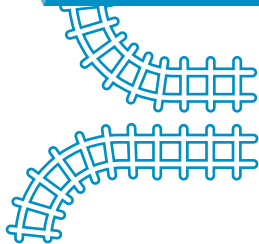


LABORATORY AND INFRASTRUCTURES FOR RAILWAY TESTING



Railway Testing Centre

Partner of manufacturers,
network managers, operators
and scientific players



EXPERTISE AT THE SERVICE OF INNOVATION AND PERFORMANCE

A reference in Europe

- **2 TESTING PLATFORMS: CEF1 – CEF2**
- **20 KM OF TRACKS**

CEF



RAILWAY TESTING CENTRE

The Railway Testing Centre (CEF) is a unique tool in France dedicated to leasing its infrastructures and services for testing, maintenance and training activities.

It allows, the railway manufacturers, equipment manufacturers, operators, infrastructure managers, test laboratories or researchers to:

- carry out their tests on dedicated infrastructures, without the constraints inherent in commercially exploited networks
- benefit from appropriate logistical facilities and high level technical support
- have facilities that can be configured according to their needs

OUR STRENGTHS

FLEXIBILITY



Given the challenges inherent in the testing process, the CEF makes it a point of honor to be able to propose to its clients organizational solutions adapted to their constraints.

ADAPTABILITY



CEF strives to offer tailor-made solutions to best meet the testing needs of its customers.

SAFETY



Safety is the first priority of the CEF, both for staff and for traffic. Each year, the CEF is subject to two safety audits according to ALSTOM Transport standards.

SECURITY



CEF has invested in significant means of protection in order to preserve in particular the rolling stock present on the site from any malicious acts.

ISO-COFRAC



CEF has obtained ISO 9001 certification since 2009 for its test tracks operations and, since 2012, for its testing laboratory activity.

The test laboratory is also accredited by COFRAC according to ISO/CEI 17025.

DYNAMIC TESTS PERFORMED ON ROLLING STOCK

CEF1	CEF2	NOISE	BRAKING	CEF1	CEF2
✗		• Measurement of internal noise, both static and dynamic	• Braking performance	✗	✗
	✗	• Measurement of external noise at 7.50 m from the track: with train at constant speed, in acceleration and in deceleration	• Tests on degraded adhesion conditions	✗	✗
			• Wheel Slide protection System: adjustment and tests under very degraded adhesion conditions	✗	✗
CEF1	CEF2	TRACTION PERFORMANCE	• Parking brake: measurement of forces applied on wheels and discs + operation of braking test system	✗	✗
✗	✗	• Electric traction and braking performance	• Anti-slip system: performance and operation	✗	✗
✗	✗	• Starting performance of traction control systems	• Brake blending: operation		✗
	✗	• Speed regulation system tests / imposed speed	TRAIN OPERATION	CEF1	CEF2
✗	✗	• Adherence performance at starting and in traction	• Train command, control and monitoring systems	✗	✗
✗	✗	• Residual acceleration of the train at maximum speed (limited to 100 kph)	• Sanding and wheel flange lubrications systems	✗	✗
✗	✗	• Brake management during emergency brake application	• Magnetic friction braking / eddy-current braking	✗	✗
✗	✗	• Speed indicator: measurement of the display accuracy	• Braking in the event of loss of train integrity		✗
CEF1	CEF2	COMPATIBILITY BETWEEN ROLLING STOCK AND TRAIN DETECTION SYSTEMS	OPERATION OF SAFETY EQUIPMENT	CEF1	CEF2
	✗	• Compatibility with track circuits	• Communication ground/train, recording of events, control of driver vigilance		✗
	✗	• Compatibility with electronic wheel detectors	• ERTMS level 1 and 2, ETCS and GSMR radio system	✗	
CEF1	CEF2	ELECTROMAGNETIC COMPATIBILITY	• Operation of the systems of indication: repetition of signals (BRS), KVB...		✗
✗	✗	• Radiated electromagnetic disturbances	• Operation of the braking automation		✗
	✗	• Interference with telecommunication lines	THERMAL CAPACITY TESTS	CEF1	CEF2
CEF1	CEF2	DYNAMIC PERFORMANCE	• In traction	✗	✗
	✗	• Vibrational comfort (ride quality)	• In braking		✗
✗	✗	• Running behaviour – measurement of forces on the track	• Air flow control		✗

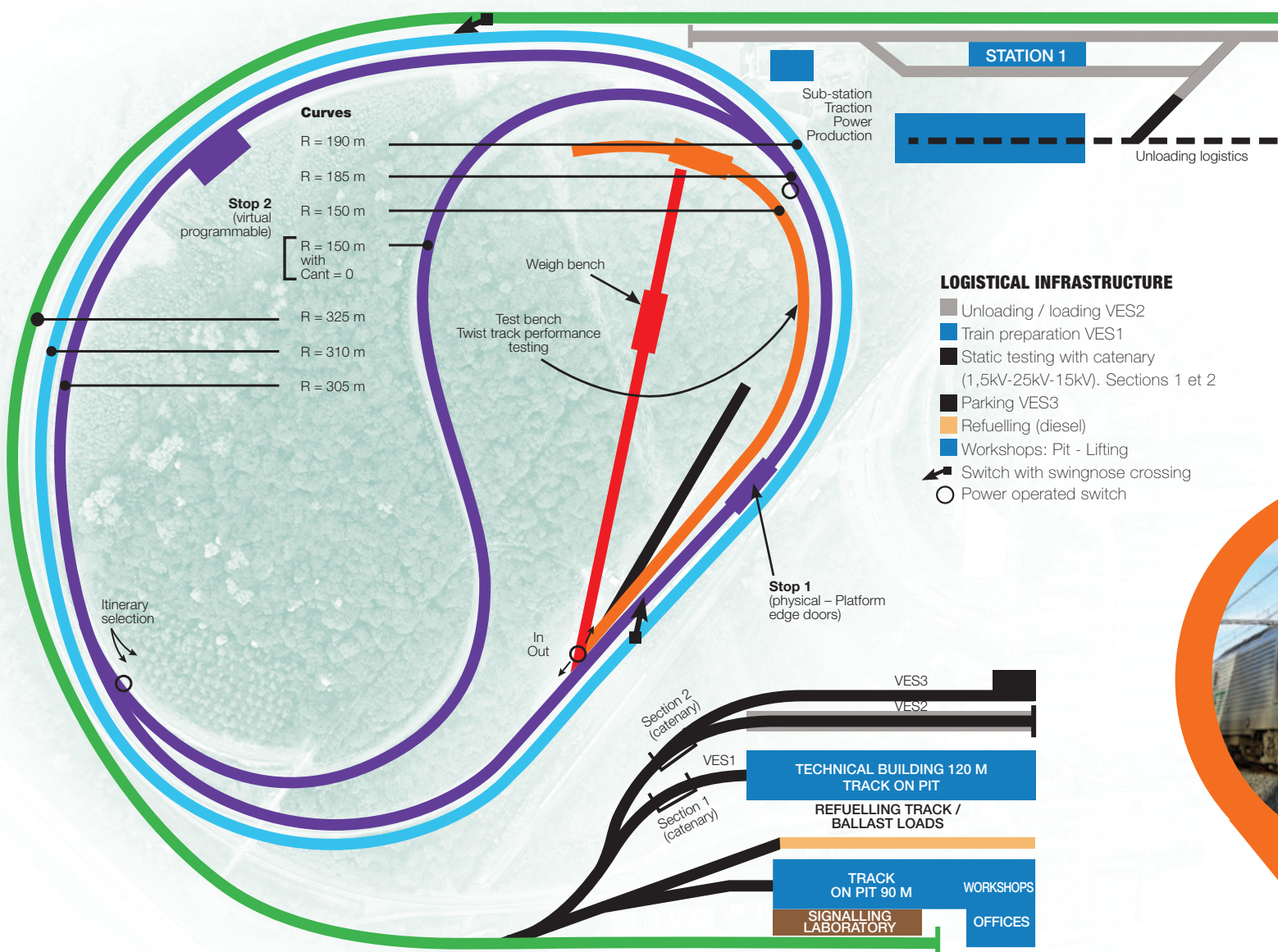




TESTING PLATFORM - UP TO 110 KPH PEAK

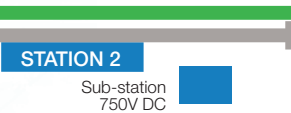
BASED IN PETITE-FORÊT, CLOSE TO VALENCIENNES, AT THE HEART OF THE REGION LES HAUTS OF FRANCE, THE CEF1 COVERS A 52 HECTARE SURFACE AND IS LINKED WITH THE NATIONAL RAILROAD NETWORK (RFN).

CEF1 is perfectly adapted in tests of urban / suburban rolling stock (such as metro, trams and tram-trains) equipped with standard gauge bogies (1435 mm). CEF1 has also installations allowing to test rubber-tired vehicles, as well as the driverless systems. CEF1 is equipped with a ERTMS track, a weigh bench and an anti-derailment test track.





A FLEXIBLE, CONFIGURABLE HIGH-TECH PLATFORM FOCUSED ON VALIDATION OF NEW PRODUCT DEVELOPMENTS AND THEIR INTEGRATION



CHARACTERISTICS OF THE CEF1 CIRCUITS	PERFORMANCE TESTING TRACKS	ENDURANCE RING TESTING TRACK	DRIVERLESS TESTING TRACK		CONCRETE TESTING TRACK FOR TYRE-MOUNTED VEHICLES
	VEV	VAE	PASC1	PASC2	VEBP
DIMENSIONS					
Length	2720 m	1828 m	1798 m	1200 m	800 m
Maximum speed	110 kph	90 kph	80 kph	30 kph	75 kph
Straight section	1400 m including 380 m of long welded rail	201 m	181 m	60 m	650 m
Maximum gradient	7,6 ‰	8,8‰	9‰	10‰	2‰
Curve radius	325 m	310 m 190 m	305 m 185 m	150 m	NULL
Dynamic gauge Power collection	UIC - Variable	UIC - Catenary	UIC - Variable		Variable
OVERHEAD POWER SUPPLY – 5 MVA PER TRACK					1,5 MVA
25 kV 50Hz - 60Hz	✗	✗			
15 kV 16Hz 2/3	✗	✗			
3000 V CC	✗	✗			
1500 V CC	✗	✗	✗	✗	
750 V CC	✗	✗	✗	✗	
3 RD RAIL POWER SUPPLY VIA AND CONTACT MODE					
750 V CC	Below		Lateral	Lateral	Lateral
Power supply sections	3	-	3	2	3
INFRASTRUCTURE FOR RUBBER-TYRED METRO					
Rollways	Ballasted track	Ballasted track	Ballasted track	Concrete track	5



CEF2

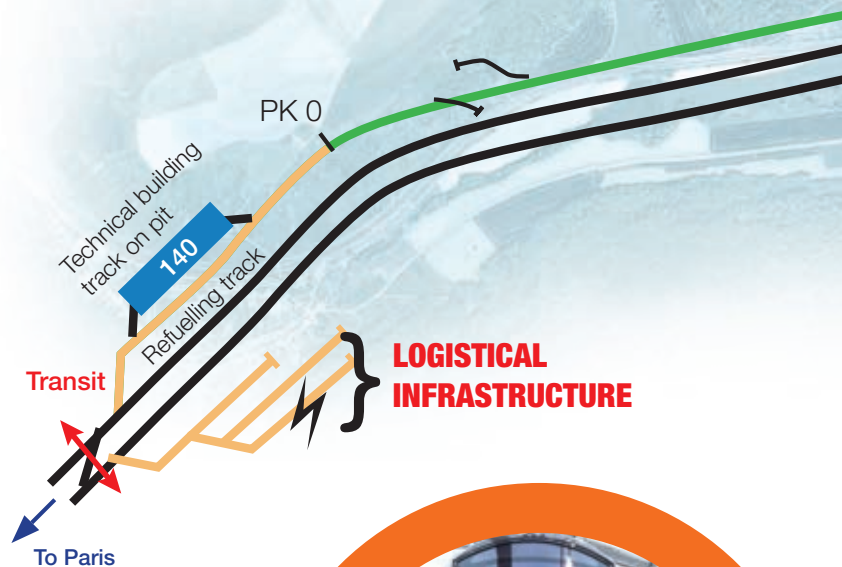
BAR-LE-DUC



TESTING PLATFORM - 160 KPH SEMI-STABILISED

BASED IN THE MEUSE DEPARTMENT ,IN TROUVILLE EN BARROIS , CLOSE TO BAR-LE-DUC, CEF2 HAS BEEN BUILT TO MEET THE EXPECTATIONS AND TESTS NEEDS OF THE THE CONVENTIONAL ROLLING STOCKS (INTERCITY, MAIN LINE AND FREIGHT).

CEF 2 offers a 12 km straight line, capable of 160km / hour, and is linked with the National Railroad network (RFN).





PK 12
To Strasbourg
Straight alignment section 1100 m - 160 kph

Straight alignment section 1100 m - 140 kph

- Operational parking area
- Static tests with catenary 25kV

CIRCUITS	SUBURBAN – REGIONAL INTERCITY - LOCOMOTIVE
	Dynamic testing track
FUNCTIONS	VED
	<ul style="list-style-type: none"> • Stabilised traction / braking performance at 160 kph • Power collection 25 kV - 1.5 kV • Low adhesion • Tests on 8 ‰ slope • Speed control using beacons

DIMENSIONAL FEATURES	
Length	12 km
Maximum speed	160 kph
Straight section	1100 m (2)
Maximum gradient	8‰
Flat section	0
Curve radius	750 m to 4500 m
POWER	
25 kV 50Hz	6 MVA with regenerative function
1500V CC	3,5 MVA without regenerative function
SIGNALLING	
KVB system	Evolvable bi-standard KVB-ERTMS
INSTALLATIONS	
Technical building	140 m
Pit	120 m
Complete lifting of train	Set of lifting jacks



TEST LABORATORY



THANKS TO SPECIFIC INFRASTRUCTURES IN CEF1 AND ITS COFRAC ISO / CEI 17025 ACCREDITATION, THE LABORATORY TEAM CAN PERFORM THE TESTS BELOW, AND DEMONSTRATE THE RESULTS:

- ✓ Rolling stock weigh tests
- ✓ Non-derailment performance tests (twist track, method 1).

Thanks to our benches capacities, CEF is a key player in Europe able to perform these tests.

WEIGH BENCH

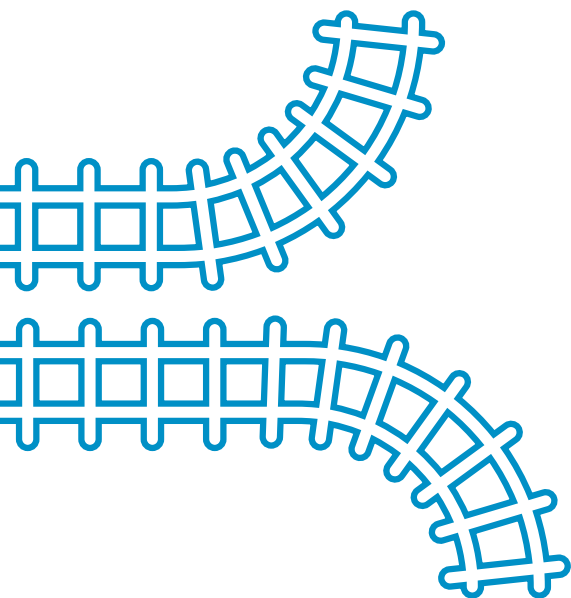
CHARACTERISTICS

- Length in straight alignment: 288 m
- Track equipped with pit and centering device
- Simultaneous measurement of 2 axes
- 20 sensors

ASSOCIATED MEASUREMENTS

- Exploitable in static and dynamic mode
- Weight assessment
- Weather conditions
- Accuracy: $\pm 0,5$ kN

REFERENCE STANDARD: NF 00-701

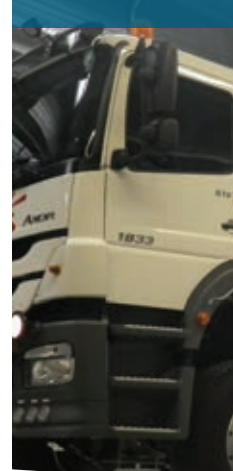


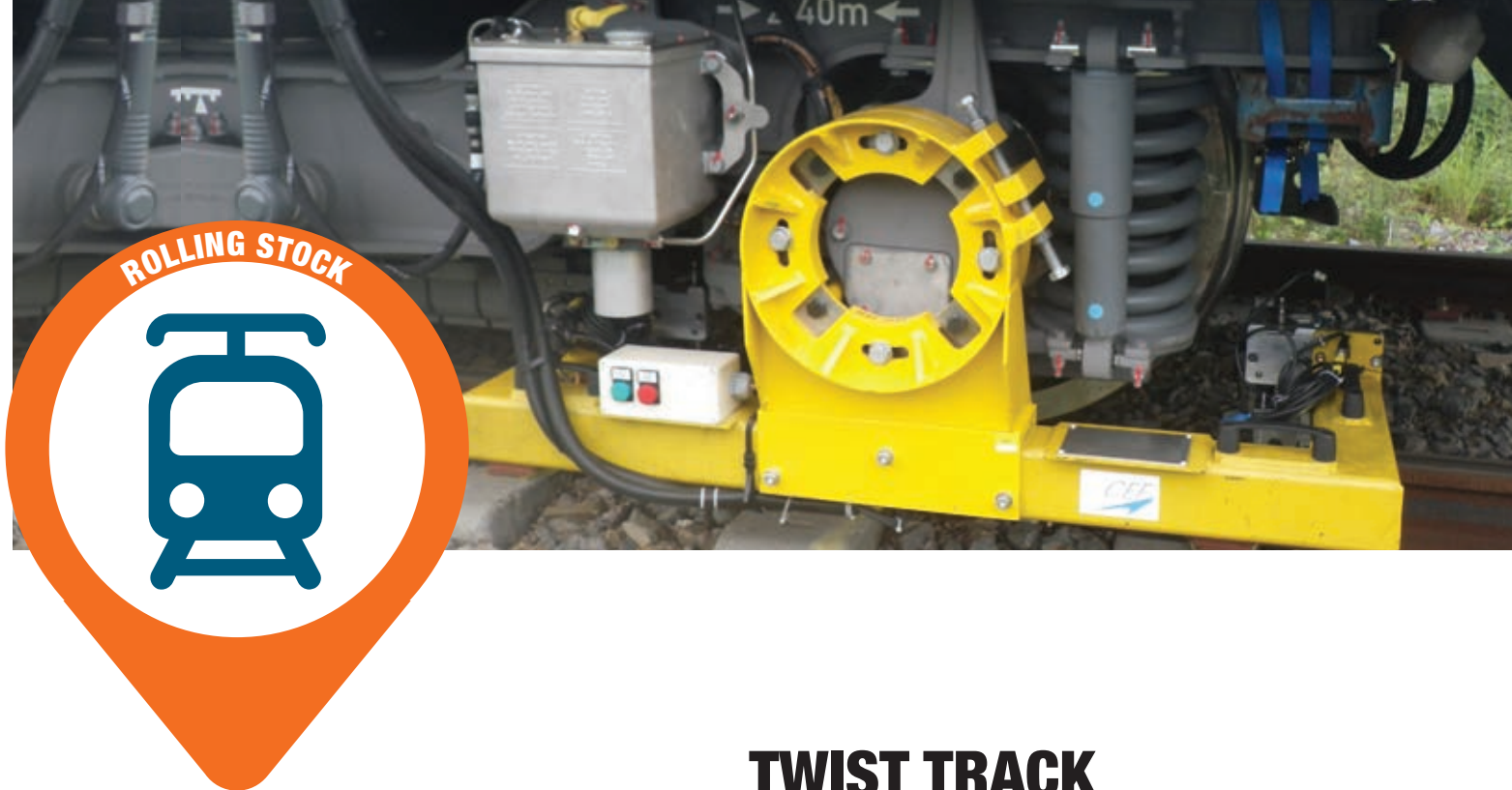
TESTS ON ALL TYPES OF ROLLING STOCK TRAINS

URBAN/SURBURBAN TRAIN

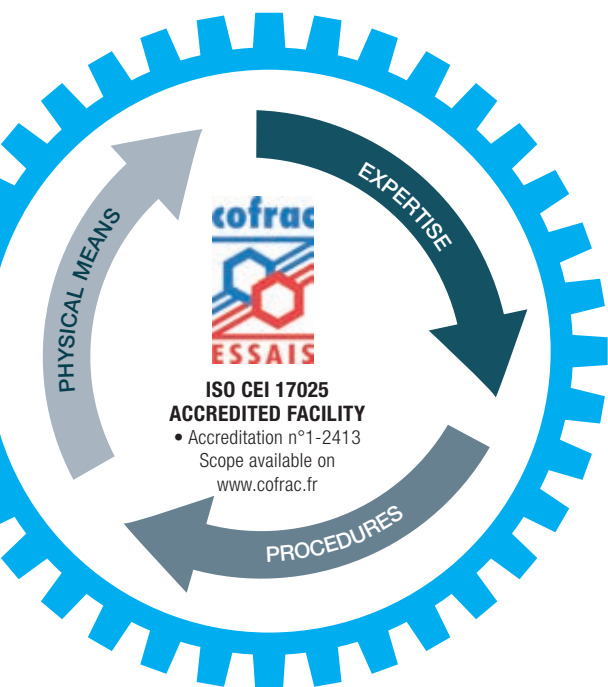


RAIL-ROAD





MONITORING/HOMOLOGATION



TWIST TRACK

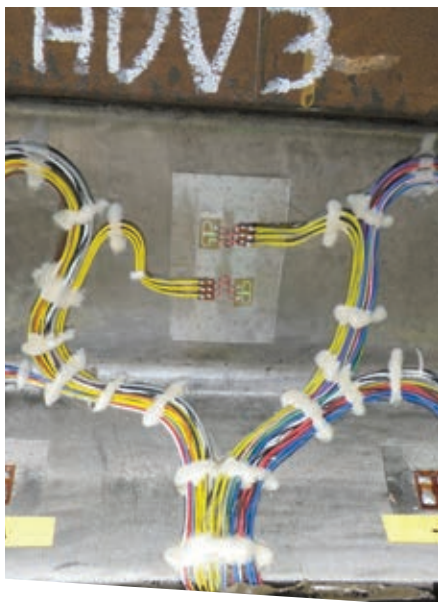
CHARACTERISTICS

- Length 350 m
- With 30 m slab track covered for measurements
- Radius of curvature: 150 m
- Slope: -45mm/+45mm on 30 m
- Twist: 3‰
- 150 sensors

ASSOCIATED MEASUREMENTS

- Non-derailment performance tests
- Wheel / rail contact stress
- Weather conditions
- Wheel lifting
- Striking angle
- Wheel profile
- Accuracy: $\pm 0,5$ mm

REFERENCE STANDARD: EN 14363





DEVELOPMENT INNOVATION VALIDATION MEASUREMENTS



Thanks to its international recognized skills and certifications (COFRAC, ISO/CEI 17025) and rich in its contribution of various projects certified by the pole of competitiveness I-Trans, the test laboratory makes of CEF the preferred partner for your research and development programs. The test laboratory takes advantage in test, metrology, rolling stock, infrastructure, to invest in complex, scientific and technical projects combining innovation and performance.

- Preliminary study
- Implementation, instrumentation
- Data acquisition

- Measurement processing
- Test reports
- Customers project management



THANKS TO OUR PARTNERSHIP WITH ALSTOM, CEF HAVE THE ACCESS TO DELOCALIZED TESTS BENCHES TO REALIZE CLIMATIC AND ACOUSTIC TESTS.

CLIMATIC CHAMBER

This installation was previously dedicated to type tests and to develop cooling or heating/ventilation equipment. It can also be used in other domains as electrical, road, aeronautics, military, etc... in order to test bigger specimen under extreme conditions.

Physical characteristics

- Total volume : $\approx 1000 \text{ m}^3$
- Usable Volume: $\approx 750 \text{ m}^3$
- Usable length : 35 m
- Usable width : 4,3 m
- 240 thermic test loops

Raw performances

- $T^\circ \text{ min} = -30^\circ\text{C}$
- $T^\circ \text{ max} = +60^\circ\text{C}$
- Max. Relative Hygrometry: 90%
- Solar radiation: $1000\text{W}/\text{m}^2$

Reference standards

- EN 13129-1, EN 13129-2, EN 14750-1, EN 14750-2, EN 14813-1, EN 14813-2

they trust us :



ACOUSTIC CHAMBER

This installation is made by a double reverberation chamber, designed for tests of acoustic transparency in diffuse field.

Vibratory analysis with impacts hammers of adapted sizes.

Physical characteristics

- Radiation room volume : $69,8 \text{ m}^3$
- Reception room volume : $58,7 \text{ m}^3$

Maximum dimensions of the specimen

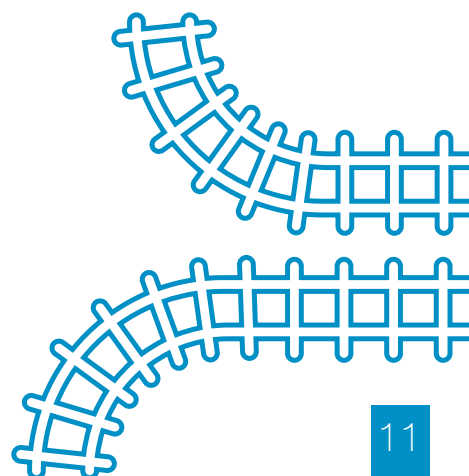
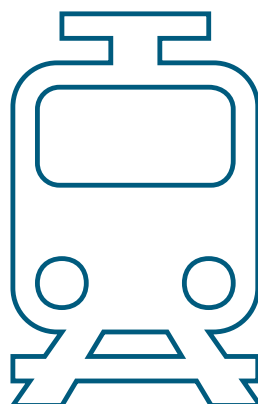
- Length = 2,295 m
- Width = 1,465 m
- Thickness = 0,3 m

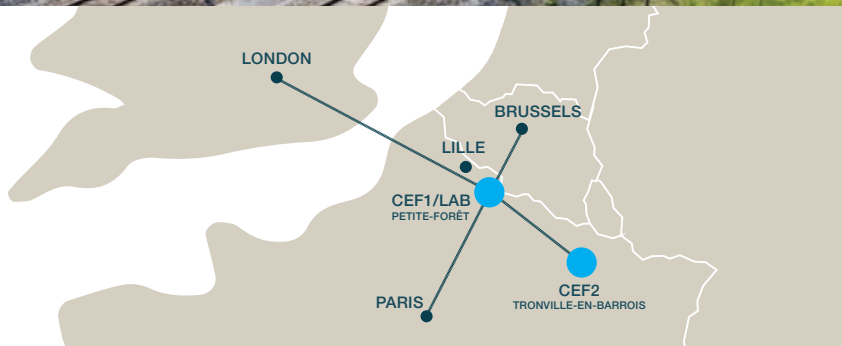
Raw performance

- Maximum sound transmission loss: 57dB(A)
- Frequency range : 100 Hz - 5000 Hz

Reference standards

- EN 3095; EN 3381; EN 15892; EN 60268; EN 3382





At the heart of a region renowned for rail excellence, CEF is a decisive partner in the I-TRANS worldwide competitiveness cluster.



SECURED DEADLINES



THEY TRUST US

ALSTOM



BOMBARDIER

CAF

DOOSAN

ETF

EURAILSCOUT

eurailtest



SNCF

Sopava
Sopemea

COLAS RAIL

EUROPORTE

SYSTRA



THALES

TP Ferro



vossloh



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