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Information System for Preventing Rail Collisions for D3 Line

- The SHERLOG SHG D3R Information System for Rail Vehicle Safety (hereinafter "SHG D3R") comprises communication units with GPS, VHF (optionally also with a supplementary GSM unit) and a display unit—touchscreen display.
- A SHERLOG SHG D3R module will be located in every rail vehicle on D3 lines. Thanks to the SHG D3R system, rail vehicle operators' attention is drawn to other rail vehicles nearby. The display shows other rail vehicles identified with their designation, distance and direction (depending on the terrain on the order of kilometres).
- The SHERLOG SHG D3R Information System for Rail Vehicle Safety therefore ensures preventative measures and prevents collisions by rail vehicles on D3 lines. The SHG D3R informs and notifies rail vehicle operators of possible dangers optically and acoustically a long time in advance.





The SHERLOG SHG D3R system provides:

Two-way on-line radio communication between units in the VHF band with the exchange of information about position, direction of movement and speed between modules in individual rail vehicles.

- Mobile unit
- Rail vehicle identification data input into unit
- Optional RFID reader for train driver identification
- Optional connection of unit to other rail vehicle systems— USB series ports, RS-232, RS-485 for transmission of relevant data
- High-precision localisation of rail vehicle on track using GNSS satellite system (optionally GPS, Galileo, Glonass)
- Optional gravitation sensors for impact detection

The SHERLOG SHG D3R system requires:

- Connection to power supply in rail vehicle, 230 V or USB connector
- Installation of unit holder in driver's cab





SHG D3R Properties:

- Own know-how
- Czech solution from development, design including unit production
- ♦ High resistance to interference
- High data transmission security (International security standards)
- Continual innovation





Video Illustrations:

- ♦ <u>https://youtu.be/rINkrC4a8U8</u>
- https://youtu.be/jGhl9NYCGcY
- https://www.youtube.com/watch?v=AZgrKP9koA



SHERLOG D3 R UNIT TEST PROTOCOL 2022



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Management summary

- On the basis of order number 4501172864 from 27.05.2022 and the subsequent kick-off meeting of the project of pilot test of D3 R units in live operation, a second set of tests was conducted on 26.07.2022 with a focus on the availability and reliability of the radio signal especially in locations without GPS and GNSS signal coverage (tunnels). The tests were carried out on line number 142 (Karlovy Vary -Johanngeorgenstadt) in Pernink.
- Subsequently, another set of tests was planned, expanded to include GPS/GNSS localization accuracy testing and a emergency button test. The SHERLOG D3R units for this test will be supplemented with a Bluetooth module that will communicate with a tablet/laptop. The test was actively participated by representatives of FSČR, ČD (O22 and O18 of DG ČD) and SHERLOG NG® company.





SHERLOG SHG D3R unit test protocol

Description of the tests

Three different functionalities were tested:

- test-demonstration of the radio unit with information transmission via Bluetooth to the tablet
- Emergency button test the message will be transmitted via radio network (independent of GSM/GPRS) to the SHERLOG monitoring centre, the response will be an SMS message delivered to the mobile phone after the phone is in an area with GSM signal
- test of accurate GPS receiver, data from the receiver will be displayed on the tablet during the ride





SHERLOG SHG D3R unit test protocol

Prerequisites and test conditions

List of tests performed:

♦ Test A

Demonstration of a radio unit with information transfer via Bluetooth to a tablet/laptop. It will take place within the first route Olomouc Os 3716.

♦ Test B

Emergency button test - message will be transmitted via radio network (independent of GSM/GPRS) to SHERLOG monitoring centre, response will be SMS message to mobile phone delivered after phone is in GSM signal, alert will be repeated within the routes.

♦ Test C

Test of an accurate GPS receiver (without GSM correction). Repeatedly within the routes. For this functionality, calibration of the GPS receiver is necessary after switching on the unit - before each ride. The position, in addition to being visualised on the tablet on the map base, will also be recorded for subsequent analysis.

Planned railways and tests:

- Olomouc Os 3716 departure 8:33 Panter 640 (event., row 162)
 Šumperk 9:26
- Šumperk R 910 departure 10:09 ESO 362
 Olomouc 11:01
- Olomouc R 887 departure 11:31 Vectron 193
 Staré Město 12:22
- Staré Město R 886 departure 13:32 Vectron 193
 Olomouc 14:27



SHERLOG SHG D3R unit test protocol

Evaluation of the tests of 11.10.22

The tests were always conducted in the presence of representatives of ČD, FSČR and SHERLOG NG

Test A - Demonstration of a radio unit with information transmission via Bluetooth to a tablet.

The test took place within the second track Šumperk Os 3716 without any problems and met expectations.

Test B - Emergency button test - message was transmitted over the radio network (independent of GSM/GPRS) to the SHERLOG monitoring centre, the response will be an SMS message to a mobile phone delivered after the phone is in an area with GSM signal. The test was carried out three times on the route Olomouc Os 3716 - Šumperk. The first test in the area of Červenka village without GSM signal, the next in the area of Zábřeh and the last in the area of Bludov.

All tests were carried out without any problems and met the expectations.

Test C - Test of accurate GPS receiver. For this functionality it is necessary to calibrate the GPS receiver after switching on the unit. The unit and the GNSS antenna were always in the driver's cab. The position, in addition to being visualised on the tablet on the map base, was also recorded in memory for subsequent analysis.

All the tests went well and met the expectations. The GPS unit worked with an accuracy of <60cm, and never once showed a larger deviation. The GPS unit also worked reliably in the Vectron locomotive, which is considered to be the most shielded motive power vehicle at ČD. The GSP unit used ONLY the native GNSS satellite signal, without GSM/GPRS correction.



Olomouc - Přerov track, locomotive VECTRON

SHERLOG D3 R USE CASE



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SHERLOG SHG D3R - Use case

A railway accident near Pernink occurred on July 7th, 2020 at 3:10 pm on railway track no. 142 (Karlovy Vary – Johanngeorgenstadt), when two passenger trains collided between the Nové Hamry and Pernink stations. 33 people were traveling on the trains, including personnel. The accident claimed the lives of two people and injured another 24. 15 of these suffered mild injuries, 9 suffered severe or moderately severe injuries, 7 people were treated on site by first responders and 14 were transported to a hospital. The total damage caused was estimated to be in excess of 25 million CZK.

Description of the situation

- On July 7th, 2020 at approximately 3:10 pm, a head-on collision of two passenger trains occurred between the Pernink and Nové Hamry stations on railway line no. 142 "roughly 600 meters down the track from the Pernink Railway Station". One of the trains was coming from Karlovy Vary, the second from Johanngeorgenstadt. The trains were supposed to have crossed at the Pernink Station. Rail traffic here is managed according to regulation D3, where traffic management relies on personnel.
- The collision site is located in a forested area with poor visibility along a turn, so the train drivers did not see each other until the last minute, and the collision occurred at nearly full speed (one of the speedometers showed 47 km/h, while the maximum speed for the given section is 50 km/h). The accident resulted in damage to both the series 814 (Regionova) and 844 (RegioShark) trainsets, while the heavier and more robustly constructed RegioShark crushed the front of the Regionova, plowed into it and pushed it 12 meters back.





SHERLOG SHG D3 R - Use case

Proposed solution

- To ensure the safety of railway vehicles our company has developed the SHERLOG D3 R informative system. This consists of communication units using GNSS and VHF technology, and displays located in every railway traction vehicle and self-propelled vehicles.
- The principle is simple the system alerts the train driver of any other train in the vicinity (either approaching or going in the same direction) – thanks to the information provided by this system, the train driver will have plenty of time to assess the situation and possibly stop the train or communicate with the track dispatcher. The system safely functions via VHF radio communications, surrounding units communicate directly between each other. Functionality does not require any GSM signal or connection with the dispatcher.





Tests performed

- The system was tested on 28. 1. 2021, an except from the press release is here
- Praha/Třebívlice The SHERLOG D3R system, which can significantly increase the safety of operation on Czech regional rail lines, was presented by the SHERLOG Company in collaboration with AŽD. The test was successfully performed with the participation of representatives of the Ministry of Transportation and other institutions.
- The presentation involved a demonstration on the track between Lovosice Most. On this single track two trains set off towards each other – one coming from Libčeves towards Třebívlice Station, the second from Třebívlic in the opposite direction. As both were outfitted with SHERLOG D3 R units, the system alerted both train drivers to each other's presence at a distance of two kilometers. Both train drivers were continuously informed of their mutual position, direction and distance. As soon as only 500 meters remained between them, visual and acoustic alarms sounded. The train drivers thus had enough time to adequately respond.





SHERLOG SHG D3R - Use case

Installation process

Installation in railway vehicles is very fast and simple. It takes no more than 1 hour to install the docking station for the D3R unit. The D3R unit itself is userportable. The unit does not require any data from the railway vehicle, just the train or connection number entered by the driver before the start of the journey.

Conclusion

If the system had been in use at the time of the accident near Pernink, there would have been no damage, let alone loss of life, and the trains would have only been delayed.





Sources:

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THANK YOU FOR ATTENTION

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