



# Modernization Program

## Peninsula Corridor Electrification Project (PCEP)

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July 5, 2018

JPB-PCEPPM-LTR-000100

Thomas Herrmann  
Federal Railroad Administration  
1200 New Jersey Avenue, SE  
Washington, DC 20590  
[thomas.herrmann@dot.gov](mailto:thomas.herrmann@dot.gov)

**RECEIVED**

**AUG 06 2018**

Subject: Caltrain EMU Base Waiver

Dear Mr. Herrmann,

Please accept this letter and attached document as Caltrain's official submission of the Base Waiver Request for the Electric Multiple Unit (EMU) railcars. The attached report contains the waiver request for the EMUs specific to the Passenger Area Emergency Brake Valve (49 CFR 229.47(b) and 238.305(c)(5)), the Clearance above Top of Rail (49 CFR 229.71) and the Safety Appliances (49 CFR 231.14(b)-(d), (f), (g), 238.229 and 238.230(d)). Caltrain staff members are available at FRA's convenience for further discussion of this request, if required.

Sincerely,

Michelle Bouchard  
Chief Operating Officer, Rail  
San Mateo County Transit District

Attachment: Caltrain KISS EMU Base Waiver Request Report

CC: Document Control

John Manutes, FRA Passenger Rail Division  
John Funghi, Chief Officer, Caltrain Modernization Program  
Joe Navarro, Director, Rail Operations  
Rick Landell, Caltrain, EMU Procurement Project Manager  
Greg Cameron, Caltrain, EMU Procurement FRA Compliance



## **Caltrain KISS EMU Base Waiver Request Report**



**Prepared by:** LTK Engineering Services  
**Revision:** Initial Release  
**Date:** July 2, 2018

## **EXECUTIVE SUMMARY**

Caltrain is pleased to submit this waiver request report for review by the FRA. This report describes aspects of the Stadler KISS Electric Multiple Unit (EMU) train that may not meet the specific requirements of 49 CFR Parts 200 through 299, and where necessary petitions the Administrator for issuance of acceptance based on alternate or equivalent compliance. This assessment does not include Alternative Vehicle Technology (AVT) related elements as those are addressed in docket FRA-2009-0124.

The elements covered by this report are:

- Passenger area emergency brake valve
- Track brake clearance
- Safety appliances

## TABLE OF CONTENTS

1	Introduction .....	1
2	Purpose .....	1
3	Caltrain KISS EMU Relevant Details .....	2
4	FRA Base Waiver Requests .....	2
4.1	Emergency Brake Valve (229.47 (b) and 238.305 (c)(5)).....	2
4.2	Clearance above Top of Rail (229.71).....	3
4.3	Safety Appliances (231.14 (b) – (d), (f), (g), 238.229, 238.230 (d)).....	4
5	Conclusion.....	6
	Appendix A. Caltrain KISS EMU Datasheet.....	A
	Appendix B. Caltrain KISS EMU General Arrangement Drawings.....	B
	Appendix C. Passenger Emergency Brake Handle .....	C
	Appendix D. Magnetic Track Brake .....	D
	Appendix E. Automatic Coupler Drawing.....	E
	Appendix F. Side Door Step and Vertical Handhold Renderings and Dimensions .....	F



## 1 Introduction

Caltrain operates commuter rail passenger service throughout the Peninsula corridor from San Francisco to Gilroy under the auspices of the Peninsula Corridor Joint Powers Board (JPB). The northern terminal is at 4th and King Streets in San Francisco where there are local connections to Muni bus and streetcar services.

Caltrain currently utilizes platforms at 8 inches above top-of-rail (ATOR) and uses mini-high platforms at 22 inches ATOR to board ADA passengers.

Caltrain operates 92 trains per day, with 5 trains per direction in peak hours. Caltrain has seen a steady growth in ridership over the past decade. In FY2015, Caltrain carried a record 18.5 million passengers and in 2016, average weekday ridership reached over 62,400 passengers. Current service is offered via 5-car diesel-hauled train sets. To meet growing demand, Caltrain recently increased the length of roughly half the fleet to 6-car train sets. Ultimately, more trains per peak hour must be operated, which requires major changes to infrastructure and rolling stock.

Caltrain Electrification of the alignment between San Francisco and Tamien will enable the introduction of multi-level EMU vehicles to meet Caltrain's continually expanding service. Significant operational benefits to be realized from the EMU vehicles include higher acceleration and braking capabilities resulting in shorter travel times, higher reliability, a more environmentally-sensitive operation, and simplified operating and maintenance procedures. The Caltrain corridor is also the link to San Francisco within in the California High-Speed Rail (CHSRA) statewide network.

The EMU procurement began with a Request for Proposal in August of 2015. The contract was awarded to Stadler Rail Group of Switzerland in August of 2016. The contract requires delivery of 16, six-car trainsets with delivery of the first train scheduled for fall of 2019. The project is currently in the final design phase and car shell construction has begun.

Each six-car trainset is identical and consists of 2 cab cars and 4 coach cars (a datasheet is provided in Appendix A and general arrangement drawings are provided in Appendix B). Each is a multi-level car built upon the Stadler "KISS" platform and contains three types of levels: a lower level, two intermediate levels and an upper level. The lower and upper levels are considered "main levels". In addition, each car contains both intermediate level doors and lower level doors. Initially, Caltrain will utilize only the lower level doors to serve their existing 8-inch platforms. Once CHSRA service begins in the corridor, there will be a station or two that will have high level platforms and will be served by the Caltrain EMUs via the intermediate level doors. Other Caltrain stations will remain low level and will be served by the lower level doors. Both intermediate and low level doors will be utilized by Caltrain EMUs once CHSRA service begins.

## 2 Purpose

The purpose of this document is to describe aspects of the Caltrain KISS EMU design that may not meet the specific requirements of relevant portions of 49 CFR Parts 200 through 299, and

where necessary, petition to the Administrator for issuance of clarification or acceptance based on alternate or equivalent compliance as required.

Each item includes a discussion of the CFR requirement, a description of the Caltrain KISS EMU configuration, and a detailed discussion of the acceptance justification. If a CFR Part or subpart is not listed, Caltrain believes that the EMU complies with the applicable requirements of that Part or subpart.

It should be noted that the Caltrain KISS EMU utilizes an Alternative Vehicle Technology (AVT) crashworthiness design and that Caltrain has been granted an AVT waiver by the FRA (reference docket FRA-2009-0124), therefore that subject, which is covered by 49 CFR Part 238, is not covered by this document.

### **3 Caltrain KISS EMU Relevant Details**

As mentioned, each six-car trainset is identical and consists of 2 cab cars and 4 coach cars. Each cab car has an automatic coupler at its front end. All cars in the six-car trainset are connected using semi-permanent couplers and each trainset is intended to be operated as a single unit (i.e. the cars will not routinely be separated). There are 12 motor trucks and 12 trailer trucks per train. Each trailer truck is equipped with a magnetic track brake. For ambulatory passengers and crew members, the lower level doors are accessed from the existing 8-inch platforms using a retractable step that is external to the car.

## **4 FRA Base Waiver Requests**

### **4.1 Emergency Brake Valve (229.47 (b) and 238.305 (c)(5))**

#### **4.1.1 Regulation**

##### **49 CFR 229.47 (b) Emergency Brake Valve**

*DMU, MU, and control cab locomotives operated in road service shall be equipped with an emergency brake valve that is accessible to another crew member in the passenger compartment or vestibule. The words "Emergency Brake Valve" shall be legibly stenciled or marked near each valve or shall be shown on an adjacent badge plate.*

##### **49 CFR 238.305 (c)(5) Interior Calendar Day Inspection of Passenger Cars**

*(c) As part of the interior calendar day mechanical inspection, the railroad shall verify conformity with the following conditions, and nonconformity with any such condition renders the car defective whenever discovered in service, except as provided in paragraphs (c)(8) through (c)(12) and paragraph (d) of this section.*

*(5) The words "Emergency Brake Valve" are legibly stenciled or marked near each brake pipe valve or shown on an adjacent badge plate.*

#### **4.1.2 Caltrain KISS EMU Configuration**

The Caltrain KISS EMU utilizes pull handles to provide a means for crew members and passengers to initiate an emergency brake condition. When a pull handle is activated (or "pulled"), propulsion

is cut and an irretrievable emergency brake is initiated. The handle can only be reset using a crew key.

There is one emergency brake pull handle per doorway area, 4 total per car, and each is appropriately stenciled with the nomenclature "Emergency Brake". See Appendix C.

#### **4.1.3 Justification**

Though the Caltrain KISS emergency brake pull handles are not technically "valves" as specified in the regulatory language, they perform the same function as a valve. The vehicle is equipped with a modern electro-pneumatic brake system that does not rely on a conventional trainlined brake pipe to initiate an emergency brake command to the train. Therefore, an 'Emergency Brake Valve' is not applicable to this design. Instead, emergency brake commands are transmitted using electronic signals using fail-safe design principles. The emergency brake handles perform an equivalent function as the required Emergency Brake Valve.

#### **4.1.4 Request**

Caltrain petitions the FRA to agree that the use of the passenger emergency brake handle (4 per car) and associated decals meet the requirements of 49 CFR 229.47 (b) and 49 CFR 305 (c)(5).

### **4.2 Clearance above Top of Rail (229.71)**

#### **4.2.1 Regulation**

##### **49 CFR 229.71**

*No part or appliance of a locomotive except the wheels, flexible nonmetallic sand pipe extension tips, and trip cock arms may be less than 2-½ inches above the top of rail.*

#### **4.2.2 Caltrain KISS EMU Configuration**

Magnetic Track Brakes are mounted on each non-powered (i.e. trailer) truck of the Caltrain KISS EMU. Track brakes are commonly used on light rail and high speed rail vehicles to provide supplemental deceleration force independent of wheel rail adhesion limitations. The track brake is deployed when activated by pneumatic operating cylinders and energized using low voltage current from the vehicle battery. When energized, the track brake becomes an electromagnet that is pulled down to contact the rail. The combination of the magnetic attraction and the coefficient of friction between the track brake and the rail results in a deceleration force that is transferred from the rail to the track brake and into the truck side frame. The magnetic track brake has two positions, stowed and deployed. In its normal stowed position, the track brake is positioned 3.9 inches above-top-of-rail (ATOR). Under maximum permissible wear conditions, the track brake assembly will remain 2-½ above-top-of-rail. In the deployed position, the track brake is in contact with the top of rail thus violating the FRA-required clearance.

The magnetic track brake is further described and depicted in Appendix D.

#### **4.2.3 Justification**

The track brake system is designed to supplement the Caltrain KISS EMU dynamic and friction brake systems. Proper operation of the track brake requires the brake to come into contact with the railhead when activated.

#### **4.2.4 Request**

Caltrain petitions the FRA to accept the use of magnetic track brakes which do not meet the minimum clearances specified 49 CFR 229.71. The use of the magnetic track brake enhances the braking capabilities of the vehicle and only violates the FRA required clearance in the area where the track brake comes into contact with the rail.

### **4.3 Safety Appliances (231.14 (b) – (d), (f), (g), 238.229, 238.230 (d))**

#### **4.3.1 Regulation**

##### **49 CFR 231.14**

- (b) Sill steps*
- (c) Side handholds*
- (d) End handholds*
- (f) Side-door steps*
- (g) Uncoupling levers.*

##### **49 CFR 238.229**

*(a) Except as provided in this part, all passenger equipment continues to be subject to the safety appliance requirements contained in Federal statute at 49 U.S.C. chapter 203 and in Federal regulations at part 231 of this chapter.*

##### **49 CFR 238.230 (d)**

*(d) Passenger cars of special construction. A railroad or a railroad's recognized representative may submit a request for special approval of alternative compliance pursuant to §238.21 relating to the safety appliance arrangements on any passenger car considered a car of special construction under §231.18 of this chapter. Any such petition shall be in the form of an industry-wide standard and at a minimum shall:*

- (1) Identify the type(s) of car to which the standard would be applicable;*
- (2) As nearly as possible, based upon the design of the equipment, ensure that the standard provides for the same complement of handholds, sill steps, ladders, hand or parking brakes, running boards, and other safety appliances as are required for a piece of equipment of the nearest approximate type already identified in part 231 of this chapter;*
- (3) Comply with all statutory requirements relating to safety appliances contained at 49 U.S.C. 20301 and 20302;*
- (4) Specifically address the number, dimension, location, and manner of application of each safety appliance contained in the standard;*
- (5) Provide specific analysis regarding why and how the standard was developed and specifically discuss the need or benefit of the safety appliance arrangement contained in the standard;*



- (6) Include drawings, sketches, or other visual aids that provide detailed information relating to the design, location, placement, and attachment of the safety appliances; and*
- (7) Demonstrate the ergonomic suitability of the proposed arrangements in normal use.*

#### **4.3.2 Caltrain KISS EMU Configuration**

The Caltrain KISS EMU does not have sill steps, side handholds, end handholds, or uncoupling levers. The Caltrain KISS EMU safety appliance arrangement is identical in concept to other Stadler equipment operating safely in the US under approved FRA waivers.

The Caltrain KISS EMU does have side-door steps at the lower level side doors, but not in the conventional sense as described in 49 CFR 231.14. These are described below.

#### **4.3.3 Justification**

##### **Sill Steps/Side Handholds**

Sill steps and side handholds are intended to allow railroad employees to ride the outside of the vehicle during switching moves to manually couple/uncouple cars and make up manual hose connections. Not only will Caltrain operating rules prohibit personnel to mount the exterior of the Stadler KISS EMU, but Caltrain will not use the EMU to make any equipment moves within yards, storage tracks or other areas where personnel would be required to utilize any exterior steps. The Stadler KISS EMU is equipped with an automatic coupler which allows coupling, uncoupling, and pneumatic and electrical connection make-up between trains to be accomplished without requiring employees to leave the car interior. A drawing of the automatic coupler is provided in Appendix E.

##### **End Handholds/Uncoupling Levers**

End handholds and uncoupling levers are intended to provide a secure hand grip for a railroad worker while performing manual coupling or uncoupling of conventional rail vehicles where it is necessary for the mechanical end connections to be connected or disconnected manually from the ground by a railway employee. As described above, the Caltrain EMUs are equipped with fully automatic couplers. This fully automatic design allows all mechanical, pneumatic and electrical end connections to be accomplished without manual intervention and without requiring personnel to leave the vehicle.

##### **Side Door Steps/Side Door Handholds**

The Caltrain EMU vehicle is configured with both high level and low level side entry doors. When the EMU is first placed in service, only the low level doors will be utilized and are accessed from Caltrain's existing 8-inch high platforms. The high level doors will be used at a later date once high level platforms are installed and level boarding is implemented. Each low level side door is equipped with a retractable step to allow passengers to transition from the 8-inch platform to the 22-inch lower level floor height. The step is located at approximately 16 inches ATOR. In addition, extended vertical handholds are located inside the doorways to facilitate the boarding/alighting process. Drawings and renderings of the side door step and the vertical handholds are included in Appendix F.



#### **4.3.4 Request**

Caltrain petitions the FRA to accept the KISS EMU vehicle without sill steps, side handholds, end handholds, or uncoupling levers and to request the Secretary of Transportation to grant safety appliance exemption for technological improvements under 49 U.S.C § 20306 (a).

## **5 Conclusion**

Caltrain believes that the KISS EMU design offers an equivalent level of safety and requests relief as described above for the following elements:

- Passenger area emergency brake valve
- Track brake clearance
- Safety appliances

## **Appendix A. Caltrain KISS EMU Datasheet**



## KISS DOUBLE-DECKER ELECTRIC MULTIPLE UNIT EMU

for Peninsula Corridor Joint Powers Board (CALTRAIN), California, USA

As one of the key parts of the Peninsula Corridor Electrification Project (PCEP) the Caltrain Board of Directors has awarded the contract for the design and manufacture of high-performance double-decker electric train sets to Stadler US, Inc. The new Stadler KISS double-decker EMU with its high performance and passenger capacity helps to alleviate the rapidly growing ridership by allowing faster and more frequent service. The adaptation of electric EMUs also significantly decreases greenhouse gases and noise emissions. With the fast, comfortable and environmental friendly KISS EMU, Caltrain is connecting San Francisco to the Silicon Valley. As highways have become more and more congested, a modernized Caltrain will be the preferred commute option between San Jose and San Francisco while addressing the mobility needs of the Bay Area in an environmentally and economically sustainable manner. The 6-car trains are extendable to 7-car or 8-car units, – providing the same swift performance with significantly increased transport capacity. Built today for tomorrow, – KISS is well ahead of its time.

[www.stadlerrail.com](http://www.stadlerrail.com)

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## Technical features

### Technology

- Vehicle body made of extruded aluminum sections guarantees durable, corrosion-resistant and lightweight vehicles
- Specific Stadler design air-suspended trucks allow smooth running at exceptionally low vibration and noise levels
- High performance traction system not only permits very swift acceleration but also an almost complete recuperation of braking energy to the catenary

### Comfort

- The generous and bright interior offers dedicated space for wheelchairs in each car, an ADA (American with Disabilities Act) accessible toilet and ADA lifts to cross between the low and intermediate levels of the train
- For the large number of commuters who bring their bikes, two large bicycle areas are provided in each train
- The state of the art Passenger Information System and CCTV ensures the passengers have up-to-date transit information and can feel secure while in the train

### Personnel

- With a strong focus on ergonomics, operability and field of vision the driver cab provides a positive and pleasant work space for the driver

### Reliability / Availability / Maintainability / Safety

- Meets FRA Alternate Compliance requirements for operating in mixed traffic, which results in a very high level of passive safety by using crash energy management technology

## Vehicle data\*

### Customer

### Region

### Track gauge

### Designation

### Supply voltage

### Axle arrangement

### Axle load limit (AW3)

### Number of vehicles/cars

### Commissioning (planned)

### Seating capacity

### Tip-up seats

### Seating capacity total

### Standing spaces 4 pers./m<sup>2</sup> (AW2)

### Number of bike spaces

### Access heights

### Access width

### Length over coupling

### Vehicle width

### Vehicle height

### Max. power at wheel

### Starting tractive effort

### (up to 23 mph)

### Starting acceleration, gross

### Max. Braking performance rating

### Maximum speed

### 6-car\*\* EMU

Peninsula Corridor Joint

Powers Board (Caltrain)

California, USA

1435 mm (4' 8 1/2")

KISS

25 KV 60Hz AC

2'Bo' + Bo'Bo' + 2'2' +

Bo'Bo' + 2'2' + Bo'2

52100 lbs (23.6t)

16 vehicles / 96 cars

2019-2020

tbd

tbd

tbd

tbd

tbd

22" for access from

existing platforms

50 1/2" for future

high level HSR platforms

51 1/4" (1300 mm)

515' 3" (157100 mm)

9' 10" (3000 mm)

15' 10 1/2" (4840 mm)

6000 kW

540 kN

2,24 mphps (1.0 m/s<sup>2</sup>)

8000 kW

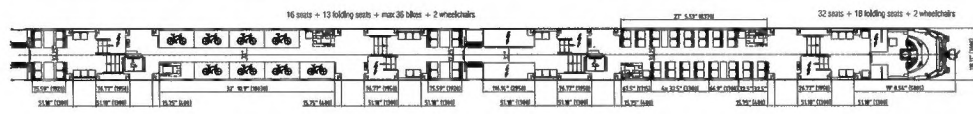
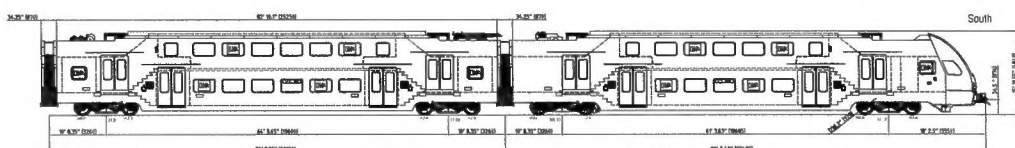
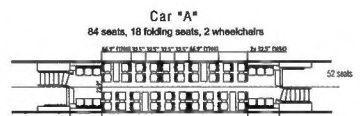
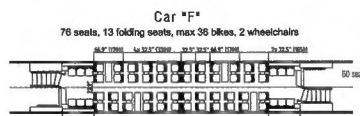
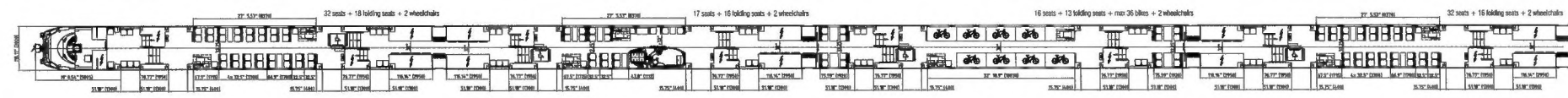
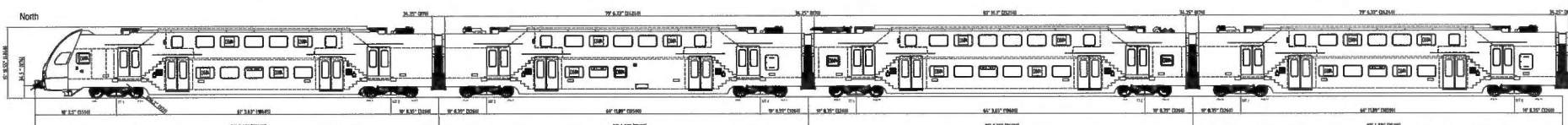
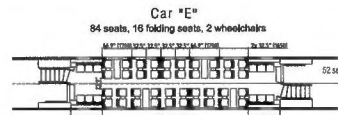
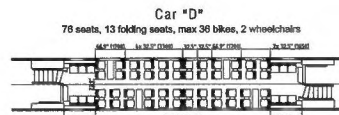
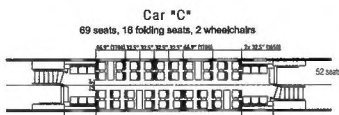
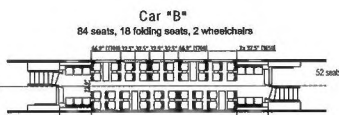
110 mph (177 km/h)

\*Data is subject to change pending Caltrain's design approval

\*\*6-car units extendable to 7 or 8-car trainsets

## **Appendix B. Caltrain KISS EMU General Arrangement Drawings**





	Car B	Car C	Car D	Car E	Car F	Car A	Total	Ratio
Fixed Seats	84	69	76	84	76	84	473	6.57
Folding Seats	16	16	13	16	13	18	94	
<b>Total Seats</b>	<b>102</b>	<b>85</b>	<b>89</b>	<b>100</b>	<b>89</b>	<b>102</b>	<b>567</b>	
Folding Seats - all passenger side doors operational	8	6	3	6	3	8	34	
<b>Total Seats - all passenger side doors operational</b>	<b>92</b>	<b>75</b>	<b>79</b>	<b>90</b>	<b>79</b>	<b>92</b>	<b>507</b>	
Countable Folding Seats - for the core number	16	13	12	14	12	16	83	
<b>Total countable Seats (core number)</b>	<b>100</b>	<b>82</b>	<b>88</b>	<b>98</b>	<b>88</b>	<b>100</b>	<b>556</b>	
Standeers 4 P / m² - without Stairwells / Wheelchairs	138	143	150	141	150	138	860	
Standeers 4 P / m² - without Stairwells / Wheelchairs	207	214	225	212	225	207	1290	
Max Capacity 4 P / m² - without Stairwells / Wheelchairs	240	228	239	241	239	240	1427	
Max Capacity 6 P / m² - without Stairwells / Wheelchairs	309	299	314	312	314	309	1857	
Wheelchairs	2	2	2	2	2	2	12	
Max Bikes (4 per stand)		36			36		72	



This drawing is dimensioned with metric values: Imperial dimensions are converted and rounded

Issue k: 16.03.2018

Bearb.	Date	Name	<b>KISS Caltrain 6-car trainset</b> 32.5" seat pitch - optimized for maximum seating	CONFIDENTIAL
Gepr.	17.06.2016	borluc		
	17.06.2016	kaetho		

**STADLER** 130276 L-4380

Page: 1/5

Issue: k

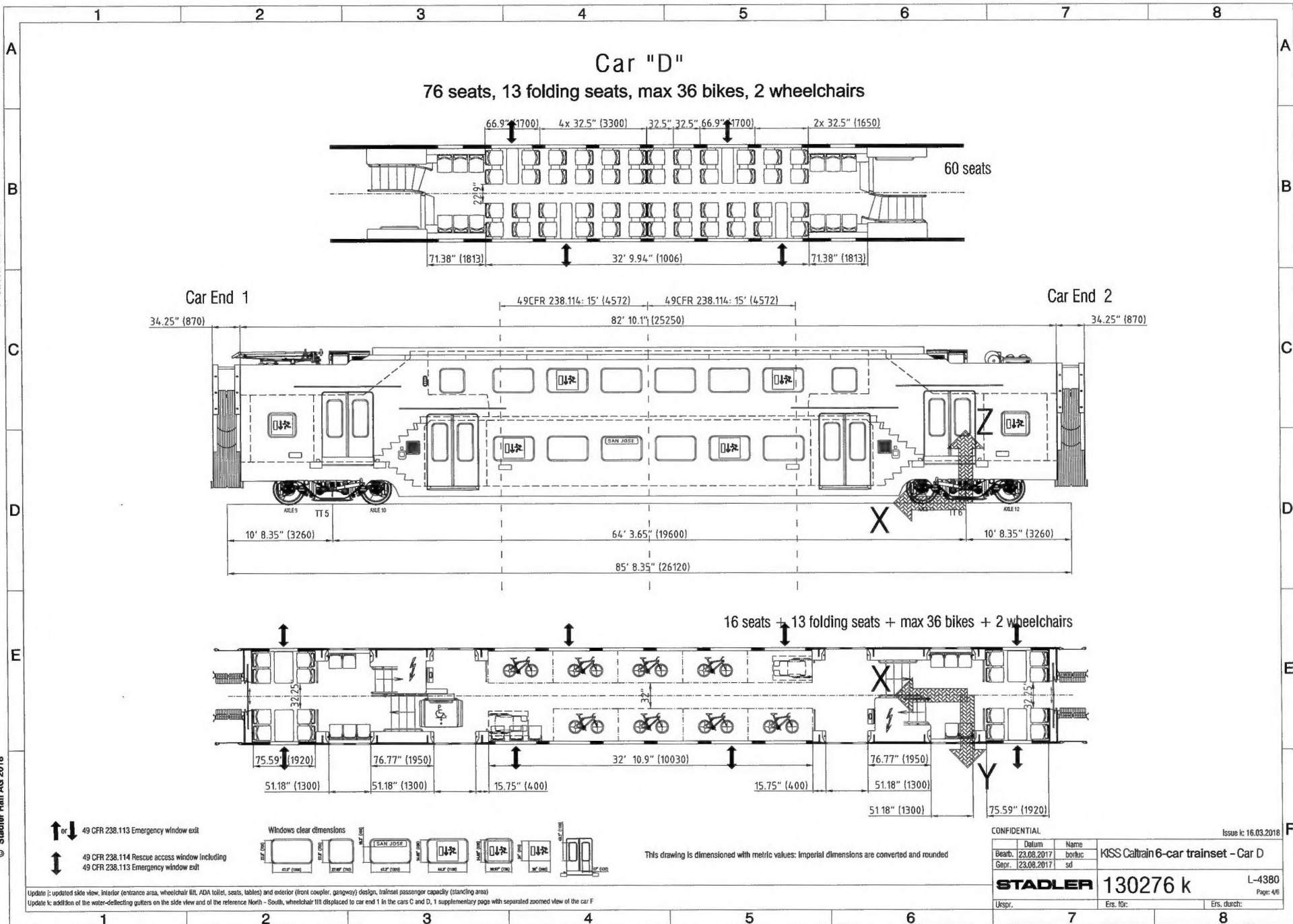
Urspr. Ers. für: Ers. durch:

12.06.2016: Dimensionierung des 6-Wagen-Zugsets für die Caltrain-Linie. Gepr. von: kaetho  
 17.06.2016: Dimensionierung des 6-Wagen-Zugsets für die Caltrain-Linie. Gepr. von: borluc  
 17.06.2016: Dimensionierung des 6-Wagen-Zugsets für die Caltrain-Linie. Gepr. von: kaetho

Update 1: updated side view / For the normal view: indication of emergency rescue and exit windows, wheelchair clear dimensions  
 Update 2: updated small emergency window (cars C/D/F) and drivers seat (cars A/B), replacement of the folding seats with a table (cars D/F), updated highest capacity and ratio / For the normal view: indication of the car coordinates system, definition of the car seats and updated wheelchair clear dimensions  
 Update 3: updated lower deck floor (cars D/F), updated intermediate deck floor and position, wheel capacity and ratio / For the normal view: indication of emergency rescue and exit windows in the side view of car end 1 (car B)  
 Update 4: updated side view, transfer (passenger area, wheelchair lift, ADA table, seats, tables) and service (port cooler, gangway) design, highest passenger capacity (standing area)  
 Update 5: addition of the water-deflecting gutters on the side view and of the reference frame - South: wheelchair lift displaced to car end 1 in cars C and D, 1 supplementary page with separated normal view of the car F





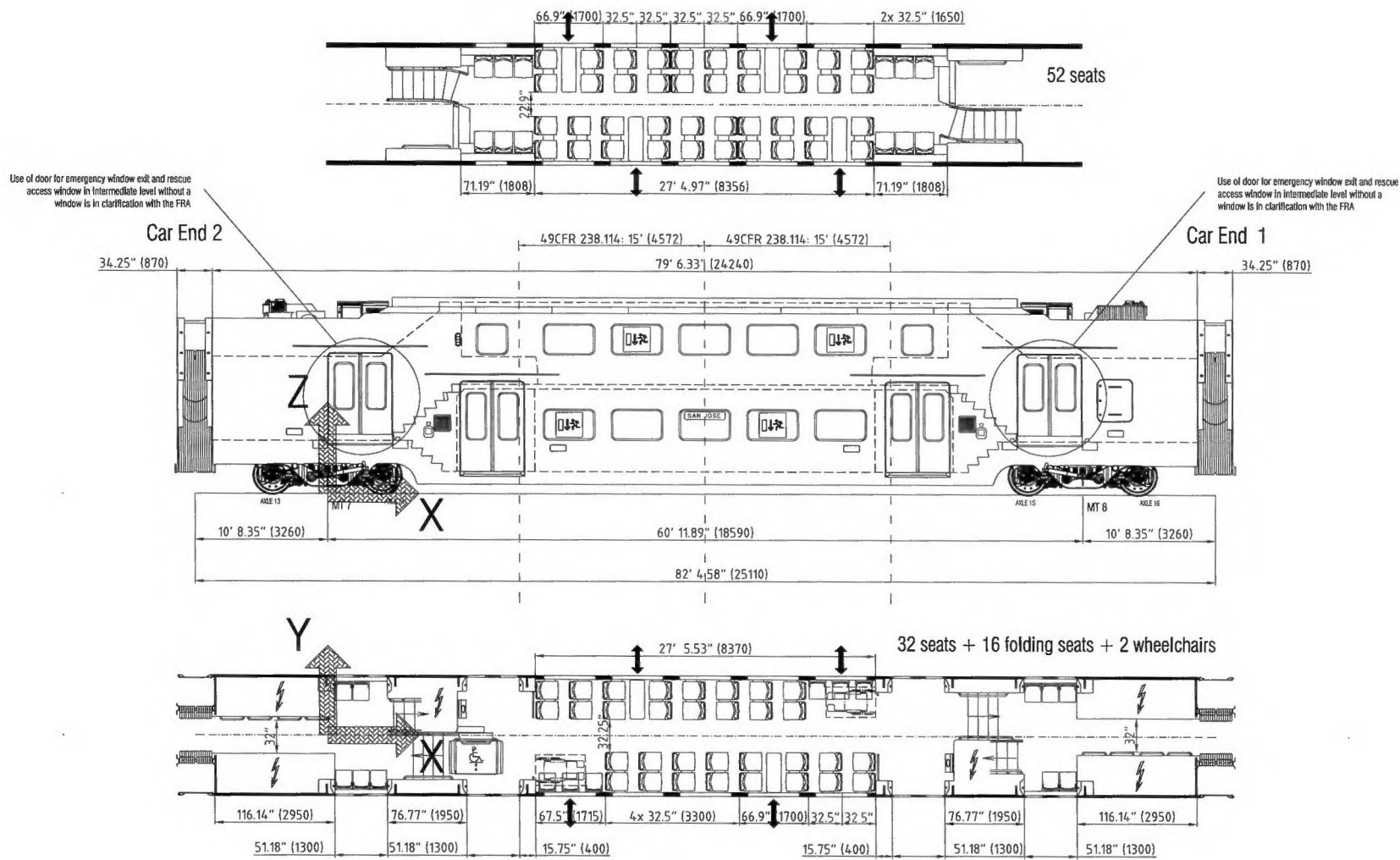


CONFIDENTIAL		Issue k: 16.03.2018	
Bearb.	23.08.2017	Name	borlac
Gepr.	23.08.2017	sd	
<b>STADLER</b>		<b>130276 k</b>	
Urspr.		Ers. für:	Ers. durch:

1 2 3 4 5 6 7 8

# Car "E"

84 seats, 16 folding seats, 2 wheelchairs



↑ or ↓ 49 CFR 238.113 Emergency window exit

↑ 49 CFR 238.114 Rescue access window including  
↓ 49 CFR 238.113 Emergency window exit

Windows clear dimensions



This drawing is dimensioned with metric values: Imperial dimensions are converted and rounded

CONFIDENTIAL

Issue 1c: 16.03.2018

Datum	Name	Issue
Beauf. 23.08.2017	beruf. sf	
Gepr. 23.08.2017		
KISS Caltrain 6-car trainset - Car E		
STADLER 130276 k		
Urspr.	Ers. für:	Ers. durch:

L-4380

Page: 5/6

Update j: updated side view, interior (entrance area, wheelchair lift, ADA toilet, seats, tables) and exterior (front coupler, gangway) design, trainset passenger capacity (standing area)  
Update k: addition of the water-deflecting gullies on the side view and of the reference North - South, wheelchair lift displaced to car end 1 in the cars C and D, 1 supplementary page with separated zoomed view of the car F

1 2 3 4 5 6 7 8





## **Appendix C. Passenger Emergency Brake Handle**

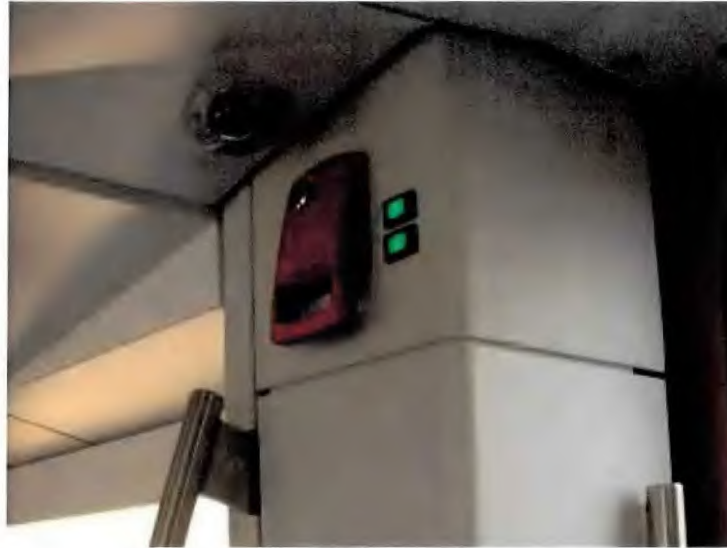


Figure C1 – Emergency Brake Pull Handle



Figure C2 – Emergency Brake Pull Handle Decal (Sample)

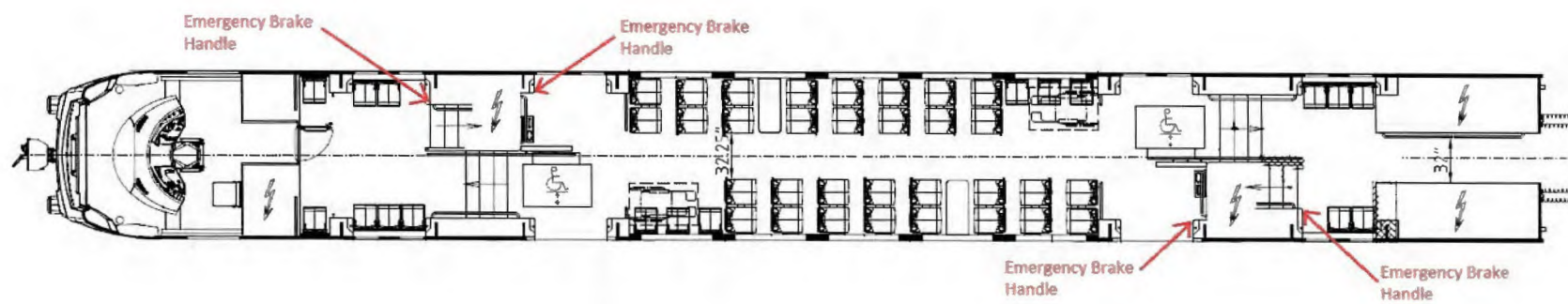


Figure C3 – Emergency Brake Pull Handle Locations (note: all cars are similar to car shown)

## **Appendix D. Magnetic Track Brake**



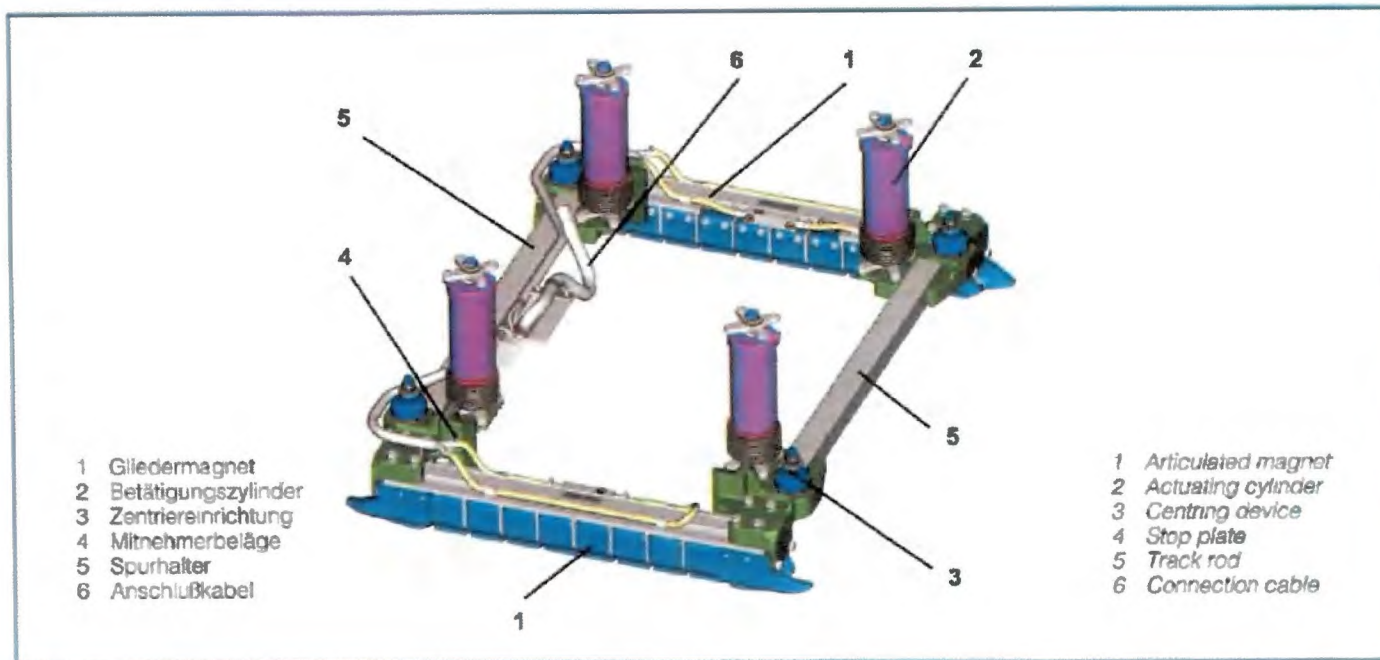


Figure D1 – Track Brake Rendering

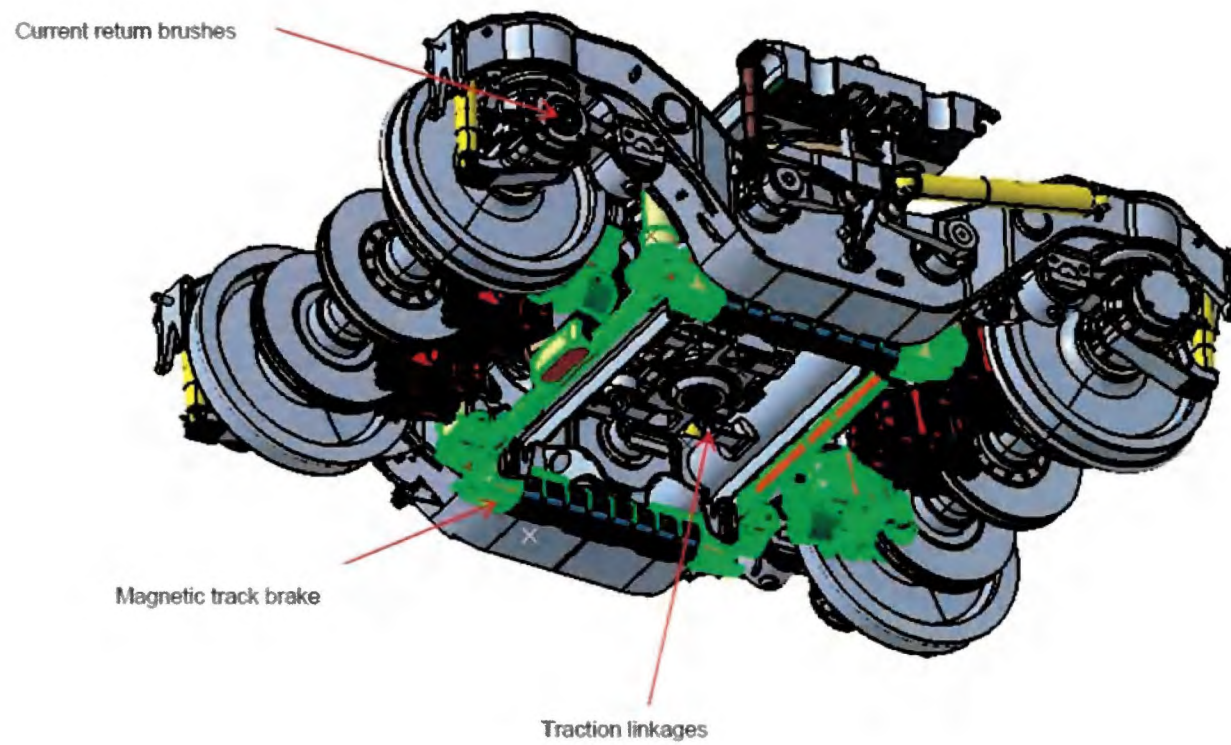


Figure D2 – Track Brake as Installed on Truck

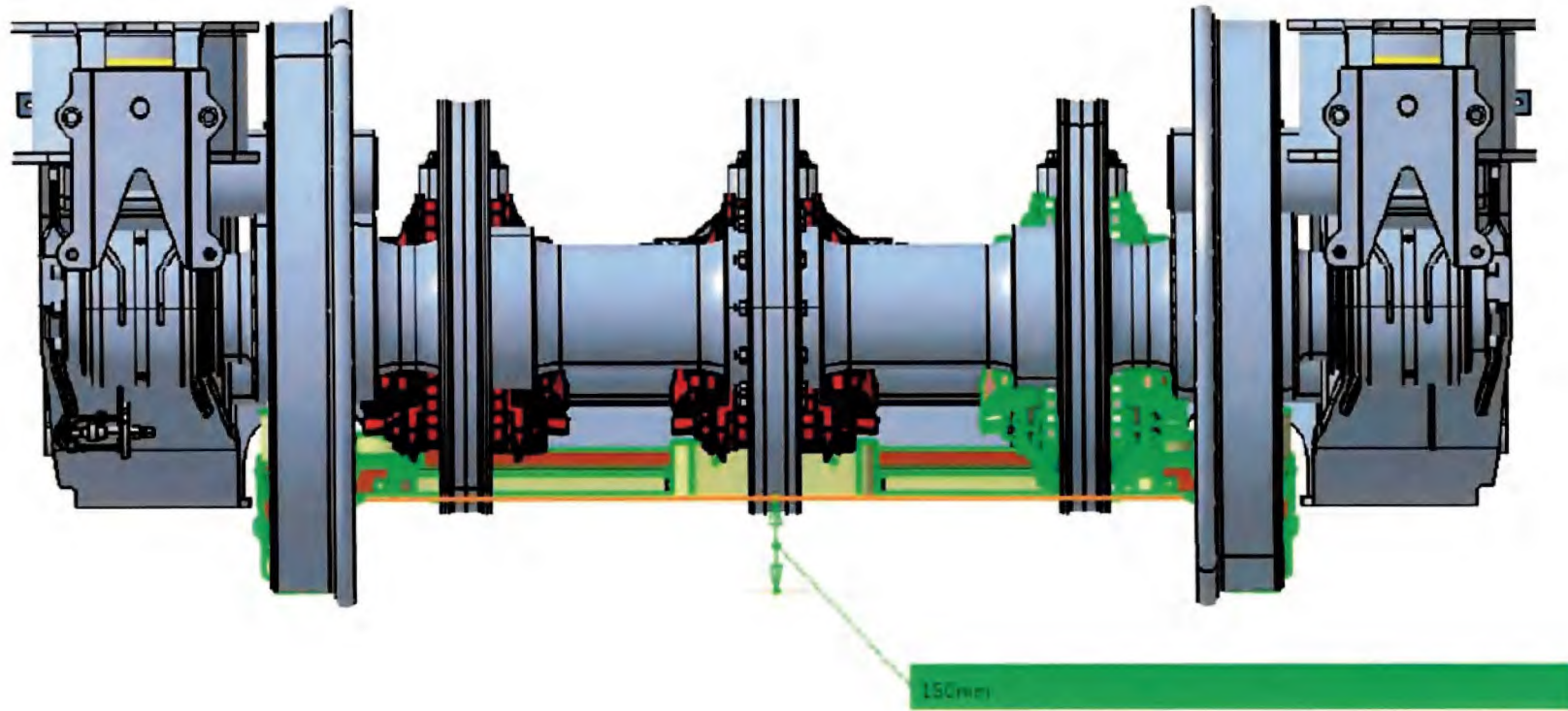
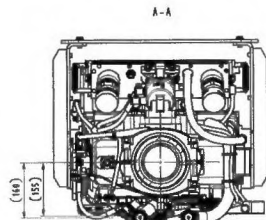


Figure D3 – Track Brake Between-Rail Nominal Clearance (150 mm ATOR)

## **Appendix E. Automatic Coupler Drawing**

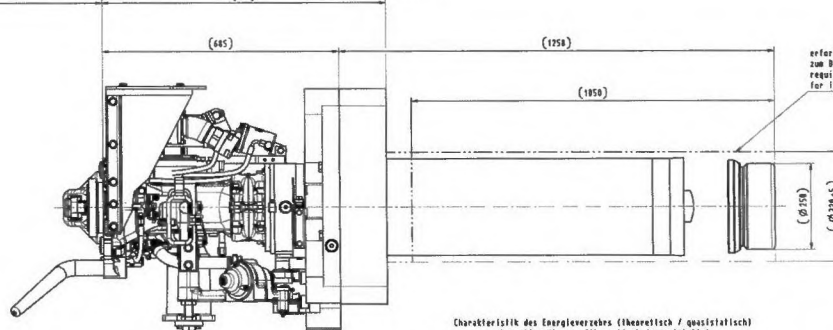
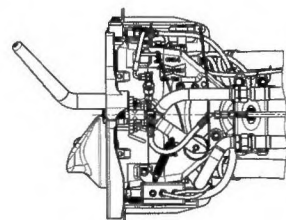
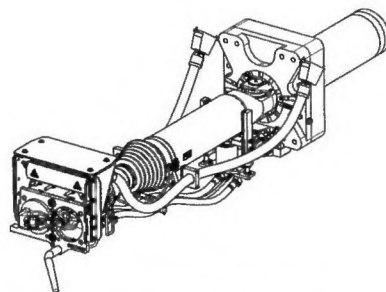
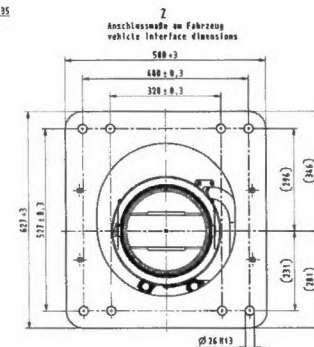
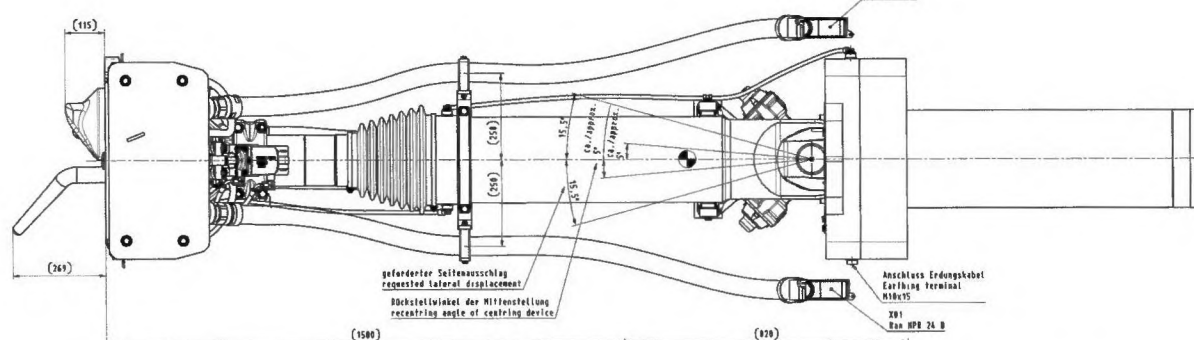
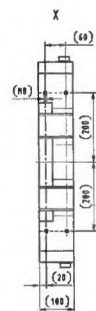
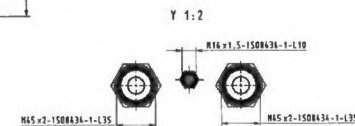
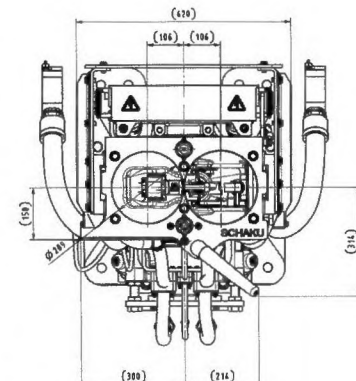
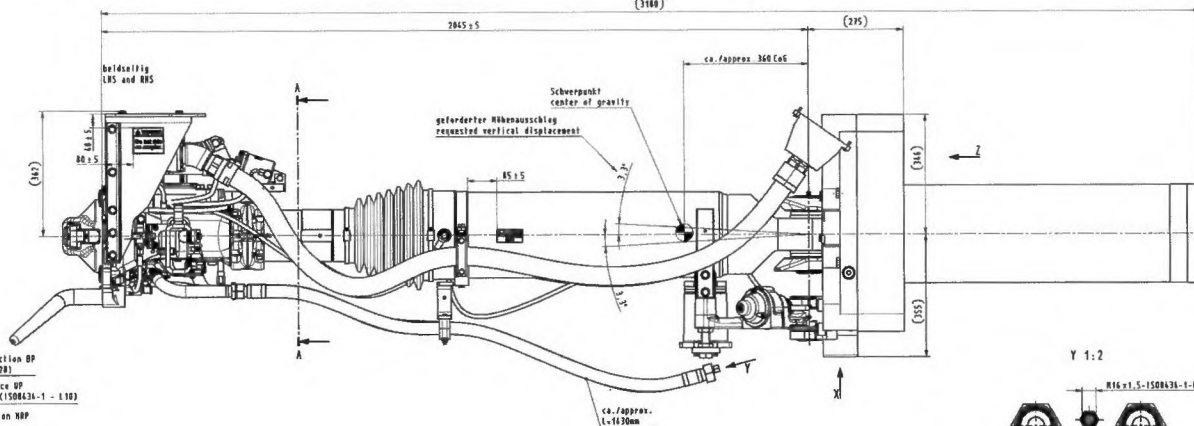


A-A

Anschluss HL / connection DP  
W36x7 (ISO8434-1 - L78)

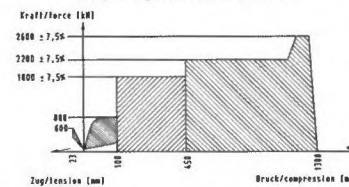
Anschluss GL / Interface UP  
W36x7 oder für Ø 10 (ISO8434-1 - L10)

Anschluss HRL / connection HRP  
W36x7 (ISO8434-1 - L70)



erforderliche Kontur des Lochs im Hintergestell  
zum Durchschieben der Kupplungsstange  
required contour of hole in the car body  
for insertion of coupler shaft

Charakteristik des Energieverzehrs (theoretisch / quasistatisch)  
absorption diagram (theoretical / quasistatic)



Anschlussplan elektr./pneumat. P1025  
circuit diagram electr. / pneumat. P1025

Scharfbergkupplung	
Automatic Scharfberg coupler	
P. 010.8081	/23100545000

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Before installing and commissioning products delivered by Scharfberg GmbH and Fa. BK and operated separately with them, it is mandatory for the customer to read and become familiar with the operating instructions and to make them available to the driver/operator of the product. The operating instructions are part of the product and must be made available to the driver/operator of the product. The operating instructions are in German. The operating instructions are in German. The operating instructions are in German.



## **Appendix F. Side Door Step and Vertical Handhold Renderings and Dimensions**

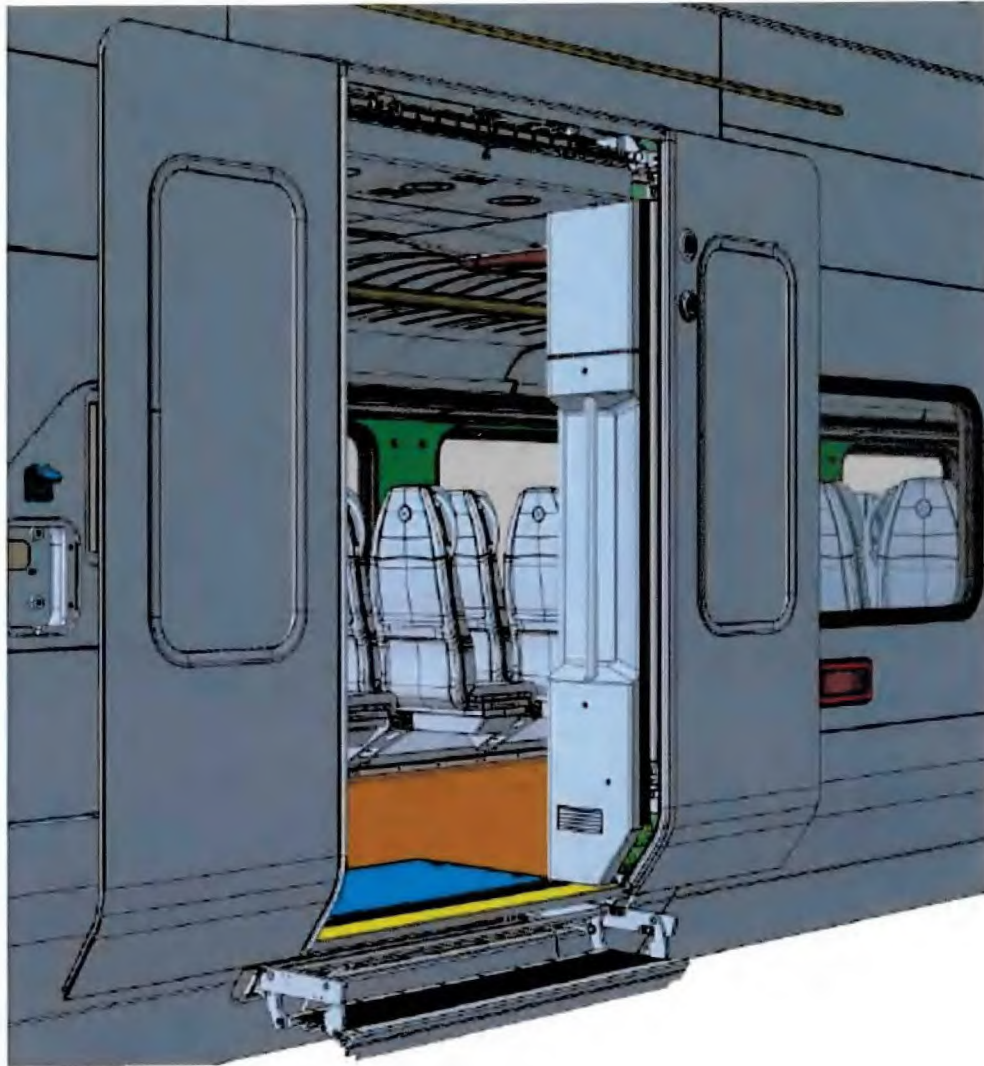


Figure F1 – CAD Rendering of Side Door Step and Side Door Handholds

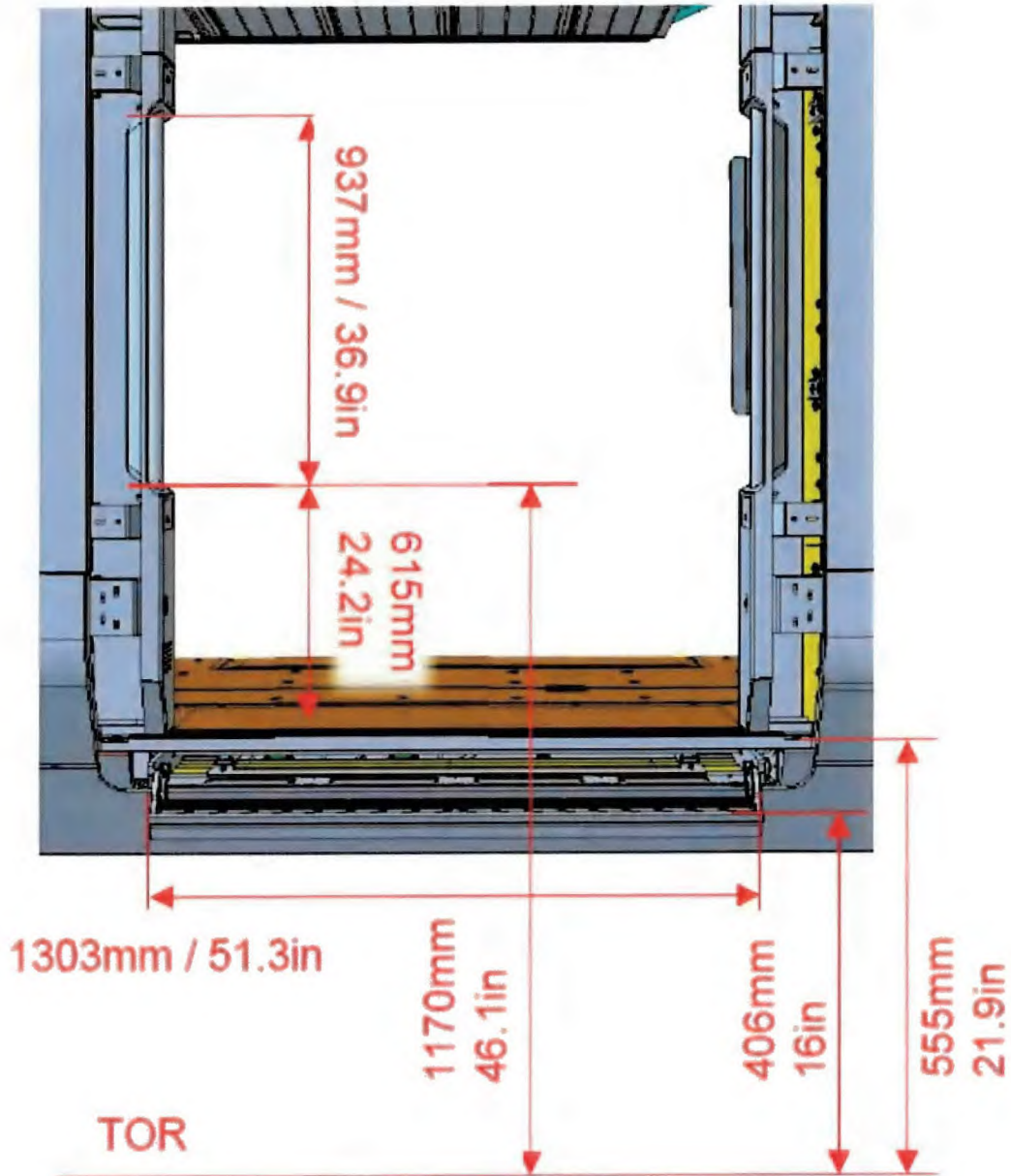


Figure F2 – Dimensions of Side Door Step and Side Door Handholds



Figure F3 – Photo Rendering of Side Door Handhold