Translation of an excerpt of the investigation report

“Trouble due to operational error Bruchköbel station – Nidderau station on 10/02/2024”

Status as of 08/04/2025, version 1.0.

Note:

In accordance with Article 3 of Implementing Regulation (EU) 2020/572, points 1, 5 and 6 of Annex I of an investigation report shall be written in a second official European language. This translation should be available no later than three months after the delivery of the report.

The following English translation is a corresponding excerpt of the investigation report. The German language version is authoritative.

Excerpt translation:

1 Summary

The first section contains a brief description of the event, as well as information on the consequences, primary causes and safety recommendations provided in the individual case.

1.1 Brief description of the event

On 10/02/2024, the Bruchköbel signaller used the substitute signal to approve the entry of the ICE 1672 into block section 492 between Bruchköbel and Nidderau stations, although this was still in use by the DGS 48508. Previously he had received a confirmation from the Nidderau signaller for the arrival of the DGS 48508 at Nidderau station, even though this was not the case.

1.2 Consequences

The Nidderau signaller noticed his error and transmitted an emergency stop order. ICE 1672 came to a stop in good time. The event did not result in any injuries or property damage.

1.3 Causes

During the investigation of the event, the following actions, failures, incidents or circumstances were identified as safety-critical factors. These are differentiated into causal or contributing and systemic factors according to Implementing Regulation (EU) 2020/572.

A system with designations in square brackets is used to provide better clarity about the factors.

A detailed assessment of the event with classification as safety-critical factors is provided in the sections below.

What happened: Date/time, and action/failure/circumstance/incident	Causal factor	Contributing factor	Systemic factor
10/02/2024, 8:56 am In-use display in track section 316, although it was free	Fault in clear track reporting system [F1]		
10/02/2024, 8:56 am Advancing of train number 48508 after train number field 308	Advancing without train travel [F2]		Information not correct [S2]
10/02/2024, 8:56 am No observation of train by Nidderau signaller		Lack of observation [F3]	
10/02/2024, 8:58 AM Nidderau signaller replaces incorrect number without identifying location	Location not identified [F4]		
10/02/2024, 8:59 AM Nidderau signaller concludes that DGS 48508 is in track section 316	Incorrect assessment of the operational situation [F5]		

10/02/2024, 8:59 AM *"Arrival message"* for DGS 48508 requested by Bruchköbel signaller		Incorrect use of operational terms [F6]	
10/02/2024, 8:59 AM *"Leaving message"* for DGS 48508 released by Nidderau signaller	Defective inspection of clearance [F7]		
10/02/2024, 9:05 AM Bruchköbel signaller approves train travel in section that was still in use	Prerequisites for travel with special order not met [F8]		

Table 1: Summary of influencing factors

1.4 Safety recommendations

The Federal Authority for Railway Accident Investigation is not issuing a safety recommendation relating to the present event. Instead, reference is made to safety recommendations numbers 04/2025 and 01/2023.

5 Conclusions

The following section contains a summary of the identified causal, contributing and systemic factors. In addition, two further subsections are provided containing information about measures already taken, and additional comments

5.1 Summary and conclusion

The trouble due to operational error was attributed to a sequence of safety-critical factors. This started with a fault in the clear track reporting system in track section 316. Several causal, contributing and systemic factors meant that a chain of events was able to develop and ultimately train ICE 1672 was allowed to travel into a block section that was already in use by the DGS 48508.

In relation to the causal factor "Fault in clear track reporting system" [F1]

A defect in a feeder resulted in the fault in the clear track reporting system in track section 316. This incident triggered the chain of events, and both the exit signal P308 and, with a time delay, the entry signal F328 automatically reverted to the stop setting due to the safety logic of the signal box. The intended safety-oriented performance level of the system was no longer available to the Nidderau signaller from this point onwards, contrary to Delegated Regulation (EU) 2018/762 Annex II criterion 5.2.2. a). As both faults and the in-use display due to train travel are displayed by the clear track reporting system illuminating in red, the Nidderau signaller did not notice the fault and incorrectly assumed this was an in-use notification due to the DGS 48508. The infrastructure manager was able to provide evidence that the existing maintenance requirements had been applied.

In relation to the causal factor "Advancing without train travel" [F2]

Due to the time-delayed stop settings, first of exit signal P308 and then of entry signal F328 at Nidderau station, the train number system ZNL800 in Nidderau signal box reacted according to its programming. It first generated an incorrect number in train number field 208 and then advanced the train number of the DGS 48508 from train number field 492 into train number field 308 of Nidderau station. From this time onwards, the display of the train number system no longer matched the actual operational situation. This should have been reliably detected by the system operator in order to initiate the specified corrective measures. No statement-

specific fault message was provided for the case “Train number advancement without train travel”.

In relation to the systemic factor “Information not correct” [S2]

This reveals the problem with the train number system, which exclusively uses the stop setting of a main signal and the additional signals as the advance criterion. It is true that train number systems are classed as notification equipment with unreliable signal technology, but in ongoing operations signal box operators utilise them in the same way as systems with reliable signal technology. The processed information is relevant for the safety of operations. In the present case, the Nidderau signaller also relied on the displayed information from the train number system more than intended in the regulations. This resulted in an incorrect assessment of the actual location of train DGS 48508 and therefore to confusion between the in-use notification in block section 492 and the fault in the clear track reporting system in track section 316.

The investigation report issued by the Federal Authority for Railway Accident Investigation for the train collision on 19/05/2022 between Altheim (Hesse) halt and Dieburg station already indicated that supporting technical systems such as train number systems should not be an independent source of trouble and faults. In this respect, it is necessary to optimise the correctness of the information provided by these systems. One possible solution approach would be, for example, linking the train number advancement to other advancement criteria, such as train location data or the statuses of clear track reporting systems, which have reliable signal technology.

The Federal Authority for Railway Accident Investigation issued safety recommendation no. 01/2023 for the aforementioned train collision between Altheim (Hessen) halt and Dieburg station. It was recommended that the working system for processing and transmitting train messages must be examined and modified so that at all times, in particular when transitioning between automated and manual processes, its information meets the requirements as per the Delegated Regulation (EU) 2018/762 Annex II criterion 4.4.3.

In relation to the contributing factor “Lack of observation” [F3]

The tasks of the Nidderau signaller included, among other things, observing the trains passing by as per guideline 408.0262. At the time of the event, the DGS 48508 was still outside Nidderau station coming from the direction of Bruchköbel station. The last train to travel from

Nidderau station towards Assenheim (Oberhessen) station was a passenger train. Confusion with the DGS 48508 can therefore be excluded. During the investigation it was not possible to clarify why the Nidderau signaller had not observed the DGS 48508. The signaller's statement did not provide any information about this. Without independently identifying the train passing, the Nidderau signaller should neither have made a corresponding entry in the arrival column of the train log book nor have provided feedback. In future, signal box personnel must receive further education and training on this safety-relevant issue, and they must be made more aware of the importance of the relevance of these matters for the safety of railway operations.

In relation to the causal factor "Location not identified" [F4]

The lack of observation of DGS 48508 passing alone should not have resulted in the event. At any point, the Nidderau signaller was free to contact the driver and identify the location of the train. Due to the incorrect number that had appeared in train number field 208, in accordance with guideline 408.0591 section 3, the signaller was even obliged to determine the location of the train, for example by asking the driver. It would have been possible to determine this information via GSM-R. This would have interrupted the chain of events at this point. In spite of the location not having been identified, without checking the Nidderau signaller replaced the incorrect number generated with the train number of the DGS 48508, without the operational requirements for this being present. Further repeat education and training, as well as monitoring of the signal box personnel, is also required in relation to the application of this regulation.

In relation to the causal factor "Incorrect assessment of the operational situation" {F5]

Even during the conversation with the Assenheim (Oberhessen) signaller in relation to the operational situation that had emerged at 08:56, the Nidderau signaller concluded that the incorrect number generated must be the DGS 48508. This demonstrated that the Nidderau signaller had deficient knowledge about the effect and functioning of the ZNL800. Based on the in-use display on his control desk, the train number printouts and the displays of the ZNL800, he should have been able to determine that this was not an advancement error in the ZNL800. According to the operating manual for the ZNL800, the generation of an incorrect number would have required an advancement to be carried out from an empty train number field into the next following train number field. Therefore, train number field 308 in Nidderau

station should have been empty. However, train number field 308 was occupied with the train number of the DGS 48508. In addition, the printout from the ZNL800 showed that first the incorrect number was generated in train number field 208 and then the train number of the DGS 48508 was advanced into train number field 308. This information was available for the signaller to use.

During the education and further training, the signal box personnel must receive thorough and ongoing training on dealing with the technical equipment in a signal box in order to be able to ensure reliable use even in the event of errors or faults.

In relation to the contributing factor "Incorrect use of operational terms" [F6]

For the supposed fault in the clear track reporting system in block section 492, the Bruchköbel signaller requested an arrival message instead of feedback for the DGS 48508. Arrival messages were not stipulated for the operating procedure as per guideline 408. During the investigation, it was not possible to clarify why the Bruchköbel signaller requested the wrong message. In answer to the incorrect request, the Nidderau signaller also incorrectly provided a leaving message for the DGS 48508. This message was also not stipulated in the operating procedure as per guideline 408. In addition, the GSM-R conversation with the Nidderau signaller showed that the latter had not observed the passing of the DGS 48508 and therefore the end of the train. The Bruchköbel signaller would therefore have been justified in doubting the correctness of the information provided by the Nidderau signaller about the DGS 48508. All further operational measures by the Bruchköbel signaller, through to approving the journey of the ICE 1672 into the block section that was in use, were based on this incorrect message. The signal box personnel must receive further education and training on the use of the correct messages.

In relation to the causal factor "Defective inspection of clearance" [F7]

The Nidderau signaller sent a leaving message for train DGS 48508 to the Bruchköbel signaller. The correct procedure would have been to provide feedback for this train. Feedback is the confirmation of the clearance inspection and is linked to certain prerequisites, which were not met at the time of the message. As the Nidderau signaller had not seen the end of the train, he should have refused to provide feedback to the Bruchköbel signaller. Consistent implementation of these regulations would have prevented the event.

In relation to the causal factor "Prerequisites for travel with special order not met" [F8]

The Bruchköbel signaller implemented the operational replacement measures as per guideline 408.0622 section 1 on the basis of the leaving message from the Nidderau signaller, and therefore allowed the train to enter the next train section contrary to the regulations of guideline 408.0261 section 1(1a). Both regulations specified a clearance inspection as a prerequisite. Part of the clearance inspection was feedback for the last train that has travelled. As the Bruchköbel signaller had not received this feedback, the prerequisites were not met. The signaller should not have implemented the operational replacement measures, and consequently should not have approved the entry of the ICE 1672 into the occupied next train section with the substitute signal. The signal box personnel must receive further education and training on the correct application of fulfilling the prerequisites through to the implementation of operational replacement measures, and must be made aware of their significance and importance for the safety of railway operations.

As the Bruchköbel signaller applied the operational replacement measures as per guideline 408.0622 (1) correctly afterwards and issued a written command no. 12 to drive on sight to the driver of the ICE 1672, it was possible to prevent a train collision with the stationary freight train. This regulation had already been introduced due to safety recommendation number 06/2018 of the Federal Railway Accident Investigation Office (predecessor organisation to the Federal Authority for Railway Accident Investigation) in relation to the train collision between Bad Aibling station and Kolbermoor.

5.2 Measures taken since the event

The Nidderau signaller was given intensive refresher training on the processes and errors during the event from the head of the operational region and in the form of practical training. In addition, the monitoring target for his further work as a signaller was increased. During future operational inspections there will be targeted examination of his knowledge by the responsible head of the operational region, in particular in relation to matters connected to the train number system.

On 12/02/2024, the Bruchköbel signaller undertook retraining. The retraining covered the modules of guideline 408.0241 and guideline 408.0244 relevant for the clearance inspection. Particular attention was paid to the wording and the requirement for clearance inspection, as well as the reset attempt for block equipment. The signaller was also given retraining on the

concepts and their meaning. In particular, this included the differences between arrival message and clearance inspection as well as the leaving statement and the use thereof.

During the operational inspections conducted since the event, there has been criticism of the lack of arrival messages in the train log books and a need for action has been documented. The employees affected have been informed of the corresponding obligation for documentation. Subsequently, evidence of arrival messages has only been missing in isolated cases. In addition, since the event there has once again been increased examination of the use of train number systems in Hanau operational region during operational inspections.

5.3 Additional observations

Not applicable.

6 Safety recommendations

During the investigation of the event, it was determined that there were shortcomings in human actions when implementing the corresponding regulation requirements. With the final report on the train collision between Meinersen station and Leiferde (b. Gifhorn) halt, the Federal Authority for Railway Accident Investigation issued safety recommendation no. 04/2025, which recommended that there was a need for improved competence management. This safety recommendation can be applied without restriction to the shortcomings identified in this case. As a result, no further safety recommendation will be issued relating to this problem.

During the investigation it was also identified that the incorrectly displayed data of the train number system resulted in incorrect assessments of the actual operational situation. With the final report on the train collision between Altheim (Hessen) stop and Dieburg station, the Federal Authority for Railway Accident Investigation published safety recommendation no. 01/2023 which, among other things, recommended improving the basic correctness of the displayed information of a train number system. Therefore, no further safety recommendation will be issued on this matter.