DK-STM

Installation manual

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Change log

Issue / Date	Affected pages	Description	References
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1.01 / 19-02-2013	All	Updated after meeting with Alstom, DSB and BDK.	
1.02/ 21-02-2013	All	Updated according to Review-01.	
1.03/14-11-2013	All	New scope: To be used for any train type without the need for a specific installation guide.	
1.04/16-12-2013	13 and 21	Information on vehicles with one antenna added	
1.05/10-01-2014	All	Some application rules specified	
1.06/01-12-2014	All	Updated after DK-STM is upgraded to baseline 3.0	
1.07/22-02-2015	2, 7, 10, 12, 36 and 42.	Updated as a consequence of CFX208948 Antenna height specified	
1.08/09-06-2016	Chapter 1, 2, 3, 5.4, 6 Chapter 2 is inserted with Decommissioning	References to dedicated application rules are removed. A general reference to Application rule document is inserted. Antenna tuning is rewritten, Decommissioning inserted	
1.09/14.08.2017	Chapter 3.1 new Chapter 4.2.6 Chapter 4.2.8 Chapter 4.4 Chapter 4.7.5 Chapter 5.2	Generel rules for installation Circuit breaker update Circuit breaker update text in drawing Havarilog included Requirement to external power included Requirement to verification of Litra code and ATP train	
1.10/02.11.2020	Chapter 5.5	The interval for tuning temperature is changed to -10°C and +40°C	

Table of Contents:

1 Introduction

1.1 Scope

The purpose of the DK-STM Installation manual is to provide the requirements and the necessary information related to the HW to install the DK-STM as an add-on system to an ETCS Onboard system.

The manual does not cope with SW related matters like the operational interaction between the ETCS Onboard system and the DK-STM. These subjects are covered by the generic approval of the DK-STM or in /10/.

This DK-STM Installation manual is written for technical personnel, who shall design the installation of the DK-STM.

1.2 Definitions

BDK	Banedanmark
DK-STM	STM developed for Danish ZUB123 infrastructure
DMI	Driver Machine Interface (of ETCS Onboard)
EB	Emergency Brake
ETCS	European Train Control System
ZUB123	Present ATC system of Banedanmark

Operational states of DK-STM

NP	No power
PO	Power on (performing self test)
CO	Configuration (initial communication with ETCS)
DE	Data entry (communication with ETCS to get train data)
CS	Cold stand by (ETCS has control). DK-STM antennas are passive
HS	Hot Stand by (ETCS has control). DK-STM antennas are active
DA	Data Available (DK-STM has control)
FA	Failure (ETCS has control)

1.3 References

Document title	References	Document identification
Antenna ZUB123 *(Valid for S25441-M1-A3)*	/1/	G81050-J2118-A004-D
Connection box	/2/	G81050-J2118-A005-B
Indbygningsforskrift ZUB123 Einbauanleitung *(Valid for S25441-M1-A3)*	/3/	G81050-J2118-A006-A
Samlingstegning for befæstigelsesbolt til punktantenne	/4/	G81050-J2118-A018-A
Indbygningsforskrift ZUB123 Einbauanleitung NF-ZKS S25441-M2-A3-*	/5/	G81050-J2118-A021-A
Indbygningsforskrift ZUB123 Einbauanleitung NF-ZKS S25441-M2-A4-*	/6/	G81050-J2118-A022-A
Grounding Concept for DK-ATC System General	/7/	G81050-J2118-U011-C
ZUB123 Beschreibung der ATC-Diagnose-Schnittstelle	/8/	G81001-E3117-U001-C
DK-STM Systembeskrivelse	/10/	KN 655.00 Q2959 (BDK)
DK-STM Brugermanual	/11/	SN655.00 Q2960 (BDK)
DK-STM Application Rules	/12/	G81001-X3107-L005-*
DK-STM Dokumenteret Slutafprøvning	/13/	AN 656.00 Q4446

Table 1 References

1.4 Context for the DK-STM

The context for the DK-STM is shown below.

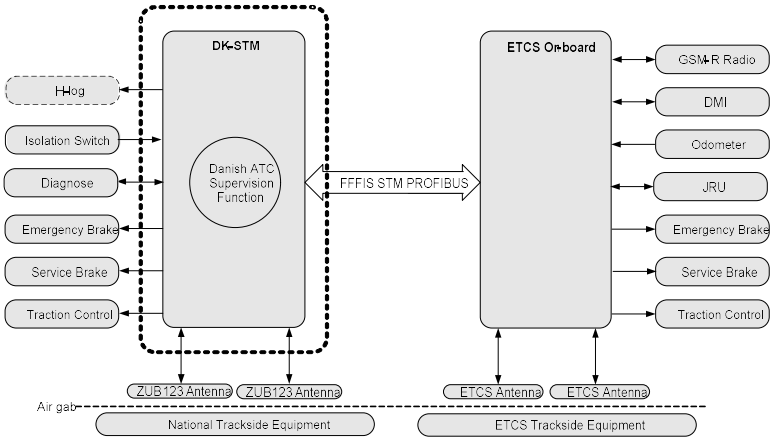


Figure 1 Surrounding of DK-STM

DK-STM is a part of the overall ETCS Onboard system. The interface to DK-STM is defined at the front connectors of the different boards in the 19" subrack.

DK-STM provides interfaces for

- Emergency brake
- Service brake
- Traction cut off
- ZUB123 antenna(s)
- ETCS Onboard unit (Profibus)
- Power supply
- HLog and diagnose

Brake commands and Traction Cut-off commands are simultaneously sent to the ETCS by the Profibus-connection.

Data sent to the Havarilog are simultaneously sent to the JRU by the Profibus-connection.

DK-STM is operated by the DMI of the ETCS Onboard system. The driver can access DK-STM through the ETCS. DK-STM gets its odometer data from the ETCS.

In most cases, the DK-STM shall be installed in a vehicle that previously had a ZUB123 Onboard system. In these cases, the ZUB antenna(s) and the antenna cables can be reused by the DK-STM. See section 4.3.

If previously installed antennas or cables can't be reused, or if the DK-STM is installed in a new vehicle, the requirements in section 3.2 shall be met.

1.5 The HW of the DK-STM

The overall DK-STM structure is seen in Figure 2.

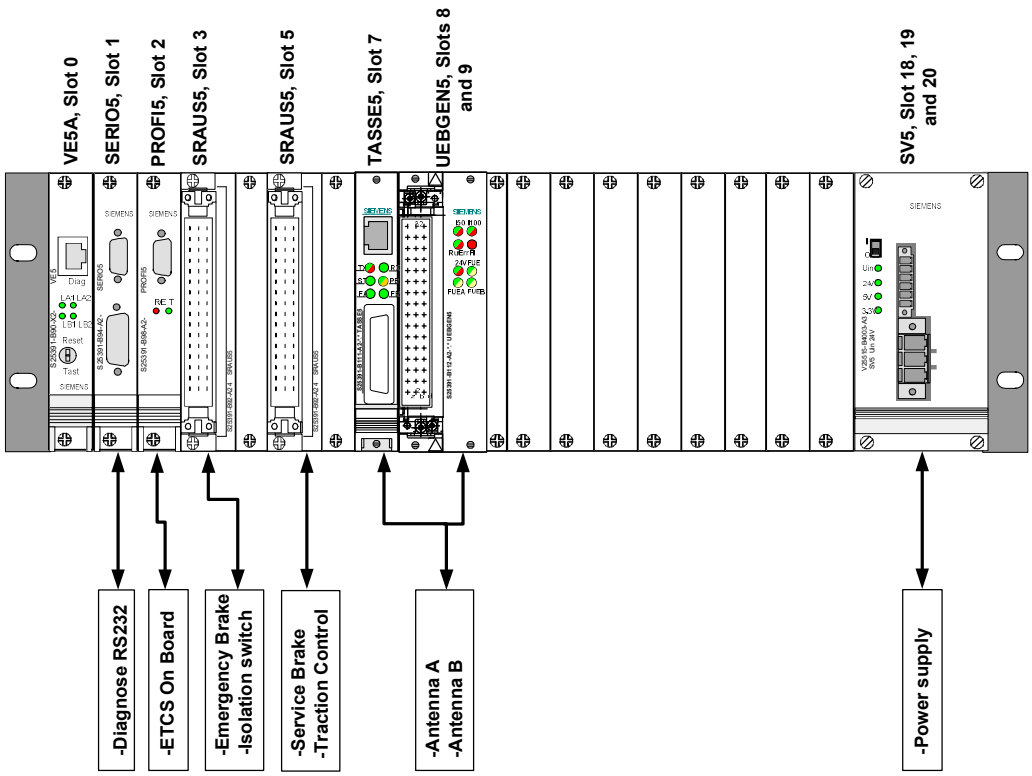


Figure 2 Overall DK-STM Structure

All interfaces are at the front connectors on the boards. The specific properties of the interfaces are described in following sections of this document.

The STM is delivered in two different HW versions:

- for 24 V DC battery voltage
- for 110 V DC battery voltage

The choice of battery voltage applies to the feeding of the power supply unit SV5 and to the energising of the relays of the SRAUS5 board.

If a DK-STM is to be used in a train with another supply voltage than 24 V DC or 110 V DC, a DC-DC converter may be inserted.

The contacts of the SRAUS5 board relays (emergency brake contact, service brake contact, traction cut off contact) may be used by a voltage different from the supply voltage. However, the permissible load current depends on the voltage.

Note: the voltage interval for the 110 V DC power supply is much wider than the voltage interval for the 110 V DC SRAUS5 cut off relays, but the cut off relays need not to be used; there are other ways to bypass the DK-STM emergency brake output.

1.6 Dimensions

19 inch rack of 3 height units:

L = 483 mm
D = 225 mm
H = 132 mm

Weight = 6 kg.

1.7 Requirement to decommissioning and installation

By decommissioning and installation the following requirements shall be fulfilled:

- The decommissioning / installation staff must have the necessary qualifications for the installation of components in trains.
- The existing emergency brake cables shall be carefully handled.
  The requirement shall be understood in that way, that the isolation of the cables and the cores MUST not be damaged.
- The bending radius of cables must be obeyed during decommissioning and installation.

2 Decommissioning of ATC ZUB123

Trains with ATC ZUB123 installed, shall have the ATC ZUB123 de-installed, decommissioning, before the DK-STM is installed.

2.1 Before decommissioning

- It shall be controlled, that the power to the ATC ZUB123 is disconnected.

> **Warning**
>
> REMARK: The ATC system may be powered from both end of the train

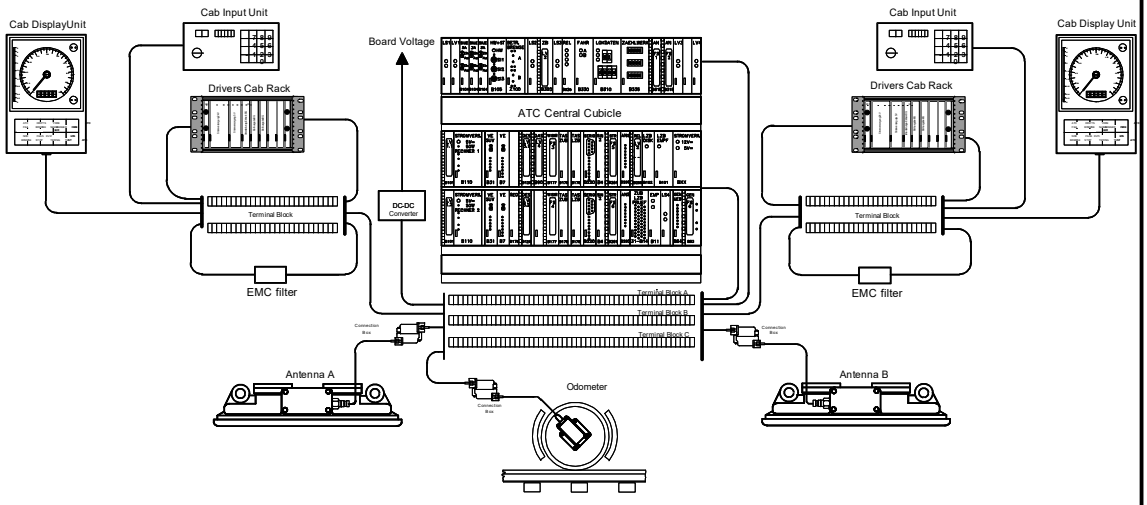
> **Warning**
>
> It shall be assured, that the power cannot be switched on during work on the system

This is a general description of the decommissioning. The decommissioning shall be described in more detail for the specific trains.

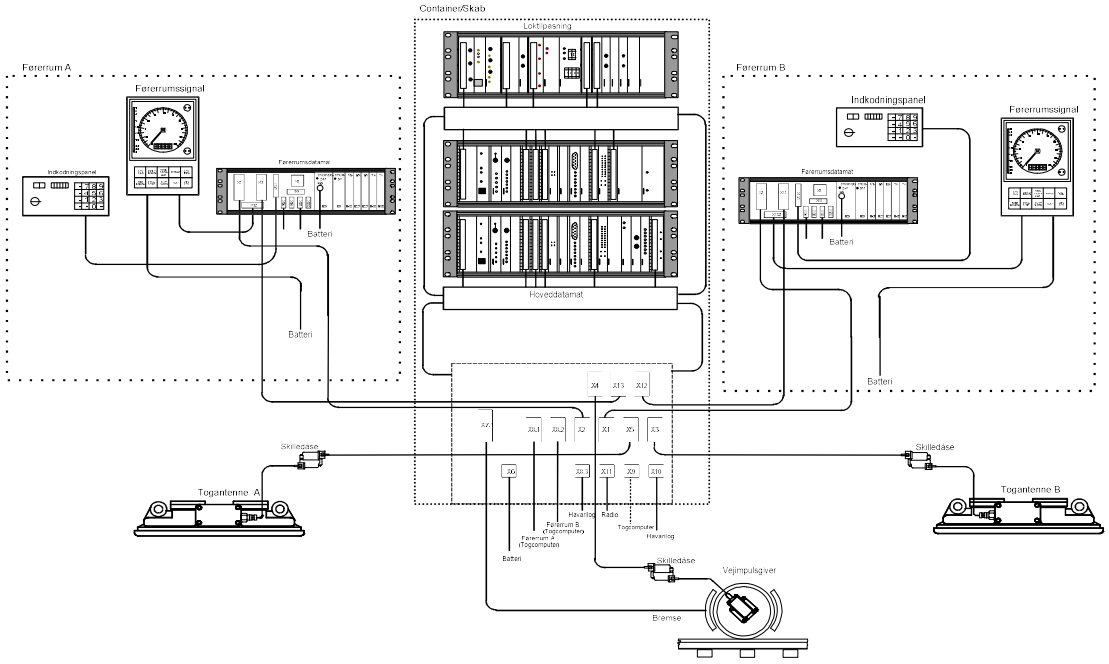
2.2 ATC ZUB123 units to be removed

There are two different types of general DK-ATC installations:
-Older installations: Train cables are connected to terminal blocks.
-Newer installations: Train cables are connected to a cubicle, with multi connectors.

<u>Older installation:</u>



Newer installation:



From the above pictures only the train antennas, Antenna A, antenna B and the antenna cables shall remain.

It shall be agreed with the RU, if the internal train cables also shall be removed.

If ATC units shall be re-used, it shall be taken care of ESD during the decommissioning.

3 General rules and procedures

This chapter is divided in two sections, one for the DK-STM itself and one for installation of new antennas.

If the DK-STM shall replace an Onboard ZUB123, the old antennas and connecting cables can be reused.

If the DK-STM is to be installed in a vehicle having no ZUB123 antenna, new ones have to be installed. The requirements for such installation of antennas are stated in section 3.2 of this document.

3.1 Generel DK-STM installation requirements

The installation of the DK-STM shall comply with the application rules for the DK-STM /12/ and with relevant parts of the grounding concept /7/.

These rules are general rules from the /12/. Specific rules are implemented in the text in this manual, which shall also be fulfilled.

1. The DK-STM shall be installed in a locked cabinet preventing unauthorised access the DK-STM.
2. Temperature range: - 40 °C to + 70 °C inside the cabinet for the DK-STM (EN 50155 class TX)
3. The DK-STM shall be installed in an enclosure, that ensures the pollution degree does not exceed PD2 of EN50124-1 and causes no higher demand on the DK-STM than OV2 of EN50124-1 and EN60664-1.
4. The cabinet for the DK-STM shall correspond to IP54 of EN60529.
5. The power to the DK-STM shall be supplied through a mains filter with properties like a "SIFI-E" filter and through a suitable circuit breaker. See details in this document.
6. All cables leading to the front connectors of the DK-STM shall be shielded. Close to the DK-STM the shield of each cable shall be attached to a ground plane (ground bar) with a good high frequency connection.
7. The DK-STM fulfils the immunity/emission requirements of EN61000-6-2/ EN61000-6-4 and EN50121-3-2. No higher demands shall be put on the DK-STM.
8. The DK-STM shall not be exposed to larger mechanical influence than specified in EN 61373/1B.
9. After power on, the DK-STM shall return to state NP within 48 hours to enable a new self test. If this limit is exceeded, the DK-STM will enter FA mode by itself causing an emergency braking.
10. The connection to the emergency brake contacts shall be proven safe against short circuits inside the front connector, the connecting cable, and the cabling in the vehicle.
11. Maximum permissible altitude: 4000 m.
12. No other connections than the ones shown in this manual are allowed. (There are more possibilities for connections, but such connections have special conditions to be observed).

13. No module (PCB or connector) shall be pulled out or inserted in the subrack when the power supply is on.
14. During storage and transport (as a component), the DK-STM shall not be exposed to harder conditions than stated in EN60721-3-2 class 2M2 and 2K2.
15. Installation and maintenance personnel shall be qualified for their work.
16. Unless explicitly stated differently in this manual it must be assured that no higher voltages that 60V can be applied to the hardware interfaces of DK-STM even in case of failure of the connected equipment.
17. After the installation the integration test on the vehicle must show that the connection ZUB123 STM does not disturb other Profibus participants.

3.2 Antennas and their connecting cables

This section applies to new installation of antenna and antenna cable.

3.2.1 Requirements for the antenna

The DK-STM shall use one of the following types of antennas:

- S25441-M1-A3
- S25441-M1-A4
- S25441-M2-A3 (low profile)
- S25441-M2-A4 (low profile)

The temperature range for the antennas is -25 °C to + 55 °C.

The maximum speed of the S25441-M2-A3 and S25441-M2-A4 for reading ZUB123 balises correctly is 160 km/h.

The requirements for metal free space around the antennas see /3/, /5/ and /6/, shall be met.

The antenna shall be placed no more than 4 m behind the first axle.
However, BDK might grand exemption.

3.2.2 Requirements for the antenna height

The installation height for de antennas, relative to S.O. plane is following: Se also reference /3/, /5/ and /6/.

Antennatype	Minimum height	Maximum height
S25441-M1-A3	130 mm	180 mm
S25441-M1-A4	130 mm	180 mm
S25441-M2-A3 (low profile)	108 mm	177 mm
S25441-M2-A4 (low profile)	108 mm	177 mm

3.2.3 Requirements for the antenna cable

Required cable types:
Habia 43739-010-09 or
Huber + Suhner, Siemens no V25132-Z5-A38
Maximum length: 60 m

Multi connector for connection to the antenna: Siemens V25132-A204-X

Although not required, it is strongly recommended to install a cable connection box /2/ on the frame of the vehicle close to the antenna. The cable connection box enables a fast replacement in case the cable is damaged close to the antenna. Further it eases disconnection if the vehicle is to be lifted from its bogies.
The connection box consists of the fixed part: Siemens V25132-A2-A24 and the plug: Siemens V25132-A2-A28.
Note: The connection box has a restriction to the orientation.

If the antenna cable is to pass between two vehicles, an interconnection cable has to be used. Note the requirements in /7/ for the connection of the cable shield in one end or in both ends depending of the possible potential difference between the vehicles.

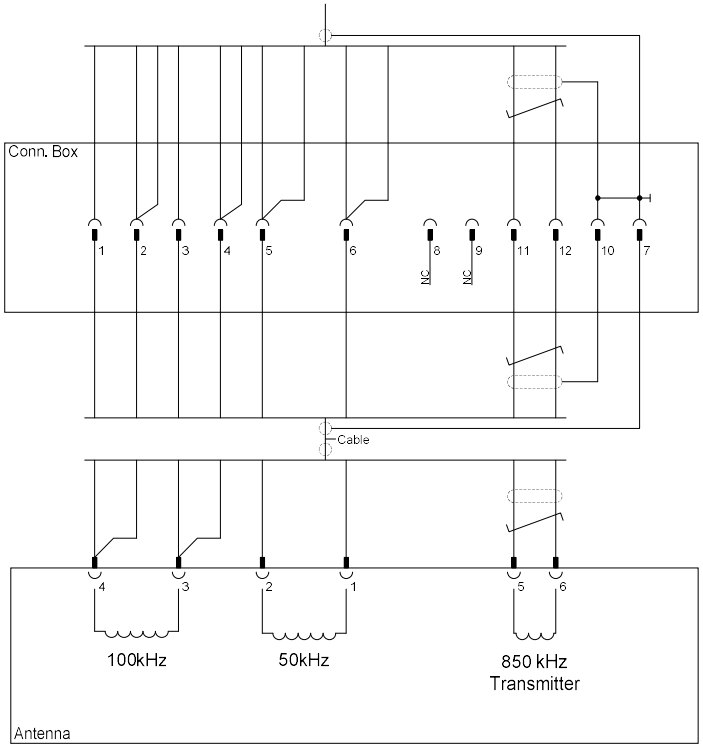


Figure 3 Key diagram of antenna cable

The wires in the antenna cable from the DK-STM to the connection box (or antenna in case of no connection box) shall be allocated this way:

Antenna connector terminal	**Signal**	**Huber + Suhner cable wire no or colour**	**Habia cable wire colour**
1	50 kHz return wire	2 6	Brown Pink (1)
2	50 kHz forward wire	1 7	Black (1) Red
3	100 kHz return wire	3 5	Yellow Yellow/Black
4	100 kHz forward wire	4 8	Green Green/Black
5	ST5 (TASSE5)	White	White
6	ST6 (TASSE5)	Blue	Blue
	Normaly not used. Connected to GND in cubicle		Grey Grey/black

(1) In older installations these wires are not used. Shall be connected to GND

50kHz

RL50kHz

100kHz

RL100kHz

850kHz

Normaly not used
Connected to GND in cubicle

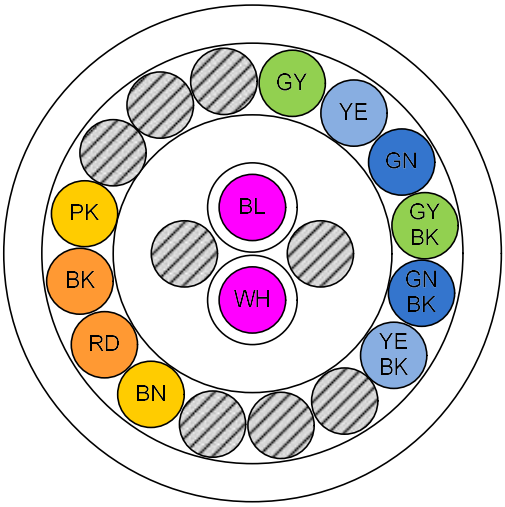


Table 2 Allocation of wires in antenna cables

The connection of the antenna cable to the DK-STM is shown in section 4.3.
Note: In case of a connector box is placed close to the antenna, the connecting cable from the connector box to the antenna shall be max 3 m. In this connection cable, only one wire per connection is needed for the 50 kHz circuit and only two wires per connection are needed for the 100 kHz circuit between, as shown in the diagram above. This corresponds to the present installations (=enables the use of existing connection cables).

For both types of cables, the shielding shall be made according to the diagram above.

Note: If the vehicle has only one antenna, it shall be connected as antenna A, see section 4.3.

4 Electric interfaces and Diagrams

The requirements in this chapter apply to the installation of the DK-STM.

4.1 Grounding Concept

See /7/ for principles for grounding of ZUB123 antenna and interconnection cable.

This section describes the grounding concepts to be applied in connection with the installation of DK-STM. The concept applies to all train types. Cables, applied to connect DK-STM to other equipment, must be shielded. In general all cables shields must be grounded in both ends. The cables to the front connectors must have their shield connected to a ground bar close to the connector.

Grounding straps (for grounding of components including the antennas) must be as short as possible and not longer than 0.8 m, and shall have a cross section of 10 mm^2.

Signal cables of the DK-STM shall be routed away from noisy cables or equipment.

A grounding concept shall be made including grounding of interconnection cables from DK-STM and grounding of the frame itself.

A suitable grounding concept is shown here for a DK-STM mounted in a closed cabinet.

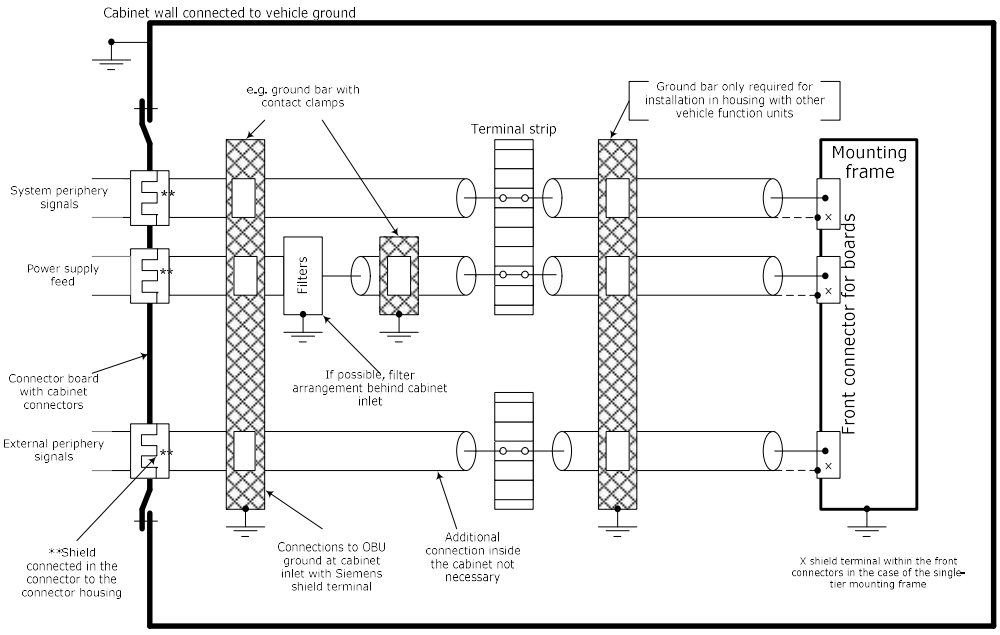


Figure 4 Grounding

4.2 Connection of Power Supply

Power supply type SV5 is located at Slots 18, 19 and 20.
Depending on DK-STM 24 V version or 110 V version, one of the following power supply versions is used:

- V25515-B4003-A3 for nominal on board voltage of 24 VDC
- V25515-B4003-A4 for nominal on board voltage from 72 to 110 VDC

In case of medium vehicle voltage (65 V for instance), the DK-STM need to be supplied by a DC-DC converter. A suitable unit is the Power One model DQ2660-9R covering an input voltage range of 43 V DC to 108 V DC and supplying 24 V DC 5.5 A.

Note: The DK-STM has to re-enter state "NP" (no power) within 48 hours after turn on to enable a self test. Besides the waste of energy this excludes a permanent energising of the DK-STM.

4.2.1 Requirements to the power source

		V25515-B4003-A3	V25515-B4003-A4	
Rated input voltage	**V DC**	24	72/96/110	Nominal battery voltage
Residual ripple	**%**	< 2%	< 2%	
Input voltage range	**V DC**	16,8 – 31,2 14,4 – 33,6	50,4– 143 43,2– 154	± 30% continuously ± 40% max 1s EN50155
Over voltage	**Cat.**	II	II	EN50124-1
Interruptions	**Class**	S1 (none)	S1 (none)	EN50155
Inrush current	**A**	≤ 16	≤ 8	≤ 100 ms
Input current con. X2 (at rated input voltage)	**A**	6,25	2 /1,6 /1,4	at 100% Load
Input current con. X1 Control signal (typical)	**A**	0,01	0,01	per input

Table 3 Requirements to power

The power supply is not loaded to its limit of approx 150 W. The total power consumption of the DK-STM is approximately 60 W.

4.2.2 Reaction of SV5 to over- and undervoltage

Overvoltage monitor

		V25515-B4003-A3	V25515-B4003-A4
Threshold level	**V DC**	35	159
Tolerance	**V DC**	± 1	± 5
Response inside SV5	Control fuse	blown (unit off until repaired)	blown (unit off until repaired)
Response delay time	**ms**	< 20	< 20

Table 4 Overvoltage monitoring

If the overvoltage monitor is triggered, an internal fuse blows. The DK-STM has to be removed from the train and sent to a workshop.

Undervoltage monitor

		V25515-B4003-A3	V25515-B4003-A4
Threshold level	**V DC**	14	42
Tolerance	**V DC**	± 0,5	± 1,1
Response inside SV5		completely switched off	completely switched off
Response delay time from normal operation	**ms**	> 200	> 200
Response delay time after turn on of the SV5	**s**	< 2	< 2

Table 5 Under voltage monitoring

If the under voltage monitor has been triggered, the DK-STM is turned off. It will re-enter service when supplied with a voltage within the specified limits.

4.2.3 Front view

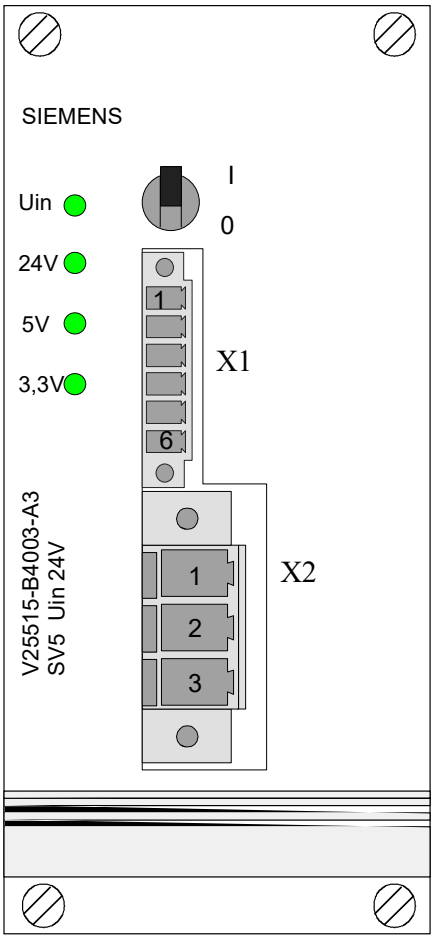


Figure 5 SV5 front

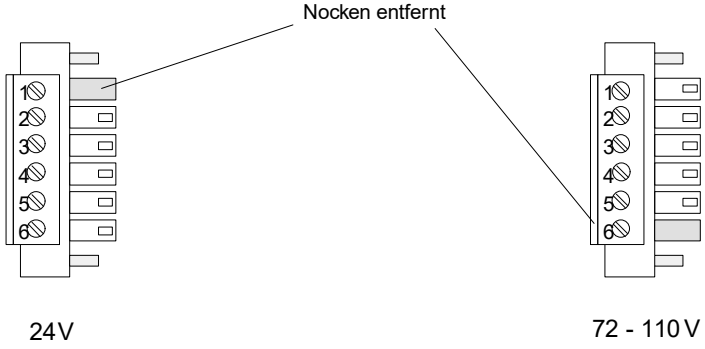
4.2.4 Pin Assignment for Connector X1

Pin assignment for connector X1, for the system activation is assigned as shown in Table 6.

Pin	Position
1	Ust Fault Switch Signal
2	FS1 Signal Cab 1
3	FS2 Signal Cab 2
4	FZG Signal Vehicle Pulled
5	PWR Signal Self-maintenance ON
6	UEN Board Voltage Minus (not to be used)

Table 6 Pin assignment for connector X1

Coding of connector X1:



The connector is shown without the housing. "Nocken entfernt" = tap removed.

Figure 6 SV5 Terminals and coding of connector X1

X1: Phoenix Mini-Combicon 6-pol 160V/8A.
Housing for 4-11mm cable diameter. Max. wire cross section 1,5mm^2

Plug:	Phoenix MC1,5/6-STF-3,81-GY	order no 1827745
Housing:	Phoenix KGG-MC-1,5/6-GY	order no 1834385

4.2.5 Pin Assignment for Connector X2

Pin assignment for connector X2, for the board voltage is assigned as shown in Table 7.

Pin	Position
1	UEN Board Voltage **Minus**
2	GND Front Panel (*)
3	UEP Board Voltage **Plus**

Table 7 Pin assignment for connector X2

(*) Not to be used. The shield of the cable is to be grounded close to the SV5

Coding of connector X2

The connector is shown without the housing

Figure 7 SV5 Terminals and coding of connector X1

X2: Phoenix Power-Combicon 3-pol. 400V/20A
Housing for 4-8mm cable diameter. Max. wire cross section 4 mm^2

Plug:	Phoenix PC4/3-STF-7,62-GY	order no 1804917
Housing:	Phoenix KGG-PC4/3-GY	order no 1837324
Code tap	Phoenix CP-HCC 4	order no 1600027

4.2.6 Requirements to the wiring of electric power

The power to the DK-STM shall be supplied through a circuit breaker/fuse and a filter.

Depending on a risk assessment and the trains battery grounding concept, a single pole fuse/circuit breaker or two fuses/double pole circuit breaker shall be used as external fuse.
The power supply input(SV5/-X2) of the DK-STM rack is floating, compared to the DK-STM rack chassis.

Filter type: Epcos SIFI-E or equivalent. Schaffner FN6020 is recommended. The filter shall be dimensioned in accordance to the power supply voltage and the power consumption.

The wires from the vehicle battery to the DK-STM power supply must have a cross section, that causes the circuit breaker to trip in case of a short circuit on the input of the DK-STM power supply.

The circuit breaker must withstand the inrush current without tripping.

If the connection to the power supply apply to Table 8 (max 10 m cable), the demands are met. In general, the selection of the required dimension for the connection cable to the SV5 shall be done according to /EN50343/.

Power supply	**Unit**	**V25515-B4003-A3**	**V25515-B4003-A4**	**Description**
Input voltage	V DC	24	72/96/110	Battery voltage
Maximum wire load current	A	8,9	3/2,2/2	72 / 96 / 110
Main Wire selection:				
Cross section	mm^2	2,5	1,5	Copper wire
Voltage drop on 10 m wire length (at maximum load current)	V	1,2	0,7/0,5/0,46	Specific resistance = 0,0172 (copper wire)
Circuit breaker selection:				
Recommended MCB	A	10	6	B or C characteristic
Minimum short circuit current	A	50 / 100	30 / 60	B or C characteristic
Inrush current	A	≤ 16	≤ 8	≤ 100 ms
Mains filter selection:				
Current capacity	A	10	6	

Table 8 Specifications for Main Circuit Cable and Circuit Breaker Dimensioning

4.2.7 Options for enabling of the power supply

The power supply can be controlled by the auxiliary signals of connector X1. As the demand for power to the DK-STM is simple, the schematic diagram in **Figure 8** will do.

In case of needs for more sophisticated control of turn on / turn off, please consult Siemens.

4.2.8 Key Diagram, Connection to Power Supply

Key diagram for connection of power supply to DK-STM, for the power supply configuration of 24 VDC to 110 VDC, is shown below.

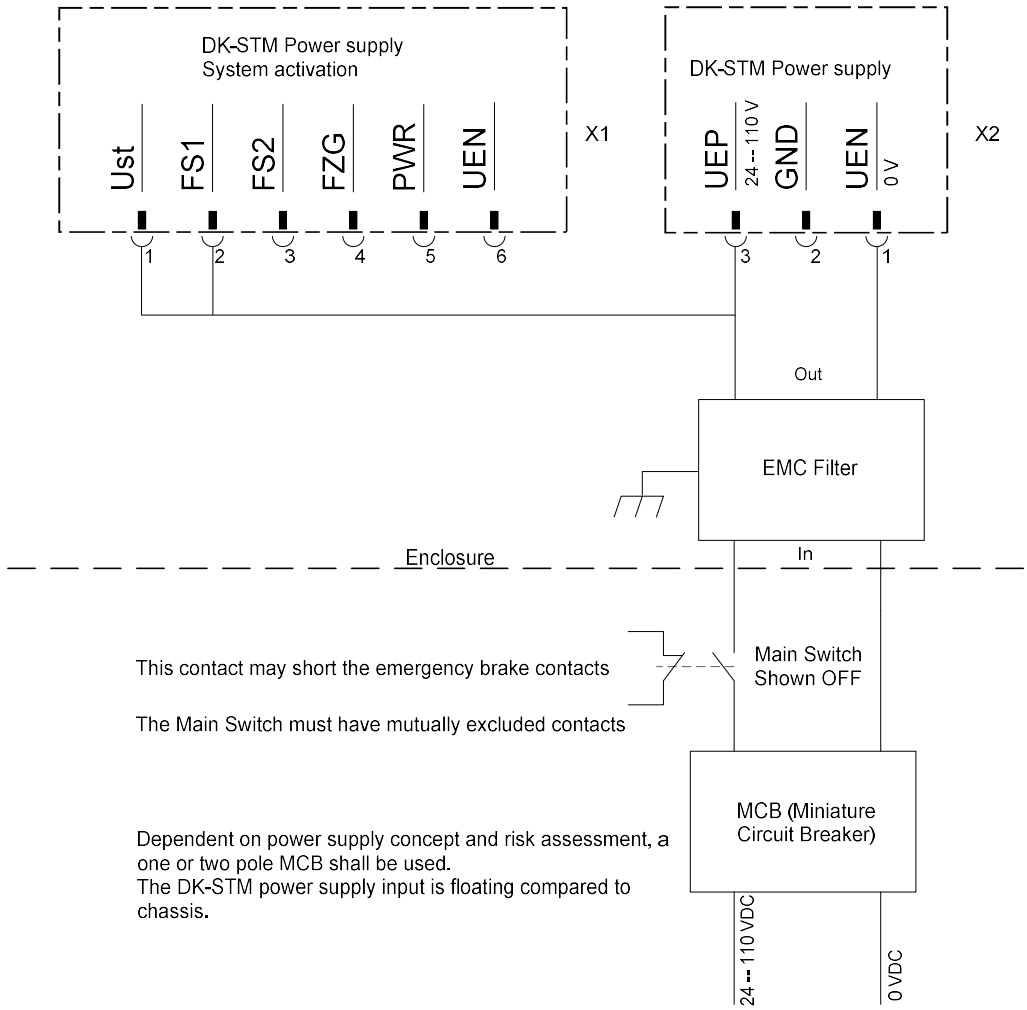


Figure 8 Key Diagram, Connection to Power Supply

It is not mandatory to use the main switch to short circuit the emergency brake contacts. See section 4.7

4.3 Connection to Antenna A and Antenna B

It shall be assured that the A- and B-end of the train is the same for both the EVC and the DK-STM

The antennas shall be connected to two boards, by a 15 pole SUB D connector to the TASSE5 board and by a 48 pole interface connector to the UEBGEN5 board. TASSE5 board is placed at Slot 7 and UEBGEN5 board is placed at slot 8 and 9. Layout of the interface is seen at **Figure 9** and **Figure 10**.

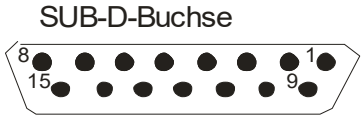


Figure 9 Layout and Counting of the 15 pole SUB D Female Connector

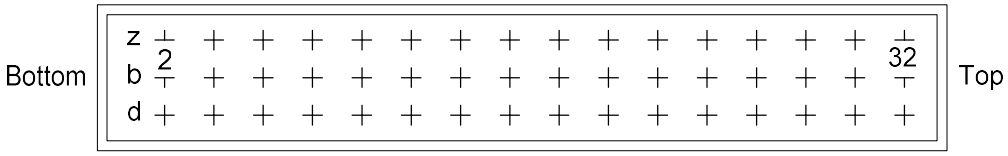


Figure 10 Layout and Counting of the 48 pole Interface Male Connector

Pin Assignment for Antenna A and B

Pin assignment for UEBGEN5 connector, for the antenna A and B is assigned as shown in Table 9.

Front connector UEBGEN5				
X2	**z**	**b**	**d**	**Description**
32	100A	100A	100A	Forward conductor 100 kHz Antenna A
30	RL100A	RL100A	RL100A	Return conductor 100 kHz Antenna A
26	100B	100B	100B	Forward conductor 100 kHz Antenna B
24	RL100B	RL100B	RL100B	Return conductor 100 kHz Antenna B
16	50A	50A	50A	Forward conductor 50 kHz Antenna A
14	RL50A	RL50A	RL50A	Return conductor 50 kHz Antenna A
10	50B	50B	50B	Forward conductor 50 kHz Antenna B
8	RL50B	RL50B	RL50B	Return conductor 50 kHz Antenna B

Table 9 Pin Assignment for UEBGEN5 Connector

Pin assignment for TASSE 5 connector, for the Antenna A and B is assigned as shown at Table 10.

Pin no	**Function**	**Specification**
1	ST5_1 for Antenna A	Connection for 850 kHz circuit for Antenna A
2	ST5_2 for Antenna B	Connection for 850 kHz circuit for Antenna B
3	ST6_1 for Antenna A	Connection for 850 kHz circuit for Antenna A
4	ST6_2 for Antenna B	Connection for 850 kHz circuit for Antenna B

Table 10 Pin Assignment for TASSE5 Connector

Note: If the vehicle has only one antenna, it shall be connected as antenna A, and the terminals for antenna B shall be left open (no external cable) and the connector shall be closed by cap.

4.3.1 Key Diagram, Connection to Antenna A and B

Key diagram for connection of antennas to DK-STM.

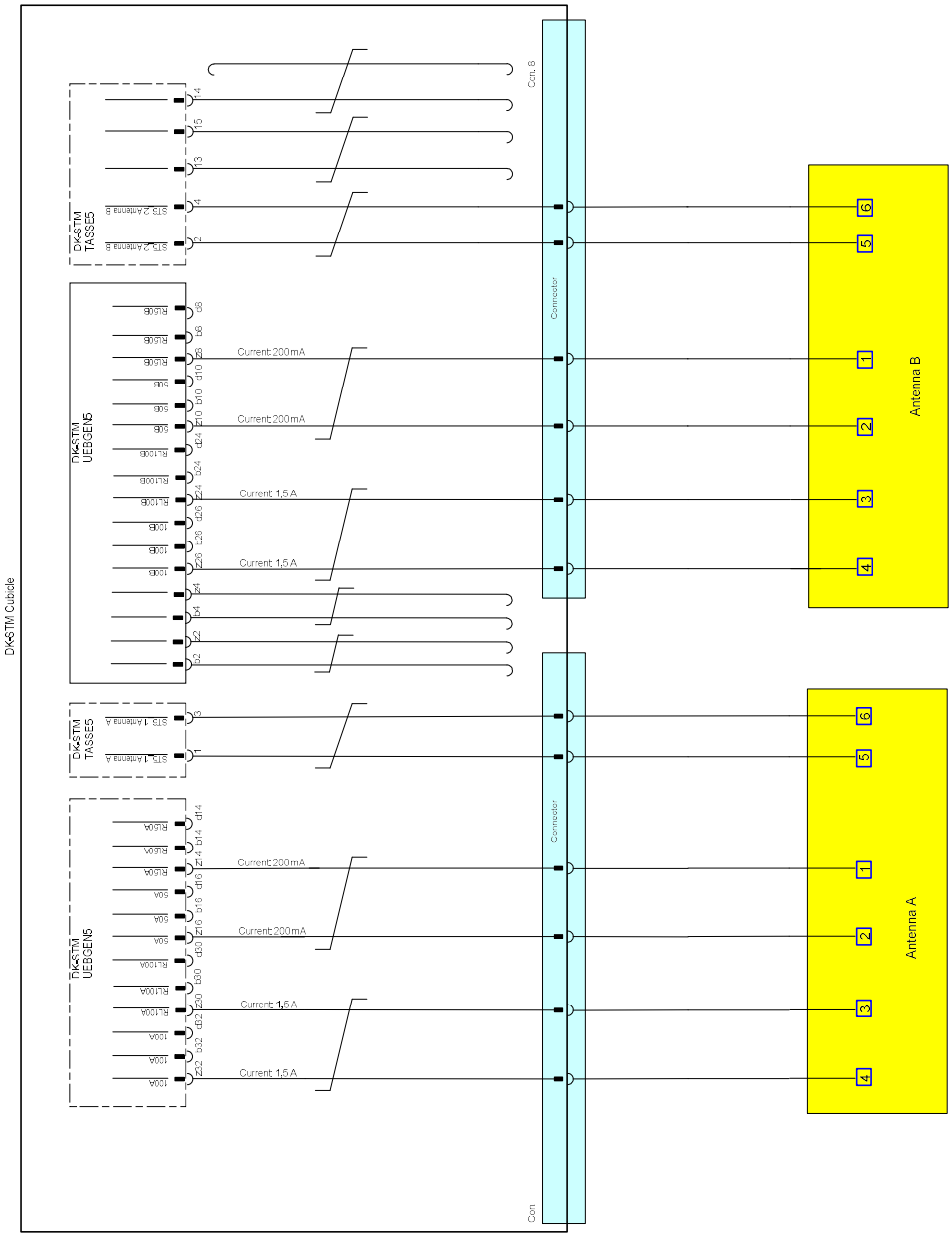


Figure 11 Key Diagram, Connection to Antenna A and B

Maximum cable length from DK-STM to ATC-antennas is 60 meters.
The wiring to the 2 antennas shall be galvanic separated.

The antenna cable shall be shielded, with minimum insulation of 60 V_{eff} and minimum impulse test voltage of 1032 V_p.

At the connection points it shall be ensured that re-inforced insulation to other potentials is sufficient according to EN50124-1

When the DK-STM is installed with a new antenna cable, all wires shall be used for signals, see section 3.2.

However, in old installation with ZUB123, not all wires in the antenna cable from the ZUB123 on board unit to the antenna connection box were used as conductors for the antenna. Such wires shall be grounded at the DK-STM enclosure similar to the grounding at the ZUB123 Onboard unit.

If the antenna cable is to pass between two vehicles, an interconnection cable has to be used. Note the requirements for grounding in section 4.1 and the diagram in section 3.2.

4.3.2 Connectors etc for connection to TASSE5 and UEBGEN5

Necessary components inside DK-STM cubicle, for connecting to UEBGEN5, DIN 48			
Component	**Number of items**	**Supplier**	**Order no.**
Metal house	1	Intermas EL	409 118 572
Cable strain relief	1	Intermas EL	409 118 571
Coding socket	1	Intermas EL	409 034 725
DIN-Power FO48FC-B	1	Harting	09 06 248 3201
Crimp contact	24	Harting	09 06 000 7472 ***)**
Cable 6 x 0,2 x 0,5 mm²		SIEMENS	V25132-Z5-A92
Necessary components inside DK-STM cubicle, for connecting to TASSE5, SUB-D 15 pole			
Component	**Number of items**	**Supplier**	**Order no.**
D SUB MA CRIMP 15 POLE	1	Harting	09 67 015 5601
Crimp contacts	4	Harting	09 67 000 8176 ***)**
Metal hood	1	Harting	09 67 015 0343
Cable 4 x 2 x 0,56 mm²		SIEMENS	V25139-Z1-A30

Table 11 Components for TASSE5 and UEBGEN5 connectors

Cable types are not mandatory
***)** Order no for packages with multiple number of contacts.

4.3.3 Prefabricated cables

Although not mandatory, it is recommended to use pre-fabricated cables to connect the front connectors of UEBGEN5 / TASSE5 to the multiconnectors or terminal strip for the external antenna cable.

4.3.3.1 Cable for TASSE5

Length: 2 m. Supplier: Siemens. Order no: V25132-M1372-A20

Connector pinout
The table shows the 15 pins of the connector. The number inside the table shows the identification number of the wire in the cable.

Pin no	Wire ID
1	1
2	3
3	2
4	4
5	
6	
7	
8	
9	
10	
11	
12	
13	5
14	7
15	6

Table 12 Wire allocation for TASSE5 cable

4.3.3.2 Cable for UEBGEN5

Length: 2 m. Supplier: Siemens. Order no: V25132-M1371-A20

Connector pinout
The table shows the 48 pins of the connector. The number inside the table shows the identification number of the wire in the cable.

Pin no	Row d	Row b	Row z
2		12	11
4		10	9
6			
8			8
10			7
12			
14			6
16			5
18			
20			
22			
24			4
26			3
28			
30			2
32			1

Table 13 Wire allocation for UEBGEN5 cable

4.4 Connection to Havarilog and Diagnose PC

The Serio5 card at slot 1 has two connectors at the frontplate: –X2 and –X8.

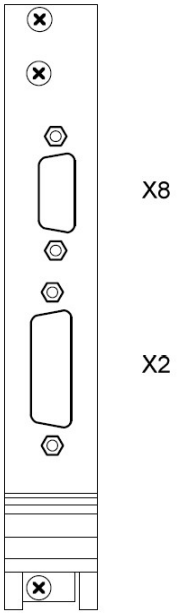


Figure 12 Serio5 Frontplate

Connector –X8 is not to use.

Connector –X2 has two electrical interfaces:

a) RS 232 (Ser_02): Interface to a diagnosis PC.
For use of this diagnosis interface(Ser_02)), please to chapter “7. Diagnosis”.
The RS232 interface (Ser_02) is acc.to standard EIA RS232.
Note: If the diagnosis interface is used when the DK-STM is responsible for the safety, the national authorities shall give the acceptance and the exact conditions shall be agreed upon.

b) Current loop (Ser_04): Interface to the standard ATC (ZUB 123) HLOG.
The current loop (Ser_04) is setup to communicate with the standard ATC (ZUB 123) HLOG.
Note: If the DK-STM is responsible for the safety and the SERIO5 is used as active part in the current loop, i.e. one or both current sources are used, then it shall be shown in the safety case that the use has no negative influence on the safety (specific that the internal 24VDC in the DK-STM is not influenced by the current loop circuit).

The –X2 connector is a male 26 pin Sub-D connector High Density (Amplimite® HD-22) with UNC 4-40 threaded stud

4.4.1 Pin Assignment for Havarilog and Diagnose Connection

Pin no	Function	Interface name	Signalname	Function
12	Diagnosis RS 232	Ser_02	SER2_TXD_T+	TxD
13			SER2_RXD_T-	RxD
5			SER1_SER2_GND	0V
6	Havarilog TTY (Current loop) 20 mA	Ser_04	SER4_TTY_T-	Transmitter, output. Connects to the partners receiver terminal input.
7			SER4_TTY_T+	Transmitter, input. Connects to the current source output, e.g SER4_TTY_I1+, if SERIO5 is the active part.
8			SER4_TTY_I1+	Current source 1 Output. E.g used as transmitter current source when the SERIO5 is the active part
9			SER4_TTY_I2+	Current source 2 Output. E.g used as receiver current source when the SERIO5 is the active part
17			SER4_TTY_R+	SERIO5 receiver input. The current from the partners transmitter flows into this terminal.
18			SER4_TTY_I1-_I2-	Return for current source I1 and I2, when the SERIO5 is used as the active part.
26			SER4_TTY_R-	SERIO5 receiver output. The current from the SERIO5s receiver flows out of this terminal (normally to the return of the current source, e.g. SER4_TTY_I1-_I2-).

Table 14 Pin Assignment for Diagnose and Havarilog

4.4.2 Components for front connector X2 of the SERIO5

RS232 (SER_02):
Use a well shielded cable. The shield shall be connected EMC correctly to the connector shell(s). Maximum cable capacitance: 2500 pF.

TTY (SER_04):
Use a well shielded cable. The shield shall be connected EMC correctly to the connector shell(s). Maximum cable resistance: 100..200 Ohm.

Suggested components for connecting to the X2 Connector on the SERIO5 Board.

Component	Number of items	Supplier	Order no.
Female crimp shell	1	Harting	09 56 200 4701
Crimp contacts	16 (depending on interfaces needed)	Harting	09 56 000 8267
Metal-Hood	1	Harting	09 67 015 0443
Cable	-	-	-

Table 15 Components etc for SERIO5

Order no for crimp contacts refer to packages with multiple number of contacts.

4.5 Connection to ETCS Onboard

Connection to the ETCS Onboard system is made by a 9 pin Sub-D socket with UNC 4-40 threaded stud, on PROFI5 card at Slot 2. The connection shall be made of a twisted pair shielded cable, with low capacitance. The required cable parameters are given at Table 16.

Parameter	Value
Impedance	135..165 Ω
Capacitance	<30 pF/m
Loop resistance	<110 Ω/km
Core diameter	>0,64 mm
Core cross-section	>0,34 mm^2

Table 16 Profibus Cable Parameters

For the used Baud rate 1,5 Mbit/s, the maximum cable length is 200 meters.

4.5.1 Pin Assignment for ETCS Onboard Connection

Pin assignment for X4, Profibus female connector, for connection of DK-STM to ETCS Onboard is assigned as shown in Table 17.

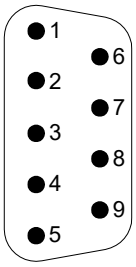
X4	Pin	Designation	Description
	1	-	Not used
	2	-	Not used
	3	RxD / TxD-P	B – Serial Channel, Wire B
	4	-	Not used
	5	GND	M5 – Ground for 5V-Power supply *)
	6	VP	P5 – External 5V-Power supply *)
	7	-	Not used
	8	RxD / TxD-N	A – Serial Channel, Wire A
	9	-	Not used

Table 17 Pin Assignment for Connection of DK-STM to ETCS Onboard

*) only for termination resistors

The connector shall be equipped with termination resistors.

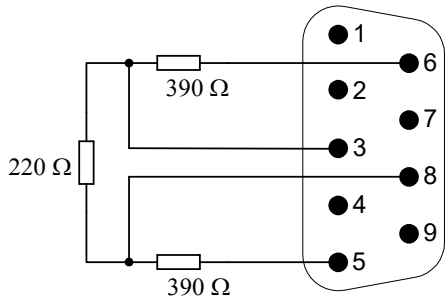


Figure 13 Termination resistors for PROFIBUS

4.6 Connection to Train Brakes and Traction Cut Off

The influence on the train brakes and the traction is made by two safe relay output boards SRAUS5 with 48 pole interface connector, at Slot 3 and Slot 5 in the subrack. Layout of the interface connector is shown in **Figure 14**.
There are the following interfaces:

- 2 contacts for Emergency Brakes
- 2 isolation relay contacts for bypassing the emergency brake contacts
- 1 contact for service brake
- 1 contact for traction cut off
- 2 control inputs for isolation relay coils

All accessible contacts of the output relays and the isolation relays are make contacts = contacts are open when no power is supplied.

The emergency brake contacts are open, when emergency braking is required.
The isolation relay contacts are open, when no bypassing is made. The input control signals are inactive.
The service brake contact is closed, when service brake is required.
The traction cut off contact is closed, when traction cut off is required.

The emergency brake contacts and the isolation relay contacts (if used) are safety critical. In connection with the design of the installation of the DK-STM it must be proved, that no short circuit in connecting cable etc can bypass the emergency brake contacts or cause a false energising of the isolation relays.

Opening of each of the two emergency brake contacts must cause the emergency braking. If the vehicle is equipped with two emergency brake valves, each contact may operate one of the valves, if release of just one valve causes an emergency braking.

The two emergency brake contacts may each be paralleled by a isolation relay contact. See description of way of working in section below.

The service brake and the traction cut off are not safety critical.
If higher contact loads for the service brake or the traction cut off are required, or if more contacts are required or if the reverse function (normally closed contact) is required, slave relays can be used. Such slave relays may be placed inside the enclosure. Note the requirement for max 2 A fuse for short circuit protection of the SRAUS5 contacts and the maximum permissible load on the contacts.

4.6.1 Power Supply of DK-STM versus emergency braking

For safety reasons the emergency braking output are performed by make contacts of relays, which are energised when no emergency braking is required.

The DK-STM is made in such a way, that the emergency brake relays are always energised (contacts closed) unless:

- DK-STM is in state "NP" (no power)
- DK-STM is in state "PO" checking the relays

- DK-STM is in state "DA" and requires an emergency braking
- A fatal condition has occurred inside the DK-STM

This means, that the contacts are also closed, when the DK-STM works correctly and the ERTMS is in charge.

However, the vehicle shall be moveable if the DK-STM is faulty. To release the brake, the emergency braking contacts have to be bypassed (shorted).
When the emergency brake contacts of the DK-STM are bypassed, it must be detected by the ETCS Onboard system.
There are two ways of doing this, and they may both be used on the same DK-STM:

- Using a DK-STM main switch with mutually excluded make and break contacts. When power to the DK-STM has been cut off, the emergency brake contacts are shorted. When the short circuit of the emergency brake contacts has been removed, the power is supplied to the DK-STM. DK-STM in state "NP" (no power) shall be recognised by the ERTMS Onboard.

- Applying a voltage to the two "Isolation Relays" of the SRAUS5 board for the emergency brake. When the first relay has left the dropped off position, the DK-STM enters state FA. This shall be recognised by the ETCS. When both override relays have picked up, the make contacts of the emergency brake relays are shorted (= emergency braking by the DK-STM is impossible). In this mode, the power can be maintained to the DK-STM.

Both ways are demonstrated in the diagrams of principle.

4.6.2 Pin Assignment for Service Brake, Emergency Brake, Traction Control and Isolation Switch

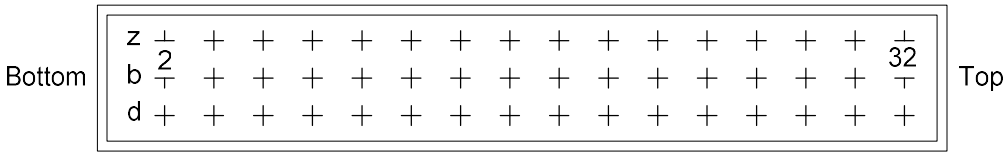


Figure 14 Pin Layouts at 48 pole Interface Male Connector

Pin assignment at SRAUS5 boards at Slot 3 and Slot 5 connector for Service Brake, Emergency Brake, Traction Control and Isolation switch is shown below

SRAUS5, Slot 3		SRAUS5, Slot 5	
Pin no	**Description**	**Pin nr.**	**Description**
z26	Emergency Brake Contact		
z4			
d24	Isolation Relay contact		
d6			
z24	Emergency Brake Contact	Z26	Service Brake Contact
z6		Z4	
d28	Isolation Relay Contact	Z24	Traction Control Contact
z28		Z6	
z2	Isolation Relay Coil		
d2			
z32	Isolation Relay Coil		
d32			

Table 18 Pin Assignment for Service Brake, Emergency Brake, Traction Control and Isolation Switch

4.6.3 Key diagram for connection of Emergency Brake

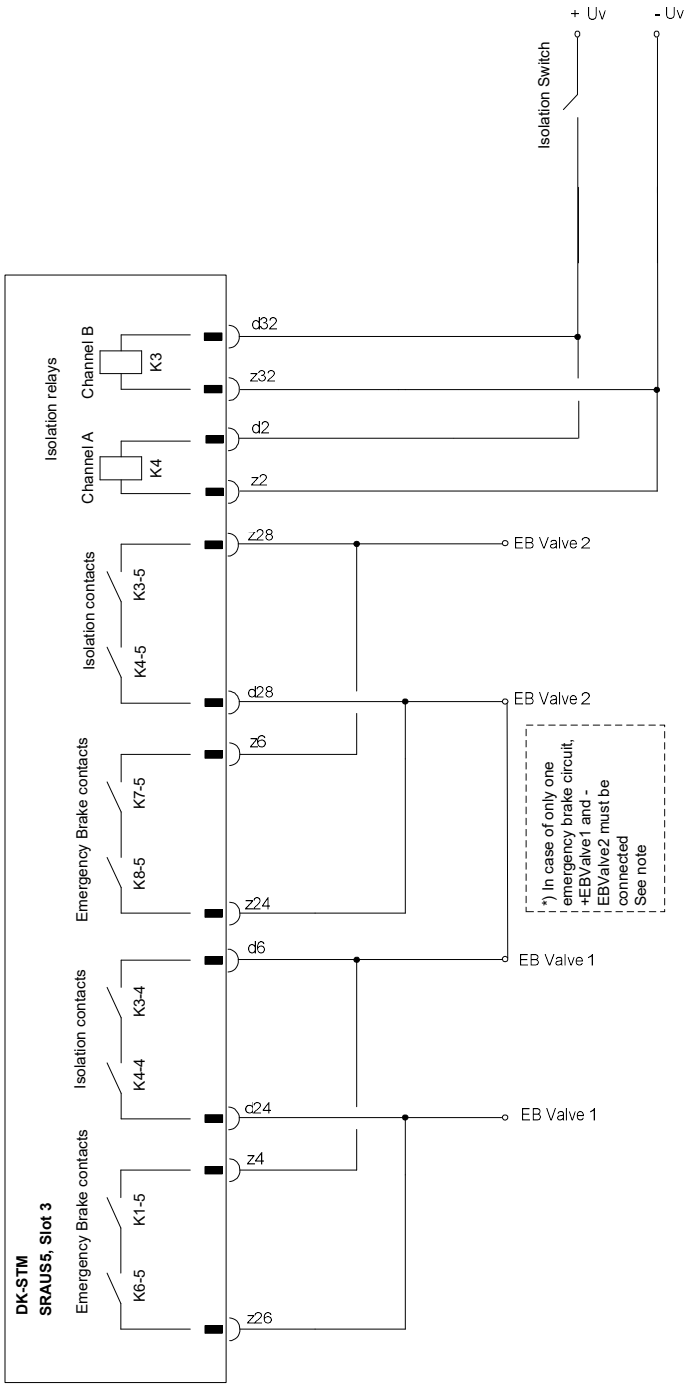


Figure 15 Key-diagram for connection of Emergency Brake

Note the requirements for the voltage to energise the isolation relays in a later section.

4.6.4 Key diagram for connection of Service Brake and Traction Cut-OFF

Key diagram at SRAUS5, Slot 5 interfaces for Service Brake and Traction Cut-OFF is shown at **Figure 16**.

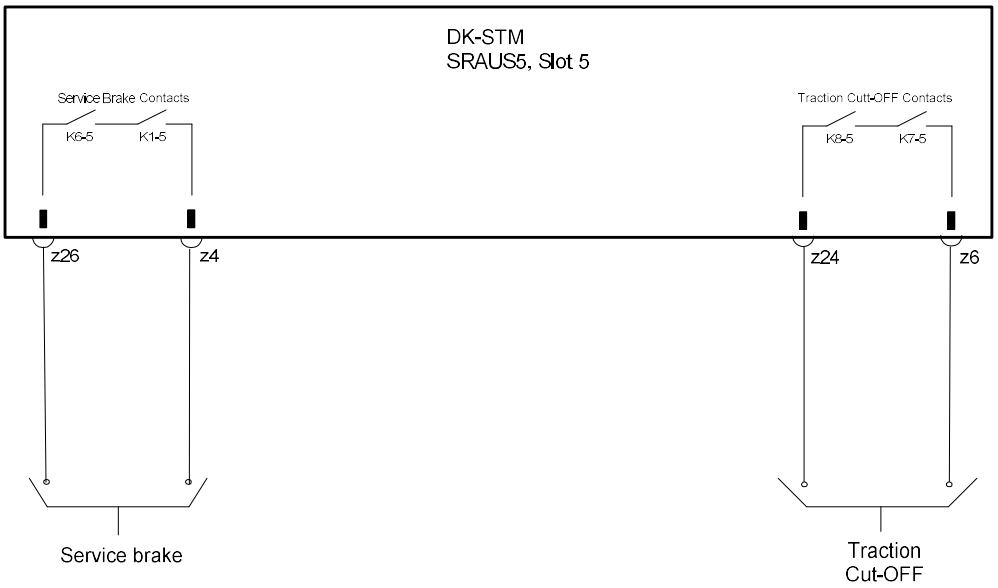


Figure 16 Key-diagram for Service Brake and Traction Cut-OFF

4.6.5 Electrical Specifications

If the Power Supply is not coming from the battery the allowed voltage tolerance is +- 30 %

The safety is related to the max. value of +30% and shall not be exceeded.

4.6.5.1 Cut out of (a faulty) DK-STM

The "isolation relays" shall be energised according to this table:

Isolation switch coils – Voltage supply **± 30 %** (short-term ≤ **1 s** to **+ 40 %**)			
Voltage range (Variant: -A2, 24 V DC nominal)	16.8 V_{DC}	24 V_{DC}	**31.2 V_{DC} (33.6 V_{DC})**
Current consumption (typ. for both relays together)		135 mA	
Voltage range (Variant: -A24, 110 V DC nominal)	77 V_{DC}	110 V_{DC}	**143 V_{DC} (154 V_{DC})**
Current consumption (typ. for both relays together))		30 mA	

Table 19 Operating voltage for Isolation Relays

4.6.5.2 Properties of the relay contacts

The contacts of the fail safe output relays and the "isolation relays" may be used in circuits with a voltage different from the supply voltage, but the load current shall be limited according to the tables below.
Relay coils with free wheeling diodes are regarded as resistive loads.

Contact loading of fail safe contacts by resistive load			
	Voltage (**+30 %,** short-term ≤ **1 s** to **+40 %**)	Max. operating load current/ Max. no of switch cycles	Maximum fuse rating for cable protection
Nominal 24 V DC	24 V (**max. 33.6 V**)	**1.5 A [1] / 400 000**	**2 A**
Nominal 36 V DC	36 V (**max. 50.4 V**)	**1.5 A [1] / 400 000**	
Nominal 48 V DC	48 V (**max. 67.2 V**)	**1 A [1] / 400 000**	
Nominal 72 V DC	72 V (**max. 100.8 V**)	**0.5 A [1] / 300 000**	
Nominal 110 V DC	110 V (**max. 154 V**)	**0.3 A [1] / 200 000**	

Table 20 Contact rating for resistive load

It is essential that the operational load current does not exceed the specified values, since the max. 2 A fuse is only for cable and connector protection.

When switching inductive loads (to $T_{0.95}$ ≤ 300 ms, category DC-13 after /EN60947-5-1/ for DC inductive loads), the load current shall be limited according to this table:

Contact loading of fail safe contacts by inductive load, $T_{0.95}$ ≤ 300 ms			
	Voltage (**+30 %,** short-term ≤ **1 s** to **+40 %**)	Max. operating load current/ Max. no of switch cycles	Maximum fuse rating for cable protection
Nominal 24 V DC	24 V (**max. 33.6 V**)	**1.5 A [1] / 300 000**	**2 A**
Nominal 36 V DC	36 V (**max. 50.4 V**)	**1.5 A [1] / 200 000**	
Nominal 48 V DC	48 V (**max. 67.2 V**)	**1 A [1] / 150 000**	
Nominal 72 V DC	72 V (**max. 100.8 V**)	**0.5 A [1] / 100 000**	
Nominal 110 V DC	110 V (**max. 154 V**)	**0.3 A [1] / 50 000**	

Table 21 Contact rating for inductive load

1) It is essential that the operational load current does not exceed the specified values, since the max. 2 A fuse is only for cable and connector protection.

4.6.6 Front Connectors for SRAUS5

Necessary components for connecting to X2 Connector on SRAUS5 Board at Slot3 and Slot5.

Component	**Number of item**	**Supplier**	**Order no.**
Metal house	2	Intermas EL	409 118 572
Cable accessories	2	Intermas EL	409 118 571
Coding accessories	2	Intermas EL	409 034 725
Plug	2	Harting	09 06 248 3201
Crimp contact	16	Harting	09 06 000 7472

Table 22 Components for SRAUS5 front connector

5 Configuration of DK-STM

After installation of the DK-STM, it shall be configured to the train type.

This is done on the DMI in the start up sequence, where the Specific Train Data is requested for the DK-STM.

In the menu for the Specific Train Data, the code “3112” shall be written in the field with caption “Maintenance code”.

A maintenance menu will appear where the current configuration is shown as preset values. It is possible to:

1. Read the Software Version Number
2. Change the Litra code/Train Type
3. Set the interval for transmitting the STM max speed
4. Trim Antenna A or trim Antenna B

After the configuration is done, the configuration shall be sent to the DK-STM by activating the “Confirm”-button.

After configuration, the DK-STM must be restarted.

After first start-up it shall be controlled, that the DK-STM starts-up correctly, i.e. arrives at state DA with the ‘Valg’-button shown.

5.1 Software Version Number

Caption: “DK-STM SW version”
Type: not editable string

It consists of a three-part number that is added by a ‘2’ or ’3’ representing the current version compatibility (‘2’ = version 2.3.0d, ‘3’ = Baseline 3).

5.2 Litra Code / Train Type

Caption: “LITRA number”
Type: integer

If the Litra Code is changed, it shall be verified and retained (normally done in the commissioning protocol for the train) after the next startup, that the correct Litra Code is shown in the Maintenance Menu.

The train type determines 3 parameters

- over speed
- type factor
- monitoring of balises during reverse shunting

Note: The designation "Litra" needs not correspond to the actual train type, but the choice of Litra code determines the "over speed", "type factor" and "reverse monitoring" properties, and these must be correct for the actual train type.

5.2.1 ATP train

If the train is given the Litra Code 75, then the train will be treated as an ATP train, which means, that the train will react immediately on a balise error instead of waiting 25m as a normal ATC train will do.

5.2.2 Over speed

The parameter "over speed" set to "yes" permits the train to use the over speed profile of the infrastructure coded in the ZUB123 balises. To use this over speed, all vehicles of the train shall comply with specific Banedanmark requirements on track forces when travelling at high cant deficiencies, and the train type must possess a formal permission from Banedanmark.

The choice is safety critical.

5.2.3 Type factor

The type factor, TypFak, relates to calculation of brake curves.
The max deceleration B [m/s2) is calculated from the brake percentage λ by the Mindener formula.
The emergency deceleration BZ is always calculated to 0.833 x B.

The service brake deceleration is calculated as B x TypFak.
There is a choice between two fixed values: 0.7 and 0.61.

Generally the value 0.7 is used, but on trains, where a magnetic rail brake is included in the calculation of λ (the magnetic brake is supervised), the TypFak is set to 0.61. This lowers the service brake curve, enabling the driver manually to brake the train under the service brake curve without applying the magnetic rail brake.

The choice is not safety critical, but if a train wrongly gets the value 0.7, it might be difficult for the engine driver manually to brake the train below the emergency brake curve without applying the magnetic rail brake.

5.2.4 Monitoring balises during reverse movement

The parameter set to "yes" causes a train shunting in reverse direction (as seen from the manned cab) to stop the train if a balise or loop transmitting "STOP" or "NØDSTOP" (emergency stop) is read by the antenna in the direction of travel.

The value "yes" requires two antennas connected to the STM.

The choice is not safety critical

5.2.5 Available Litra codes

Litra	Litra code	Over speed	Type-Factor	Reverse monitoring
MZ I + II	00	no	0.7	yes
MY	01	no	0.7	yes
MZ III	20	no	0.7	yes
MZ IV	30	no	0.7	yes
EG	31	no	0.7	yes
BR 185	32	no	0.7	yes
BR 189 / Vectron / Taurus	33	no	0.7	yes
Class 66	34	no	0.7	yes
Class 66	35	no	0.7	yes
MR / MRD	40	no	0.7	yes
ME	50	no	0.7	yes
EA	60	no	0.7	yes
Test /a	61	no	0.7	yes
ABns	70	no	0.7	**no**
SW98a1	71	no	**0.61**	yes
SW98a2	72	**yes**	**0.61**	yes
SW98a3	73	**yes**	**0.61**	yes
SW98a4	74	no	0.7	yes
ATP train	75	no	0.7	yes
NBTb	76	no	0.7	yes
NBTc	77	no	0.7	yes
MQ (Desiro)	78	no	0.7	yes
Coradia	79	no	0.7	yes
Bns-e	80	no	0.7	**no**
IC4a	81	no	0.7	yes
MG (IC4)	82	**yes**	0.7	yes
MF (IC 3)	90	**yes**	**0.63**	yes
ER (IR 4)	91	**yes**	**0.63**	yes
ET (OTU)	92	**yes**	0.7	yes
X2 med traktion	93	no	0.7	**no**
X2 uden traktion	94	no	0.7	**no**
Test /#	95	no	0.7	yes
ABS (styrevogn)	96	no	0.7	**no**

Table 23 Litra Code / Train Type

After a Litra coder has been written, the DK-STM changes to the FA-state and must be restarted.

If the train is configured to a Litra code, which does not exist, it will not be accepted. To check if the configuration of a Litra code has been successful, it is necessary to open the maintenance menu again after restart, and see if the desired Litra code appears in the “Litra number” field.

5.3 New Train Type

If the DK-STM is to be installed in a new train type, a suitable litra code has to be selected. The choice has to be approved by BDK.

5.4 Set the transmitting interval for STM max speed

The train can be parameterised to frequently send its supervision speed in the transistion area, where the DK-STM is ordered to the state “HS”

Caption: “V_MAX interv(100ms)”

Values:

0	no STM max speed will be send
1	will automatically be treated as 2
2 -250	Raster in 100 ms, when the STM max speed will be send (200ms to 25s)

5.5 Tuning of Antenna A or Antenna B

The antennas A or B can automatically be tuned in this menu.

Before tuning of the antenna it shall be assured, that the antenna is not closer than 2 meters to any balise or loop. The vehicle shall stand on a normal type of track, i.e. without extra metal parts within 2 m from the antenna.

The vehicle shall be in thermal equilibrium with the surroundings. The temperature shall be in the interval between -10°C and +40°C. *To ensure the thermal equilibrium, the vehicle can be placed in the specified temperature interval for approximately 4 hours.*

The STM-DK subrack shall be powered for at least 5 minutes, before performing antenna tuning.

In the Data Entry position the Maintenance window is selected by entering 3112 in the Maintenance code and Antenna Tuning is selected by CAB A or CAB B

The tuning of the antenna at Cab A is initiated from Cab A, and the antenna at Cab B is initiated from Cab B.
Definition: By Alstom: Cab A is the Cab closest to the EVC.

Caption: “Antenna Tuning”
Type: pick-up list

Values:

“no”	no tuning will be performed (preset value)
“Cab A”	tune antenna of cab A
“Cab B”	tune antenna of cab B

The tuning takes about 1 minute.

When tuning is selected, the text “running A” or “running B” will be shown, dependent of the selected antenna.

By pressing the “enter-button” on the DMI after 1 minute, the result of the tuning will be shown on the DMI.

The result can be one of the following:

1. FF555 selected antenna is tuned, OK
2. FF590 selected antenna B is tuned OK, but antenna A needs to be tuned
3. FF591 selected antenna A is tuned OK, but antenna B needs to be tuned
4. FF592 tuning 100 kHz failed
5. FF593 tuning 50 kHz failed
6. In any other cases: FF556 selected antenna is tuned, NOT OK

FF591 will be shown as the result of tuning of the antenna in a train with only 1 antenna. This antenna shall be installed as in the A-end of the train.

To finish the tuning press the “X”-button on the DMI.

After the antenna tuning the STM-DK subrack shall be restarted.

6 Functional Test

After the installation, the correct function of all interfaces of the DK-STM must be tested. The functional test is performed according to “Dokumenteret Slutafprøvning”, /13/.

7 Diagnosis

To use the diagnosis, the following equipment shall be used:

1. PC with a serial COM Port
2. DB26 pin high density SUB D - DB9 service cable
3. Terminal program

The terminal program shall use the following communication parameters:

1200 Baud
8 Data bit
Odd parity
1 Stop bit

The diagnosis PC shall be connected to the RS232 interface in the connector X2.
The use of diagnosis is equal to the diagnosis of the ZUB123/LZB-DSB.
After connection the terminal program shows the actual configuration of the ZUB component of the DK-STM. An example:

```
1)  1.87074<0xff01> ZUB123/LZB-DSB Ausgabestand:137
2)  1.87074<0xff01> ZUB123 STM Version 1.39
3)  1.87074<0xff01> Copyright (c) SIEMENS AG Mobility
4)  1.87074<0xff01> Loktyp links:   2   MZ III
5)  1.87074<0xff01> Loktyp rechts:  0
6)  1.87074<0xff01> Raddurchmesser: 0611  mm
7)  1.87074<0xff01> Ausgabe an Funk        /EIN
8)  1.87074<0xff01> Ausgabe an TC          /EIN
9)  1.87074<0xff01> Ausgabe an Havarilog   /EIN
10) 1.87074<0xff01> NeueFehlAnz (RestwegZ1)/AUS
11) 1.87074<0xff01> Z1-Ueberwachung        /EIN
12) 1.87074<0xff01> V_Ist_UnkorrigiertamFST/EIN
13) 1.87074<0xff01> SchlupfKorrektur       /AUS
14) 1.87075<0xff01> FstAVorwaertsRichtung1 /EIN
15) 1.87075<0xff01> DSB-Fernbahn
```

Only the lines 4, 5, 7 and 9 have relevance for DK-STM. The rest are internal fixed parameters. The shown data has the meaning:

1)	ZUB123/LZB-DSB	SW-version	(actual value)
2)	ZUB123 STM	SW-Version	(actual value)
3)	Copyright notice		(fixed text)
4)	The selected litra type, first digit + name		(selectable value)
5)	The selected litra type, second digit		(selectable value)
6)	Wheel diameter	611mm	(fixed value)
7)	MSR3 radio	enabled	(selectable value)
8)	TC train computer	enabled	(fixed value)
9)	Havarilog	enabled	(selectable value)
10)	Simplificeret displaying of error codes	OFF	(fixed value)
11)	Z1-monitoring	ON	(fixed value)
12)	Velocity, corrected for spin/slide	OFF	(fixed value)
13)	Spin correvtion active	OFF	(fixed value)
14)	Odometer orientation	ON	(fixed value)
15)	DSB-Fjernbane		(fixed text)

Line 4) and 5): value ”2 MZ III” resp. ”0” means train type ”20” = MZ III.

To access the diagnosis menu use the:

LOGIN<space><Return>

Then the following appears:

```
01) FIFO Informationen. . . .[YN]   02) Dekodierte Streckentel. .[YN]
03) LA   Informationen. . . .[YN]   04) GKS  Informationen. . . .[YN]
05) BetriebsZustandsWechsel .[YN]   06) BetriebsZustandsDaten . .[YN]
07) Richtungsbearbeitung. . .[YN]   08) ZugdatenAnzeige . . . . .[YN]
09) ZugdatenTask Messages . .[YN]   10) FST-Anzeigen bei Wechsel.[YN]
11) FST-Anzeigen zyklisch . .[YN]   12) Bremsverursacher Info . .[YN]
13) V_BB, V_ZB, Restweg . . .[YN]   14) ZKS-Anschaltung . . . . .[YN]
15) WISIR Informationen . . .[YN]   16) GleitSchleuderProtkl. .[KMYN]
17) Interruptinformationen. .[YN]   18) FahrzeugTelegrammProtkl .[YN]
```

The meaning of the different items in the menu is described in: ”Beschreibung der ATC-Diagnose-Schnittstelle”, ref. /8/.

Appendix 1 Configuration test procedure (1 of 1)

This configuration test procedure ensures that the DK-STM is configured with the correct Litra code /train type. The test of configuration correctness must be performed after every entrance in the maintenance menu, so inadvertent change of train data is detected.

1. Perform the diagnosis on DK-STM, as it is described in chapter 7.

2. Read out and note the Litra code of the train.

Train type (Litra code): _____