DEUTA*News*

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Driver’s safety devices for trams

DEUTA-WERKE

Technology under Control

DEUTA-WERKE

Driver's safety devices for trams

A medical emergency in a tram on 22nd December 2019 has reignited the debate on whether trams shall be fitted with an intelligent driver's safety device. This newsletter answers your questions on the issue and offers approaches to its solution.

Crucial to the controversial discourse is a medical emergency on 22nd December 2019 in Germany. Shortly after midnight, a tram on Line 66 from Siegburg station travelling towards Bonn went past eight stops and through thirteen crossings without stopping before it was finally brought to a halt by passengers. The tram was fitted with a "dead man's switch" in accordance with the German Federal Regulations on the Construction and Operation of Light Rail Transit systems (BoStrab), but this had not prevented the near-miss incident. As was later discovered, the vehicle driver lost consciousness and the dead man's switch blocked by his weight.

How does a dead man's switch operate compared to a driver's safety device (DSD)?

So far, the driver's cab has been equipped with a dead man's button or a dead man's pedal in the driver's cab. One of the two must be kept permanently pressed to signal that the vehicle driver is capable of action. The combination of a handle with a foot pedal is not mandatory. Instead of a button, a drive lever can be used as signal transmitter. If the driver performs no action for longer than 10 seconds, an acoustic and a visual signal occur, which require him to act. However, if there is no reaction after 4 seconds, forced braking is triggered. In the event of emergency braking being actuated from the passenger compartment, a signal is triggered in the driver's cab inform the driver of the emergency situation but there is no independent forced braking.

The driver's safety device (DSD) works in the same way but with one crucial difference: depending on the operator, one or more DSD control elements (e.g. foot pedal or push button) are installed in the driver's cab whereas one of the control elements must be released and pressed again in specific time intervals. Pressing the control permanently is not accepted and responded to by forced braking. The DSD can be designed to work in different ways. One of the most common variants is the "time-time" DSD. With this system, the pedal or button must be released and pressed again before the expiry of e.g. 30 seconds to signal that the driver is capable of action. If the system registers that the control is being permanently pressed or released, it initiates a visual signal, then after 2.5 seconds an acoustic signal and finally, after a further 2.5 seconds, forced braking. A time-distance DSD can be used to take into account the distance travelled. In addition to time, this also considers distance and activates the driver's safety device in the event of non-compliance.

Requirements of TAB Düsseldorf

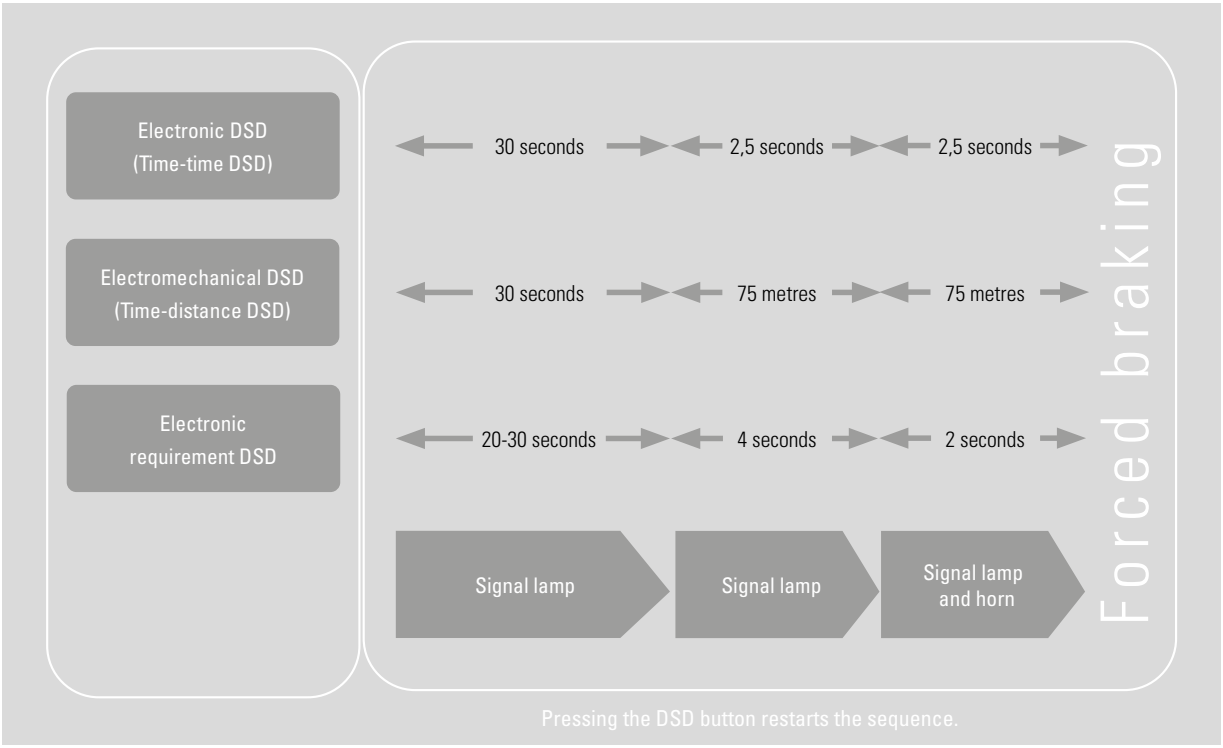
The new requirements of the Technical Supervisory Authority (TAB) for the administrative division of Düsseldorf go even further: the driver's safety device of all trams in North Rhine Westphalia (NRW) shall check the capability of action of the vehicle driver every 15 seconds and, in a

similar way to the mode of operation on trains, apply forced braking until the vehicle reaches a standstill.

What happens when passengers initiate emergency braking?

In the event that emergency braking is actuated from the passenger compartment, the driver makes contact with the passenger compartment and informs the passengers that the tram will be brought to a halt at a location suitable for evacuation and rescue. This applies in particular in an area with an emergency brake override in tunnels or on bridges. Furthermore, the vehicle driver asks the passengers about the emergency situation so that the rescue services can be requested to attend, if necessary. If the driver does not react, the period between the activation of the passenger emergency brake and the initiation of forced braking may not exceed 15 seconds. In the view of Paul Ehrenberg, project coordinator at DEUTA-WERKE, a DSD which is actively involved in driving operations and ensures by repeated querying whether the driver is still capable of action is a MUST in all types of rail vehicle operation.

An incident like the one in Bonn should give operators way beyond the borders of NRW cause for thought and prompt a changeover to a safer version of the driver's



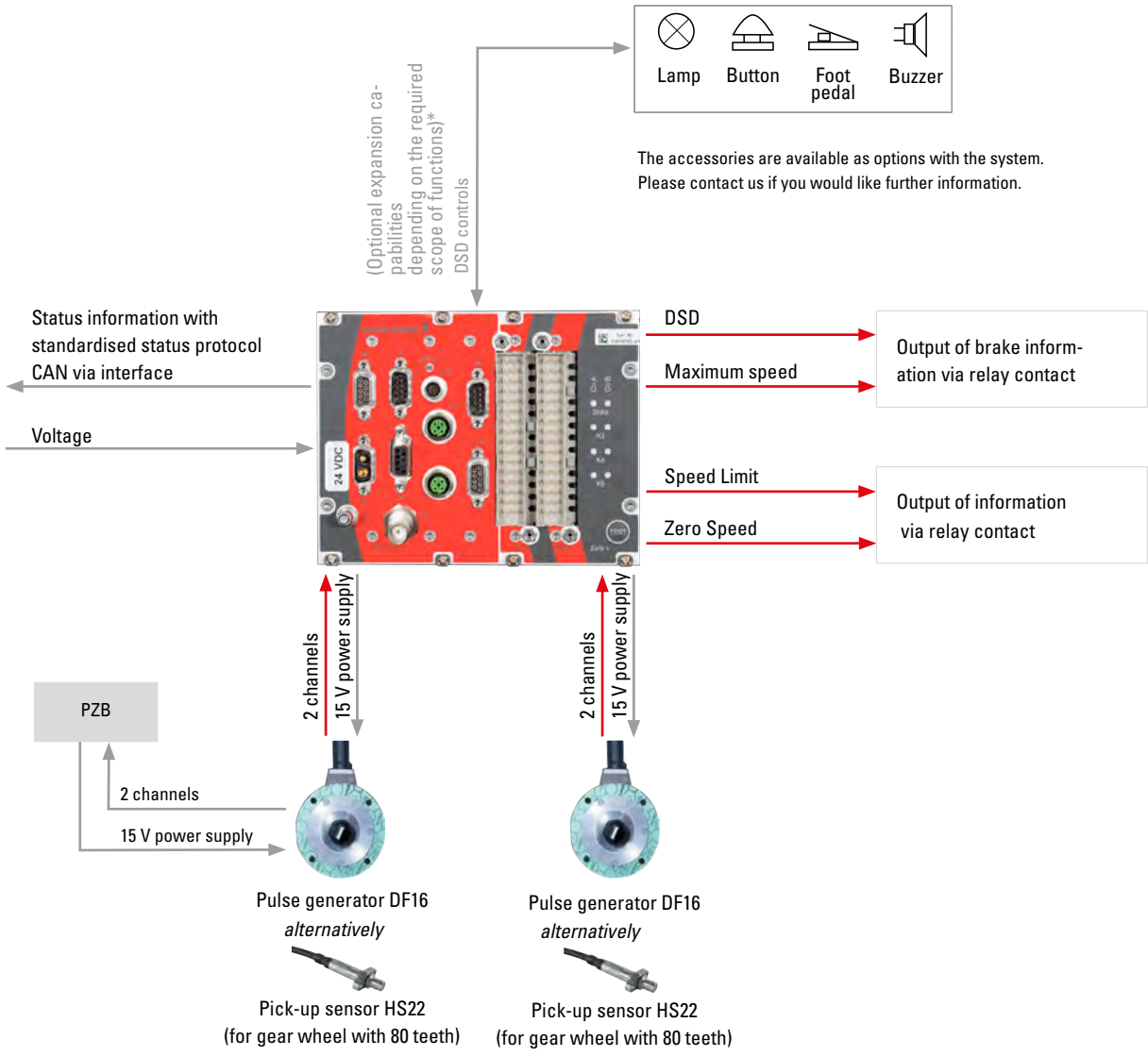
safety device. There are already options for retrofitting or conversion. In the federal state of Baden-Württemberg, a DSD is already obligatory in trams.

What form would a retrofit solution take for trams already in service?

A specially designed Safe+ module can be retrofitted as a stand-alone RED*safe* unit or in combination with a travel data recorder in the tram. This is done by integrating the module into the vehicle electronics and coupling it into the system using existing hardware. Optionally, additionally two sensors can be mounted on axes independent of one another to provide a speed signal for the operation of the DSD.

Tram system operators have a number of different options for retrofitting. Depending on the age of the vehicles in the fleet, it is possible to check whether the vehicle control systems are suitable for retrofitting without additional components and whether the components can be upgraded for the train protection system.

The DEUTA RED*safe* module also includes further safety-relevant functions. In addition to the driver's safety device DSD which brings the tractive vehicle to a standstill by using forced braking, it is also possible to monitor predefined limit and maximum speeds. It detects whether the vehicle is at a standstill and protects against unintentional rollback.



»Technical Data«

REDsafe 1 dybe

The REDsafe assumes the safety functions, offering high flexibility for parametrising and works as a time-time or a distance-distance DSD. The REDsafe consists of the Safe+ module (SCU) and a communication module with a power supply. The REDsafe has been designed to meet the requirements of UIC 641 and standards EN 50126, EN 50128, EN 50129 and EN 50155.

	DEUTA REDsafe 1 dybe
Operating voltage	24 VDC, 72 VDC or 110 VDC
Power consumption	Typ. 23 W/ max. 30 W
Temperature range	-25 °C to +70 °C (operation)
	-40 °C to +85 °C (storage)
2 frequency inputs	Squarewave, f_{max} 10.0 kHz, 2-channel
13 digital inputs	High level +12 to +154 VDC
1 analogue output	0 (4) to 20 mA
3 x 2 safety relay contacts	for brake, standstill and limit speed
2 relay contacts	for DSD lamp and buzzer
1 relay contact	for error output
Vehicle bus	Ethernet, MVB, CAN
Service PC connection	1 Ethernet
Safety functions	Driver's safety device DSD
	Standstill detection
	Rollback protection
	Monitoring of maximum speed
	Monitoring of limit speed
Dimensions	
Width	162.2 mm
Height	128.4 mm
Depth	169 mm
Weight	approx. 1.75 kg
Protection category	IP 20
Connection	2 x F48 plugs, DIN 41612 for IP 20, 1 x USB
	2 x MVB, 1 x USB, 2 x Ethernet M12, 1 x USB
	1 x D-Sub plug 2-pin

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