

SIEMENS

Document kind	Application rules	Protection Class
Title	Application rules	Restricted
Product name		
Project	STM-DK Cubicle	

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1 Introduction

1.1 Change List

Version	Date	Author	Changed Sections	Reason for Change
A draft	2015-05-04	Per Petersen-Sonn	all	New. First review
A draft2	2015-06-15	Per Petersen-Sonn	all	Updated
A	2015-06-18	Per Petersen-Sonn	all	Released
B	2017-12-15	Per Petersen-Sonn	1.1 + 1.3 + 1.5	Update of STM-DK Subrack application rules to version 09. (G81001-X3107-L005-09). The following Apprules have been deleted: 4 + 64 + 65 + 68 + 69 + 73 + 78 + 81 -> 86 + 88 + 89 + 91 + 92 + 95 + 99 -> 103. Apprule 174 has been added. Reference to STM-DK Subrack installation manual has been added.

1.2 Purpose

Purpose

To state the application rules for the STM-DK_Cubicle.

Valid for:

STM-DK Cubicle, 24 VDC: G81002-E3134-H024

STM-DK Cubicle, 72 VDC: G81002-E3134-H072

STM-DK Cubicle, 110 VDC: G81002-E3134-H110

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1.3 References

Reference ID	Document incl. Title, Unequivocal identifier and version
[STM-DK_C_INST_MAN]	DK-STM Cubicle Installation Manual IN 655.00Q4432 2.00 23.04.2015 or newer
[STM-DK_C_MAINT_MAN]	DK-STM Maintenance Manual Cubicle VN 655.00 Q4433 3.00 09.06.2016 or newer
[STM-DK_R_INST_MAN]	DK-STM Subrack Installation Manual IN 655.00 Q2962 1.09 or newer
[EN 50155]	Railway Application - Electronic equipment used on rolling stock 2007-07-01
[EN 50121-3-2]	Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock – Apparatus dated 2007-09-01
[EN 50124-1]	Railway applications -Insulation coordination Part 1: Basic requirements Clearances and creepage distances for all electrical and electronic equipment. dated 2001 + corrigendum May 2010
[EN 50129]	Railway applications Safety related electronic systems for signalling. dated 2003-02-01
[EN 50343]	Railway applications – Rolling stock – Rules for installation of cabling Dated 2015-02
[EN 60529]	Degrees of protection provided by enclosures (IP Code) 2002
[EN 61373]	Railway applications - Rolling stock equipment - Shock and vibration tests dated 2010

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1.4 Terms and Abbreviations

The following abbreviations are used here:

Abbreviation	Term
ATC	Legacy "Automatic Train Control". In this context, ZUB123 system from Siemens.
EMC	ElectroMagnetic Compatibility
EVC	European vital computer (Train onboard computer)
Profibus	Profibus is a standardized serial fieldbus protocol, used for connecting industrial devices (in this case EVC and STM). See www.profibus.com
RST	Rolling Stock
STM-DK	STM = Standard transmission module. STM-DK = STM for the Danish ATC. Replaces the existing mobile ATC and interfaces between the ATC train antenna and the EVC.
STM-DK_Subrack	19" equipped Subrack with STM-DK functionality.

1.5 How to read this document

This document is written as follows:

App Rule number	Text	Category

Where "App Rule number" is a running number, "Text" is the application rule and "Category" is where the application rule shall be used.

Category	Explanation
Acceptance test	Conditions established to ensure completion of the development project by means of testing in the first test train running under STM control. The test must demonstrate correct STM functionality in a train installation typically on test tracks.
Bdk Infrastructure	Conditions to be fulfilled by the infrastructure owner, Banedanmark, when installing and operating the STM in the legacy ATC

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	environment and the mixed ATC- ERTMS environment.
EVC requirements	Requirements to the functionality of the ERTMS equipment.
Installation manual	Conditions to be fulfilled when installing the STM-DK Cubicle. Shall be assigned to [STM-DK_C_INST_MAN]
Installation manual_R	Conditions to be fulfilled when installing the STM-DK Cubicle. Is assigned to [STM-DK_R_INST_MAN]
Maintenance manual	Conditions to be fulfilled when performing maintenance of the STM-DK Cubicle. Shall be assigned to [STM-DK_C_INST_MAN].
Specific application	Conditions to be fulfilled for each train or train type in order to prove the safety.

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App Rule number	Text	Category
APPRU_3	<p>The user of the tiu function shall use an idle cycle timeout that enables reconnecting the profibus connection for the tiu function in less than 1,5 seconds.</p> <p>This can be understood as a requirement for 1 second timeout value on TIU connections.</p>	EVC requirements
APPRU_5	The maximum system speed at HS-area shall be covered by trackside engineering.	Bdk Infrastructure

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App Rule number	Text	Category																								
APPRU_6	<p>The STM shall have the possibility to use indicators on 5 positions on the DMI. The mapping shall be:</p> <table border="1" data-bbox="479 405 1254 981"> <thead> <tr> <th data-bbox="479 405 613 496">NID_ INDPOS</th> <th data-bbox="613 405 781 496">Position CENELEC</th> <th data-bbox="781 405 913 496">Position ERA</th> <th data-bbox="913 405 1254 496">Indication</th> </tr> </thead> <tbody> <tr> <td data-bbox="479 496 613 603">5</td> <td data-bbox="613 496 781 603">C5</td> <td data-bbox="781 496 913 603">C2</td> <td data-bbox="913 496 1254 603">DRIFTSBREMSE (yellow) NØDBREMSE (red)</td> </tr> <tr> <td data-bbox="479 603 613 657">6</td> <td data-bbox="613 603 781 657">C6</td> <td data-bbox="781 603 913 657">C3</td> <td data-bbox="913 603 1254 657">PASS STOP (red)</td> </tr> <tr> <td data-bbox="479 657 613 871">7</td> <td data-bbox="613 657 781 871">C7</td> <td data-bbox="781 657 913 871">C4</td> <td data-bbox="913 657 1254 871">ATC INDE (green) RANGER (yellow) YDRE SIGNAL (yellow) LØS ATC (green)</td> </tr> <tr> <td data-bbox="479 871 613 925">8</td> <td data-bbox="613 871 781 925">C2</td> <td data-bbox="781 871 913 925">C5</td> <td data-bbox="913 871 1254 925">Yellow display</td> </tr> <tr> <td data-bbox="479 925 613 981">9</td> <td data-bbox="613 925 781 981">C3</td> <td data-bbox="781 925 913 981">C6</td> <td data-bbox="913 925 1254 981">Red display</td> </tr> </tbody> </table>	NID_ INDPOS	Position CENELEC	Position ERA	Indication	5	C5	C2	DRIFTSBREMSE (yellow) NØDBREMSE (red)	6	C6	C3	PASS STOP (red)	7	C7	C4	ATC INDE (green) RANGER (yellow) YDRE SIGNAL (yellow) LØS ATC (green)	8	C2	C5	Yellow display	9	C3	C6	Red display	EVC requirements
NID_ INDPOS	Position CENELEC	Position ERA	Indication																							
5	C5	C2	DRIFTSBREMSE (yellow) NØDBREMSE (red)																							
6	C6	C3	PASS STOP (red)																							
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9	C3	C6	Red display																							

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App Rule number	Text	Category																
APPRU_7	<p>The STM needs to use Buttons on 4 possible positions. The mapping shall be:</p> <table border="1" data-bbox="479 405 1310 1054"> <thead> <tr> <th data-bbox="479 405 629 491">NID_ BUTPOS</th> <th data-bbox="629 405 819 491">Position CENELEC</th> <th data-bbox="819 405 1010 491">Position ERA</th> <th data-bbox="1010 405 1310 491">Push Button</th> </tr> </thead> <tbody> <tr> <td data-bbox="479 491 629 687">1.</td> <td data-bbox="629 491 819 687">F6.</td> <td data-bbox="819 491 1010 687">F8.</td> <td data-bbox="1010 491 1310 687">Valg Afbryd AFBRYD RANGER Retur</td> </tr> <tr> <td data-bbox="479 687 629 836">2.</td> <td data-bbox="629 687 819 836">F7.</td> <td data-bbox="819 687 1010 836">F9.</td> <td data-bbox="1010 687 1310 836">RANGER YDRE SIGNAL LØS ATC</td> </tr> <tr> <td data-bbox="479 836 629 1054">3.</td> <td data-bbox="629 836 819 1054">F8.</td> <td data-bbox="819 836 1010 1054">F10.</td> <td data-bbox="1010 836 1310 1054">PASS STOP LØS BREMSE (Yellow – driftsbremse) LØS BREMSE (red – nødbremse)</td> </tr> </tbody> </table>	NID_ BUTPOS	Position CENELEC	Position ERA	Push Button	1.	F6.	F8.	Valg Afbryd AFBRYD RANGER Retur	2.	F7.	F9.	RANGER YDRE SIGNAL LØS ATC	3.	F8.	F10.	PASS STOP LØS BREMSE (Yellow – driftsbremse) LØS BREMSE (red – nødbremse)	EVC requirements
NID_ BUTPOS	Position CENELEC	Position ERA	Push Button															
1.	F6.	F8.	Valg Afbryd AFBRYD RANGER Retur															
2.	F7.	F9.	RANGER YDRE SIGNAL LØS ATC															
3.	F8.	F10.	PASS STOP LØS BREMSE (Yellow – driftsbremse) LØS BREMSE (red – nødbremse)															
APPRU_8	The train data shall be displayed in order of the related N_ITER value in packet STM-179 (starting with the lowest value).	EVC requirements																

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APPRU_9	If the ETCS on-board is compatible to Baseline 2.3.0d, it shall additionally fulfil the requirements of UNISIG CR 618.	EVC requirements
APPRU_26	<p>Connection of the antenna</p> <p>Use only the following antenna types:</p> <p>S25441-M1-A3</p> <p>S25441-M1-A4</p> <p>S25441-M2-A3</p> <p>S25441-M2-A4</p> <p>Only shielded cable with specified data shall be used.</p> <p>Isolation min. 60Veff</p> <p>Impulse min. 1032Vp</p> <p>The housing of the antenna must be connected to the vehicle chassis with low impedance.</p> <p>The values for the antenna isolation between housing and internal electronics can be considered the same as for the cable. This is given for the mentioned antennas above.</p> <p>At the connection point it shall be ensured that re-inforced isolation to other potentials is sufficient according to EN50124-1</p>	Installation manual

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App Rule number	Text	Category
	<p>When connecting the two wires (Fahrtrichtung A and Fahrtrichtung B) to the module (Uebgen5) the following apply:</p> <ul style="list-style-type: none"> - The two 100kHz connections shall be galvanic insulated from each other - The two 50kHz connections shall be galvanic insulated from each other. 	
APPRU_34	<p>The ETCS Onboard shall support the STM Functions</p> <ul style="list-style-type: none"> · STM CONTROL · CLOCK · TIU · BIU · ODOMETER · JRU · DMI CAB A · DMI CAB B 	EVC requirements

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APPRU_37	<p>Check after first start up and after maintenance work that the STM-DK starts up correctly.</p> <p>Verify that the self test has been run without errors.</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_43	<p>Tuning of the antennas shall be done from the EVC/DMI.</p> <p>Tuning shall be done when:</p> <ul style="list-style-type: none"> - First use of the STM-DK Cubicle <p>After all service and maintenance like</p> <ul style="list-style-type: none"> - Exchange of STM-DK_Subrack. - By exchange of the antenna. - By exchanging the cable connection - By moving the cables - If the position of the antenna has changed. <p>Recommendation: Tuning during maintenance, once each year.</p> <p>Tuning shall take place during the following conditions:</p> <ul style="list-style-type: none"> - Ambient temperature. 15°C...40°C. <p>The temperature shall be within these limits for at least 4 hours, before tuning.</p> <ul style="list-style-type: none"> - During tuning, the antenna shall not be influenced by metal(for instance a point) or balises under the antenna. <p>The metal free area shall correspond to the trafical conditions:</p> <p>Horizontally at least to the rail and below at least to the sleeper.</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_47	The user must confirm by tests that the PROFIBUS bandwidth used by the ZUB123-STM is compatible with the ETCS on-board equipment.	EVC requirements (Only baseline 2)
APPRU_58	The user must ensure that PROFIBUS node addresses and SAP numbers are unique in the entire system (/Subset-35) Id 14.5.1.9).	EVC requirements

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APPRU_61	If the STM CONTROL-Function connection is disconnected, the ETCS Onboard shall apply the safe action. The safe action shall be the emergency brake.	EVC requirements (Only baseline 2)
APPRU_66	After receiving the state order HS (or DA, when HS is not used), the DK-STM uses 2s to activate the train antenna. With maximum speed of 200 km/h this means: The distance between the Transition Location and the first Zub123 Balise (danish ATC balise) shall be greater than 110 meter.	EVC requirements
APPRU_67	The STM train specific data values are safety relevant. The ETCS Onboard shall implement a safe STM specific data entry procedure for data to the legacy ZUB123-STM software. The safety level for this ETCS function is SIL4. Safe data input from driver is to be realized by ETCS Onboard.	EVC requirements
APPRU_70	Train data entered by Driver on the DMI shall be secured using proper data protection.	EVC requirements
APPRU_71	The DMI shall have a MTBF of at least 10000 hours.	EVC requirements
APPRU_90	After the installation the correct functionality of the system STM-DK_Cubicle must be shown in a field test with the aspects speed measurement and receiving of track information, The train speed during the test must be up to 200 km/h including reading and treatment of balise pairs with a mutual distance of 21m. After the installation the correct functionality of the system STM-DK_Cubicle must be shown in a field test with the aspects speed measurement and receiving of track information, The train speed during the test must be up to 200 km/h including reading and treatment of balise pairs with a mutual distance of 21m.	Acceptance test

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APPRU_97	After the installation the integration test on the vehicle must show that the STM-DK_Cubicle does not disturb other Profibus participants.	Acceptance test
APPRU_104	For STM to STM-Transitions, the ETCS Onboard shall follow the definitions of [SUBSET-035] including the definitions regarding STM TRIP situation (conditional CS order).	EVC requirements (Only baseline 2)
APPRU_105	In case of a STM-STM-Transition, the ETCS Onboard shall follow the requirements of [SUBSET-035] regarding the "conditional cold standby".	EVC requirements (Only baseline 2)
APPRU_108	The Clock used in ETCS Onboard must have the safety relevant THR=10-9/h or better.	EVC requirements
APPRU_174	Working procedures shall ensure reading out and noting down train type information after any access to the DK-STM maintenance menu during installation and maintenance work. This will prevent inadvertent changes to train type, which might be hazardous.	Installation manual_R Maintenance manual

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APPRU_200	<p>The RST shall not require more severe environmental conditions for the STM DK Cubicle than for :</p> <ul style="list-style-type: none"> - noise immunity than defined in [EN_50121-3-2], - transient/noise emissions than defined in [EN_50121-3-2] and [EN_61000-6-4], - electro statical discharge than defined in [EN_50121-3-2] and [EN_61000-6-2], - transport and storage than defined in [EN_60721-3-2] class 2M2. und 2K2, - mechanical conditions than defined in [EN_50155], class 1B(EN61373) , - temperature than min -25 °C and max 40 °C, - isolation conditions than pollution degree PD3 and overvoltage category OV2 according to [EN_50124-1], - altitude than max 2000 meter above sea level, and 400 m below. - air pressure than max 106 kPa and min to 80 kPa. - degree of protection for housing than [EN_60529], IP54, - for power supply than [EN_50155]. Supply voltages are either 24 VDC, 72 VDC or 110 VDC. - for power supply interruptions than [EN_50155], S1. 	<p>Specific application</p> <p>Installation manual</p>
APPRU_201	<p>The STM-DK Cubicle shall be installed in a cabinet/room, not accessible for travelers and staff. Only maintenance staff are allowed to access the STM-DK_Cubicle.</p>	Installation manual
APPRU_202	<p>All external cables leaving the STM Cubicle(except for the internal diagnostic interface), shall have their cable shield EMC properly connected to the earthing bar on the STM-DK Cubicle.</p>	Installation manual

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App Rule number	Text	Category
APPRU_203	If the power supply is not from a battery, it shall be proven that the maximum voltage is within the specified limits (EN 50155), also in case of error, i.e. it is safety relevant that the voltage stays within the maximum limits.	Specific application Installation manual
APPRU_204	The cross section of the connecting cable for the power supply (connector -X6) shall be dimensioned acc. to [EN_50343]. All pins in connector –X6 shall be used.	Installation manual
APPRU_205	The cable for the power supply (connector -X6) shall be protected by a circuit breaker. The circuit breaker shall: - withstand the inrush current without tripping (max 8A in max 100 ms). - protect the cable from overload. - in case of a short circuit, not be prevented to trip due to cable resistance.	Installation manual
APPRU_206	The installer/maintainer is allowed to access the diagnose interface on the SERIO5. Normal ESD precautions shall be observed. It must be ensured that no higher voltages that 60V can be applied to the diagnose interfaces even in case of failure of the connected equipment. The door shall be attached after use. Standard EIA RS232 must be followed If this interface shall be used during normal service, i.e. where the STM-DK Cubicle is safety responsible, the national authorities shall give their acceptance and the exact conditions agreed upon. No other ports are allowed to be used.	Installation manual Maintenance manual
APPRU_207	For the emergency brake connection, it shall be ruled out that any short circuit in connecting cable etc can bypass the emergency brake contacts.	Specific application Installation manual

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APPRU_208	<p>The STM Cubicle emergency brake circuit (connector –X7) has two set of relay contacts, EB1 (EB1 (1) and EB1 (2)) and EB2 (EB2 (1) and EB2 (2)). Whether EB1 and EB2 are used in parallel(i.e used as two separate branches) or in serial(i.e connected together) depends on the train type.</p> <p>The brake shall be applied if the connection between these pins (EB1 (1) and EB1 (2) respectively EB2 (1) and EB2 (2)) is open. It shall be released if the connection is closed.</p>	<p>Specific application</p> <p>Installation manual</p>
APPRU_209	<p>The STM-DK_Cubicle shall be fastened on the vehicle using the mounting holes shown in “[STM-DK_C_INST_MAN]”, using either:</p> <ol style="list-style-type: none"> 1) all the bottom holes or 2) all the left <u>and</u> right side holes. <p>The STM-DK_Cubicle shall only be mounted in a position where the connection plate is at the topmost position.</p>	<p>Specific application</p> <p>Installation manual</p>
APPRU_210	<p>When being transported, the connectors on the STM-DK Cubicle shall be protected by environmental caps, protecting the interior of the STM-DK_Cubicle against dust.</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_211	<p>The vehicle connectors being attached to the connection plate shall being coded acc. to “[STM-DK_C_INST_MAN]”.</p>	<p>Installation manual</p>
APPRU_212	<p>The RST supplier shall protect the two sets of emergency brake relay contacts(EB1 and EB2) against overload. This is safety relevant.</p>	<p>Installation manual</p>

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APPRU_213	If only one antenna is used, Ant-A shall be used, and Ant-B shall be covered by an environmental cap(EMC version), protecting the interior of the STM-DK_Cubicle against dust.	Installation manual Maintenance manual
APPRU_216	<p>If the voltage used as activation voltage for the isolation switch function is not from a battery, it shall be proven that the maximum voltage is within the specified limits, also in case of error, i.e. it is safety relevant that the voltage stays within the following maximum stated limits:</p> <p>STM-DK_Cubicle, 24 VDC version:</p> <ul style="list-style-type: none"> - Nom: 24 VDC - Min: 16,8 VDC - Max 30 VDC (for < 1 s: 33,6 VDC) <p>STM-DK_Cubicle, 72 VDC version:</p> <ul style="list-style-type: none"> - Nom: 72 VDC - Min: 50,4 VDC - Max 90 VDC (for < 1 s: 100,8 VDC) <p>STM-DK_Cubicle, 110 VDC version:</p> <ul style="list-style-type: none"> - Nom: 110 VDC - Min: 77 VDC - Max 137,5 VDC (for < 1 s: 154 VDC) 	Installation manual
APPRU_217	If isolation switch function is not used, the connector "-X7.2" shall be covered by an environmental cap(EMC version), protecting the interior of the STM-DK_Cubicle against dust.	Installation manual Maintenance manual

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APPRU_219	<p>The emergency brake relay contacts (connector -X7) are for short circuit protection reasons, internally fuse protected with a 6,3 A slow blow fuse.</p> <p>Load: Min: 10 mA, Max: 6 A @ max 110 VDC 1,6 A @ max 137,5 VDC 1,6 A @ max 154 VDC in 0,1 s Load current applies to non-inductive load</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_221	<p>Before applying power to the STM_DK_Cubicle, check that the version of the STM-DK_Cubicle is suited for the applied supply voltage (i.e. 24 VDC, or 72 VDC or 110 VDC).</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_222	<p>The cable for the isolation switch interface (-X7.2) shall be protected by a circuit breaker/fuse.</p>	<p>Installation manual</p>
APPRU_223	<p>Except for diagnosis purposes, the door shall be attached to the STM-DK_Cubicle. This is to keep the IP54 classification of the STM-DK_Cubicle.</p>	<p>Installation manual</p> <p>Maintenance manual</p>
APPRU_224	<p>LRU part must only be replaced, when the STM-DK Cubicle is without power.</p>	<p>Maintenance manual</p>

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