



# DB Class 424 Electrical Multiple Unit

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# 1 The Class 424

## 1.1 Class 424 EMU

The Class 424 is an Electric Multiple Unit (EMU) made for the Hanover S-Bahn commuter network.

It is similar in size to the Class 423 EMU (which is its predecessor) but feature a comparatively low floor height of 78 cm (31 in) to allow step-free access on 76 cm platforms.

A Class 424 EMU comprises four cars which share three Jacobs bogies, and the cars can only be separated at maintenance facilities. The two driving cars are each designated Class 424 and the two inner cars are designated Class 434.

The Class 424 EMU typically runs as either the four-car set, or as two four-car sets coupled together.

## 1.2 Technical Specification

<b>Total Weight</b>	40
<b>Weight</b>	105t
<b>Train Length</b>	67.5 m (221 ft)
<b>Engine Power</b>	2,350kW
<b>Max Speed</b>	87 mph (140km/h)
<b>Fuel Capacity</b>	N/A

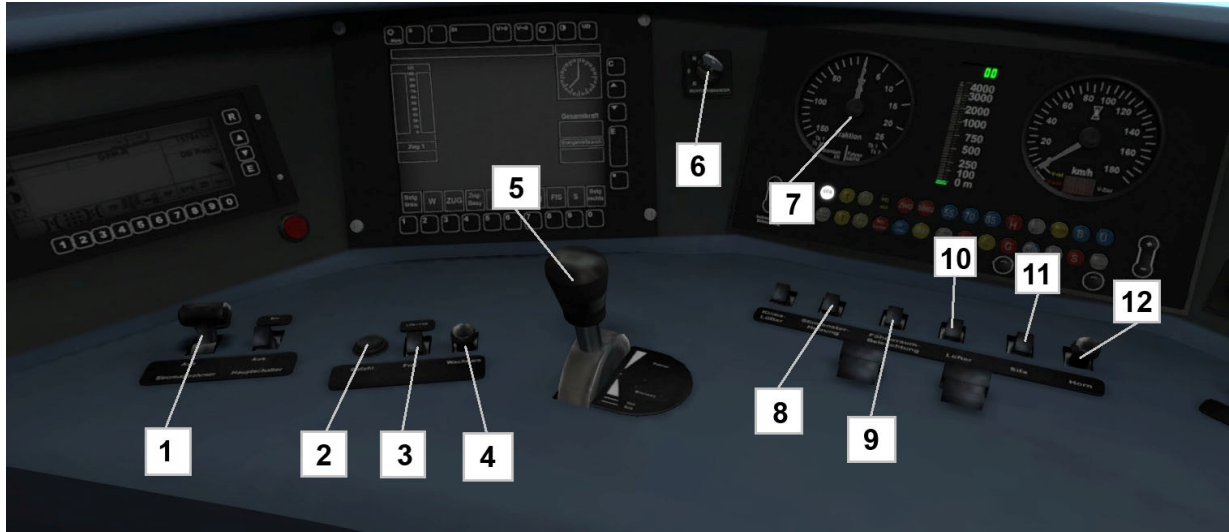
## 2 Rolling Stock

### 2.1 DB BR424



## 3 Cab Controls

### 3.1 Controls



- |                               |                           |
|-------------------------------|---------------------------|
| 1 – Pantograph Up/Down        | 7 – Traction Effort Meter |
| 2 – PZB Befehl40 (Override)   | 8 – Cab Light             |
| 3 – PZB Frei (Release)        | 9 – Sander                |
| 4 – PZB Wachsam (Acknowledge) | 10 – Headlights           |
| 5 – Throttle and Brake Lever  | 11 – Sifa Reset           |
| 6 – Reverser                  | 12 – Horn                 |



- |                  |                           |
|------------------|---------------------------|
| 13 – Speedometer | 15 – Brake Pressure Dials |
| 14 – Wipers      | 16 – Emergency Brake      |

### 3.2 Keyboard Guide

Increase / Decrease Throttle / Brake	A / D
Increase / Decrease Reverser	W / S
Horn	Space
Open Passenger Doors	T
Request Permission to Pass Signal Ahead	Tab
Request Permission to Pass Signal Behind	Ctrl-Tab
Headlights On / Headlights Off	H / Shift + H
Raise / Lower Pantograph	P
Emergency Brake	Backspace
Wipers Toggle	V
Change state of Junction Ahead / Behind	G / Shift + G
Couple Manually	Ctrl + Shift + C
SIFA Toggle	Shift + Numpad Enter
SIFA Acknowledge	Numpad Enter
LZB Toggle (only needed for Non-LZB routes)	Shift Ctrl Numpad+
LZB Automatic Brake Intervention Toggle	Ctrl Numpad+
PZB Toggle	Ctrl + Numpad Enter
PZB Wachsam / Acknowledge	Page Down
PZB Frei / Release	End
PZB Befehl40 / Override	Del
Toggle Cab Light	L

## 4 Cab Functions

### 4.1 SIFA Driver Vigilance

SIFA is short for Sicherheitsfahrschaltung or "Safety Driving Switch".

The SIFA vigilance alerter is disabled at startup, but can be activated or deactivated by pressing 'Shift+Enter(Numpad)'. While activated the SIFA light on the cab dashboard is normally switched off. While the train is moving the driver is required to confirm an alarm every 30 seconds.

When the 30 second alarm is triggered the SIFA light on the cab dashboard will illuminate, after an additional 4 seconds an audible alert will sound. After a further 2.5 seconds the emergency brake will be applied. This can be avoided by acknowledging the alarm at any stage by pressing the 'Enter(Numpad)' key.

### 4.2 LZB

LZB is a cab signaling and train protection system. LZB brake intervention is off by default. It can be enabled with Ctrl-numpad+. B indicator will show when brake intervention is enabled. LZB displays will activate when needed, regardless of brake intervention state, LZB active is shown by Ü.

LZB is activated by an LZB start sign. It is ended by LZB end balises. Displays can also be enabled/disabled by the user pressing Ctrl/shift-numpad+ (usefull for existing routes with no balises).

LZB will override any enabled PZB (enabled by Crl-Enter(Numberpad)). PZB will run in the background and will takeover when LZB deactivates. This may be in a restricted state resulting from 1000hz balises. Active 2000hz balises will also cause a brake application with LZB.

When active LZB shows the distance to the next speed change, on a 4000m range graphic bar, or digits upto 9900m. The next speed target is shown in digits at the base of the speedo, if the next speed target is less than the current speed limit, in which case the current speed limit is shown. The current speed limit is always displayed with a bug on the speedo.

Exceeding the limit will cause the G light to be shown. When LZB brake intervention is enabled if the limit is exceeded for 5 seconds the brakes will be applied.

When approaching reduced speed targets (including 000 for red signals) the limit bug will command a deceleration rate by gradually moving the bug counter clockwise. While commanding deceleration the G light will be shown.

At the end of an LZB section the ENDE light will flash. If LZB brake intervention is enabled this must be acknowledged within 10 seconds or the brakes will be applied.

### 4.3 PZB90 Cab Signaling

The PZB90 function is similar to the UK AWS function. By default it is disabled.

The following keyboard controls are used for operation:

Function	Keyboard
Activate/Deactivate	Ctrl+Enter(Numpad )
Acknowledge	Page Down
Release	End
Override	Del

There are six cab dashboard lights associated with the function - 85, 70, 1000, 500, befehl40 and S.

Function	Control Panel Light(s)
85km/h maximum / Normal operation	85
45km/h maximum	Alternating 70 85
25km/h maximum	500 + alternating 70 85
Distant at warning passed. 85km/h maximum	85 + 1000
Stop signal approaching. 45km/h maximum	85 + 500
Emergency brake applied	S + flashing 1000

#### 4.3.1 Pulling away

When first pulling away the PZB will enter the starting program mode until speed exceeds 5km/h. This is shown by the 70 and 85 lights flashing alternately. Speeds below 45km/h will be allowed for the next 700m. If there is no adverse stop signal ahead the speed monitoring can be cancelled with the 'End' key. However, if the monitoring is cancelled and the next signal is red when passing the 500hz balise (similar to an AWS ramp), the emergency brakes will be applied, whatever the train speed.

#### 4.3.2 Passing a Distant Signal at Warning

When passing a distant signal set at warning, the signal should be acknowledged with the Acknowledge key ('Page Down') within 2.5 seconds of passing or the emergency brakes will be applied. After acknowledging the signal, the 1000 light will show, and 85 will start flashing. You now have 23 seconds to reduce speed to 85km/h or less, or the emergency brakes will be applied.

Once train speed drops below 85km/h the speed will be monitored to this maximum. This cannot be cancelled while 1000 is lit. 700m after passing the distant signal, the 1000 light will go out. The speed monitoring can now be released

If the train speed drops below 10km/h while 1000hz 85km/h monitoring is active, then the maximum speed will be reduced to 45km/h. This is indicated by 70 and 85 flashing alternately as per the start program mode.

If speed monitoring is not cancelled with the Release key ('End') it will expire 1250m after the distant signal (providing another active distant has not been passed).

### **4.3.3 Approaching a Stop Signal at Danger**

If the stop signal ahead is red then passing a 500hz balise will cause the 85 and 500 lights to be displayed steady. If the train speed exceeds 65km/h at this point the emergency brakes will be immediately applied. If not, you have 153m to reduce speed to below 45km/h, or again the emergency brakes will be applied.

If train speed drops below 10km/h while 500hz 45km/h monitoring is active then the maximum monitored speed will be reduced to 25km/h. This is indicated by 70 and 85 flashing alternately together with the 500hz lit.

Speed monitoring cannot be released while the 500hz light is on. It is extinguished, and the 500hz monitoring expired, 250m after passing the 500hz balise, which should be approximately the position of the associated stop signal.

If an adverse stop signal is passed (2000hz balise) the emergency brakes will immediately be applied.

### **4.3.4 Passing a Stop Signal at Danger**

If it is necessary to pass a red signal, press and hold the Override key ('Del') while passing the signal. Ensure train speed is below 40km/h. As the signal is passed, the befehl40 light will show. The Override key can now be released. If the 1000 and 500 lights are out then any speed monitoring can be cancelled using the Release key.



## 5 Scenarios

### 5.1 424 Driver Training

**Duration:** 10 minutes

**Description:** A simple tutorial on operating the BR 424.

### 5.2 S5 replacement to the Airport

**Duration:** 30 minutes

**Description:** Drive from the main station to the airport section of the S-Bahn S5 Route

### 5.3 Nightly Airport Shuttle

**Duration:** 45 minutes

**Description:** Take the S5 to Hannover Airport.