



Bundesamt
für Güterverkehr

Toll Statistics

Methodical Explanations

Table of contents

0.	Introduction	2
1.	Definition	3
1.1	Toll vehicles	3
1.2	Toll ride	3
1.3	Emissions figure	4
2.	Database	5
3.	Evaluation cycle	7
4.	Explanations about the tables	7
5.	Table overview	9

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0. Introduction

Since the beginning of 2005, Germany has successfully charged distance-related fees for heavy trucks on highways. The toll obligation¹ applies for vehicles and vehicle combinations starting with a permissible total weight of at least 7.5 tons (12 tons until 30.9.2015) on all federal highways (BAB) including all federal roads (until 30.6.2018 only on some segments of federal roads) and begins with drives on toll-street sections. All toll roads are listed at www.mauttabelle.de.

As a dual system, the toll system offers users two basic options: automatic charging by a vehicle device (automatic procedure) and manual charging at toll terminals or online via internet or app (manual procedure). The automatic charging system is based on a combination of mobile radio technology (GSM) with the satellite positioning system GPS (Global Positioning System). The core of the automatic charging is a vehicle device, the so-called On-Board Unit (OBU), which determines the position and path travelled by the truck based on satellite signals and transmits time-delayed journey data and vehicle features relevant to the toll to the Operator.

The possibility for manual charging at the toll terminal or online (internet, app) is particularly suitable for truck drivers and transport companies who rarely drive on German toll roads.

With the beginning of the toll, the responsible Federal Office for Goods Transport (Bundesamt für Güterverkehr) began with the design of an information system in which all of the required data for controlling and monitoring the operator can be evaluated centrally. This includes drive data from the manual and automatic procedures. Only this data is the basis for the tables described below.

Due to the fact that the data is normally available in a timely manner, the rapid provision of tables, the **actuality of the publication** have priority.

¹ Bundesstraßenmautgesetz (BFStrMG) <http://www.gesetze-i,-internet.de/bfstrmg/index.html>

1. Definitions

1.1 Toll vehicles

All tables relate to vehicles subject to toll with a permissible total weight of at least 7.5 tons (12 tons until 30.9.2015) for vehicles and vehicle combinations on streets requiring toll, which were recorded either through the automatic or manual procedure. These vehicles are described in the following as **toll vehicles**.

The number of toll vehicles is calculated by recording the vehicle registrations. Hence, a real vehicle can be recorded several times as a toll vehicle within a given period of time if, for instance, its registration was changed.

Deviating from the vehicles subject to toll, vehicles whose rides are reimbursed retrospectively are also included. On the other hand, toll dodgers are not included. This also applies if a toll fee is charged in retrospect due to controls.

1.2 Toll ride

A ride - also called a **toll ride** to distinguish it from other definitions - in this statistic begins with the entrance onto a street subject to toll and ends when the street is left.

In the manual procedure, the start and end points and, if applicable, stopovers, are specified within a booking process.

In the automatic procedure, rate characteristics (rate version, fee class and axle class or weight class) can change during a "ride" or the toll road is left. This ends the toll ride and thus results in multiple toll rides, and it does not correspond to a ride in the logistical sense. With the gradual conversion of the OBU from a decentralized system to a centralized system for toll collection (see 2. f)) has led with an adapted invoicing to an increased number of toll rides.

Examples: A toll vehicles drives from Hamburg to Munich and leaves the highway to load in Kassel. Afterwards, the ride continues at the same or a different highway entrance. In this case, we are dealing with two toll rides. If the axle class changes during the ride (e.g. from 5 to 3 axles) through, for example, a trailer being added at a rest place and the ride begins, then this is also two toll rides. For billing reasons a break of more than 24 hours (for example on a rest place) can lead to more than one toll ride

1.3 Emissions figure

The amount of the toll depends on the pollutant category, which is assigned to the vehicles depending on their exhaust emissions class. The assignment of the currently defined exhaust emissions classes S1 - S6 and EEV for the currently valid categories of A, B, C, D, E and F is not constant due to legal adjustments over time. Changes to the assignment and new categories are possible. Thus, the categories are not ideal for the calculation of an **emissions figure**. The figure must be calculated directly from the exhaust emissions classes.

The exhaust emissions can be assigned in accordance with attachment XIV to § 48 StVZO the thresholds of the directive 88/77/EEG in the respectively specified edition. Thus, it is possible to assign each exhaust emissions class a highest permissible amount of pollutants in g/kWh (see table below). With this highest permissible amount of pollutants, an average emissions figure over all pollutant categories for a toll road section is calculated according to the following formula:

$$E_{BAB} = \frac{\sum_{i=1}^n (S_i \times L_i)}{\sum_{i=1}^n L_i} [g / kWh]$$

With E_{BAB} = average emissions figure for the selected section [g/kWh]
(Value area currently 2.04 ...15.53)

S_i = total permissible amount of pollutants from the exhaust emissions class i [g/kWh]
See table below

L_i = total km driven in the selected section with vehicles from the
exhaust emissions class i [km]

i = 1..n index of the exhaust emissions class (currently n = 7)

Calculation of the total permissible amount of pollutants S_i for the exhaust emissions class i (respectively g/kWh)

	CO	HC	NO _x	Particle	Sum = S_i	i
Class S1 ¹⁾	4.9	1.23	9.0	0.4	15.53	1
Class S2 ¹⁾	4.0	1.1	7.0	0.15	12.25	2
Class S3 ²⁾	2.1	0.66	5.0	0.10	7.86	3
Class S4 ²⁾	1.5	0.46	3.5	0.02	5.48	4
Class S5 ²⁾	1.5	0.46	2.0	0.02	3.98	5
Class EEV1 ²⁾	1.5	0.25	2.0	0.02	3.77	6
Class S6 ³⁾	1.5	0.13	0.4	0.01	2.04	7

1) Directive 88/77/EEG in the edition of directive 91/542/EEG

2) Directive 88/77/EEG in the editions of directives 1999/96/EEG and 2001/27/EEG. The values in both editions are identical.

3) Regulation (EG) 595/2009

2. Database

The ride data and DSRC control data (OBU data read from toll control bridges) are provided by the operator in the form of raw data and prepared in the central information system (**ZIS**, DataWarehouse) of the Federal Office for Goods Transport (Bundesamt für Güterverkehr).

The basis for the evaluations are the so-called data cubes or reports provided by ZIS.

Evaluations according to countless criteria are possible here on this basis. In particular, this includes:

Criteria	Description
Date (Year, month, day)	<p>A toll ride or the mileage is assigned according to time with the end of the ride in the automatic procedure and with the specified start in the manual procedure.</p> <p>A calculation of the number of toll vehicles (see table M or J 10) with different vehicle registrations within a specific period of time can be executed only on a monthly/yearly basis.</p> <p>An accumulated evaluation cannot be displayed because a registration can occur in different months and thus, would be counted multiple times.</p>
Nationality (starting on 1.1.2007)	<p>In the manual procedure, the country of registration for the vehicle is specified during registration. The assignment of nationalities in the automatic procedure is done using the "State of registration" parameter stored in the OBU.</p> <p>Note: Before the gradual conversion of the OBU (see 2. f)), the nationality could only be determined using DSRC control data. Due to the limited number of toll control bridges, this assignment is complete except for up to about 0.4%. Thus, the label "unknown" is given in tables with the country of registration criteria.</p>
Emissions class (S1, S2, S3, S4, S5, EEV, S6)	<p>The emissions classes result from the directives 88/77/EWG in the edition of directive 91/542/EWG and 88/77/EWG in the editions of the directives 1999/96/EWG and 2001/27/EWG and Regulation EG 595/2009.</p>
Axle class (2, 3, 4, 5)	<p>The total number of axles results from the number of axles on the vehicle or the vehicle combination.</p>
Toll section	<p>A toll section is a route subject to toll between two sequential nodes. A node can be an entrance/exit as well as a start/endpoint of a federal highway (BAB) or federal road, a three-leg interchange, a motorway interchange or a federal border.. The basis for this is the toll table published by the Federal Highway Research Institute (Bundesanstalt für Straßenwesen), (http://www.mauttabelle.de/). Kilometres driven are designated separately according to the directions driven.</p>

Changes affecting the toll statistics

The ZIS is subject to additions and adjustments that may arise due to operation and technical requirements and may have effects on the evaluations in individual cases. This should be pointed out in this section.

- a) Cancelled rides (only possible using the manual procedure) and the federal roads subject to toll have been taken into account since January 2008 when the evaluation system has been changed.
- b) Since January 2009, so-called zero-bookings are no longer considered. Through a new management of the ZIS, this applies both for the current and previous year's month. Zero-bookings may arise for inspection purposes of the BAG control vehicles and for vehicles temporarily released of their toll obligations.
- c) With effect from 1/8/2012, the toll road network has been extended by more than 1,100 km of federal roads.
- d) With effect from 1/7/2015, the toll road network has been extended additionally by more than 1,100 km of federal roads.
- e) Since 1 October 2015 vehicles and vehicle combinations with a permissible total weight of at least 7.5 tons are subject to toll charges. At the same time the axle classes were extended from two to four.
- f) In the period from the end of 2017 to around June 2018, due to the introduction of the European electronic toll service, the approximately 1.1 million On-Board Units installed in trucks were gradually converted from a decentralized system to a centralized system for toll collection. In addition, the frequency of data delivery from the OBU to the operator has been increased. This has led with an adapted invoicing to an increased number of toll rides.
- g) With effect from 1/7/2018, all federal roads are subject to toll charges. The toll road network in Germany now covers about 52,000 km of federal highways and federal roads.

The extensions and adjustments described above have to be considered when performing time series analysis.

3. Evaluation cycle

The delivery of data from the toll system takes place continuously. Due to the system, data can flow from the automatic procedure into the database, which the evaluations are based on - even months later.

Example: A vehicle does not move within the network subject to toll. However, the OBU contains the route data collected that were not sent to the central systems of the toll system. Only after switching on the OBU will data (every 4 hours if the vehicle is in Germany and once a day when the vehicle is abroad) be transferred to the toll system.

Evaluations have shown that after about 10 days of the following month, the toll data is nearly completely available. After this, just toll data in the per mille range flow into the database. The informative value of the tables is not restricted by this.

The evaluations normally occur on the following reporting days:

- For monthly appearing tables, 15 working days after the respective last day of the month. With this reporting day, the evaluation occurs for the current month and for the comparable month of the previous year.
- For annually appearing tables, 15 work days after December 31st of the respective year. With this reporting date, the evaluation for the current year occurs for the comparable previous year as well.

Evaluations for the current reporting period that are executed at a later reporting date may have minimal deviations.

4. Explanations about the tables

The publication includes tables illustrated as **monthly** with **M** and **annually** with **J**. In both table types, there is a comparison to the month from the previous year or the previous year.

There is no value in a table field marked with . For example, there are no numbers for the previous year 2006 for an annual table published in January 2008 for the period of 2007 with the criteria nationality (which is included in the ZIS starting on 1.1.2007).

The tables M 1, M 2 and J 1 and J 2 deliver overviews of the kilometres driven and toll rides of the toll vehicles on streets requiring toll, separated according to the country of registration

for the toll vehicle. Additionally, there is a sub-categorization according to domestic / foreign and here according to EU and non-EU countries. The label "unknown" contains the ride data of a nationality not contained in the ZIS (see also point 2.).

In order to consider the different calendar trends (see also the note page in the monthly tables) for the current and the previous year, a table M 1a was exclusively introduced for the table M 1 in January 2009. In addition to the actual changed values compared to the previous year's month or year's sum, this includes these values determined under consideration of the calendar processes. The determination occurs according to the following method. For the current month and for the previous year's month, the corresponding kilometres driven are calculated for workdays, Saturdays and Sundays (including federal holidays). Depending on the respective number of days, the separate calculation of (net) kilometres driven occurs for the current month. The comparison of the total value resulting from this with the value of the previous year's month results in the changed value listed in M 1a. The calculation occurs according to nationalities. From 1.7.2018 all federal roads are subject to toll. In table M 1b, there is an additional distinction between driving performance by federal highways and by federal roads.

The tables M 3, M 4, M 5 and J 3, J 4, J 5 illustrate the number of toll vehicles passing through the borders in both directions. Due to the toll free sections to France (A6: Goldene Bremm-border and A5: Ottmarsheim border) and to Switzerland (A5: Weil am Rhein border), the traffic in and out of these countries can only be illustrated in a limited manner.

The consideration of the characteristic of the emission classes can be shown in the tables M 6, M 7 and J 6, J 7.

The tables M 6 and J 6 are based on the emissions figure defined under point 1.3. Based on the distance-related toll, the tables illustrate the average emissions figure per nationality. In table J 6, the column "Anteil in %" shows the percentage of the total accumulated toll kilometers (see also table J 1).

In tables M 7 and J 7, the kilometres driven are separated according to origin (domestic / foreign and EU without domestic and non-EU) and emissions classes.

Since January 2010 the following tables are introduced into the evaluation for the toll statistics:

The tables M 8 and J 8 illustrate the kilometres driven according to the emissions class and axle class, the tables M 9 and J 9 illustrate the toll rides according to the emissions class and

axle class. These evaluations are only in regards to the current month or the current year, a comparison to the previous year's month or to the previous year does not occur.

The tables M 10 and J 10 are based on the number of different vehicle registrations of toll vehicles recorded within a specific period of time in the system. Here only a monthly or annual evaluation is possible, because a registration may be found multiple times in an accumulated value. In an annual evaluation (and, in some circumstances, also in a monthly evaluation), a real vehicle can appear several times if, for instance, its registration was changed within that period. The average of the kilometres driven is based on the kilometres driven from M 1 (J 1), the average of the toll rides is based on the toll rides from M 2 (J 2). In the tables M 11 and J 11, which show the average travel length per toll ride, the kilometres driven from M 1 and J 1 are compared to the toll rides from M 2 and J 2.

5. Table overview

J 1 / M 1	Kilometres driven of the toll vehicles according to nationality
J 2 / M 2	Toll rides of the toll vehicles according to nationality
J 3 / M 3	Number of incoming and outgoing toll vehicles at the borders
J 4 / M 4	Number of incoming toll vehicles at the borders
J 5 / M 5	Number of outgoing toll vehicles at the borders
J 6 / M 6	Emissions figure of the toll vehicles according to nationality
J 7 / M 7	Kilometres driven of the toll vehicles according to origin and emissions class
J 8 / M 8	Kilometres driven according to emissions class and axle class
J 9 / M 9	Toll rides according to emissions class and axle class
J 10 / M 10	Average kilometres driven / toll rides of the toll vehicles with different vehicle registrations according to nationality
J 11 / M 11	Average length driven per toll ride according to nationality