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IN THIS ISSUE

Editor's

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In 2018, we are celebrating the 100th anniversary of Poland regaining independence. In 1918 railways were extremely important for the Polish society and economy as they formed the backbone of the transport system of the country. In a short time it was recognized, that the crucial condition for development of the Polish railways was the research of new technical solutions especially new rolling stock. Therefore in 1923 the Experimental Division was formed in the structure of Ministry of Railways. It was managed by professor Albert Czeczott. The international experience and best practices in testing had been collected from France (Service des essaies of Compagnie du Nord), Germany (Lokomotiv-Versuchabteilung) and the USA (Testing Department of Pennsylvania Railway). The first task performed by the Experimental Division was the testing of the new series of steam locomotives acquired by the Polish State Railways and establishment of their technical characteristics. For example in the years 1923 –1924 the Tr21 and Ty23 freight locomotives were tested. The majority of test runs were performed at selected sections of railway lines in the Eastern regions of pre-war Poland, in particular Zelwa – Jeziornica (between Wolkowysk and Baranowicze) and Brzesc – Pinsk, both sections at the territory of contemporary Belarus. In 1927, the technical characteristics of all steam locomotives operated by PKP were calculated according to the unified method and compiled in a uniform way by professor Czeczott. It was the work of fundamental importance for the operation of railways, necessary to rationalise the utilisation of existing rolling stock. In the years 1928–1930, the new measuring car was designed by professor Czeczott and manufactured by Lilpop, Rau and Loewenstein works in Warsaw.

In early 1930, the extensive track research was initiated by the Ministry of Transport of Poland. These research works were carried out by the team supervised by Professor Aleksander Wasiutyński of Warsaw Technical University and were focused on the investigation of track behaviour under increased dynamic load. The dedicated test site was prepared at the main line at Włochy (close to Warsaw). So called photographic method was adopted to determine the elasticity modulus of track substructure. Moreover the stresses in rails as well as longitudinal rail displacements were determined. Later, in 1937, the influence of the temperature changes on behaviour of 15 m rail sections was investigated at Włochy test site.

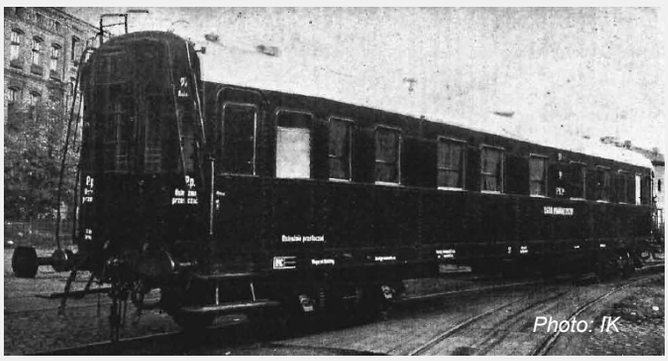


Photo: IK

In October 1934, the Central Laboratory of the Polish State Railways (PKP) was established. The main role of the Laboratory was to test all materials delivered to PKP and elaborate technical standards for the Polish railways (in particular for materials and chemicals). Thanks to the modern equipment it was possible to carry out advanced mechanical and electrical tests of various structures. For example the Laboratory was involved in the assessment of various rail welding techniques.

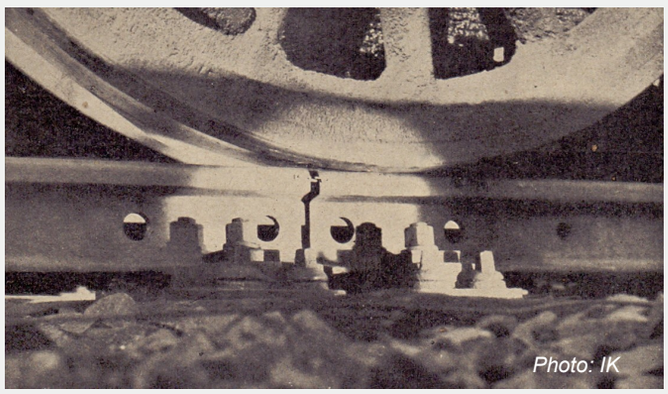


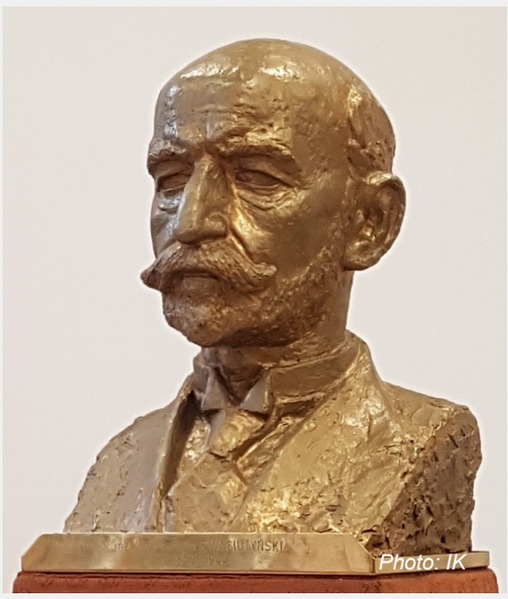
Photo: IK

World War II stopped the development of railway research in Poland. In 1945, however, the Experimental Division of Ministry of Transport was formed again, with the same structure as before and again with professor Czeczott as the head of Division. The first post-war years were extremely difficult, especially due to lack measuring equipment. Therefore the first tests of steam locomotives delivered to PKP at that time were performed with the adoption of simplified methods. Finally, in 1949, the new measuring car was delivered.

Photo: IK

Moreover, 3 steam locomotives were rebuilt as compressors to generate the artificial resistance and simulate the real train load.

In 1951, the Railway Scientific and Research Institute (INBK) was formed on the basis of the Experimental Division. Also the Central Laboratory of PKP was integrated into the structure of the Institute. After three transformations: in 1958, in 1987 and in 2010, the Institute continues its mission as the Railway Research Institute (Instytut Kolejnictwa). As the tribute to the pioneers of railway research in Poland, there is a commemorative plate devoted to Professor Albert Czeczott (1873–1955) placed at the building of Braking Section in the Rolling Stock Laboratory. Moreover, the bust of Professor Aleksander Wasiutyński (1859-1944) is presented in the IK conference hall.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Unified verification method of electromagnetic compatibility between rolling stock and train detection systems

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Axle counters are more and more often applied in train detection systems. The wheel sensor is a main part of each axle counter system. In parallel, more and more complex railway vehicles, especially traction ones, are a potential source of interferences influencing the operation of these train detection systems. It is the reason to verify the electromagnetic compatibility (EMC) between the signalling equipment, particularly train detection systems and new vehicles in the process of obtaining the permission for their placing into service. The measurement of interfering magnetic fields generated by vehicles is one of tests to be carried out. For the simplification and unification purposes of the applied interference test methods the EN 50238 standard and TS 50238-3 technical specification were developed. The specification defines unified testing procedures.

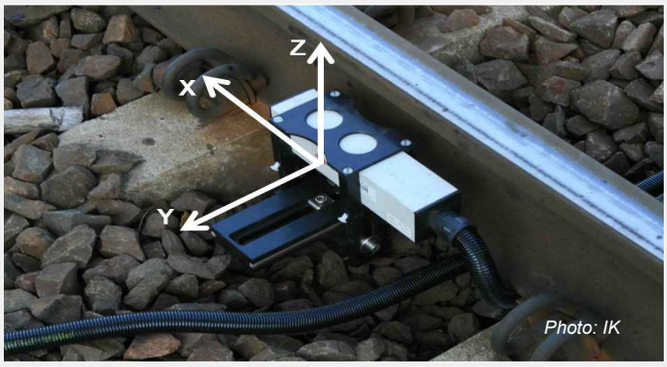

Fig. 1. Measurement directions

Fig. 2. Measurement antennas mounted to the rails

Facing the general trend of introducing axle counters on new railway lines and replacing track circuits with them on modernized ones, the issue of testing the impact of magnetic fields on axle counters is essential and it should be carried out for the entire range of rolling stock that is operating on the rail network.

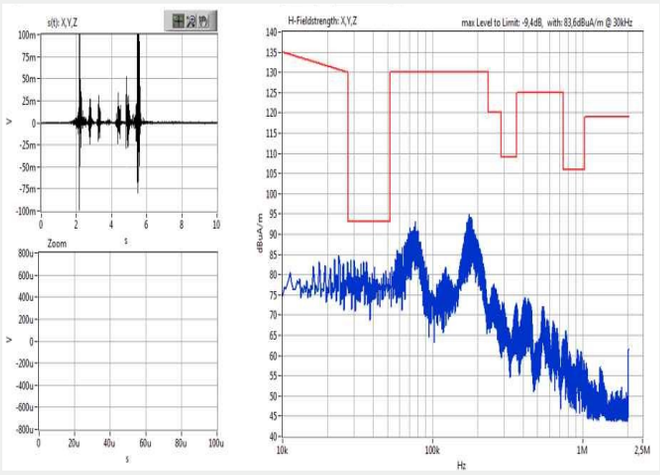

Fig. 3. Exemplary results of measurement

The applied method of measuring magnetic field strength meets requirements of the technical specifications of the TS 50238-3 and allows a clear determination of whether the tested vehicle may affect the operation of the wheel sensors and consequently the axle counters. Such an action would eliminate rolling stock that may affect the operation of axle counters, and thus will reduce disturbances in train movements allowing easier traffic management.

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ZBR Distributor Valve

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The article presents the prototype of a new distributor valve with a working name ZBR, which is the result of Polish engineers' work. The distributor is the basic control element in the pneumatic braking systems of all rail vehicles.

Despite recent years' rapid development of electronics and the use of electronic and microprocessor components in rail vehicles' brake systems, the distributor valve remains the most important element of the braking system, due to the requirement to maintain this system operational in the event of power failure or electronic system failure.

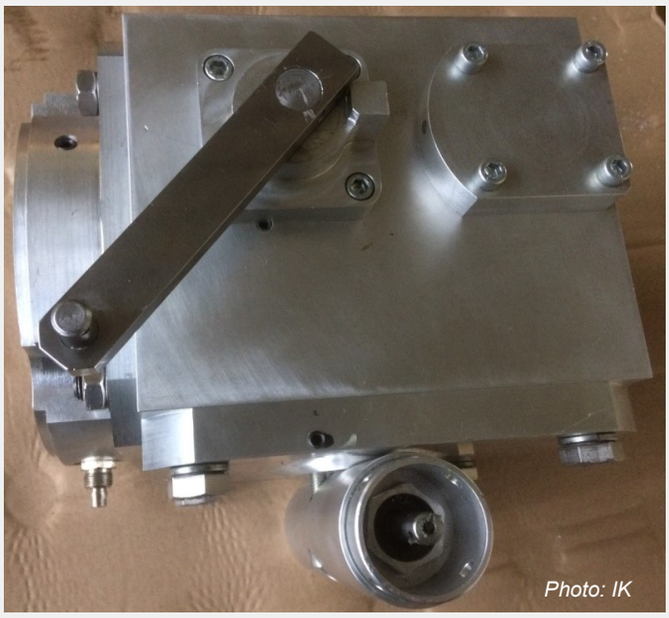

Fig. 1 ZBR distributor valve, prototype

Each new type of distributor valve must keep the so-called "Backward compatibility", i.e. it must strictly cooperate with older types of valves. In practice, this means that both the pneumatic input signals and the pneumatic output signals of each new valve type must be the same as in the distribution valves currently used.

Requirements and regulations regarding distributor valves are developed and published by UIC in the form of leaflets (particularly UIC 540 and UIC 547), moreover, in the requirements of the TSIs and European standards EN15355, EN15611, etc. The development of a new design of a distributor valve or any other element of rail vehicle braking devices that will pass certification is a difficult task. Therefore, most European countries have not developed their own braking systems components' solutions, only the production of license products was launched or import of ready-made solutions in this field was decided. Due to the fact that the distributor valve performs many different functions and the required by regulations accuracy and repeatability of parameters, it is the most complicated construction among all elements of the braking system.

Currently, there is no company in Poland producing braking system equipment, which means that producers of rolling stock in Poland are forced to buy braking systems from foreign suppliers mainly from Knorr-Bremse and Wabtec.

The new ZBR distributor valve is a design of a completely unified operation. This means that the valve can directly control the filling in of the brake cylinders on the vehicle, i.e. without the use of a relay valve, as well as through a relay valve of any type. In a braking system with a ZBR valve and a relay valve, no expansion chamber is required. In addition, the ZBR valve ensures constant filling in times for air tanks on the wagon, regardless of their capacity.

Several new construction solutions, not found in valves of other companies, were used in the ZBR distributor valve for the first time. The most important of them include:

- Single-piece integrated air flow adjuster,
- Accelerator with compressed air energy recuperation function,
- Adjuster filling in air tanks on a wagon,
- Horizontal brake loosening device,
- Reducing approx. 50% of the number of parts in the valve compared to other valves,
- Multiple use of the same parts in different valve components,
- Electronic valve identification system.

If series production is started, the ZBR distributor will be made in one adjustment variant, which means that while ordering, it will not be necessary to provide parameters characterizing the valve or its purpose, as it has been so far, and the ZBR distributor valve might be used without having to be adjusted in all types of railway vehicles, both new and currently in operation.

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Tests of control system compliant with EN 50128 SIL 2 standard, the launch of the mixed multiple traction for four vehicles

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From August to October, at the Test Track Circle of the Railway Research Institute in Żmigród, homologation tests were carried out on the BR632 and BR633 vehicle control systems. The purpose of the tests was to launch multiple traction BR633 and BR632 vehicles enabling running trains in different configurations of up to four vehicles and introducing additional customer requirements after the initial period of operation.

The BR63x vehicle control system consists of two main components, i.e. a standard part - performing basic vehicle functions such as diagnostics, drive control, air conditioning, etc. and a safe part that performs safety functions selected basing on European standards, TSIs, EBA regulations, TESIP annex and the team of constructors' own experience. The functions implemented by the safety controller include:

– traction permit,

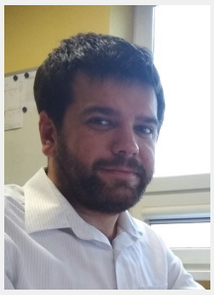
– emergency braking,

– door control,

– passenger's emergency brakes, etc.

The construction of both components is characterized by a modern distributed structure.

The control system responsible for the safety functions undergoes the validation process according to EN 50128 standard. A detailed software documentation is prepared within this process, where each function has separate requirements and relevantly developed test cases in order to confirm its correct operation on the vehicle. The next part of the control system validation process involves testing on the vehicle. In this part, a test track is necessary, where the team in charge of validation carries out all the necessary tests according to their scenario. The configuration of vehicles connected to multiple traction can be also freely changed thanks to the use of a "triangle to rotate the trainset" located in the Centre, which is particularly important in tests such as unlocking doors and other functions for which the configuration of vehicles may be important.



The validator is responsible for the entire validation process. He prepares a validation plan, defines the scope of team members' responsibilities, the type of necessary documentation, prepares a test strategy and responds to the assessor and experts from other areas (e.g. braking) for the process of the control system validation.

The complexity of this process is evidenced by the fact that within this "delta" for more than two months, about 2,500 test cases were carried out on vehicles, in addition, the entire control system was thoroughly tested in the laboratory before it was used on the vehicle.

Photo 1. Testing BR vehicles in the mixed multiple traction

Due to the validator's and the team's experience and with the participation of the Institute's employees, the process was successfully conducted again without any problems. This is already the fifth certificate of compliance with EN 50128 at SIL 2 level.

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Polish presentation on 10th UIC WCHSR: The New Station Łódź Fabryczna as Model of Multimodal Hub Integrating Conventional and High Speed Railway with Local City Transport

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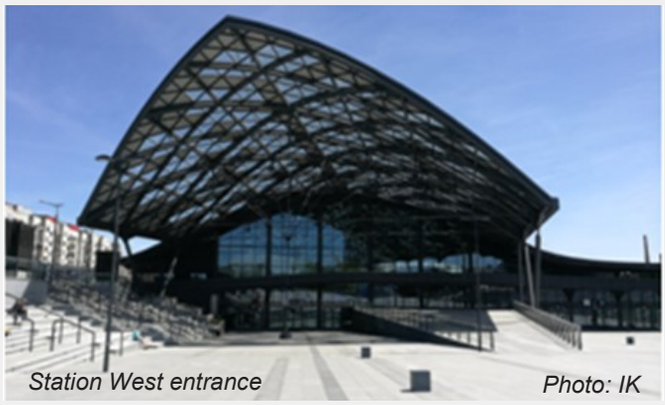
One of the Polish representative's presentations delivered at the 10th UIC World Congress on High Speed Rail, held in Ankara, Turkey on 8–11 May 2018 under the theme "Sharing Knowledge for Sustainable and Competitive Operations", was the presentation entitled "The New Station Łódź Fabryczna as a Model of Multimodal Hub Integrating Conventional and High Speed Railway with Local City Transport" prepared jointly by Agata Pomykała, Ewa Raczyńska-Buława, engaged in current activities of Łódzka Kolej Aglomeracyjna, and Jan Raczyński who supports the Marshal of Łódź Office of Łódź voivodship with his expert knowledge on planning activity on the transport market.



Station West entrance *Photo: IK*

The presentation dealt with the history of the construction project of the train station, main assumptions of how to transform the non-functional railway node into a modern hub and an important element of the TENT-T network element, its parameters as well as general information about the city of Łódź and the region. Special attention was drawn to the fact that Łódź is located in the centre of Poland on the crossing of two TENT-T corridors: one running north – south from the Baltic Sea to the Adriatic and the west-east one from the North Sea to the Baltic, which makes it to function naturally as a multimodal node and regional hub. Paradoxically, the work to improve it started a few years ago. The presentation explains the principles of the Łódź node restructuring and the time frames of its realization. The first stage has been completed. The modern underground railway station in the centre of Łódź was opened in December 2016. The reconstructed railway station is dedicated to carry out services of both conventional and high-speed trains, as well as to provide regional and suburban transport services. Moreover, adopted technical solutions allow the integration with long-distance, local and urban bus transport systems. There is a cycle lane near the station and special parking facilities for bicycles. In the second stage not only it is planned to

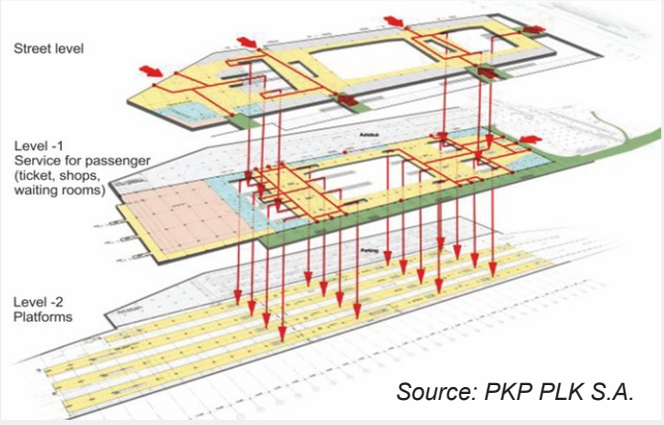


Fig. 1 Pedestrian passages between station levels

connect Łódź Fabryczna and Łódź Kaliska through a new tunnel which will allow a better and much more faster transport to and through Łódź but also suburban trains will be able to reach the city centre. This investment is being carried out and its completion is planned for the end of 2021.

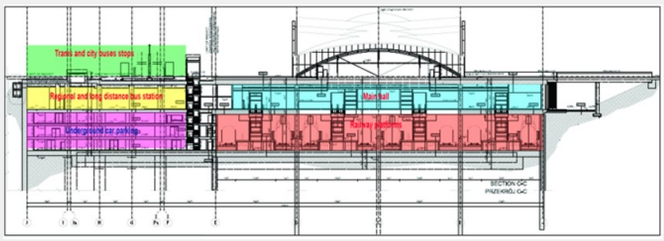


Fig. 2 Cross section of the station - view from west entrance

Another major undertaking which was also mentioned was the construction of Łódź Agglomeration Railway system which aims at developing local transport and transporting passengers from the agglomeration area to Łódź Fabryczna main station after building a high-speed line. Over 2 billion zlotys (with the support of EU funds) has been spent on restructuring the Łódź railway node so far. The total cost of Łódź Agglomeration Railway system construction will amount to approximately 1 billion PLN financed by Łódź voivodship.
Other similar projects built in the world of agglomeration railway systems and new railway stations were presented during the session.

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Research of railway stations for compliance with TSI PRM

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It has been 10 years since the first technical specification of the TSI PRM appeared. Since then, the design of passenger infrastructure has changed significantly. In 2017, standards for obstacle free routes, contrast, travel information, properties of transparent obstacles and anti-slip solutions were issued, which until now are not placed in the TSI PRM specification, however they are harmonized with Directive 2008/57/EC, thus it is expected that at the next update of the regulations they will be directly invoked and thus obligatory. The present time is therefore a good moment to get acquainted with the requirements included in the mentioned standards.

Contrast

The EN 16584-1: standard covers the contrast parameter. This standard defines the contrast as perceiving the difference visually between two building surfaces or a railway vehicle by reference to their light reflectance (LRV) or luminance values. The standard in Annex A defines the contrast assessment method based on the reflectance factor (LRV). On the LRV scale, the ideal black corresponds to value 0, while the ideal white value is 100 (Fig. 1).

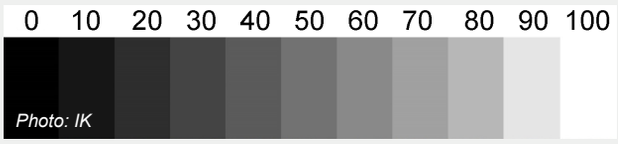

Fig. 1 The scale of the LRV reflectance

Information

The EN 16584-2 standard is devoted to information. The standard drawings show the location of information in the form of tactile in the area of stairs. The height on which the information should be located is 85-100 cm when placed on a handrail and 145-165 cm when placed on a wall. On the handrails, the information should be placed in such a way that when you grab the handrails you could easily locate them. Placing information on the surface of the handrail from the side of the stairs could make it difficult to find.

Transparent obstacles

The PN-EN 16584-3 standard clarifies the requirements for seven elements: an obstacle free route, floor surfaces, transparent obstacles, lighting, visual information, danger zone and platform edge, and level track crossings.

If the subsystem is covered with painted or varnished floors, the gloss should be checked according to the PN-EN ISO 2813 standard. A maximum gloss of 50 is allowed.

Fig. 2 Placing the information on the handrail

Transparency of obstacles should be checked with a glass transparency meter. For obstacles with a transparency greater than 50%, additional markings are required according to EN 16584-1.

Obstacle free route

The EN 16584 series standards contain requirements for both infrastructure and rolling stock, while the EN 16587 standard applies to routes free from obstacles in the infrastructure subsystem. Obstacles free routes should be used:

- for all categories of people with reduced mobility,
- at all times when trains at a given station arrive and depart on schedule,
- as a connection to other public areas of infrastructure located in the vicinity of the station.

The EN 16587 standard is mostly a set of TSI PRM requirements and refers to the requirements of the 16584 series standards.

Summary

Guidelines of EN 16584 series standards and EN 16587 standards are an essential supplement to the provisions of the TSI PRM from the point of view of meeting the requirements for persons with reduced mobility. Appropriate adaptation of the infrastructure for the needs of all groups of travellers requires a lot of experience and involvement of both investors (e.g. railway infrastructure managers) and notified bodies.

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Polish locomotive presented in Żmigród

Dragon 2, a new locomotive constructed by NEWAG from Nowy Sącz was presented on the Test Track Operation Centre in Żmigród on 12 June 2018. The event was honoured with the presence of the Minister of Infrastrcture Andrzej Adamczyk and Vice Minister Andrzej Bittel. The vehicle is the first in Europe six-axle electric locomotive, fully compliant with Technical Specifications for Interoperability (TSI 2014) and equipped with ETCS level 2.

Photo: Kurier Kolejowy

Establishment of Polish Transport Research Institutes' Network – POLTRIN

The Railway Research Institute, the Road and Bridge Research Institute and the Motor Transport Institute, research institutes operating in the transport area and subordinated to the Minister of Infrastructure, have signed an agreement to establish the Polish Transport Research Institutes Network – POLTRIN.
The idea of the agreement is to strengthen the potential of research institutes, enabling the implementation of large research projects for the development of transport, economy and competitiveness of enterprises.


Source: www.gov.pl/infrastruktura

Seminar KOLEJ 4.0 at the Railway Research Institute's Test Track in Żmigród

On 6 September, a seminar Kolej 4.0 together with test runs of the Vectron locomotive and a discussion panel took place at the Railway Research Institute's Test Track in Żmigród. During the runs there was held an official transferring of the advanced multi-system Vectron locomotive manufactured by Siemens for Cargounit. The Institute hosted over 100 guests including representatives important railway sector institutions and media. The event was aired live by two TV crews (TVP and TVN24) and commented by major Polish newspapers and magazines.

Photo: IK

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