

# Train protection ETCS system All trackside types

## ETCS System Compatibility Test Description

**Document Management** 

	Name	Signature Date	Signature
Written	Thomas Destrée		
Checked	Valérie Chirez		
Approved	Yves Werner		

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History

Author Version Date § Adapted Reason		Reason			
T. Destrée	1.1 draft 1	17/08/2020	1	Creation of the document	
T. Destrée	1.1 draft 2	27/08/2020		Review comments	
L.Brelot	1.1 draft 3	28/08/2020		Clarification of the "practical" section in ESC_ALL_2	
L. Brelot	1.1	31/08/2020		Major version	
	1.2 draft 1	4/10/2022		Correction of the test case ESC_COM_3 and ESC_TR_17	
T. Destrée	1.2 draft 2	15/11/2022		Review comments.	
	1.2	8/02/2023		New version of [1]	

**Abrogated documents** 

Name	Version	Date

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### 1. Introduction

### 1.1 Purpose of the document

The purpose of this document is to define the test scenarios to perform in order to prove the ETCS System Compatibility (ESC) between the trackside ETCS and the On-board. This document contains test cases applicable to all ETCS trackside types.

The test cases "ESC\_ALL\_x" needs to be done on each trackside type.

The test cases "ESC\_COM\_x" needs to be done on one of the trackside types (and are valid for the others trackside types).

The tests scenarios describe more in detail each "high level" scenarios defined in the ESC test plan [1]. The success of these test scenarios shall prove the technical compatibility between ETCS On-board and the Trackside part ETCS of the CCS subsystems within the ETCS areas on Infrabel network.

The technical specification for interoperability used are defined in [1].

If required, Infrabel can provide additional operational test scenarios performed during the verification that the trackside subsystem complies with the requirement of the TSI.

In case of doubt concerning the ESC of the board with the trackside, the railway undertaking shall take the required action with his supplier and inform Infrabel.

#### 1.2 Basic documents

Ref.	Title	Owner
[1]	PSI (TC,ETCSsys,z) ESC TST PLN 1.6	Infrabel

#### 1.3 Reference documents

Ref.	Title Title	Owner
[2]	PSI (TC,ETCSdata,z) national values 3.2 F	Infrabel

### 1.4 Annexes

Ref.	Title	Owner
[3]	Document	Owner

#### 1.5 Scope

This document is applicable for all trains would run under the protection of ETCS on the Infrabel conventional network.

### 1.6 Definitions, symbols and abbreviations

2Y	Aspect wo yellow displayed by the signal
CCS	Control Command System
CES	Conditional Emergency Stop
DMI	Driver Machine Interface
ESC	ETCS System Compatibility
ETCS	European Train Control System
LS	Limited Supervision
NR	Not Relevant
OBU	On Board Unit
RNP	Aspect Red not permissive displayed by the signal
SBG	Signal Balise Group



SFE Safe Front End SoM Start of Mission

TSI Technical Specification for Interoperability

UES Unconditional Emergency Stop

### 1.7 Known imperfections

None

### 2. On-board Equipment

Out of scope of railway manager Infrabel.



### 3. Functionalities

The tested functionalities are described in the table here under:

Test scenario	Tested functionality	
(ref ESC TST PLN [1])		
ESC_ALL_1	Driving ergonomics and nominal conditions	
ESC_ALL_2	Braking curves	
ESC_COM_1	Receiving a P203 by an OBU B3	
ESC_COM_2	National values of OBU B3 in absence of P203 (default values)	
ESC_COM_3	National values of OBU B3 in absence of P203 (national values	
	defined on board)	
ESC_COM_4	Receiving a P203 by an OBU B2	
ESC_COM_5	Odometer precision	
ESC_COM_6	Resetting the confidence interval	
ESC_COM_7	Technical functions of electrical traction in zone FS (voltage	
	change)	
ESC_COM_8	Testcase deleted	
ESC_COM_9	Technical functions of electrical traction in zone FS (phase change)	
ESC_TR_17	Board reaction in absence of transition acknowledgment	

The document will only describe the sequences to perform the scenarios but not all the actions to prepare the execution of the test scenarios.



### 4. Test scenarios

### 4.1 ESC\_ALL\_1: Driving ergonomics in nominal conditions

No specific scenario is defined. During the whole test campaign, the tester observes the behavior of the system in nominal situation while the driver acts in compliance with regulation.

### 4.2 ESC\_ALL\_2 : Braking curves

The assessment has 2 sections: a "theoretical" section and a "practical" section.

intervention in the case of driver not reacting.

- 1) "Theoretical" section:
  - The applicant provides a demonstration of compliance with applicable Infrabel braking curves, which are assessed. The demonstration is generally based on the values of the parameters which intervene in the calculation of the braking curves and which shall be presented in a technical document by the applicant.
- 2) "Practical" section:
  - ESC Test Manager carries out braking tests during which several Data Entries are entered. For each Data Entry, the tester records the speeds, distance of indication and distance of intervention for each braking caused by the EVC. The Data Entry, speed and gradient values are then sent to the applicant who is asked to calculate / model the indication and intervention distances based on the parameters presented in the "theoretical" section. ESC Test Manager then compares the results provided by the applicant and those observed during the tests. The ESC Test Manager validates the effect / integration of the parameters of the "theoretical" part on the braking curves calculation done by the ETCS system on the train. The ETCS Test Manager checks also that the braking curve are long enough to avoid a SPAD due to an ETCS



### 4.3 ESC\_COM\_1: Receiving a P203 by an OBU B3

This test case is only applicable to Baseline 3 trains and has to be executed on a trackside type sending P203 with M\_VERSION 1.1.

The test cases ESC\_TR\_3 or ESC\_TR\_4 can be used to test this functionality.

### 4.3.1 Description

ID	Date			Location / Line		
ESC_COM_1	<dd mm="" td="" y<=""><td colspan="2"><dd mm="" yyyy=""></dd></td><td><line></line></td></dd>	<dd mm="" yyyy=""></dd>		<line></line>		
Description	Functiona	lities tested :				
	Receiving	a P203 by an OBU B3				
	A Baselin	e 3 train with national values f	or LS-area rece	ives national values		
	for FS-are	ea.				
Signal passed						
Name			Trackside data	afile in service		
Test Scenarios						
Starting condition	Train 1 i	s a Baseline 3 train with	LS-area natio	nal values stored		
	onboard.					
	Train is in level 1, mode SR or LS					
	Train 1 is upwards a BG sending national values for FS area (P3 and P203)					
	Be sure all authorisations are filled in before performing the test					
	scenarios	S				
Sequences of the test s	cenario					
Step Step descript	ion	Description of what to be tested	Statement C	Comment		
1 Train passes	s the BG	The national values	Pass / Fail			
and receiv	es the	defined in P203 (see [2])				
national va	ues (P3	are stored onboard,				
and P203)						
Test scenario finished	Test scenario finished					

### 4.3.2 Scenario diagram

	None	
Final State		



### 4.4 ESC\_COM\_2: National values of OBU B3 in absence of P203 (default values)

This test case is only applicable to Baseline 3 trains and has to be executed on a trackside type sending with  $M_VERSION$  1.0.

### 4.4.1 Description

ID		Date	Date Location / Lin			
ESC_CO	M_2	<dd mm="" td="" y<=""><td>yyy&gt;</td><td></td><td><line></line></td></dd>	yyy>		<line></line>	
Description	on	Functiona	lities tested :			
		National v	values of OBU B3 in absence	of P203 (defau	ult values)	
Signal pa	ssed					
Name				Trackside da	tafile in service	
Test Sce	narios					
Starting of	condition	Train 1 is	s a Baseline 3 train withou	t Belgian nat	ional values stored	
		onboard.				
			n level 1, mode SR or LS			
		Train 1 is	upwards a BG sending national values for FS area (P3 only)			
		Be sure	all authorisations are filled in before performing the test			
		scenario	S			
Sequenc	es of the test s	cenario				
Step	Step descript	ion	Description of what to be tested	Statement	Comment	
1	Train passes	the BG	The national values stored	Pass / Fail		
	and receives	an MA	onboard are the default			
	with the	national	ones defined in the			
values (P3 only)		nly)	baseline 3 set of			
			specifications for what			
			concerns only the values			
			defined in P203.			
Test scer	nario finished					

### 4.4.2 Scenario diagram

	None	
Final State		



### 4.5 ESC\_COM\_3: National values of OBU B3 in absence of P203 (national values defined on board)

This test case is only applicable to Baseline 3 trains and has to be executed on a trackside type with  $M_VERSION$  1.0.

### 4.5.1 Description

ID	Date			Location / Line		
ESC_COM_3	<dd mm="" td="" y<=""><td>/yyy&gt;</td><td></td><td><line></line></td></dd>	/yyy>		<line></line>		
Description	Functiona	alities tested :				
	National v	alues of OBU B3 in absence	of P203 (natior	nal values defined on		
	board)					
Signal passed						
Name			Trackside dat	tafile in service		
Test Scenarios						
Starting condition	Train 1	is a Baseline 3 train with	Belgian nation	onal values stored		
	onboard.					
	Train is in	in level 1, mode SR or LS				
	Train 1 is	s upwards a BG sending national values for FS area (P3 only)				
	Be sure	all authorisations are filled in before performing the test				
	scenario	s				
Sequences of the t	est scenario					
Step Step des	scription	Description of what to be tested	Statement	Comment		
1 Train pa	asses the BG	The national values stored	Pass / Fail			
and rec	eives an MA	onboard corresponds to				
with t	he national	those listed in [2] for what				
values (P3 only)		concerns only the values				
		defined in P203.				
Test scenario finish	ned					

### 4.5.2 Scenario diagram

	None	
Final State		



### 4.6 ESC\_COM\_4: Receiving a P203 by an OBU B2

This test case is only applicable to Baseline 2 trains and has to be executed on a trackside type sending P203 with M\_VERSION 1.1.

The test cases ESC\_TR\_3 or ESC\_TR\_4 can be used to test this functionality.

### 4.6.1 Description

ID	Date			Location / Line	
ESC_COM_4	<dd mm="" td="" y<=""><td>/yyy&gt;</td><td></td><td><line></line></td></dd>	/yyy>		<line></line>	
Description	• 1	Receiving a P203 by an OBU	B2	1	
Signal passed		· ·			
Name			Trackside da	atafile in service	
<del>-</del> 					
Test Scenarios					
Starting condition	Train 1 is	a Baseline 2 train.			
	Train is in	in level 1, mode SR			
	Train 1 is	upwards a BG sending national values (P3 and P203)			
	Be sure	all authorisations are filled in before performing the test			
	scenario	s			
Sequences of the t	est scenario				
Step Step des	scription	Description of what to be tested	Statement	Comment	
Train passes the BG and receives an MA with the national values (P3 and P203)		The OBU accepts the message and the national values defined in P3 are stored onboard.	Pass / Fail		
Test scenario finish	ned				

### 4.6.2 Scenario diagram

	Mana	
	None	
Final State		
Timal State		



### 4.7 ESC\_COM\_5: Odometer precision

### 4.7.1 Description

ID		Date			Location / Line
ESC_CO	M_5	<dd mm="" yyyy=""></dd>			<line></line>
Description Odometer precision					
Signal pa	ssed				
Name				Trackside	datafile in service
Test Sce					
Starting of	condition	Trair	is in SR mode.		
		_			
			sure all authorisations are filled in	n betore pe	erforming the test
Coguene	oo of the toot o		narios		
•	es of the test s		Description of what to be tested	Stateme	Comment
Step	Step descrip	lion	Description of what to be tested	nt	Comment
1	An error	is	None	TIL	
•	introduced		None		
	recording	the			
	wheel diame	ter			
2	Train starts		odometry errors are recorded by the	(Informat	
			JRU:	ive)	
			Distances and errors are listed here		
			under:		
			Distance 1: <xxx> m</xxx>		
			L_DOUBTUNDER : <xxx> m</xxx>		
			L DOUBTOVER : <xxx> m</xxx>		
			Distance 2: <xxx> m</xxx>		
			L_DOUBTUNDER : <xxx> m</xxx>		
			L DOUBTOVER : <xxx> m</xxx>		
			L_DOODTOVER.		
4	Commont the		Nana		
4	Correct the in the w	error /heel	None		
	diameter	nieei			
Test scen	nario finished				



4.7.2	Scenario diagram			
		None		
Final	State			

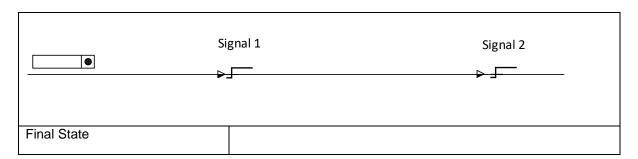


### 4.8 ESC\_COM\_6: Resetting the confidence interval

### 4.8.1 Description

ID		Date			Location / Line	
ESC_CO	M_6	<dd <="" mm="" td=""><td colspan="4"><dd mm="" yyyy=""> <line></line></dd></td></dd>	<dd mm="" yyyy=""> <line></line></dd>			
Description	on		Resetting the confidence interval,			
			g the resetting of the confidence	•	-	
		there is I	inking information on board and v	when there isn't	l linking on board.	
Signal pa	ssed					
Name				Trackside data	afile in service	
Signal 1 ETCS1 F	_	e> is an	open signal equipped with an			
	•	e> is an	open signal equipped with an			
ETCS1 F						
Test Scer						
Starting of	condition		s in level 1 mode SR.			
			nore than 250m upwards signal 1	without BG be	tween the train and	
		the SBG	•			
		_				
			all authorisations are filled	in before per	forming the test	
Coguene	es of the test s	scenario	)S			
Step	Step descript		Description of what to be	Statement (	Comment	
Step			tested		Johnnent	
1	Train runs signal 1	towards	Odometry error increase	Pass / Fail		
2	Train passes the SBG of signal 1		Train changes to FS mode and odometry is reset (L_DOUBTUNDER and	Pass / Fail		
	T'-		L_DOUBTOVER)	D / E		
3	Train passes the SBG of signal 2		Odometry is reset (L_DOUBTUNDER and L_DOUBTOVER)	Pass / Fail		
Test scer	nario finished					

### 4.8.2 Scenario diagram



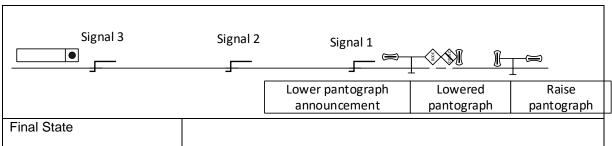


### 4.9 ESC\_COM\_7: Technical functions of electrical traction in zone FS (voltage change)

### 4.9.1 Description

ID		Date			Location / Line	
ESC_CO	M_7	<dd mm="" yyyy=""> <line></line></dd>				
Description	on	Functionalities tested :				
			functions of electrical tract	ion in zone F	S (catenary voltage	
Cianalna		change)				
Signal pa Name	issea			Trackaida dat	tafile in service	
	· -cianal name	> ic proto	cting an area where a track	Trackside dai	taille ili Service	
	is defined.	s> is prote	cuing an area where a track			
		> is an ope	n main stop signal			
			n main stop signal			
Test Scer						
Starting of	condition	Train is i	n FS mode upwards signal :	3.		
			all authorisations are fille	d in before p	performing the test	
Camuana	+	scenario	<b>S</b>			
•	es of the test s		Description of what to be	Statement	Comment	
Step	Step descript	ION	Description of what to be tested		Comment	
1	•	proaches	"Lower pantograph	Pass / Fail		
	Signal 1 in FS	S mode	announcement" icon is			
2	Troin noosss	the nenel	displayed on the DMI.	Pass / Fail		
2	Train passes at the entry	•	"Lower pantograph" icon is displayed on the DMI.	Pass / Pall		
	change of		displayed on the Divil.			
	traction area.	F				
3	Last pantograph of the		"Raise pantograph" icon is	Pass / Fail		
train passes the panel		displayed on the DMI				
	at the end					
	change of	p				
_	traction area.					
Test scer	nario finished					

### 4.9.2 Scenario diagram





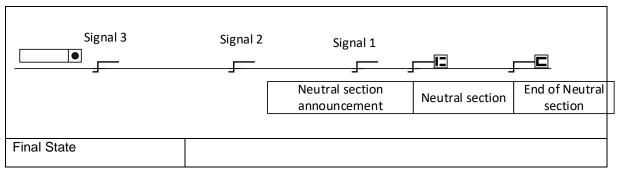
### 4.10 ESC\_COM\_8: Deleted testcase

### 4.11 ESC\_COM\_9: Technical functions of electrical traction in zone FS (phase change)

### 4.11.1 Description

ID	Date			Location / Line
ESC_COM_9	<dd mm="" td="" y<=""><td><line></line></td></dd>	<line></line>		
Description	Functionalities tested :			
	Technical	functions of electrical trac-	tion in zone F	S (catenary phase
	change) d	on a 25kV line.		
Signal passed				
Name			Trackside data	afile in service
Signal 1 : <signal name<="" td=""><td>e&gt; is prote</td><td>ction an area where a track</td><td></td><td></td></signal>	e> is prote	ction an area where a track		
condition is defined.				
Signal 2 : <signal name<="" td=""><td>&gt; is an ope</td><td>n main stop signal</td><td></td><td></td></signal>	> is an ope	n main stop signal		
Signal 3 : <signal name<="" td=""><td>&gt; is an ope</td><td>n main stop signal</td><td></td><td></td></signal>	> is an ope	n main stop signal		
Test Scenarios				
Starting condition	Train is i	n FS mode upwards signal :	3.	
	Be sure	all authorisations are fille	d in before p	erforming the test
	scenario	S		
Sequences of the test s				
Step Step descript	ion	Description of what to be tested	Statement	Comment
1 Train ap	proaches	"Neutral section	Pass / Fail	
Signal 1 in F	S mode	announcement" icon is		
		displayed on the DMI.		
2 Train passes	the panel	"Neutral section" icon is	Pass / Fail	
at the entr	y of the	displayed on the DMI.		
change of	power			
traction area.			Pass / Fail	
	Last pantograph of the "End of Neu			
train passes	•	icon is displayed on the		
at the end		DMI		
change of	•			
traction area.				
Test scenario finished				

### 4.11.2 Scenario diagram





### 4.12 ESC\_TR\_17: Board reaction in absence of transition acknowledgment

ID		Date			Location / Line		
ESC_TR	17	<dd mm="" yyyy=""></dd>			<line></line>		
Description		Board reaction in absence of level transition acknowledgment (transition					
Ţ			ETCS1 or ETCS2).		- '		
Signal pa	assed						
Name				Trackside datafile in service			
-	1: <signal e<="" etcs1="" named="" or="" td="" to=""><td></td><td>en) and is at a level</td><td></td><td></td></signal>		en) and is at a level				
Test Scenarios							
Starting condition		Train is in STM upwards of signal S1					
			thorisations are fille	d in before p	erforming the test		
		scenarios	thorisations are fille	d in before p	erforming the test		
•	es of the test so	scenarios cenario					
Sequence Step	es of the test so	scenarios cenario	Description of what to be tested		erforming the test  Comment		
•	Step descripti	scenarios cenario	Description of what to be tested  Train changes to	Statement			
Step	Step descripti	scenarios cenario on and receives a	Description of what to be tested	Statement	-		
Step	Step descripti  Train starts level transition The driv	scenarios cenario on and receives a n order. ver doesn't	Description of what to be tested Train changes to level 1 or level 2. A service brake	Statement	-		
Step	Step descripti  Train starts level transition The driv	scenarios cenario on and receives a	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is	Statement	-		
Step 1	Step descripti  Train starts level transition The driv acknowledge	scenarios cenario on and receives a n order. ver doesn't the transition.	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is triggered.	Statement Pass / Fail	-		
Step	Step descripti  Train starts level transition The driv acknowledge  Drivers ackno	scenarios cenario on and receives a n order. ver doesn't	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is triggered. Brakes are	Statement	-		
Step 1	Step descripti  Train starts level transition The driv acknowledge	scenarios cenario on and receives a n order. ver doesn't the transition.	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is triggered. Brakes are released and driver	Statement Pass / Fail	-		
Step 1	Step descripti  Train starts level transition The driv acknowledge  Drivers ackno	scenarios cenario on and receives a n order. ver doesn't the transition.	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is triggered. Brakes are	Statement Pass / Fail	-		
Step  1	Step descripti  Train starts level transition The driv acknowledge  Drivers ackno	scenarios cenario on and receives a n order. ver doesn't the transition.	Description of what to be tested Train changes to level 1 or level 2. A service brake reaction is triggered. Brakes are released and driver	Statement Pass / Fail	-		

### 4.12.1 Scenario diagram

	None	
Final State		