUNGSTECHNIK  
Bereich Schienenfahrzeuge

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Interval (km / time)	Maintenance procedure	Section
- / 3 months	First visual Inspection after starting operation	
100,000 km / 6 months	Visual Inspection	
1,200,000 km / 6 years	Overhaul, exchange	

Table 1 : Maintenance intervals

### 7.1.1 Safety notes

Please strictly refer to Section 0.1 Safety notes

### 7.1.2 Preparatory work

**WARNING MAKE SURE THE FOLLOWING CONDITIONS ARE MET BEFORE AND DURING MAINTENANCE PROCEDURES !**

Place the EMU over a pit to gain access to the units under the bogie.

Make sure the vehicle cannot move during maintenance work.

Switch off all power supply, secure against reconnection and wait at least 1 minute for discharging of capacitors.

Make sure that no residual pressure remains in the piping of the bogie and the air springs. It is mandatory to release compressed air from the piping of the bogie and from the air spring before working on the bogie!

Follow all special Maintenance and Safety Procedures of the maintenance company.

## 7.2 Maintenance instructions

### 7.2.1 First visual Inspection after three months

For security reasons, it is recommended to do the first visual inspection of the traction rod for damage after three months in operation, as described hereunder for visual inspection every six months.

Defective parts have to be changed !

### 7.2.2 Visual Inspection every 6 months / 100,000 km


1. Visual inspection of the component for damage (cracks, deformations) and for loose and missing parts.

Defective parts have to be changed !

The complete expertise of the part can be done without dismantling the bushes from the rod. It is mostly based on a visual inspection of the part.

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	13
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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<p>SCHWINGUNGSTECHNIK Bereich Schienenfahrzeuge</p>	

In new condition, the spherical bushes are as shown on figure 7, with no defect neither on the elastomer or on the stop.



Figure 7 : new bush

After some time in service, small cracks (2 or 3 mm long) may appear. These ozone cracks are not dangerous by themselves. Nevertheless, they can initiate fatigue cracks, which can damage the part.

After a longer time in service, parts may show cracks in the rubber around the axle or in the rubber between the axle and the metallic stop. The function of the part is not necessarily affected by these cracks. Nevertheless any significant bonding failure between rubber and metal shall lead to an immediate replacement of the part.

#### Expertise of parts

It is difficult to establish a clear relationship between the number and the length of cracks and the remaining life of the part. The best way to know more about these parts is to expertise some parts after a certain time in service. This expertise has to be done with special measuring equipment by the manufacturer or an accepted by Paulstra equivalent service providing institution. More precise criteria for evaluation of cracks will be set up according to experiences from real service conditions.

### 7.2.3 Overhaul every 6 years / 1,200,000 km

Remove bogie from carbody if necessary (see description of system manufacturer).

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	14 PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

# PAULSTRA



ANTIVIBRATOIRE INDUSTRIE  
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In case of renewal :

For installation of the component see section 8.6 Installation.....

For installation of the bogie into the carbody see description of system manufacturer.

After this period the parts should be exchanged completely, as the ageing process of the rubber has changed considerably the characteristics of the parts.

As for general inspection, the overhaul may be postponed on the basis of successful expertise of the parts.

## 7.2.4 Cleaning instructions

Cleaning of the part should be done with water or aqueous solutions based on soap. For other products the compatibility with rubber has to be checked with the specific data sheet of the concerning product.

**CAUTION** PRODUCTS BASED ON MINERAL OIL LIKE SOLVENTS WITH HYDROCARBONS MAY CAUSE DAMAGE OF RUBBER PARTS.

## 7.3 Recommissioning and Functional-Test

Please refer to section 8.7.

## 8. CORRECTIVE MAINTENANCE

Please strictly refer to  Section 0.1 Safety notes

### 8.1 Troubleshooting

Not applicable, for further criteria see section 7.2

### 8.2 Removal of units from the bogie

The rod can be removed from its position by unscrewing all fitting elements.

### 8.3 Dismantling

The voided bushes can be pressed out from the rod by applying a load on the outside tube of the bush. The load has to be applied on the chamfer side.

The drawing of the tooling (reference 905274/100) is transmitted for information only as a paper version. It may require some adaptation to fit to the customer's needs and existing toolings.

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	15
			PA TEC 017/00



# PAULSTRA



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## 8.4 Repair

Repair of the parts is not possible. Defective parts must be replaced.

The rods can be reused when the elastic bushes have to be changed. Nevertheless, the rods must be controlled when the bushes are pressed out. The inner diameter (130 mm H7) has to be measured two times : once along the axis of the rod and once perpendicular to the axis. If the result of measurement is not correct, a new rod has to be taken.

This measurement is important for two reasons :

- to ensure that the press fitting can be realized as defined
- to check that there's no permanent deformation (ovalization) of the rod

## 8.5 Assembly

The bushes have to be press fitted on the rod. It has to be noted that the bushes are slightly oval, due to the effect of the voids. After being pressed into the rod, they will be circular.

The drawing of the tooling (reference 905239/100) is transmitted for information only, as a paper version. It may require some adaptation to fit to the customer's needs and existing toolings.

### 8.5.1 Press fitting of the bushes in the rod

- Put the rod reference 358800 on the lower part of the tooling (gliding plate). Due to the weight of the rod, this operation may be done with a specific tooling.
- Oil the outside diameter of the parts with the oil (or any other oil to be used for press fitting)

<b>CAUTION</b>	<b>CONTACT WITH OIL IS DAMAGING FOR RUBBER. NO PERMANENT CONTACT WITH OIL ALLOWED.</b>
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- Put the bushes reference 565181 (chamfers on the lower side) with the help of the fixation pins in the tooling
- Press fit the bushes in the rod. If some metal is pulled out, stop the press fitting 10 mm before the end, press out the bushes from the rod and grind the exceeding metal and

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	16
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA



press fit them once again (step b). The bushes have to be press fitted so that they are centered in the rod (the external diameter of the bush exceeds from 7.5 mm on each side of the rod).

**WARNING GRINDING OPERATIONS HAVE TO BE DONE WITH ADAPTED PROTECTIONS (GLOVES AND GLASSES).**

- e) Remove from the bushes the fixation pins before lowering the press. Remove all oil and metal elements that could damage the rod

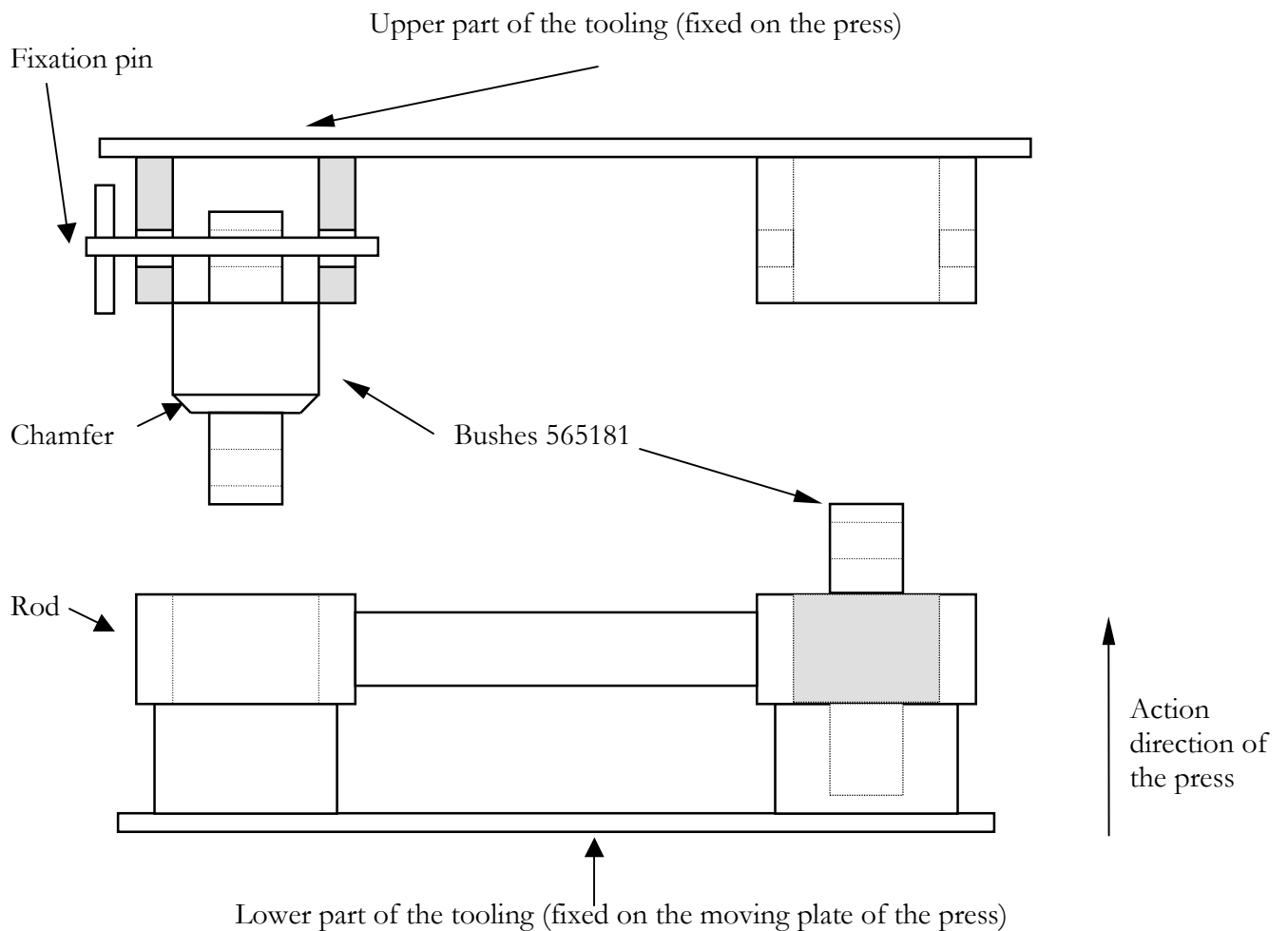



Figure 8 : sketch for press fit of the bushes in the rod

Référence du document / Dokumentennummer : MP.F192.D03  
Reference of the part : 905369 (Paulstra)  
A2V00001373379 (Siemens TS BG)

Indice	Date/Datum	Page/Seite
Index		
A	01/08/2007	17
		PA TEC 017/00

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The bushes have to be press fitted in the rod so that the marking can be seen as following :

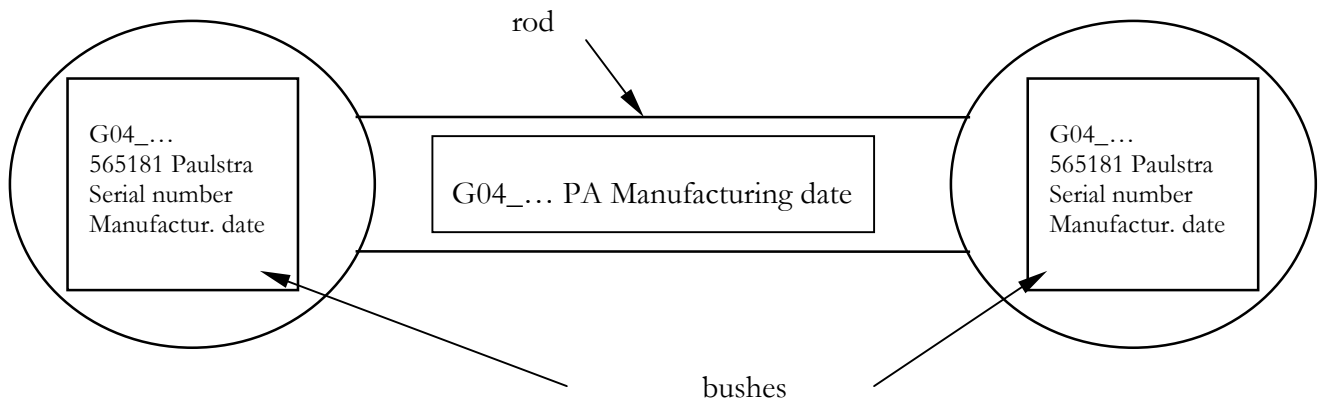


Figure 9 : position of the bushes in the rod

### 8.5.2 Additional painting of the bushes

The external tube of the bush has to be painted after press fitting operation. Furthermore, the press fitting operation can damage the paint of the rod. Therefore, the rod may have to be repainted locally.

- a) Degrease the areas which have to be painted
- b) Preparation of primary coating : 80% of primer (salmon colour, reference 405027/00) and 20% of hardening agent (reference 405030/00). A diluting agent can be used for preparation : Thinner 400 reference 405031.
- c) Primary coating application : thickness of the coat about 100 µm. Drying time : minimum 8 hours. Avoid coating the rubber area (eventually by protecting the rubber surface)
- d) Preparation of final coating : 80% of paint type RAL9011 (black graphite, reference 405029/00) and 20% of hardening agent (reference 405030/00). A diluting agent can be used for preparation : Thinner 400 reference 405031.

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	18
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA

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- e) Final coating application : thickness of the coat about 120 µm. Drying time : Minimum 24 hours. Avoid coating the rubber area (eventually by covering the rubber surface).

## 8.6 Installation of the rod in the bogie

The rods have to be screwed on the bogie. Screwing torques : see the documentation of the train supplier.

## 8.7 Commissioning and functional test

Not applicable

## 9. SPECIAL TOOLS AND MATERIALS, MEASURING AND TEST EQUIPMENTS

Special tools			
Ref. no.	Description of materials	Order no.	Manufacturer
	Dismantling tool		
	Press fitting tool		

Table 2 : Special tools

Materials			
Ref. no.	Description of materials	Order no.	Manufacturer
[H01]	Rustilo Aqua 750		CASTROL
	Primer		
	Hardening agent		
	Diluting agent Thinner 400		
	Final coating RAL 9011		

Table 3 : Materials

Référence du document / Dokumentennummer : MP.F192.D03	Indice	Date/Datum	Page/Seite
Reference of the part : 905369 (Paulstra)	Index		
A2V00001373379 (Siemens TS BG)	A	01/08/2007	19
			PA TEC 017/00

Status: freigegeben STELZ\_ALE 27.08.2007  
DCC: MDC062 OKZ Prod: TS\_REA