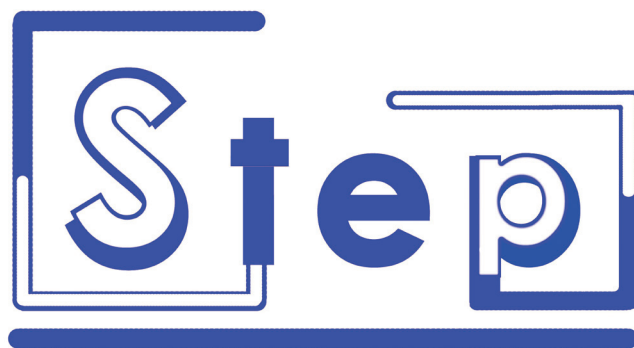


TEST BENCHES FOR RAILWAY SYSTEMS AND EQUIPMENT





G.B.M. and Step Technology is pleased to offer to its customers a wide range of test benches for railway pneumatic systems and components that can be customized according to market and customer needs.

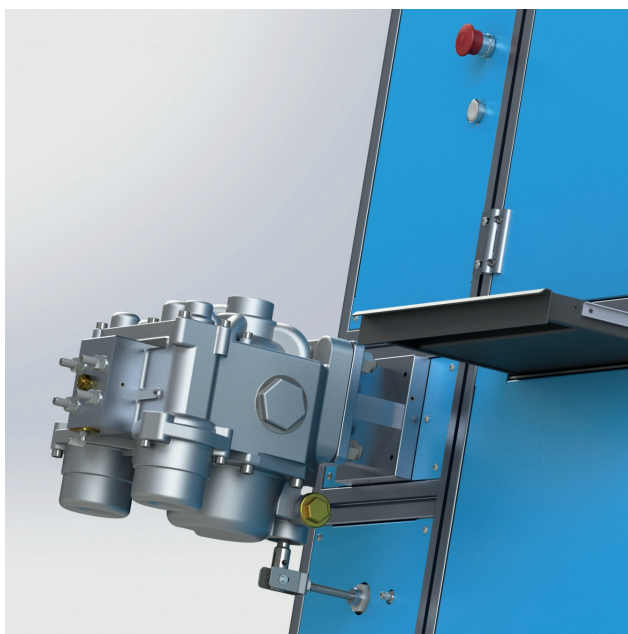
- test benches and equipment for testing brake systems and brake equipment;
- test benches and equipment testing air production units, screw elements, and compressors;
- test benches and equipment for testing electronic equipment for toilet modules.

Many test benches are computerized and automatically carry out the testing and printing of the pertinent Certificate.

BPWU, Test Bench for U-type Distributors (U1, Normal, and Centralized Variants) in Cast Iron and Aluminum

Following disassembly and subsequent reassembly of the specified component, whether in the case of regular servicing or the occasional repair, the distributor must be tested in all its specified functions, and appropriate evidence of this test must be produced. This equipment performs all the required functions to stress the distributor and detect the pressure delivered at the specified times and in the manner provided. Other measurements include sensitivity, insensitivity, and response time.

The distributor is mounted to the equipment as shown in the render and, once the fully automated testing process is initiated by operating either the touch screen or the keypad, the test automatically runs through all its phases. The operator can follow the test progress using the screen.



A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived.

BPSW4, SW4-type Distributor Test Bench



Much like the test bench featured in the previous paragraph, this one also allows for automated testing of the specified component whenever testing of its functionality is required. The distributor is applied to the equipment as shown in the render and, once the fully automated testing process is initiated either through the touch screen or the keypad, the test automatically runs through all its phases. The operator can follow the test progress using the screen.

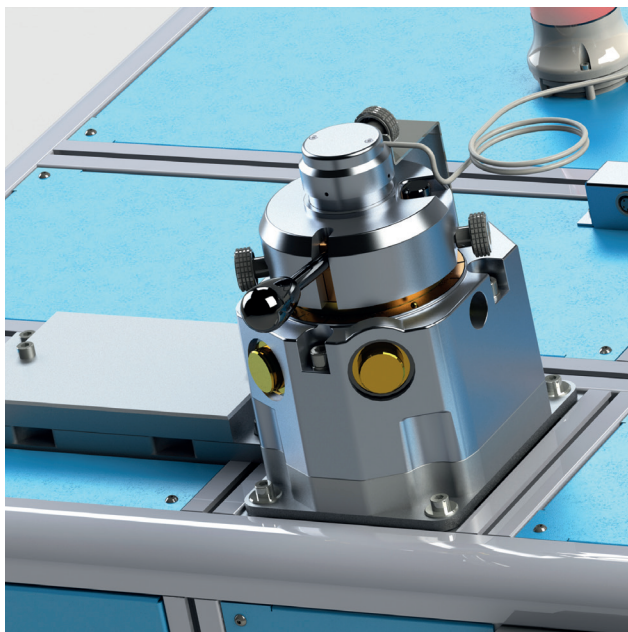
A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived.



BPMF, Test Bench for WA8, WF3, and RAM Brake Control Manipulators

This test bench was developed for the verification and certification of the specified components after they have been repaired or serviced. It features three separate mounting points, and it is possible to specify which component to test using the computer management system.

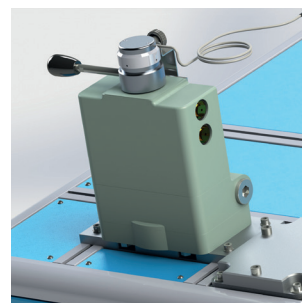
The tests are automated and servo-assisted. In other words, a system that detects the angular position of the manipulator control lever transmits the detected value to the computer system, which will in turn then be able to interact with the operator, requesting that the same control lever be placed in a specific position and then automatically carry on with the testing process once this position is reached in the way and time frame specified. The operator can follow the test progress using the screen. A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention.



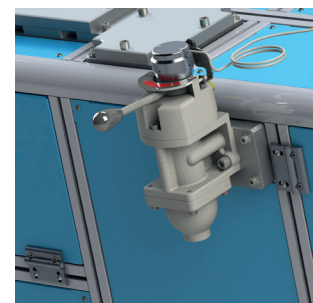
WA8 Manipulator

Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived. Pictured here is the placement of the WA8 brake control manipulator. Note the encoder and its bracket mounted above the control lever, with the reference bracket mounted towards the body of the manipulator itself.

The other two pictures show the placement of the other two types of brake control manipulators. Also of note in these cases is the placement of the adapters and the encoder.



WF3 Manifold



RAM Manifold

BPVPA, Supply Valve Test Bench

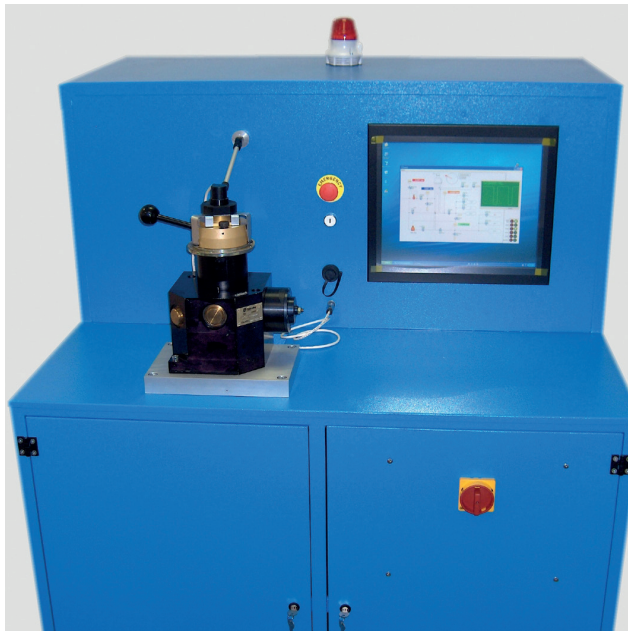
This test bench was developed with the aim of testing and certifying the different types of brake cylinder supply valves (relay, pressure transformer, and self-continuous) after their scheduled maintenance period. It features a station equipped with a series of mechanical interfaces that allow for the possibility of attaching a wide range of valves, among them PT1 and PT2 valves, 1A relays, 2D transformers, ALR series self-continuous valves and VCACs, as well as other types. All tests are automated. There is a dedicated section in the software that allows the entry of new valve types, as well as the definition of the tests to be performed and the parameters required to run them.

Once the tests are initiated, they are fully automated. The operator can follow the test progress using the screen. A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator.



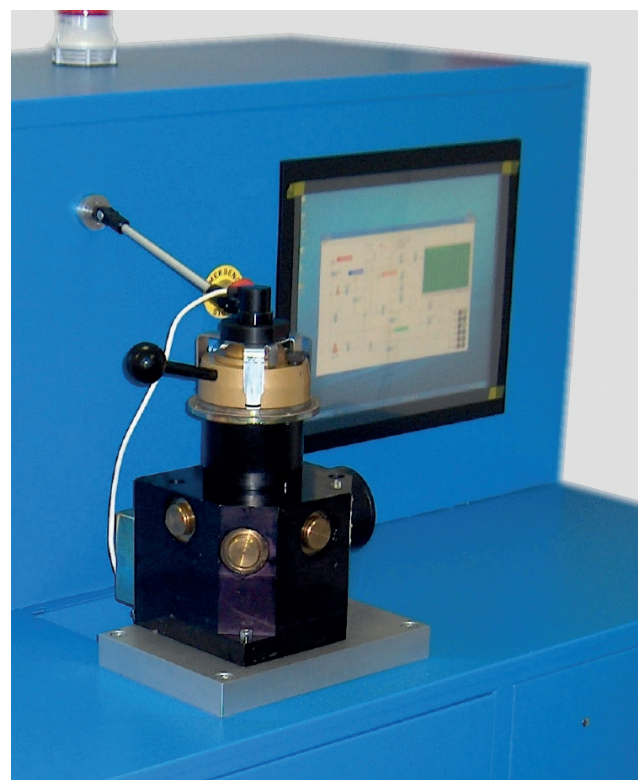
The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived. The adjacent picture shows the coupling of a relay valve, with the test selection screen for the said valve.

REU Brake Signal Transmitter Test Bench



This test bench was developed to perform RFE210 and Wabcotrol REU brake control manipulator testing and certification after they have undergone repair or servicing. It is equipped with a mounting point for the component to be tested, and, using the computer management system, the user can specify which component they want to test. All tests are automated and servo-assisted. In other words, a system that detects the angular position of the manipulator control lever transmits the detected value to the computer system, which will in turn then be able to interact with the operator, requesting that the same control lever be placed in a specific position and then automatically carry on with the testing process once this position is reached in the way and time frame specified.

The operator can follow the test progress using the screen. A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived. A special measurement circuit makes it possible to detect the output square wave and the duty-cycle generated that correspond to the position of the control lever. The picture on the right shows the placement of the brake control manipulator on the test bench with the adapter and encoder installed.



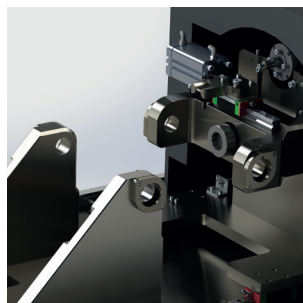
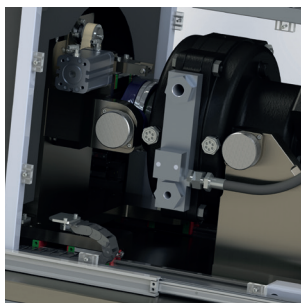
BPCF, Brake Cylinders Test Bench



Tilt cylinder test bench

For the testing of brake cylinders, specifically for those equipped with an automatic energy reclaimer. In addition to its pneumatic section, the test bench comes equipped with a solid mechanical structure and a system that measures the applied stresses by means of a load cell. A number of variations of these test benches have been produced as size, functionality, and mechanical characteristics have not always made it possible to account for all of them on the same rig. For all of them, however, the same point already made for the aforementioned test benches applies, namely that the tests are fully automated, and once the cylinder is mounted and the test procedure is initiated it continues until the cycle is completed. A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived. There is a dedicated section of the software that allows the user to specify the type of cylinder being tested, along with the test parameters to be used.

Mechanical shrouds, equipped with locking control, ensure operator safety during the cylinder strut operation phases of the test. The test bench shown in the picture comes equipped with a tilting cylinder attachment, and it is suitable for testing brake cylinders with a simple reclaimer, without spring-loaded brake, in the various brake cylinder sizes and reclaimer capacities. The top mount version, on the other hand, shows a test bench variant suitable for brake cylinders of electric TAF trains, with and without a spring-loaded parking brake. The image on the right shows the mounting points for the cylinder being tested. It is fastened onto those points using bayonet pins. The picture on the left, however, shows a spring-loaded brake cylinder mounted on the same mounting points.



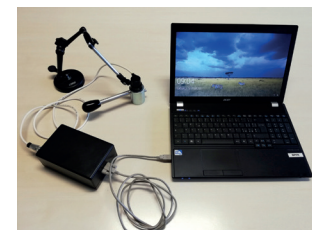
Top-mounted cylinder test bench

BPFR, Rolling Stock Test Bench

The BPFR test bench was designed and built to perform brake testing of railway rolling stock, after its scheduled maintenance period. It is a portable piece of equipment intended to be placed near the rolling stock, be it a wagon, carriage or locomotive. It is fitted with pneumatic test points and a supply line, and is capable of supplying the general line with the pressures necessary to perform the test. It also powers the load and primary supply line simulation circuits when necessary. It comes supplied with the necessary software designed to configure the tests to be performed on a given rolling stock, and is therefore capable of creating a record of the testing procedures.

The tests the machine is capable of performing are grouped under three categories: automated tests, servo-assisted tests, and manual tests. Automated tests are performed in one go once they have been initiated. Servo-assisted tests, on the other hand, needing the presence of the operator are initiated on an individual basis and the operator may intervene if needed to execute the required actions. Manual tests are performed by the operator, and manual input of the results is required. The tests can be selected from and configured by the aforementioned software. Once the automated or servo-assisted tests are initiated, it is possible to observe the value trends on the screen. A sound and light alarm kicks in if the item being tested does not pass a phase, so as to alert the operator to the need for their intervention. Special manual controls allow targeted control and troubleshooting by the operator. The data and test parameters of the test performed are stored, and a test report is produced from them, that is then automatically archived.

Among the servo-assisted tests, the testing of rotary brake control manipulators can also be performed through the use of a specialized external circuit. The BPFR unit is equipped with a router that creates a proprietary WIFI network. There is also the option of connecting to the test bench using a laptop computer, which is usually supplied with the BPFR, through the Windows remote desktop feature, which enables the user to control of the test remotely. Supplied with the laptop computer is a kit consisting of an encoder, a suction cup attachment for comparators, USB capture system, and a series of attachments that allow the encoder to be connected to various kinds of brake control manipulators. The suction cup attachment attaches securely to the encoder and the capture system sends the data to the computer. The data are processed using specialized software installed on the laptop and are then sent to the BPFR test bench through the proprietary WIFI network. The image below shows the driver-panel of a rail convoy with the laptop from which the BPFR test bench is remotely controlled. It detects the position of the encoder, and consequently the manipulator handle, and transmits it to testing software. Thanks to this system that detects the angular position of the manipulator control lever, the computer system is able to interact with the operator and request that the same control level be placed in a specific position and automatically carry on with the testing process once this position is reached in the way and time frame specified.



Test Reports

All these and other computer-controlled testing instruments automatically archive all testing data and are able to issue a report of the tests performed. These reports all share the same format despite referring to what is clearly different equipment and therefore report differing findings. Each page of these reports is made up of a header, body, and footer.

The following RAM-style brake control manipulator report is shown as an example.

The header typically contains the logo of the testing company, the name of the testing instrument, the description of the tested component, its serial number, and its drawing. The test is automatically assigned a number and the specification to which the test procedure refers to is given.

Data esecuzione 19 luglio 2022	Firma operatore Marco Berlindoni	Esito prova: Appareto conforme
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The body of the document, on the other hand, contains the outcomes of the individual testing phases. Each row reports each individual test results required by the test specification. It contains a reference number that points to the specific paragraph in the specifications text in which the test procedure is described, a brief description of the test, the acceptable range of the detected value, the detected value, and information regarding the correctness of the test findings. One row for each of the values detected.

 Step TECHNOLOGY		 Banco prova manipolatori freno			
Manipolatore freno diretto tipo RA-M4					
Seriale componente VO 1227			Disegno: 1/440951		
Codice prova RAM/0153/0516			Specifica prova di riferimento 306389A1_02		
Prova effettuata da Marco Berlindoni presso Stabilimento di Calenzano (01).			Apparato di prova n° 5053. Ultima taratura 09/06/2022		
Rapporto di prova					
Rif.	Descrizione della prova		Valore di riferimento	Valore rilevato	Esito

The other information concerns the operator who physically performed the test and the location in which it was performed in. Also present is the serial number of the testing equipment used and the date it was last calibrated.

The footer contains the test execution date, a space for the operator's signature, and comprehensive acknowledgment that the test was passed. Should the document have multiple pages, the page number and the total number of pages are also noted.

Rapporto di prova				
Rif.	Descrizione della prova	Valore di riferimento	Valore rilevato	Esito
2.01	Taratura della pressione al cilindro del freno in frenatura di servizio.	3,95 ± 4,05 bar	3,99 bar	Ok
3.04	Tenuta della valvola di immissione. C&P nella CP in 120,0 s.	< 0,03 bar	0,00 bar	Ok
4.04	Tenuta della valvola di scarico in frenatura di servizio. C&P nella CP in 120,0 s.	< 0,03 bar	0,00 bar	Ok
5.01	Verifica della pressione al cilindro del freno in prima frenatura.	0,10 ± 0,70 bar	0,29 bar	Ok
5.04	Tenuta della valvola di scarico in prima frenatura. C&P nella CP in 120,0 s.	< 0,03 bar	0,00 bar	Ok
6.01	Tempo di frenatura fino al 90% della frenatura di servizio.	< 4,00 s	2,55 s	Ok
6.03	Tempo di rifrenatura fino a 0,50 bar nel cilindro del freno.	< 6,00 s	3,91 s	Ok
7.05	Sensibilità in incremento della pressione. Differenziale a 25°±3°. P1 = 0,76 bar; P2 = 0,89 bar.	> 0,02 bar	0,12 bar	Ok
7.05	Sensibilità in incremento della pressione. Differenziale a 40°±3°. P1 = 1,51 bar; P2 = 1,64 bar.	> 0,02 bar	0,13 bar	Ok
7.05	Sensibilità in incremento della pressione. Differenziale a 60°±3°. P1 = 2,28 bar; P2 = 2,42 bar.	> 0,02 bar	0,14 bar	Ok
7.05	Sensibilità in incremento della pressione. Differenziale a 80°±3°. P1 = 3,21 bar; P2 = 3,33 bar.	> 0,02 bar	0,13 bar	Ok
8.03	Sensibilità in decremento della pressione. Differenziale a 80°±3°. P1 = 3,74 bar; P2 = 3,60 bar.	> 0,02 bar	0,14 bar	Ok
8.03	Sensibilità in decremento della pressione. Differenziale a 60°±3°. P1 = 2,87 bar; P2 = 2,73 bar.	> 0,02 bar	0,13 bar	Ok
8.03	Sensibilità in decremento della pressione. Differenziale a 40°±3°. P1 = 2,12 bar; P2 = 1,99 bar.	> 0,02 bar	0,14 bar	Ok
8.03	Sensibilità in decremento della pressione. Differenziale a 25°±3°. P1 = 0,76 bar; P2 = 0,89 bar.	> 0,02 bar	0,12 bar	Ok

Hand-Controlled Brake Testing Equipment



Like the BPFR, this device was designed and built to perform brake testing of a railway rolling stock following the maintenance period. It is meant to be placed near the rolling stock, be it a wagon, carriage, or locomotive. It is fitted with pneumatic and supply line testing points, and is capable of powering the general line at the pressures necessary to perform the test. It also powers the load simulation circuits when necessary. As is common with these types of instruments, there is no brake manipulator and its functions are therefore carried out by a pneumatic circuit constructed using commercially available components.

In addition to the various pressure levels in the general brake line, this allows for the supply and exhaust ramps typical of brake testing. It requires no additional power supply other than the pneumatic one. There are two different models, one with digital gauges and another with analog gauges. The latter is also available as a smaller version with three gauges and is unable to power the load circuits, should this feature not be necessary. As with other manually operated testing equipment, the report must be written by the operator.



Load Valve Testing Equipment

This device is equipped with a load valve compression circuit with adjustable thrust, and the thrust is controlled by a load cell. A measurement system allows the value delivered by the valve being tested to be measured against the applied thrust. The valves being tested are easily connected to the testing equipment through a sliding system and bayonet couplings.



Brake Lever Regulator Test Bench

This unit is designed to test the DRV-type brake lever regulators of various sizes after their scheduled maintenance period. It is able to adapt its size to the type of regulator being tested to verify the brake energy recuperation capability and reverse recuperation capability, which are typical of these types of regulators. The controls, both electric and pneumatic, are clustered on a dedicated panel, with an optical barrier system preventing the operator from coming into contact with moving parts.

Screw Element Test Bench

This equipment was designed in order to functionally test the screw elements of air compressors. Equipped with interchangeable flanges, it allows testing of a variety of types of air production units. An inverter-controlled electric motor allows it to be operated at the desired power and speed. An external circuit measures the air-flow rate at the various conditions provided by the specifications.



Quality

Step Technology is **ISO 9001:2015** certified.

In addition, when it comes to the servicing of railway brake equipment, Step Technology has qualified its Competency Management System and its Register of Qualified Maintainers in accordance with the following provisions, laws and regulations:

- Certified as per organizational communication COCS 30.6 issued by Trenitalia
- Certified as per organizational communication COCS 30.1 issued by Mercitalia
- Certified as per organizational procedure PO 96.3 issued by Trenord
- CME/SRM certificate, in accordance with EU Regulation 779/2019

All these certifications are recognized by ANSF - the National Railway Safety Agency.

Other Certifications:

- Occupational Health and Safety Management System Certificate ISO 45001:2018
- Environmental Management Systems Certificate ISO 14001:2015



CERTIFER ITALIA ACCREDIA CERTIFICATO DI CONFORMITÀ PER FUNZIONI DI MANUTENZIONE

1. NUMERO EIN: IT/32/0621/0004

2. ORGANIZZAZIONE CERTIFICATA Denominazione legale: STEP TECHNOLOGY S.r.l. Denominazione commerciale e acronimo (se applicabile): Indirizzo postale completo (via, codice postale, città, stato): Via di Fabbiana, 20-22 - 50041 - CALENZANO (FI) Numero nel registro delle imprese: RI 560228 Numero di partita IVA: 05405150480

3. ORGANISMO DI CERTIFICAZIONE Denominazione legale: CERTIFER ITALIA S.r.l.s. Indirizzo postale completo (via, codice postale, città, stato): Via Chiassatello 57, 56121 Pisa, ITALIA Numero di riferimento dell'organismo di certificazione: IT/30/0621/0001

4. INFORMAZIONI RELATIVE AL CERTIFICATO Si tratta di un - nuovo certificato - rinnovo del certificato - certificato aggiornato/modificato Validità dal: 02/07/2021 al: 05/06/2024

5. AMBITO DI APPLICAZIONE DELLA ATTIVITÀ DI MANUTENZIONE Categoria di veicoli: carri merci, locomotive, unità multiple, carrozze passeggeri, veicoli destinati all'alta velocità, mezzi d'opera - On-Track Machines (OTM) Comprende carri speciali per il trasporto di merci pericolose: NO

6. FUNZIONI DI MANUTENZIONE Sviluppo della manutenzione Gestione della manutenzione della flotta Esecuzione della manutenzione

7. INFORMAZIONI SUPPLEMENTARI Applicato a manutenzione, revisione e riparazione dell'impianto Pneumatico e freno e dell'impianto pneumatico porte (componentistica e apparati pneumatici, meccanici, elettromeccanici ed elettropneumatici) di veicoli ferroviari. Rapporto di audit e ispezione: ECS742_0009_V01

Data del rilascio: 02/07/2021 Numero di riferimento interno: CERT/2021/SRT/IT/5472/0004 Ed 01

Firma: Diego Mazzini Amministratore Delegato

CERTIFICATE No. 3909694

STEP TECHNOLOGY S.R.L. Via di Fabbiana, 20/22 50041 Calenzano (FI) Italy

Operational site: Via di Fabbiana, 24/26 Calenzano (FI)

has been assessed and found to be in compliance with the Standard

ISO 45001:2018

applicable to Design, manufacture of mechanical, pneumatic, electromechanical, electro-pneumatic and electro-hydraulic equipment and devices. Maintenance of mechanical, pneumatic, electromechanical, electro-pneumatic and electro-hydraulic equipment and devices, based on own and customer requirements, in the railway field and not.

EA Code: 22 (NACE 30), 18 (NACE 33.12), 19 (NACE 33.14)

The certificate has been issued under No. 3909694 for the registration period from 09 April 2022 to 08 April 2025. The first certificate date of issue is 09 April 2019.

IAF S 3137

LL-C (Certification) Czech Republic a.s. - Poboční 620/3, 186 00 Praha 6

CERTIFER ITALIA CERTIFICATO DI VALUTAZIONE SGC

n. CERT/2021/SGC/IT/5472/0003 Ed. 01

Tipologia di Valutazione: Sistema Gestione delle Competenze (SGC)

Denominazione Sociale: Step Technology S.r.l.

Sede Legale e Operativa: Via Fabbiana, 20-22 50041 Calenzano (FI) (Italia)

A seguito delle verifiche condotte sul Sistema di Gestione delle Competenze Organi di Sicurezza (SGC) di Step Technology S.r.l. è risultato che:

- il sistema di gestione competenze è conforme ai requisiti indicati nella Comunicazione Organizzativa per il Certificato di Sicurezza n. 30.6 del 03 Agosto 2018 - Sub Allegato 1, emessa da Trenitalia S.p.A.
- il sistema di gestione competenze è conforme ai requisiti indicati nella Comunicazione Organizzativa per il Certificato di Sicurezza n. 30.1 del 27 Marzo 2017 - Sub Allegato 1, emessa da Meritalia Rail S.r.l.
- il sistema di gestione competenze è conforme ai requisiti indicati al paragrafo 6.7 della Specifica Tecnica "TRENORD P096 in rev. 3 - Procedura del SGC - Prestazioni in servizio di manutenzione, organi e componenti di sicurezza" del 19/11/2019 emessa da Trenord Srl.
- il sistema di gestione competenze Organi di Sicurezza è conforme al Decreto ANSF 4/2012 del 09 Agosto 2012, Allegato C.
- il formato dell'albo manutentori MOD ELE rev 4 del 14/1/2019 è conforme alla COCS 30.6 Sub Allegato 1a.
- il sistema gestione competenze è correttamente ed effettivamente attuato.

Il Rapporto di Valutazione ECS472_9006_V01 riporta il dettaglio delle valutazioni e le loro risultanze. Data audit sul campo: 08/05/2021. Identificazione del Sistema di Gestione Competenze oggetto di valutazione: PQ-027 Ed. 1 Rev. 0 del 26/01/2021.

Data prima emissione: 15/05/2021 Data emissione corrente: 15/05/2021 Data fine validità: 14/05/2022

Firma: Diego Mazzini Amministratore Delegato





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VAT: 12708060152
