DK-STM

Documented Final Test

banedanmark

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		Replaces G81001-X3107-U508			
		Approved by Banedanmark 23-10-2015 ECP			
	Version1 Date and initials	Lastest version Date and initials	Mål -	Drawing name **DK-STM** **Documented Final Test**	
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1 Introduction

This specification describes how the function test of the DK-STM should be performed. The reader of this specification should be familiar with:

- DK-STM Installation Manual /1/

1.1 Change Log

Version	Date	Author	Changed sections	Reason for change
01	2012-10-17	ALM	Prepared	Document prepared
	2012-11-07	ALM	all	Review-01
	2013-01-29	ALM	all	Updated because of G81001-X3107-U506-03 change
02	2013-02-04	ALM	all	Review-02
03	2013-03-20	ALM	all	Updated after ALSTOM comments
	2013-05-14	ALM	all	Updated according to DTR0100025546-B diagrams
04	2013-05-22	ALM	all	Review-02
05	2013-07-30	ALM	all	Updated after ALSTOM comments and STM commissioning
06	2013-09-02	ALM	most	Test of H-log input for Main Switch and SIS. Other minor changes.
07	2013-10-18	ALM	most	Version D of DTR0100025546. Section 6.1.5 Test of System Isolation Switch re-established. Title: 6.1.6 Test of the MSR3 and Havarilog Interfaces re-established
08	2014-11-26	ALM	most	Updated after DK-STM has entered baseline 3.0 and Build-in in a cubicle
09	2015-02-10	ALM	most	Updated after meeting with BDK + review
10	2015-04-27	PJH	minor	Updated reference and update Figure 1

Siemens version 10 has been delivered and approved by BDK.
BDK will be in charge of maintaining and future updating of the document.

01.00	2015-06-23	ECP	most	Minor graphical changes in the layout, Add-ons from DSB and BDK front page added.
01.01	2015-10-23	ECP	all	Imported the Siemens document into a Banedanmark lay-out. A new chapter 5 has been added.
01.02	2016-01-07	ECP	all	Adjustment after the first use of this document version 01.01 on the 16.12.2015.
01.03	2016-04-18	ECP	5	Train number changed to Train type number.
01.04	2016-07-07	ECP	Most	Update references to documents /1/ and /6/. Updated table in sec. 5. Add of sec. 6.2. Minor changes after first commissioning.
01.05	2016-11-28	XAAV/ ECP	4.2 + appendix 1	Photos of serial numbers added. Serial number lines in App.1 added.
01.06	2017-01-24	XAAV	App. 1	Added: “Connector Plate serial no.”
01.07	2017-06-12	XAAV	4 + App 1	Added reference 7.
01.08	2017-06-22	ECPn	4 + App 1	Added SW version of EVC.

Version	Date	Author	Changed sections	Reason for change
01.09	2017-11-17	XAAV	1.5 + 4.2+App1	Add new chapter 1.5, new figure in chapter 4.2 and changed schema in App.1.
01.10	2018-06-01	ECPn	5 + 7.1.4 + 7.2.3 + App 1	MSR3 has been substituted with max. speed. Added test of reset function.
01.11	2018-07-16	ECPn	1.2, 1.5, 5	Removed versions from ref. list. For SW update, version shall be filled in. Litra code for Lint Coradia changed from 79 to 76. DSB litra EB is a Vectron loco.
01.12	2019-01-07	ECPn	4 + App 1	Added fields for registering previous version.
01.13	2020-01-13	ECPn	5 + App 1	Move “EB” up to Vectron line. Add field for check of antenna tuning in JRU. Add info about storing this document.
01.14	2020-04-24	ECPn	App1	Add “or N/A” for check of antenna tuning. Add “Company” and “Name” over signature.
01.15	2022-11-09	ECPn	3	Not a must to bring PC anymore.

1.2 References

Document incl. Title and Unique Identifier	Ref.	Reference ID
DK-STM Installation manual	/1/	IN 655.00 Q 2962
User's Manual for Debug Terminal DK-STM	/2/	G81001-X3107-U537
DK-STM Users' Manual	/3/	IN 655.00 Q 2960
Installation design guide (Train type Specific)	/4/	----------
DK-STM Cubicle Electrical Interface	/5/	G81002-E3106-U500
DK-STM Cubicle Installation Manual	/6/	IN 655.00Q4432
DK-STM Cubicle Final Inspection Report	/7/	G81002-E3134-F005

1.3 Limitations

This specification only describes how the functional test of DK-STM shall be performed.

1.4 Prerequisites

Before the DK-STM function test can be started, the installation must be tested according to the installation diagrams for the specific train type, /4/. The DK-STM cubicle shall be factory tested by DK-STM supplier.
It also must be insured that the installation of the DK-STM Cubicle, which is described in DK STM Cubicle Installation Manual /6/, is successfully carried out.
It also must be insured that the configuration of the DK-STM, which is described in the Installation Manual, Chapter 5, Configuration of DK-STM /1/, is successfully carried out.

1.5 Test needed if DK-STM SW is updated

For SW updates, the test may be limited to registration of the new SW version, section 4.1, and four function test, cf. sections 7.1.1 and 7.1.2, 7.2.1 and 7.2.2. All controls must also be carried out and documented.

When installing or replacing hardware, all tests and controls must be completed and documented.

1.6 Terms and Abbreviations

Term	Explanation
ATC	Automatic Train Control
DK-STM	STM dedicated for Danish Infrastructure
ETCS	European Train Control System
EVC	European Vital Computer
FA	STM Failure state
DA	Data Available (STM is in monitoring mode)
CS	Cold Standby (STM is in hibernate state)
SB	Standby mode

2 DK-STM Cubicle Overview

To give a basic understanding of DK-STM and its interfaces, an installation overview of the cubicle is shown in Figure 1.

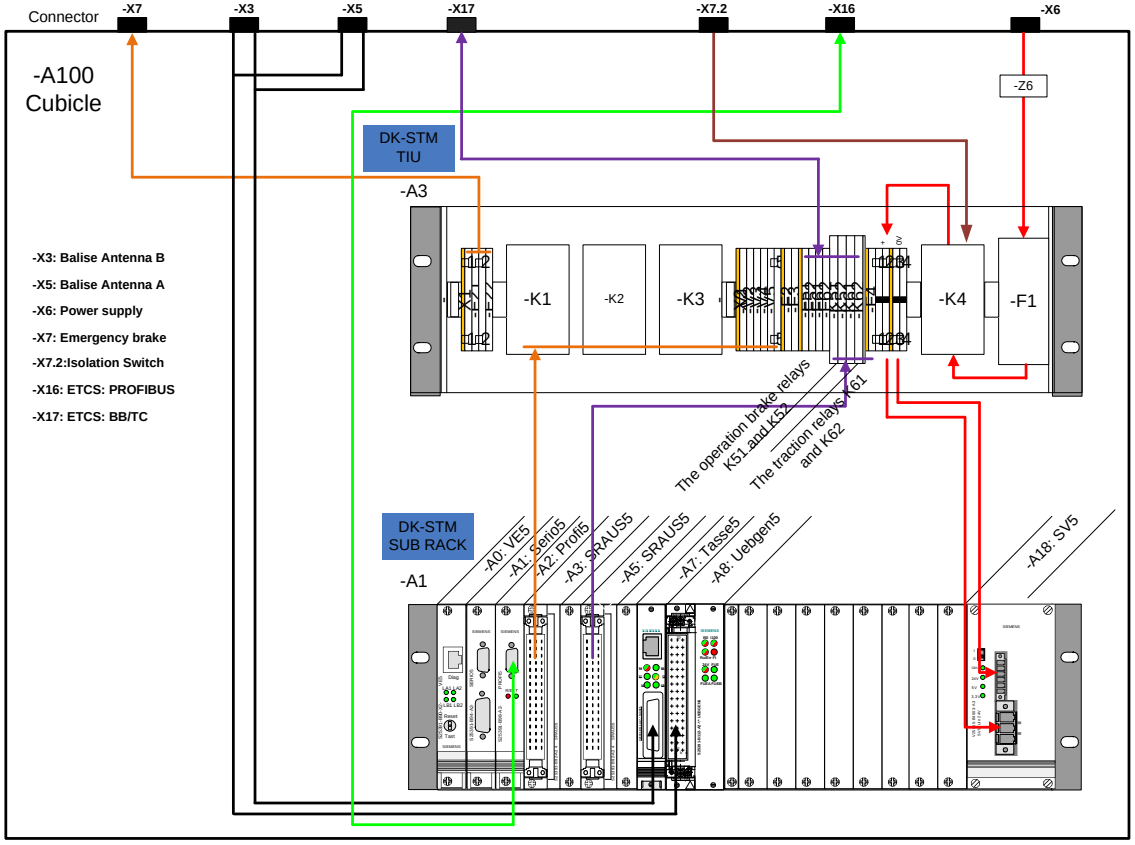


Figure 1 DK-STM Cubicle overview

K1, K2, and K3 are the so called 3-relay solution for the emergency brake relays.

When the emergency brake is activated: K1 activated, K2 and K3 de-activated.
When the emergency brake is de-activated: K1 de-activated, K2 and K3 are activated.

K4 is the bypass relay, which when active power-offs the DK-STM and bypasses the emergency brake circuit.

The LEDs of K51 and K52 are active when the service brake is active.

The LEDs of K61 and K62 are active when the traction is cut off.

3 Tools and Instruments

To perform the function test on DK-STM the following tools and instruments shall be used:

Equipment	Type	Serial No.
ATC ZUB 123 Test Balise(1) (Delivered by BDK)	Test Balise	

(1) An ATC ZUB 123 Test Balise that sends the GK=8 telegram BZBPR (Brake test). Most DSB workshops has this test balise.

In case you would like to perform point 6.1, you also need to bring:

Equipment	Type	Serial No.
PC equipped with Windows XP or later, and a RS232 serial port		
DB26-DB9 service cable		
SW: Debug Terminal DK-STM		SW ver.: Version 1.2 or later. Another terminal program configured with 1200 Bd, 8 Bit, Odd parity, 1 stop bit can be OK.

Time for the commissioning test is approximately 1 hour.

Note that at completion of the commissioning, the JRU/DRU file shall be checked (appendix 1 page 4) and saved in the technical dossier.

4 SW and HW-Version

4.1 Software

DK-STM software version shall be noted and added to the documented test in appendix 1. When changing the SW, the previous version ought to be noted too. The SW-version can be seen in the maintenance menu. See note below or Bilag G in DK-STM User's Manual /3/.

Note
The maintenance menu is accessed from the ATC train data entry dialog. Chose the "Maintenance Code", and enter "3112".

To enable the Technical Expert later on to verify, that the DK-STM has been connected to an EVC with a legal version of software, the EVC SW version shall also be registered in Appendix 1.

4.2 Hardware

DK-STM cubicle consist of below listed hardware, known as Lowest Exchangeable Units (LEU).

- DK-STM SUB-RACK
- Train Interface Unit (TIU)
- Connector plate

To keep track on the configuration for each cubicle, the version and serial number for each LEU shall be checked and verified with reference to /7/ and noted in the protocol appendix 1.
In case of repair, where one or more components are exchanged, the previous version ought to be registered too.

The figure below shows an example of the serial and version numbers to be registered in appendix 1.

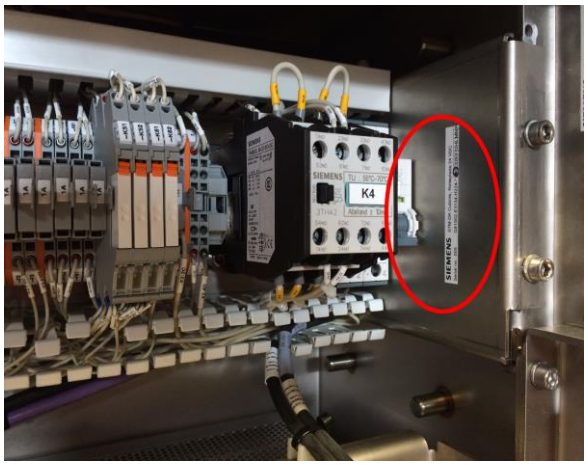
Traceability

STM-DK Cubicle, Train Interface Unit (TIU) G81002-E3134- (H224, H272 or H210)	H 224 - B
Serial no:	0005
STM-DK Cubicle, Connector plate G81002-E3134-	H300- A
Serial no:	0009
STM-DK Subrack G81002-E3135- (H024 or H110)	H 024 - C
Serial no:	0005

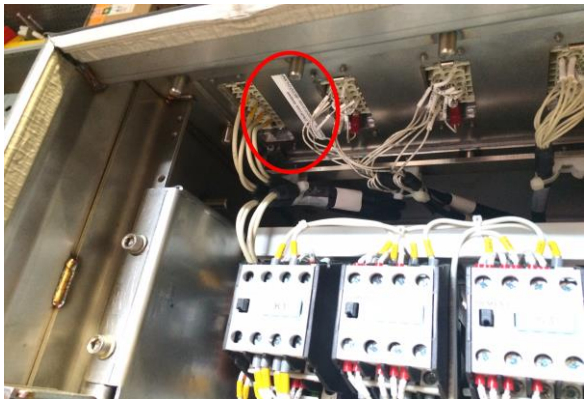
Label for the cubicle serial number is placed outside the cubicle (see picture).

The numbers are unique for each cubicle and include information about power, version and serial number.

TIU Serial number is shown on a label on the right side of the mounting plate (see picture).



Connector Plate serial number is shown inside top of the cubicle (see picture).



STM-DK SUB rack serial number is shown on the left side of the rack (see picture).

5 Train Parameters

Train parameters are checked by entering the Maintenance menu.
The following train parameters shall be checked:

- V_MAX interv(100ms) (always 0)
- H - log Enabled/disabled (always disabled)
- Train Type Number

These configuration data shall be noted and added to the documented test in appendix 1.

Each Litra corresponds to a given Train type number according to the table below.
It must be checked that the correct Train Type Number is registered in the STM.

Litra	**Train Type Number**
MZ I + II	00
MY / MX	01
MZ III	20
MZ IV	30
EG	31
BR 185	32
EB / BR 189 / Vectron / Taurus	33
Class 66	34
Class 66	35
MR / MRD	40
ME	50
EA	60
Test /a	61
ABns	70
SW98a1	71
SW98a2	72
SW98a3	73
SW98a4	74
Lokaltog with ATP on HHGB	75
Coradia	76
NBTc	77
MQ (Desiro)	78
NBTe	79
Bns-e	80
IC4a	81
MG (IC4)	82
MF (IC 3)	90
ER (IR 4)	91
ET (OTU)	92
X2 med traktion	93
X2 uden traktion	94
Test /#	95
ABS (styrevogn)	96

Note: The system shall be reset after the ATC train type has been set, and after an antenna has been tuned.

6 Antenna Tuning Test

From DK-STM Version R03.00.08 and later versions there exists two ways to verify the correct completion of the antenna tuning. For all versions it can be verified at the DebugTerminal, but for R03.00.08 and future versions, it can be verified at the DMI. It shall be noted that Antenna A is tuned from Cab A, and Antenna B from Cab B.

6.1 Antenna Tuning Test, verification at the Debug Terminal

Prior to the functional test on the DK-STM, it must be verified that the antennas can be tuned, which can be seen on the PC when connected to the DK-STM diagnosis. An antenna tuning test is done in following way:

1. Connect the DK-STM diagnostic channel at X2 connector on SERIO5 board to a PC, through a DB26-DB9 service cable. Note: The cubicle door must be dismounted to access the X2 connector. When mounted again, if door bolts are used, then they shall be tightened with 7 Nm, else the dorn locker shall be locked as normal with a square railway key.

2. Switch ON the DK-STM.

3. Start the Debug Terminal DK-STM, see User's Manual for Debug Terminal DK-STM, /2/.

4. Do the tuning of the DK-STM, as it is described in chapter 4 in the DK-STM Installation manual, /1/. First tune Antenna A and then Antenna B. The message on the diagnosis must show FF555 (Tuning correctly finished) and FF558 (One antenna is tuned). The diagnosis must not show FF556 (tuning failed / tuning incomplete). An example of diagnostic output is shown in Figure 2, marked with blue rings. The result of the tuning test shall be added to appendix 1.

   When the antenna tuning is initiated in the maintenance menu, verify that the train type shown is correct, see figure 2 below, marked with red ring.

   Note:
   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.

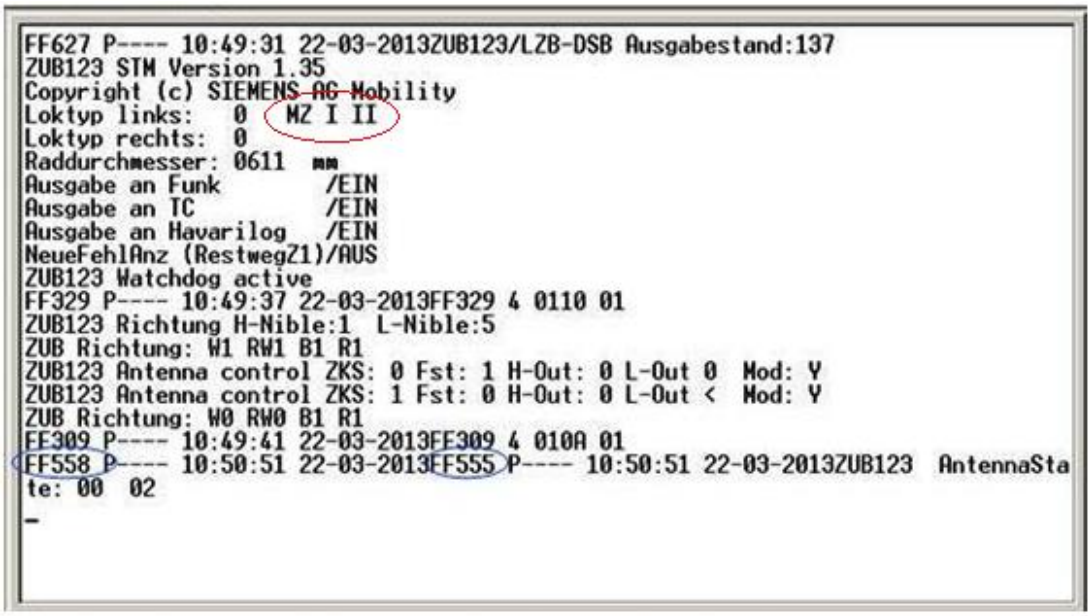


Figure 2 DK-STM Diagnostic output

6.2 Antenna Tuning Test, verification at the DMI

Prior to the functional test on the DK-STM, it must be verified that the antennas can be tuned, which can be initiated, and verified from the DMI (DK-STM R03.00.08 and later).
An antenna tuning is done in the following way:

1. After the maintenance menu has been activated through entering the maintenance code “3112”, the menu item for the antenna tuning, that shall be tuned, shall be selected.

2. When the antenna has been selected “running A” or “running B” will appear in the maintenance menu.

3. The maintenance menu can be activated more times, but while the tuning is running, only either “running A” or “running B” will appear. When the maintenance menu is activated approximately 45 secs after the tuning was initiated, then the result code will appear.

   The following result codes can appear:

   a) FF555 means the tuning went OK
   b) FF590 Antenna B tuning went OK, antenna A is not tuned
   c) FF591 Antenna A tuning went OK, antenna B is not tuned
   d) FF592 Antenna tuning failed, error in the 100 KHz circuit
   e) FF593 Antenna tuning failed, error in the 50 KHz circuit. Might be caused if antenna is over a balise.
   f) FF556 Antenna tuning failed

7 Functional Test

When the DK-STM installation is finished, the functionality of DK-STM must be verified. To do a function test, the DK-STM and the ETCS Onboard shall be switched ON. After each of the following tests, the result shall be added to appendix 1.

7.1 Functional Test with CAB A active

Activate Cab A.

7.1.1 Set DK-STM in DA mode

Set DK-STM in DA mode via ETCS by adding train data for the DK-STM. The DK-STM is in DA mode when the button “Valg” is visible on the DMI. When the DK-STM is in the DA-mode it is assured that the Profibus-connection between DK-STM and EVC works correctly. Check if the DK-STM has reached DA mode. No error messages are allowed on the DMI. See DK-STM users manual, chapter 9, reference /3/.

7.1.2 Brake Test

In the Brake Test, the Service Brake and Emergency Brake are tested.

To perform a Brake Test, the telegram BZBPR (Brake test) is selected on the Test Balise. The instruction how to set a telegram is delivered with the Test Balise.

Release the brakes. Place the Test Balise and remove it afterwards, under the ATC Antenna on CAB A. The Test Balise shall be placed 150 - 200 mm under the ATC antenna (according to IN 655.00 V1260). There must not be large metal objects very close to the Test Balise during the test.

The indicator on the DMI shall indicate “DRIFTS BREMSE”.

Check during the test that the Service Brake is applied.

Then acknowledge the service brake on the DMI and release the brake.
After 10 seconds the Emergency Brake will be activated.

The indicator on the DMI shall indicate “NØD BREMSE”.

Check during the test that the Emergency Brake is applied.

Check during the test that the Traction is cut off. The Traction Cut-OFF shall be active when the Service Brake or the Emergency brake or both are applied.

7.1.3 Test of the Main Switch

1. Put the DK-STM in CS mode (⇔ETCS is in SB mode with a CAB active, choose Level 0, enter data but do not start).
   DMI Icon for SB:  , and for ETCS Level 0: 
2. Turn OFF the power of the DK-STM by means of DK-STM power circuit breaker switch, e.g. “ATC A0”. On the DMI you now get: “ATC Failed”.

⇨ Result: only DK-STM EB is applied. EVC EB is not applied (because ETCS is in SB mode).

3. Isolate the DK-STM by means of the DK-STM isolation switch, e.g. “STM-DK 1415”.

⇨ Result: DK-STM EB is bypassed. Train EB is not applied any more.

Make sure that the Emergency Brake loop, activated by the DK-STM, is bypassed.

7.1.4 Test of the System Isolation Switch

1. Put the DK-STM in CS mode (⇔ ETCS is in SB mode with CAB active). For details concerning the ETCS mode see paragraph 7.1.3 above.
2. Turn OFF the power of the DK-STM by means of the DK-STM power supply switch.

⇨ Result: Only DK-STM EB is applied. EVC EB is not applied (because ETCS is in SB mode).

3. Turn ON the power of the DK-STM and check that LEDs starts to flash again. Reset the DK-STM by means of the System Isolation Switch (located in the cab and labelled “Togkontrolanlæg”) and hold the switch in reset position.

⇨ Result: DK-STM becomes powered OFF and the flashing LEDs goes off.

4. Isolate the DK-STM by means of the System Isolation Switch (located in the cab and labelled “Togkontrolanlæg”).

⇨ Result: EVC becomes powered OFF. EVC EB and DK-STM are bypassed. Train EB is not applied anymore.

7.2 Functional Test with CAB B Active

Activate Cab B.

7.2.1 Set DK-STM in DA mode

Set DK-STM in DA mode via ETCS by adding train data for the DK-STM. The DK-STM is in DA mode when the button “Valg” is visible on the DMI. When the DK-STM is in the DA-mode it is assured that the Profibus-connection between DK-STM and EVC works correctly. Check if the DK-STM has reached DA mode on the DMI. No error messages are allowed on the DMI.

7.2.2 Brake Test

In the Brake Test, the Service Brake and Emergency Brake are tested.

To perform a Brake Test, the telegram BZBPR (Brake test) is selected on the Test Balise. The instruction how to set a telegram is delivered with the Test Balise.

Release the brakes. Place the Test Balise and remove it afterwards, under the ATC Antenna on CAB B. The Test Balise shall be placed approx. 150 mm under the ATC antenna. There must not be large metal objects very close to the Test Balise during the test.

The indicator on the DMI shall indicate “DRIFTS BREMSE”.

Check during the test that the Service Brake is applied.

Then acknowledge the service brake on the DMI and release the brake. After 10 seconds the Emergency Brake will be activated.

The indicator on the DMI shall indicate “NØD BREMSE”.

Check during the test that the Emergency Brake is applied.

Check during the test that the Traction is cut out. The Traction Cut-OFF shall be active when the Service Brake or the Emergency brake or both are applied.

7.2.3 Test of the System Isolation Switch

1. Put the DK-STM in CS mode (⇔ ETCS is in SB mode with CAB active).
   For details concerning the ETCS mode see paragraph 7.1.3 above.
2. Turn OFF the power of the DK-STM by means of the DK-STM power supply switch.

⇨ Result: Only DK-STM EB is applied. EVC EB is not applied (because ETCS is in SB mode).

3. Turn ON the power of the DK-STM and check that LEDs starts to flash again. Reset the DK-STM by means of the System Isolation Switch (located in the cab and labelled “Togkontrolanlæg”) and hold the switch in reset position.

⇨ Result: DK-STM becomes powered OFF and the flashing LEDs goes off.

4. Isolate the DK-STM by means of the System Isolation Switch (located in the cab and labelled “Togkontrolanlæg”).

⇨ Result: EVC becomes powered OFF. EVC EB and DK-STM are bypassed. Train EB is not applied anymore.

Appendix 1 Functional test protocol (1 of 4)

Train set, Locomotive or Unit (litra + nr.): _____

DK-STM configuration:

Check and note the DK-STM SW- and HW-version/serial number according to chapter 4:

Item	Serial nr./version Removed	Installed	OK *)
DK-STM SW			
DK-STM Cubicle			
DK-STM TIU			
Connector Plate			
DK-STM SUB RACK			

*) Identical to what is stated in ref. /7/

ETCS / EVC configuration:

Register the ETCS / EVC baseline SW version according to chapter 4:

ETCS / EVC baseline SW: _____

Verification of train parameters:

Open the DK-STM service program. Check all train specific settings (chapter 5).
All train specific settings has been set to the right values:

V_MAX interv(100ms): _____ (=0, yes/no)

H-Log enabled: _____ (yes/no)

Train Type Number: _____

Antenna tuning test:

Perform the antenna tuning test according to chapter 6.
When the test is performed successfully, write OK in the check field.

Check antenna A:_____ Check antenna B:_____

Check train type: _____ Check train type: _____

Performance of DK-STM functional test:
Perform the DK-STM functional test according to chapter 7.

Functional test with CAB A active:

DK-STM in DA mode:

Set the DK-STM in DA mode according to section 7.1.1.
When the test is performed successfully, write OK in the check field.

Check:_____

Appendix 1 Functional test protocol (2 of 4)

Trainset, Locomotive or Unit (litra + nr.): _____

Brake test:

Test of Service Brake:

Perform the brake test according to section 7.1.2.
When the test is performed successfully, write OK in the check field.

Check:_____ Time of service brake:_____

Test of Emergency Brake:

Perform the brake test according to section 7.1.2.
When the test is performed successfully, write OK in the check field.

Check:_____ Time of emergency brake:_____

Test of Traction Cut-OFF:

Perform the brake test according to section 7.1.2.
When the test is performed successfully, write OK in the check field.

Check:_____

Main Switch test:

Perform the Main Switch (e.g. “ATC A0” + “STM-DK 1415”) Test according to section 7.1.3.
When the test is performed successfully, write OK in the check field.

Check:_____

System Isolation Switch test:

Perform the Reset and Isolation Switch (e.g. “Togkontrolanlæg”) Test according to section 7.1.4.
When both tests are performed successfully, write OK in the check field.

Check:_____

Appendix 1 Functional test protocol (3 of 4)

Trainset, Locomotive or Unit (litra + nr.): _____

Functional test with CAB B active:

DK-STM in DA mode:

Set the DK-STM in DA mode according to section 7.2.1.
When the test is performed successfully, write OK in the check field.

Check:_____

Brake test:

Test of Service Brake:

Perform the brake test according to section 7.2.2.
When the test is performed successfully, write OK in the check field.

Check:_____ Time of service brake:_____

Test of Emergency Brake:

Perform the brake test according to section 7.2.2.
When the test is performed successfully, write OK in the check field.

Check:_____ Time of emergency brake:_____

Test of Traction Cut-OFF:

Perform the brake test according to section 7.2.2.
When the test is performed successfully, write OK in the check field.

Check:_____

System Isolation Switch test:

Perform the Reset and Isolation Switch (e.g. “Togkontrolanlæg”) Test according to section 7.2.3.
When both tests are performed successfully, write OK in the check field.

Check:_____

Appendix 1 Functional test protocol (4 of 4)

Trainset, Locomotive or Unit (litra + nr.): _____

Verification of functional test result in JRU / DRU:

Download the data file from the JRU or DRU. Investigate the test period.

The service- and emergency brakes are registered: _____ (yes/no)

The balise data (telegrams) are correctly registered: _____ (yes/no)

The results of antenna tuning are correctly registered: _____ (yes/no or N/A)

The time stamping of data are correctly registered: _____ (yes/no)

If there is an offset, how many hours: _____ Hours

After verification store the data file together with the protocol in the Technical file.

Overall functional test result:

DK-STM all functional test OK	DK-STM functional test **not** OK

Comments:

_____

_____

_____

_____

_____

_____

_____

_____ _____

Company Name with capital letters

_____ _____

Date Signature