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## APTU Uniform Rules (Appendix F to COTIF 1999)

### Uniform Technical Prescriptions (UTP) relating to the Subsystem Rolling Stock

### FREIGHT WAGONS - ANNEX LL

### HOT AXLE BOX DETECTOR

#### Explanatory note:

*The texts of this UTP which appear without columns are identical with corresponding texts of the European Union regulations. Texts which appear in two columns differ; left-hand column contains the UTP regulations, right-hand column shows the text in the corresponding EU regulations. The text in the right hand column is for information only and not part of the OTIF regulations.*

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| Corresponding text in EU regulations <sup>1</sup>

EU ref. <sup>2</sup>

These specifications are equal to those included in Technical Document (TD1) from the European Railway Agency (ERA) as published on the ERA website on 03.07.2009.

#### 1. **Terms and Definitions** 4.1

For the purposes of this section of the document, the following terms and definitions apply:

**axle bearing:** a bearing or bearing assembly on a rail vehicle axle that transmits a proportion of the weight of the rail vehicle directly to the wheelset.

**axle box:** the structure, including for example cartridge bearing adaptor, which houses, or is in contact with, the axle journal bearing and provides an interface with the bogie and/or suspension arrangement

**Hot axle box detector (HABD):**

**target zone:** a defined area on the underside of an axle box that is designed to have its temperature monitored by a HABD.


**target area:** the plan view dimensions, that is in the XY plane, of the target zone.

**prohibitive zone:** a zone in which heat sources such as exhausts, which might influence the behaviour of a HABD, are excluded or thermally shielded.

**rolling stock coordinates:** rolling stock coordinates, figure 1, are based on the right hand rule Cartesian coordinate system, where the positive X-axis (longitudinal) is along the vehicle in the direction of travel, the Z-axis is vertically upwards and the origin is at the centre of the wheelset axle. The Y-axis is the lateral axis.

<sup>1</sup> TSI Freight Wagons – The Annex to the Commission Decision 2006/861/EC published in the EU Official Journal L344 on 08.12.2006 as amended by Commission Decision 2009/107/EC published in EU Official Journal L45 on 14.02.2009.

<sup>2</sup> If no EU reference is indicated, it means that the chapter/section number is the same as in the OTIF text.

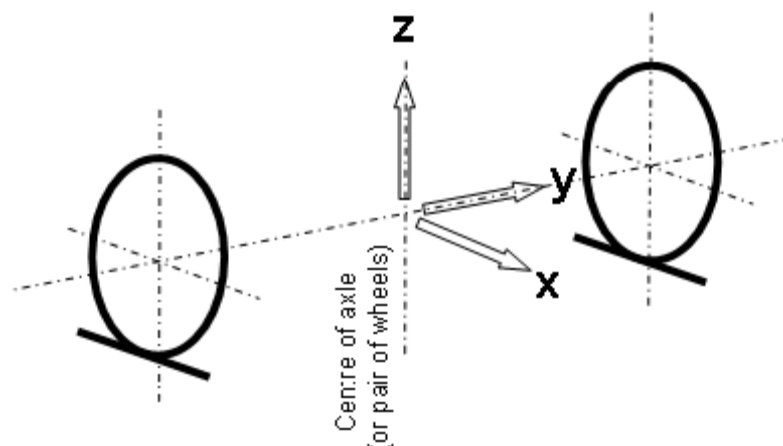
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Figure 1. Rolling Stock Coordinates



**wheelset:** a unit comprising: an axle, two wheels and their axle bearings, or a pair of independent wheels located at the same longitudinal position and their bearings.

**heat source:** a part of the rolling stock that may have a temperature above the in-service running temperature of the underside of the axle box, such as a hot load or an exhaust pipe.

## 2. Symbols and Abbreviations

4.2

For the purposes of this section of the document, the following symbols and abbreviated terms apply:

HABD Hot Axle box Detector

IM Infrastructure Manager (as defined in the TSIs)

LPZ Longitudinal length in mm of the prohibitive zone

LTA Longitudinal length in mm of the target area

PZ Prohibited zone

RST Rolling stock (as defined in TSI)

RU Railway Undertaking (as defined in TSI)

TA Target area

UTP Uniform Technical Prescription

TSI Technical Specification for Interoperability

WPZ Lateral width in mm of the prohibitive zone

WTA Lateral width in mm of the target area

YPZ Lateral position in mm of the centre of the prohibitive zone relative to the centre line of the vehicle

XTA Longitudinal position of the centre of the target area relative to the centre line of the vehicle

YTA Lateral position of the centre of the target area relative to the centre line of the Vehicle

## 3. Rolling Stock Requirements


4.3

This chapter contains the requirements for the rolling stock side of the HABD interface.

### 3.1 Target Zone

4.3.1

The target zone is an area on the underside surface of an axle box described by the intersection of the axle box with a virtual cuboid that has a horizontal cross sectional area given by the dimensions XTA and YTA using the rolling stock coordinates. The horizontal cross sectional area of the virtual cuboid is therefore congruent to the plan view area (that is in the XY plane) of the target zone, herein named the target area.

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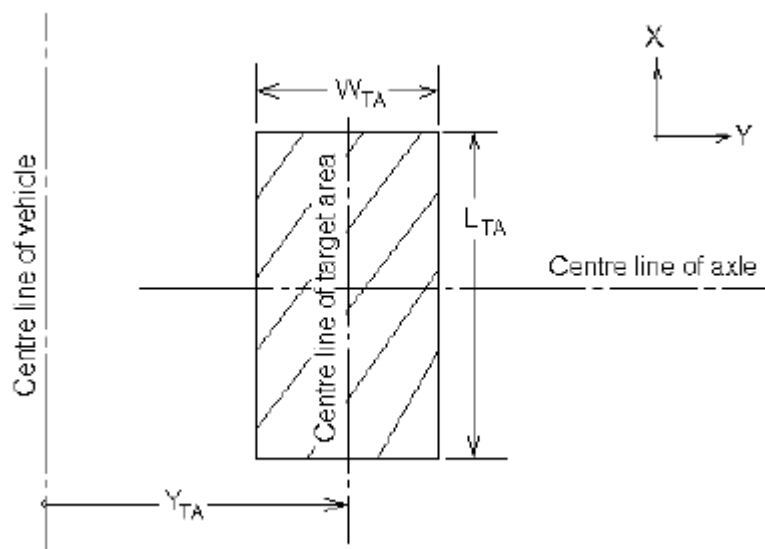
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### 3.2 Target area

4.3.2

The target area is set in space relative to the axle dimensions, and defines an area in which a HABD can focus to monitor the temperature of an axle box. Figure 2 shows the position and minimum dimensions of the target area using rolling stock coordinates.

Figure 2 **Dimensions and position of the target area (TA) in the XY plane (viewed from below)**



### 3.3 Dimensions of the Target Area

4.3.3

Taking into account mechanical tolerances the target area shall:

- have a lateral width,  $W_{TA}$ , greater than or equal to 50 mm
- have a longitudinal length,  $L_{TA}$ , greater than or equal to 100 mm

### 3.4 Position of the Target Area in the XY plane

4.3.4

In the XY plane the centre of the target area shall be positioned at a lateral distance,  $Y_{TA}$ , relative to the centre of the axle (or centre of a pair of wheels at the same position), where 1065 mm is less than or equal to  $Y_{TA}$  and  $Y_{TA}$  is less than or equal to 1095 mm. In the longitudinal axes the centre of the target area shall be congruent with the centre line of the axle.

### 3.5 Visibility requirements for the Target Area

4.3.5

Rolling stock shall be designed with no obstruction between the target zone and the HABD that would impede or prevent the HABD from focusing within the target zone and thereby prevent a measurement of its thermal radiation.


Note 1: The design of the rolling stock axle box should aim to achieve a homogeneous temperature distribution within the target zone.

## 4. Other mechanical design requirements

4.4

To minimize the opportunity for a HABD to calculate a temperature from a heat source that is not an axle box, rolling stock shall be designed so that other heat sources, for example hot payload or exhaust, are not immediately adjacent to or directly above the target area position. To facilitate this no other heat source shall be located within the prohibitive zone defined in this document.

Note 1: If, due to the design of the rolling stock, it is possible /unavoidable for a heat source other than that of an axle box to be contained within the prohibitive zone, that

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heat source shall be thermally shielded to prevent erroneous temperature calculations by a HABD measuring its thermal radiation.

Note 2: The prohibitive zone shall be maintained for all rolling stock, including for example rolling stock with inboard bearings.

#### 4.1 Prohibitive Zone

4.4.1

The prohibited zone is defined by a rectangular area, which includes the target area, and is extended vertically to form a virtual cuboid. The dimensions of the cuboid are XPA and YPA in the XY plane and ZPA in the vertical axes. Figure 3 shows a possible position of the target area in the prohibitive zone using rolling stock coordinates.

The dimensions of the prohibitive zone's cuboid, taking into account mechanical tolerances, shall be;

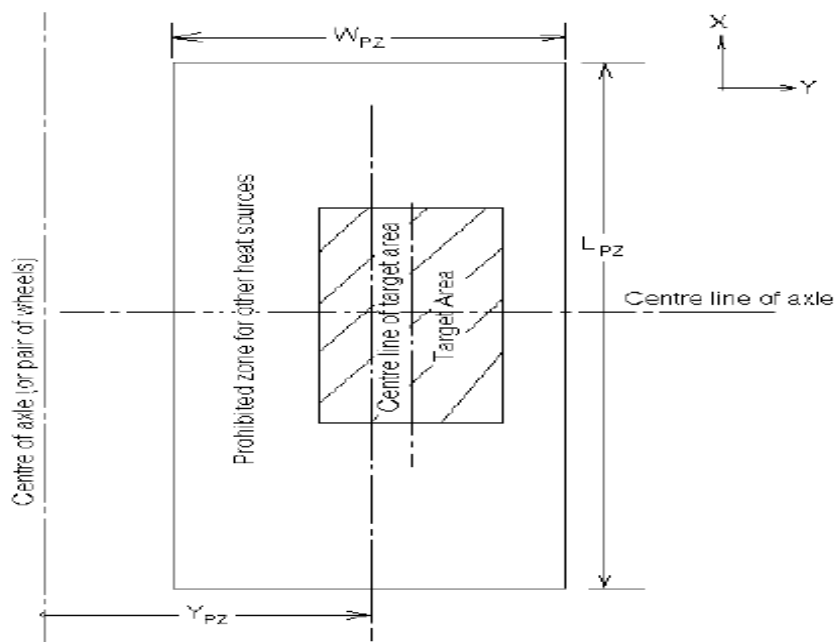
- lateral width, WPZ, greater than or equal to 100 mm
- longitudinal length, LPZ, greater than or equal to 500 mm
- vertical height, HPZ, starts at a point in the XY plane immediately above the HABD and ends at either the height of the target area, the height of a thermal shield or the height of the vehicle.

The position of the centre of the prohibitive zone in the X-Y plane shall be;

- in the lateral direction, YPZ = 1080 mm  $\pm$  5 mm measured relative to the centre of the axle (or centre of a pair of wheels at the same position)
- in the longitudinal direction it shall be congruent with the centre line of the axle  $\pm$  5 mm.

Figure 3


**Dimensions of the prohibitive zone (PZ) in the XY plane (viewed from below) showing a possible position of a target area**



#### 5. Cross reference table

4.5

For the purposes of traceability a cross-reference table relating this document with the original prEN 15437-1 [3] is included.

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Annex LL section reference	prEN15437-1 section reference
1.	3.0
2.	4.0
3.	5.
3.1	5.1
3.2	5.1.1
3.3	5.1.2
3.4	5.1.3
3.5	5.1.4
4.	5.2
4.1	5.2.1