

D4.1 Interface Requirements Specification (IRS)

for the development of an STM ATB

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1 Preface

STMA-21193 - In the figure below the STM ATB is shown in the context of the ETCS environment.

The interface between the ETCS on-board and the STM ATB is specified in the ERA subsets 035, 056, 057 and 058, and not an item in this IO specification.

The other interfaces of the STM ATB are:

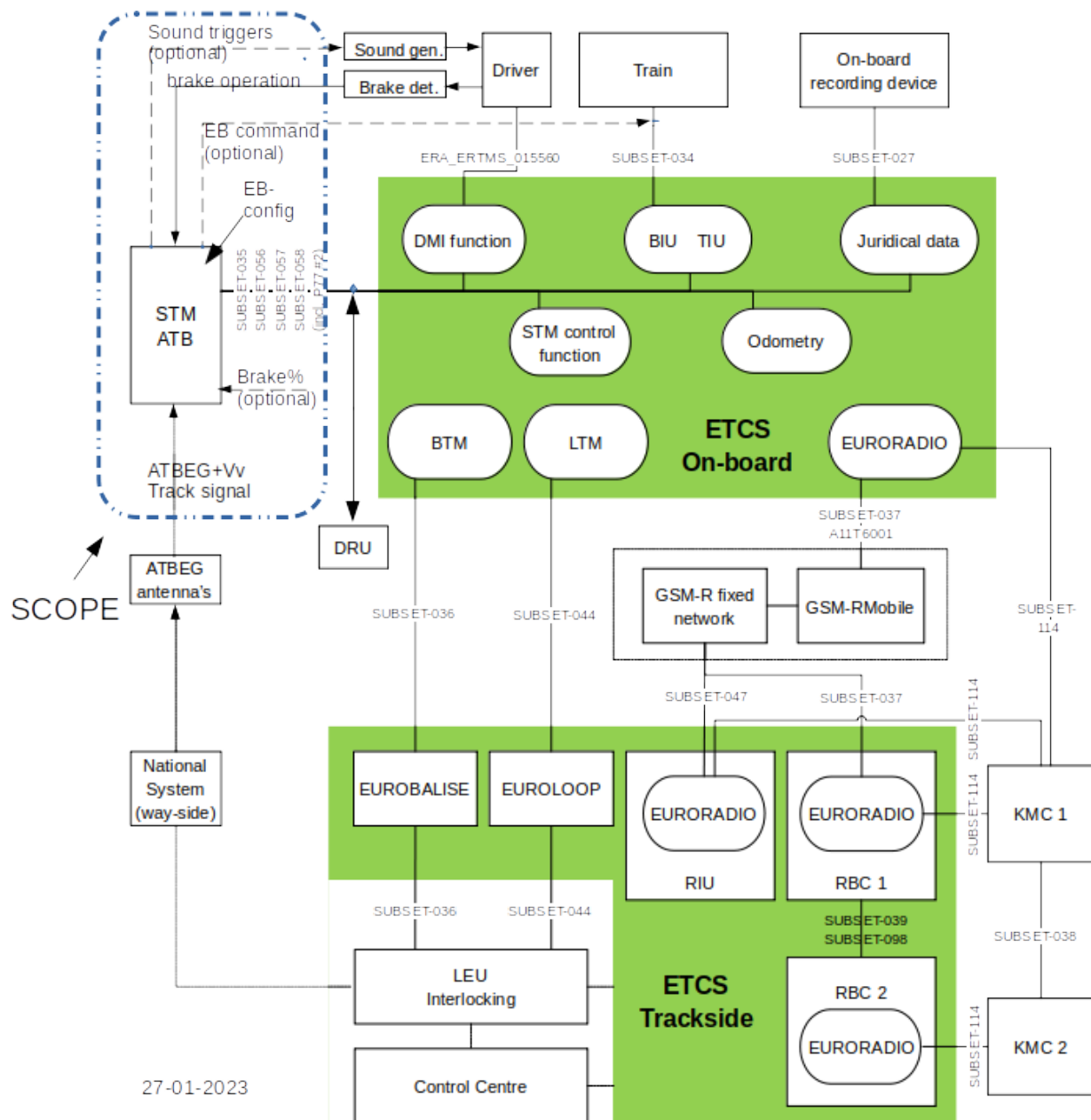
- Power supply
- The interface to the way-side ATB (EG+Vv) equipment
- Inputs to detect brake operation by the driver
- Outputs to communicate sound information to the driver (time critical information for which ETCS on-board equipment might cause too long delay times).
- Outputs to communicate indicator information (different from cab signals), e.g. for diagnostic purposes.
- A feed-back from the EB command given by the ETCS on-board (not specified in the mentioned ERA subsets)

STMA-28791 - Required legal standards and norms applicable to the STM ATB project and product are listed in

document  D3.0 Legal framework standards and norms

Definition, STMA-4891 - (figure)

STM ATB system scope



2 Interfaces

STMA-2186 - Parallel interfaces of the STM ATB are:

- Power supply
- Antenna signals: analogue signals containing the ATBEG+Vv track signal
- Digital input signals to detect if the driver is operating the brakes: "brake handle applied", "brakes sufficiently operated" (BHA and BSO)
and EB config (configuration if the EB command is connected)
- Analogue signal to detect if the driver is operating the brakes: "brake pipe pressure signal".
- Digital outputs for controlling the sound generator, and the EB-commands
- A Profibus interface to the ETCS on-board system.


2.1 Power supply

Requirement, STMA-4892 -

The STM ATB shall be available for supply voltages used in existing rolling stock.

Voltages used to power existing ATB on-board systems are 24Vdc (nominal) and 110Vdc (nominal) according to the specification described in [4.5] (environmental specifications). Requirements concerning the power supply are described in the latter document and therefore out of the scope of this IO specification.

2.2 Generic requirements

Requirement, STMA-10763 - All digital inputs shall be implemented as redundant inputs with inverse information. ( ST MA-10024)

Definition, STMA-10024 - The information given by a digital input with two physical inputs (A and B) is defined as follows:

Value input A	Value input B	Resulting information	Diagnostic information
high	low	True	OK
low	high	False	OK
high	high	False	Fault
low	low	False	Fault

For all inputs shall be configured in a way that "False" is the "safe state"

"high" shall be above 11Vdc

"low" shall be below 9Vdc

9-11Vdc: don't care

Definition, STMA-19190 - The digital inputs are defined as specified in the table below

input	signal	description
DIn_1A	BHA	Brake Handle Applied
DIn_2A	BSO	Brake Sufficiently Operated
DIn_3A	EB_A	Indication if direct EB is used (high active, i.e. high if the EB is connected, low if the EB is not connected)
DIn_1B	BHN	Brake Handle Not applied

DIn_2B	BSN	Brake Not Sufficiently operated
DIn_3B	EB_B	Indication if direct EB is used (low active, i.e. low if the EB is connected, high if the EB is not connected)

Requirement, STMA-4897 -

A nominal voltage level for digital inputs from 24Vdc to 110Vdc shall be supported (real values 14,4Vdc-154Vdc, i.e. range from 0Vdc to 154Vdc)

Definition, STMA-28699 - The digital outputs are defined as specified in the table below

output	signal	description
DOut_1A	rembel	Acoustic signal, overspeed
DOut_2A	gong	Acoustic signal, cab signal change
DOut_3A	EB_A	Emergency Brake (Active high)
DOut_1B	Yellow4	Yellow cab signal
DOut_2B	Code	coded signal to communicate the guarded speed (= Cab Signal)
DOut_3B	EB_B	Emergency Brake (Active high)

Requirement, STMA-28709 - It shall be possible to connect the "rembel" and "gong" signals to a LogiPlus Railtone (see D4.1.2).

The sound inputs are active high. Logical high for a LogiPlus Railtone can be 24 VDC, 48 VDC, 72 VDC or 110 VDC. The LogiPlus Railtone sound inputs are 5mm Faston connectors with common reference.

Requirement, STMA-10764 - Analogue inputs used for detection of brake operation or determination of configuration shall be implemented a set of two inputs. In case of a brake operation it will be two signals from different sensors, with complimentary information. In case of the configuration it will be redundant information.

Requirement, STMA-10765 - If redundant inputs provide conflicting information then the STM ATB shall take measures to ensure safety

2.3 ATB antennas**Requirement, STMA-14774 -**

The STM ATB shall provide four antenna inputs, two (one left and one right) per cabin (CAB-A and CAB-B).

Requirement, STMA-14775 -

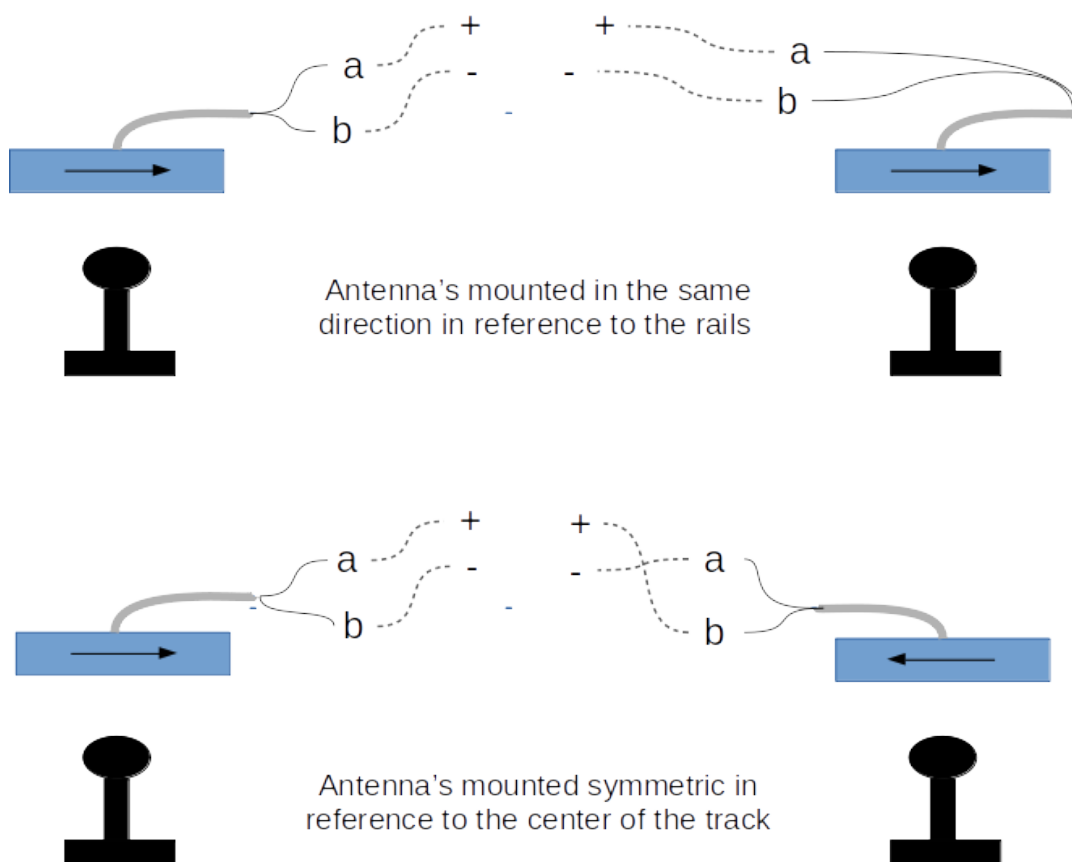
The ATB coil signals corresponding to CAB-A shall be connected to Ain-1 (right coil in the forward direction related to CAB-A) and Ain-6 (left coil in the forward direction related to CAB-A), and the ATB coil signals corresponding to CAB-B shall be connected to Ain-2 (left coil in the forward direction related to CAB-B) and Ain-5 (right coil in the forward direction related to CAB-B), where CAB-A and CAB-B are defined as the indicated by the ETCS on-board (in packet STM-139, see ss058). (For the complete pinning, see ¶ STMA-8241).

Requirement, STMA-14776 - Orientation of the antenna's and connection of the wiring (¶ STMA-14777)

If the antenna's are mounted symmetric in reference to the center of the track then the wires of the left and right antenna shall be connected equally to the + and - input at the connector (¶ STMA-8241 and ¶ STMA-8276)

If the connections are mounted in the same direction in reference to the concerning rail then the wires of the left and right antenna shall be connected inverse to the + and - input at the connector (¶ STMA-8241 and ¶ STMA-8276)

Definition, STMA-14777 - Figure: possible orientations and connection schemes of the antenna's corresponding to one cabin.



Requirement, STMA-4894 -

The STM ATB shall be compatible with all ATBEG antenna's used in existing rolling stock without configuration of the unit. Type dependent (i.e. not per unit) configuration at the rolling stock side may be required.

The interface of between the ATB way-side and the ATB on-board equipment is described in [1.1] ("ATBEG+Vv system concept"). In currently used ATBEG on-board equipment five different antenna types are used to "pick-up" the electro magnetic ATBEG signal and translate it into a voltage:

- ATBEG phase3 antenna: old antenna type used in ICM, SGM and a part of the DE6400 fleet
- The standard Alstom antenna: used for bogie mounting in trains equipped with an ATB on-board systems supplied by Alstom.
- The Alstom V-antenna: used for body mounting in trains equipped with an ATB on-board systems supplied by Alstom (Thalys and ICE)
- Antenna type PW170-0: used for bogie mounting in trains equipped with Bombardier ATB on-board systems.
- Antenna type PW225-30: used for body mounting in trains equipped with Bombardier ATB on-board systems.

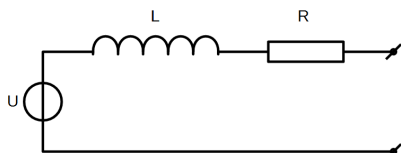
Equivalent (Thevenin) scheme's for the antenna plus coupling to the rail as a function of the current floating through the rail and peak currents to be taken into account are available below.

Definition, STMA-7001 - Specification of ATBEG antenna's in use, including coupling.

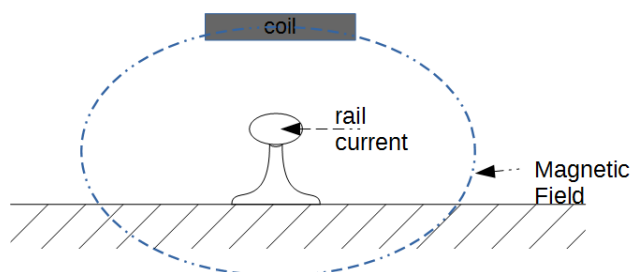
Antenna	self inductance	resistance R	output voltage U	output voltage U
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type	L in H	in ohm	/ rail current (mV/A @75Hz)	/ di/dt (mV/(kA/s))
Alstom bar	1.4	45	21.3	31
Alstom V	1.4	44	4.7	6
PW170-0	4.7	270	22.3	33
PW225-30	4.55	270	14.0	21
fase 3	10.85	250	123	185

(currents and voltages in RMS values, preliminary values based on field measurements)



Thevenin equivalent scheme of the ATBEG antenna's with U, L and R as defined in the table above.



EM coupling of an antenna with the rail current.

STMA-21195 -

Rail current peaks to be taken into account

Short circuits in the infrastructure can cause high current peaks depending on the self inductance between the short circuit and the sub station, and depending on the capability of switching the current off:

Requirement, STMA-7002 - The following two short circuit currents have to be taken into account, i.e. the input circuits shall not be damaged in case of a rail current as defined below, independent of the type of antenna used:

- A current raising with a time constant $\tau = 5\text{ms}$, initial di/dt : 20MA/s , end value: 100kA cut-off after 15ms , with a $di/dt = -40\text{MA/s}$.
- A current raising with a time constant $\tau = 25\text{ms}$, initial di/dt : 2MA/s , end value: 50kA cut-off after 50ms , with a $di/dt = -6\text{MA/s}$.

Definition, STMA-7003 -

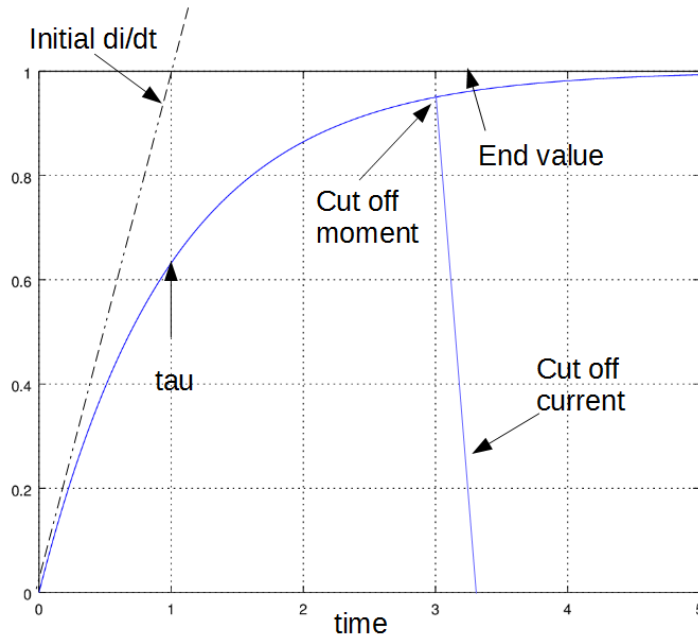



figure 4

Rail current pulses to be taken into account (values given in requirement  STMA-7002)

STMA-7000 - Saturation of ATBEG antenna's

In case of saturation of the ATBEG antenna's a "rail current peak" will not lead to a peak in the antenna voltage. Therefore the need for input protection of the STM ATB antenna inputs could be limited if ATBEG antenna's saturate. Below it is calculated at which rail current level the ATB phase 3 antenna saturates ($B=2T$). This antenna type will saturate at app. the same rail current level as the PW-170. However due to the higher voltage (U) in relation to the antenna impedance is more critical for the phase 3 antenna.

$$B_{\text{iron}} = \text{Constant} * I_{\text{rail}}$$

$$I_{\text{rail}} = \text{Amplitude} * \cos(\omega * t)$$

$$\Rightarrow |U| = \left| \frac{d}{dt} \int_A B_{\text{iron}} dA \right| = A_{\text{iron}} * \text{Constant} * N * \text{Amplitude} * \omega$$

Phase 3 antenna characteristics:

- $N = 5000$ windings
- $A_{\text{iron}} = 0,05 * 0,05 = 2,5 * 10^{-3} \text{ m}^2$

Measurements were done at 75Hz ($\omega=471$), result:

- Amplitude (of the current): $4700\text{mA} * \sqrt{2}$
- resulting voltage $|U| = 580\text{mV} * \sqrt{2}$

$$\Rightarrow N * A_{\text{iron}} * \omega * \text{Constant} = 580/4700$$

$$\Rightarrow \text{constant} \approx 2,1 * 10^{-5} \text{ T/A}$$

$$\text{Assuming } B_{\text{saturation}} = 2T: \Rightarrow I_{\text{rail,saturation}} = 2/(2,1 * 10^{-5}) \approx 100\text{kA}$$

Therefore:

Requirement, STMA-7005 - Saturation shall not be taken into account to reduce the input transients as described above.

2.4 Brake application detection

STMA-21187 - Inputs to detect brake operation by the driver

For currently in use ATB systems different ways are used to detect if the driver is operating the brake at a pre defined level:

- If trains have a brake handle with a direct relation between brake handle position and brake power requested by the driver a contact at a specific position of the brake handle is used. (BHA: "brake handle applied")
- If trains have a "pulse controlled" braking system, i.e. brake power is requested by short operation of the brake handle to lower the brake pipe pressure, then braking may be detected by
 - a contact switching if the brake pipe undershoots a predefined pressure (BSO: "brake operated sufficiently")
 - measuring the brake pipe pressure
 - a contact at the brake handle to detect initial operation by the driver in combination with a contact switching if the brake pipe undershoots a predefined pressure or a measurement of the brake pipe pressure

All inputs are diverse redundant, thus two digital inputs for BHA and BSO or redundant pressure measurement.

The voltage level for the digital inputs can vary from 24Vdc to 110Vdc (according to EN50155).

The current level for the analogue inputs is 4-20mA

The above leads to the following requirement:

Requirement, STMA-4896 -

The STM ATB shall be equipped with the following inputs to detect if the driver is operating the brake:

- An input "brake handle applied" (BHA), operating at the brake handle
- An input "brake operated sufficiently (BSO), operating at the brake pipe pressure or another control signal with a constant relation with the requested brake power.
- A redundant analogue input for a brake pipe pressure (or other analogue signal with a constant relation with the requested brake power) (P_brake),.

Definition, STMA-4898 -

The current level for the analogue inputs for pressure measurement shall be 4-20mA (resolution 0,01mA, 1,6mA/bar), @ $\leq 200 \text{ ohm}$

5,6mA shall be 1 bar = environmental pressure,

13,6mA shall be 6 bar (= 5 bar + environmental pressure)

below 4,6 bar: brake applied

above 4,6 bar: brake not applied

below 3,6mA: failure or not connected

above 21mA: failure

2.5 <Intentionally deleted>

2.6 Configuration inputs

Requirement, STMA-6923 -

21a/21b:

The STM ATB shall be equipped with two analogue inputs to configure the braking percentage. Those analogue inputs are supplied via a resistor.

Range: 0 braking% to 200 braking%

Accuracy: +/- 10 braking%

Not connected (i.e. no configuration information available) shall be detectable (i.e. must be distinguished from valid values)

Relation between resistor values and braking percentage to be decided during implementation.

2.7 DMI

STMA-21185 - Outputs to communicate sound information


Currently in use ATB on-board systems use specific devices in the cabin to generate sounds in the cabin. The profibus communication is not used because it leads to delays in the starting moment of the sounds which are time critical (the profibus may be used if it can be proven that the ETCS on-board system communicates fast enough).

The devices in the cabin can be controlled with two 24Vdc or 110Vdc digital signals (bel and gong) according to EN50155.

The above leads to the following requirement:

Requirement, STMA-4901 -

The STM ATB shall be equipped with two digital outputs compatible with the interfaces as described in [D4.1.2 Logiplus and phase 3 sound generator interface specification].

STMA-80489 - For diagnostic purposes the STM ATB is equipped with two digital outputs providing information concerning the ATBEG code. These outputs are further defined in  [STMA-80488 - Definition of outputs with optical information \(Dout_1B and Dout_2B\): * 1B \(Yell...](#)

Definition, STMA-80488 - Definition of outputs with optical information (Dout_1B and Dout_2B):

- 1B (Yellow4): closed in case the code is noCode, open in all other cases
- 2B: coded (e.g cyclic with 100ms, starting low for $n * 10\text{ms}$, rest closed, n depends on the value of the ATBEG code:
 - code220: $n=2$
 - code180: $n=3$
 - code147: $n=4$
 - code120: $n=5$
 - code96: $n=6$
 - code75: $n=7$
 - other: $n=9$

2.8 EB command outputs and EB configuration inputs

STMA-80491 - The STM ATB is equipped with two digital outputs providing the EB command. These outputs may be used to shorten the response time of the EB in case an EB command is given (via Profibus), and may not be used as sole EB command. If the Digital outputs for commanding the EB are connected shall be communicated to the STM ATB via the EB configuration inputs.

3 Communication with the ETCS on-board




Requirement, STMA-6787 -

The STM ATB shall be equipped with a PROFIBUS connection according to "CENELEC EN 50170-2 (1996)"


Requirement, STMA-2177 - Interfacing between the STM ATB and the ETCS on-board system shall comply with ERA requirements

-  [STMA-10814 - D4.7.4 Specific Transmission Module \(SS035 v3.2.0\)](#)
-  [STMA-11331 - D4.7.2 STM FFFIS Safe Time Layer \(SS056 v3.0.0\)](#)
-  [STMA-11326 - D4.7.1 STM FFFIS Safe Link Layer \(SS057 v3.1.0\)](#)
-  [STMA-10810 - D4.7.3 STM FFFIS Application Layer \(SS058 v3.2.0\)](#)
-  [STMA-7262 - D4.7.5 Performance requirements \(SS059 v3.1.0\)](#)

3.1 DMI information coded using a DMI configuration table

STMA-21186 - The STM ATB has to exchange data with the ETCS on-board in order to comply with the requirements defined in the document mentioned above. For this purpose information packets for exchanging data are defined in  [STMA-10810 - D4.7.3 STM FFFIS Application Layer \(SS058 v3.2.0\)](#). The DMI communication will be based on a "customizable DMI" according to  [STMA-10814 - D4.7.4 Specific Transmission Module \(SS035 v3.2.0\)](#), paragraph 13.5 ( [STMA-15487 - Customisable DMI service](#)).

In this paragraph the format of the "Recapping Table with configuration data for customisable DMI" (ss035, 13.5.1.2) is defined specifically for the STM ATB (STMA-8277). Together with the above mentioned documents this table completes the DMI specification.

Requirement, STMA-7011 - The STM ATB shall send information to the DMI (via the ETCS on-board) using definitions specified in a DMI configuration table ( [STMA-8277](#)) defining, (a.o.) indicator IDs, button IDs, sound IDs, Icon IDs and position IDs.


STMA-21190 - According to the size and positions:

- the minimum size is (w x h) 12x15mm
- A screen must be 10" (480x640 pixels) diagonal: 800 pixel pixels = 10" = 25,5cm
=> 1 pixel = 0,32mm
- Minimum size: 38x48 (used: 40x50)
- Width area: 272, 6 lamps 240, so 16 additional at each side:
- Position lamp 1: (71,366), soft key(71,351) 71 = 55+16 margin
- ATB status indicator (140,275), softkey (140,260), size: 36x108

For the different indicators fixed positions shall be used, i.e.:

- The “indicator_ID” as sent by the STM will always be equal to the “indicator position_ID”
- The “button_ID” as sent by the STM will always be equal to the “button position_ID”

Definition, STMA-8277 -

DMI configuration table according to  **STMA-4671**. The values in the table are mandatory as far as provided. Other values shall be prescribed by the customer.

The speed indication is an ETCS function.

Description	Values									
NID_STM of the STM	1 (= ATB)									
Number of Indicators	9									
Indicator id (i)	1	2	3	4	5	6	7	8	9	
font size (pixels)	30	30	30	30	30	30				
Horizontal text alignment (i)	center	center	center	center	center	center	center	center	center	
Vertical text alignment (i)	center	center	center	center	center	center	center	center	center	
Number of Indicator positions	9									
Indicator position id (i)	1	2	3	4	5	6	7	8	9	
X Offset of the upper left corner (i)										
Y Offset of the upper left corner (i)										
Horizontal size (i)										
Vertical size (i)										
Number of Buttons	5									
Button id (i)	11	12	13	14	15					
Font size (i)										
Horizontal text alignment (i)										
Vertical text alignment (i)										
Number of Button positions	5									

touch screen										
Button position id touch screen	11	12	13	14	15					
X Offset of the upper left corner (i)										
Y Offset of the upper left corner (i)										
Horizontal size (i)										
Vertical size (i)										
Number of Button positions soft keys	5									
Button position id soft keys	11	12	13	14	15					
X Offset of the upper left corner (i)										
Y Offset of the upper left corner (i)										
Horizontal size (i)										
Vertical size (i)										
Linked soft key										
Number of Icons	15									
Icon id (i)	1	2	3	4	5	6	7	8	9	10
Icon (i) (.bmp)	Yellow_on	Yellow_off	Green_on	Green_off	red_on	Red_off	Blue_on	Blue_off	white_on	white_off
Display text upon icon	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Icon id (i)	11	12	13	14	15					
Icon (i) (.bmp)	release_ button	attention_ button	BD_ button	Test_ button	Override button					
Display text upon icon	no	no	no	no	no					
Number of Sounds	6									
	Sound id (i)	sound (i) (.wav)	type							
gong	1	Gong.wav	One-stroke							
BD-signal	2	BD-signal.wav	One-stroke							
losbel	3	Losbel.wav	One-stroke							


bel	4	Bel.wav	continuous							
Bel-damping	5	Bel-damping.wav	One-stroke							
gong-bel	6	gong-bel.wav	One-stroke							

note: indicator 6 and buttons 14 and 15 are not used in the current version of the STM ATB

3.2 Text messages

STMA-80321 - In specific situations the STMATB will send text messages to the ETCS DMI to be displayed in the field indicated in the packet (STM-38), and to be acknowledged by the driver if indicated in this packet.















All text messages will be send with request to acknowledge. Immediately after the DMI function sends the acknowledgment (packet STM-40) to the STMATB, the STMATB will respond with an order to remove the concerning text message (by sending packet STM-39 for the reported ID).

In  **STMA-80100** - [table: text messages as function of the measure measure text NID_XMESSAGE T_supp...](#) the defined text messages are given together with their identifier and "T_suppress". The latter is the time a text will not be sent again (even if the condition for sending again is met). The "measure number" is not included in the packet send to the DMI function.

As the text messages are contained in the packets send by the STMATB, there is no need to store the information from

 **STMA-80100** - [table: text messages as function of the measure measure text NID_XMESSAGE T_supp...](#) in the ETCS system.

Definition, STMA-80100 - [table: text messages as function of the measure](#)

measure	text	NID_XMESSAGE	T_suppress (s)
 STMA-80081	ontgrendel met attentie, bel tr.dienstl	1	10
 STMA-80087	Laag rempercentage: geel = 30km/u	2	10
 STMA-80082	Kies rijrichting (opnieuw)	3	10
 STMA-80077	STMATB heeft foute snelheid ontvangen	4	10
 STMA-80074	Override fout, ontgrendel met attentie	5	10
 STMA-80148	free to use 2	6	10
 STMA-80154	ATB Baansignaal verstoord	7	30
 STMA-80150	opneemspoel fout	8	300
 STMA-80149	ATB-ETCS communicatie fout, zet ATB uit	9	10
 STMA-80152	temperatuur te laag/hoog, zet ATB uit	10	900
 STMA-80155	ATBVv bakenbericht verstoord	11	10
 STMA-80151	Terug naar geel door interne ATB fout	12	infinite
 STMA-80153	ATB Remcriterium fout, zet ATB uit	13	infinite
 STMA-80160	ATB gegevens ontbreken, max. 100km/u	14	infinite

STMA-80161	Maximum treinsnelheid niet bewaakt	15	infinite
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4 Connector specifications

STMA-21191 - Below the details of the connectors used are specified

Requirement, STMA-29032 - All connectors shall be front mounted.

4.1 Digital I/O connector

Definition, STMA-8323 - (table)

For the power supply and digital I/O signals a front connector type DIN41612-F-48P is defined.

DIO Front connector



Pin	I/O	Pin name	Description
2d		PE	Shield
4d	I	DIn_1B	Digital input
6d		DIn_B-PWR	External power supply for input circuit
8d		PE	
10d	O	DOut_1B	Digital output
12d		DOut_B-Common	Digital out common
14d		PE	
16d	I	Supply1 +	Power input (supply 1)
18d	I	Supply -	Power input
20d		PE	
22d	I	DIn_1A	Digital input
24d		DIn_A-PWR	External power supply for input circuit
26d		PE	
28d	O	DOut_1A	Digital output
30d		DOut_A-Common	Digital out Common
32d		PE	
2b		PE	
4b	I	DIn_2B	Digital input
6b		DIn_B-GND	Digital in ground
8b		PE	
10b	O	DOut_2B	Digital output
12b		DOut_B-Common	Digital out common
14b		PE	

16b	I	<i>Supply2 +</i>	Power positive input (supply 2)
18b	I	<i>Supply -</i>	Power negative/return input
20b		<i>PE</i>	
22b	I	<i>DIn_2A</i>	Digital input
24b		<i>DIn_A-GND</i>	Digital in ground
26b		<i>PE</i>	
28b	O	<i>DOut_2A</i>	Digital output
30b		<i>DOut_A-common</i>	Digital out common
32b		<i>PE</i>	
2z		<i>PE</i>	
4z	I	<i>DIn_3B</i>	Digital input
6z		<i>Di4-6 GND</i>	Digital in ground
8z		<i>PE</i>	
10z	O	<i>DOut_3B</i>	Digital output
12z		<i>DOut_B-Common</i>	Digital out common
14z		<i>PE</i>	
16z	I	<i>Supply2 +</i>	Power input (supply 2)
18z	I	<i>Supply -</i>	Power input
20z		<i>PE</i>	
22z	I	<i>DIn_3A</i>	Digital input
24z		<i>DIn_A-GND</i>	Digital in ground
26z		<i>PE</i>	
28z	O	<i>DOut_3A</i>	Digital output
30z		<i>DOut_A-Common</i>	Digital out common
32z		<i>PE</i>	

GND: common minus for the group of inputs (or outputs)

Common: common plus or minus for the group of outputs

4.2 Analogue inputs connectors

STMA-21189 - For the analogue input signals front connectors of type SubD-15 female and SubD-15 male, are defined ( **STMA-8241** and  **STMA-8276**).

Definition, STMA-8241 - (table)

AD-A Front connector, SubD-15-F

Pin	I/O	Pin name	Description
1	I	<i>Rconfig_A</i>	Configuration resistor input
15	I	<i>Aln_1A+</i>	Coil input
7	I	<i>Aln_1A-</i>	Coil input
14	I	<i>Rg_1A+</i>	Coil gain resistor
6	I	<i>Rg_1A-</i>	Coil gain resistor
13		<i>Aln_A_GND</i>	
5	I	<i>Aln_2A+</i>	Coil input
12	I	<i>Aln_2A-</i>	Coil input
4	I	<i>Rg_2A+</i>	Coil gain resistor
11	I	<i>Rg_2A-</i>	Coil gain resistor
3		<i>Aln_A_GND</i>	
10	I	<i>Aln_3A+</i>	brake pipe pressure input
2	I	<i>Aln_3A-</i>	brake pipe pressure input
9	I	<i>Aln_A_GND</i>	
8	I	<i>Rconfig_A_ret</i>	Configuration resistor return
Sh		<i>PE</i>	Shield

Definition, STMA-8276 - (table)

AD-B Front connector, SubD-15-M

Pin	I/O	Pin name	Description
8	I	<i>Rconfig_B</i>	Configuration resistor input
9	I	<i>Aln_1B+</i>	Coil input
2	I	<i>Aln_1B-</i>	Coil input
10	I	<i>Rg_1B+</i>	Coil gain resistor
3	I	<i>Rg_1B-</i>	Coil gain resistor
11		<i>Aln_B_GND</i>	
4	I	<i>Aln_2B+</i>	Coil input
12	I	<i>Aln_2B-</i>	Coil input
5	I	<i>Rg_2B+</i>	Coil gain resistor
13	I	<i>Rg_2B-</i>	Coil gain resistor

6		<i>Aln_B_GND</i>	
14	I	<i>Aln_3B+</i>	brake pipe pressure input
7	I	<i>Aln_3B-</i>	brake pipe pressure input
15	I	<i>Aln_B_GND</i>	
1	I	<i>Rconfig_B_ret</i>	Configuration resistor return
Sh		<i>PE</i>	Shield

4.3 Profibus connectors

Requirement, STMA-8244 -

The STM ATB shall be equipped with a male and a female profibus connector (internally connected for daisy chaining) as defined in [STMA-8172](#).

Definition, STMA-8172 - table

Profibus connector pinning (Sub-D9)

Pin	Name	Description
1	not used	
2	not used	
3	RxD/TxD P	Data line plus (B)
4	not used	
5	DGND	Data ground
6	VP	+5V supply for bus termination
7	not used	
8	RxD/TxD-N	Data line minus (A)
9	not used	

5 Description of the LEDs and JRU packets

5.1 Indications at the unit

STMA-77735 - At the front of the unit 4 three color LEDs are visible. Two of those LEDs (A and C, see [STMA-36942](#)) are controlled by the safety processor in the unit, the other LEDs (B and D, see [STMA-44279](#)) refer to the status AD converters.

The LEDs status can be used for fault finding.

Definition, STMA-36942 - The meaning of the LEDs (A and C, controlled by the functional processor) is defined in [STMA-80418](#) - document containing the content of the JRU messages including text messages for...

STMA-77732 - The meaning of LED B and D is defined in table [STMA-44279](#). LED B is used for channel A (coils cabin A-right and cabin B-left) and LED D is used for channel B (coils cabin B-right and cabin A-left).

STMA-44279 - During start-up of the STM ATB, status LEDs B and D blink shortly to indicate the status of the input channels.

LED B, D	Meaning
Red	Not active
Orange	Initialisation
Green	Operational

6 ATB specific messages (packet 44)

STMA-43143 -

NO FUNCTIONS WHICH REQUIRE ADDITIONAL TRACK TO TRAIN INFORMATION TO BE COMMUNICATED USING PACKET-44 (SS026) AND PACKET STM-45 (SS058), SHALL BE IMPLEMENTED IN THE STM ATB. THEREFORE THE DEFINITIONS BELOW DO NOT APPLY FOR THE STM ATB DEVELOPMENT. THE CONCERNING TEXT IS MARKED IN RED.

STMA-21194 - The ETCS specification offers the possibility to pass national data to an STM. This option will be used for the following functionalities. This option will be used to partly replace national beacons which are used

- Adapting ATBEG speed levels, equivalent to the original ATB function "ATBM+ mode" (replacing ATBNG beacons)
- Distance to a signal at danger, equivalent to the ATBVv function (replacing ATBVv beacons).

6.1 Definition of packet 44 for adapting speed levels

STMA-21196 - Apart from the standard data in packet 44, including the address information NID_XUSER and NID_NTC (which in the case of an STM ATB have the values "102" and "1"), a packet 44 includes a national defined data block: "Other data depending on NID_XUSER" (see ss026, v3.6.0, 7.4.2.11).

The "other data" shall for the purpose of ATBM+ mode (adapting speed levels) be defined as:

Definition, STMA-13935 - The data block (MSB first) in a packet 44 (= M_DATA(k) in packet STM-45, see subset026 chapter 7) providing new speed levels includes:

- Packet Identifier (Identifier); number distinguishing between different packet-44 types used by the ATB STM = "0" range: (0,...,255)
- Distance in m [0,...,2¹⁶-1] the new speeds are valid (D_Validity_Speeds), 2 bytes
- Train category (NC_TRAIN), value "undefined" implies "valid for all trains" (extended to 16 bits)
- One new speed in km/h [0,...,255] per ATBEG code (CodeSpeeds, range: 0,...,255, steps: 1km/h i.e. one byte)
 - V_code96_temp
 - V_code120_temp
 - V_code147_temp
 - V_code180_temp
 - V_code220_temp
 - V_noCode_temp
- Braking percentage below which the new speeds are valid (MaxBrakingPercentage [0,...,200]), 1byte

6.2 Definition of packet 44 for distance to a signal at danger

STMA-21192 - Apart from the standard data in packet 44, including the address information NID_XUSER and NID_NTC (which in the case of an STM ATB have the values "102" and "1"), a packet 44 includes a national defined data block: "Other data depending on NID_XUSER" (see ss026, v3.6.0, 7.4.2.11).

The "other data" shall for the purpose of sending ATBVv information be defined as:

Definition, STMA-13937 - The data block (MSB first) in a packet 44 (= M_DATA(k) in packet STM-45, see subset026, chapter 7) providing distance to a signal at danger includes:

- Packet Identifier (Identifier); number distinguishing between different packet-44 types used by the ATB STM = "1"
range: (0,...,255), 1 byte
- Distance to the next signal in m $[0, \dots, 2^{16}-1]$, 2 bytes
note only the range $[3, \dots, 2000m]$ shall be used for distances, any value > 2000 shall be interpreted as "Release"

6.3 Definition of packet 44 for "remtabel"

STMA-34497 - Apart from the standard data in packet 44, including the address information NID_XUSER and NID_NTC (which in the case of an STM ATB have the values "102" and "1"), a packet 44 includes a national defined data block: "Other data depending on NID_XUSER" (see ss026, v3.6.0, 7.4.2.11).

The "other data" shall for the purpose of sending "remtabel" information be defined as:

Definition, STMA-34496 - The data block (MSB first) in a packet 44 (= M_DATA(k) in packet STM-45, see subset026, chapter 7) providing "remtabel" values includes:

- Packet Identifier (Identifier); number distinguishing between different packet-44 types used by the ATB STM = "2"
range: (0,...,255)
- Distance in m $[0, \dots, 2^{16}-1]$ the new "remtabel" values are valid (D_Validity_Remtabel), 2 bytes
- Flag indicating if safe maximum speed values are included in the table
note: in some circumstances (e.g. in tunnels) overspeed must be allowed.
- Twenty speed levels in km/h, range: (0,...,255), 1 byte