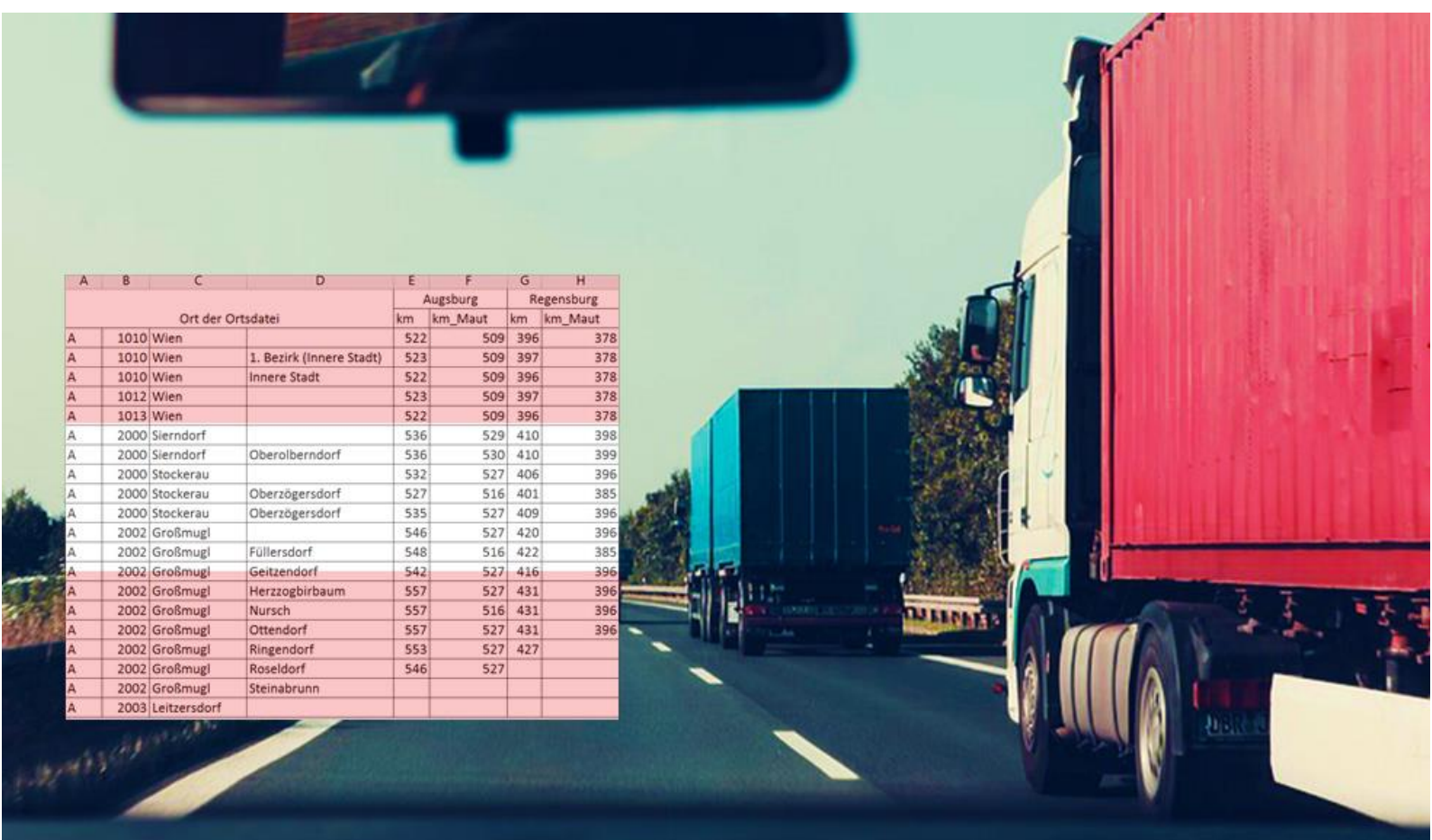


# PTV Entfernungswerk Straße

## Toll Austria

### R2024\_V1.0

A	B	C	D	Augsburg		Regensburg	
				km	km_Maut	km	km_Maut
Ort der Ortsdatei							
A	1010	Wien		522	509	396	378
A	1010	Wien	1. Bezirk (Innere Stadt)	523	509	397	378
A	1010	Wien	Innere Stadt	522	509	396	378
A	1012	Wien		523	509	397	378
A	1013	Wien		522	509	396	378
A	2000	Sierndorf		536	529	410	398
A	2000	Sierndorf	Oberolberndorf	536	530	410	399
A	2000	Stockerau		532	527	406	396
A	2000	Stockerau	Oberzögersdorf	527	516	401	385
A	2000	Stockerau	Oberzögersdorf	535	527	409	396
A	2002	Großmugl		546	527	420	396
A	2002	Großmugl	Füllersdorf	548	516	422	385
A	2002	Großmugl	Geitzendorf	542	527	416	396
A	2002	Großmugl	Herzzogbirbaum	557	527	431	396
A	2002	Großmugl	Nursch	557	516	431	396
A	2002	Großmugl	Ottendorf	557	527	431	396
A	2002	Großmugl	Ringendorf	553	527	427	
A	2002	Großmugl	Roseldorf	546	527		
A	2002	Großmugl	Steinabrunn				
A	2003	Leitzersdorf					



Karlsruhe, 19.12.2023

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# 1 Introduction

On January 1, 2004, mileage-based toll charges were introduced in Austria for trucks and buses with a maximum permissible gross weight of over 3.5 tons. As a result, the requirement for domestic and foreign trucks and buses to have a vignette on Austrian highways and expressways no longer applied. The amount of toll charged depends on factors including the number of axles. There is a subdivision into 3 categories here: Category 2 (2 axles), Category 3 (3 axles) and Category 4 (4 and more axles).

Originally, DDS GmbH, together with PTV GmbH and Dr. Malek Software GmbH, developed EWS Toll Austria in addition to EWS and EWS Toll Germany. From 2012 to 2020, the EWS distance tables were produced by DDS GmbH in cooperation with Dr. Malek Software GmbH. In 2021, PTV GmbH again took the place of DDS GmbH, after DDS GmbH was merged with PTV GmbH, now PTV Logistics GmbH. The cooperation with Dr. Malek Software GmbH still exists.

EWS Toll Austria is available as the ideal addition to EWS Europe.

EWS Toll Austria is characterized by the following features:

- Calculation of highway distances for truck transportation between all locations in Austria based on a digitized street network
- Simple and transparent handling
- Excellent accuracy for long-distance transportation
- Simple combination of EWS Toll Austria with EWS Europe or EWS Europe Plus.

## 1.1 Release notes

In EWS Europe, there were small position corrections at inner-city nodes of major cities in DACH, France, Poland and the Netherlands to create a better connection to major roads. Furthermore, there is a new node in France.

The underlying map base has been refined in some cases for through traffic in Germany. The map basis is the latest, detailed PTV premium map, which is based on data from HERE Technologies.

In addition to current changes in the postal and statistical offices in Germany, Austria and Switzerland, the locations in Hungary and Romania were updated regarding location and postal code, and a densification was carried out.

## 1.2 Release notes archive

### **Changes in release R2022\_V1.0**

The processing of the EWS has been fundamentally revised this year and now offers even more detailed content. This year's release R2023\_V1.0 not only uses the latest PTV development components for distance calculation, it is also based on the latest map material from PTV, respectively HERE Technologies. The combination of extensive map

material including closures and precise truck routing results in an EWS that is optimally adapted to long-distance traffic.

Furthermore, a comprehensive revision of the nodes (local representatives) was carried out. On the one hand, existing nodes were checked for their location, especially near the border, and on the other hand, the number of nodes was significantly increased:

- Germany: so far 7,407 nodes → now 10,382 nodes
- Europe: so far 9,953 nodes → now 14,845 nodes
- Austria as a subset of Europe: so far 605 nodes → now 888 nodes  
NEW: The nodes in Austria now have their own numbering - different from the European nodes in the same position

The densification of the node network results in a doubling of the number of relations in the distance matrix for Germany and Europe. All nodes receive a new ID once with this release. For a matching between new and old node IDs a lookup table is included. The format of the distance matrix remains the same.

This year, the EWS Toll Austria also takes international routes into account, so that the toll kilometers are based on the road kilometers of the EWS Europe.

Current information from the postal and statistical offices of Germany, Austria and Switzerland in the period from quarter 3/2021 to quarter 3/2022 was taken into account in the location file. For Portugal, a holistic revision of the existing locations with regard to location and postal code as well as a densification was carried out - with the result that over 1700 new Portuguese locations were added.

As announced in release R2021\_V1.0, this release sets the location file version with character set codepage850 and 24 character location name length. The location file with utf-8 character set and 60 characters location name length is included in the delivery.

### **Changes in release R2022\_V1.0**

Current information from Austria's postal and statistical offices have been taken into account in the location file. Furthermore, the node assignment of individual locations has been adjusted.

General street updates and a complete overhaul of toll information have been made. Changes to the street network also cause changes to distances compared to the previous EWS.

See also notes on the previous release.

### **Changes in release R2021\_V1.0**

Current changes by the postal and statistical offices in Austria have been included in this release.

The location file in ods format is available in two versions, now – as always – with character set Codepage 850 and 24 characters location name length and additionally with character set utf-8 (BOM) and 60 characters location name length.

**The version with character set Codepage 850 and 24 character location name length is discontinued with release R2023\_V1.0.**

Likewise, each distance matrix is now also supplied as a binary file (\*.bin). Points 3.1, 4.4 and 4.5 of this description are helpful here.

## 2 The principle of EWS Toll Austria

Like the EWS, EWS Toll Austria consists of a location file and a corresponding distance matrix in which the road distances are stored. The design and structure of EWS Toll Austria is completely identical to the EWS.

In contrast to the EWS Europe, only those kilometers are entered in the distance tables of EWS Toll Austria that are marked as kilometers on toll roads in the underlying street network. If the distance between two locations was calculated only on secondary roads, this distance is equal to "0", because secondary roads are not subject to toll charges. For example, a distance from A to B on highways has a distance of 450 km in EWS Europe, but only 400 km in EWS Toll Austria as 400 km are covered on roads with toll charges.

EWS Toll Austria has been available since the 2004 version and has been updated annually since then. It is an excerpt from EWS Europe. Therefore, the number of locations in EWS Toll Austria corresponds to the number of Austrian locations in EWS Europe. An update of the location file takes place once a year.

### 2.1 Nodes as representatives of the location file

Due to the high number of available locations, it is not the distances between all locations that are calculated, but only between selected representatives of the location file. These representatives are also referred to simply as nodes. They are selected depending on the population density. Economically significant areas are therefore covered by more nodes.

The remaining locations (non-representatives) are each assigned to the nearest node. This assignment is based on the shortest distances (= road distances) to the nodes

EWS Toll Austria is based on a number of 888 nodes.

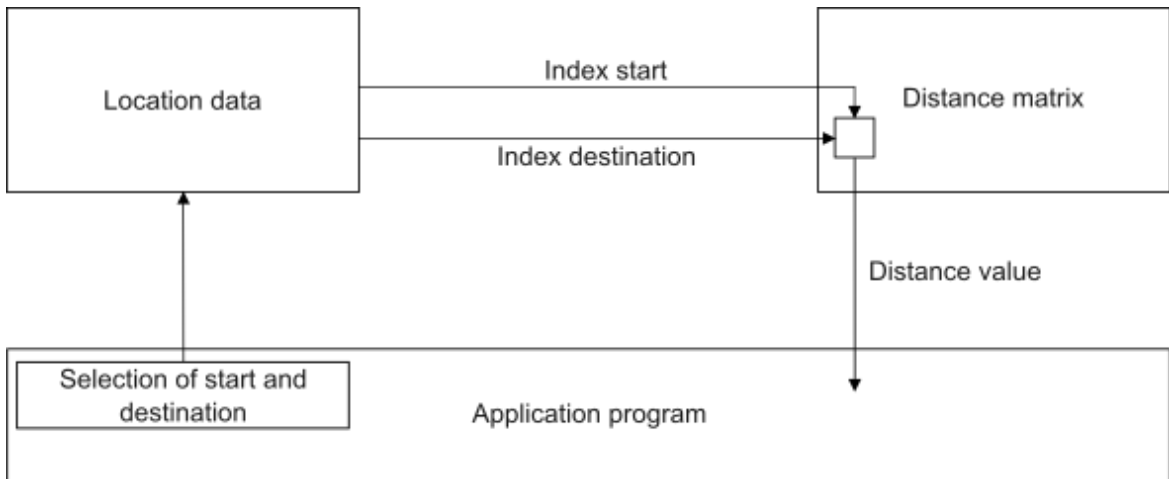
### 2.2 Distance calculation between any locations

Location file and distance tables are separate databases. To calculate the distance, the start and destination are selected from the location file. Each location entry contains an index that is used to determine the distance value from the matrix.

#### Example:

Country	Postcode	Name1	Name2	Matrix index
A	1080	Vienna		3
A	1080	Vienna	Josefstadt	2
A	6230	Brixlegg		471
A	6230	Brixlegg	Mehrn	466
A	6230	Brixlegg	Zimmermoos	471

In this example, the distance from 1080 Vienna to 6230 Brixlegg is found between nodes or matrix indexes 3 and 471. The distance from node 3 to node 471 is the same as from node 471 to node 3 (see also 4.3 Structure of distance matrix).



A distinction is made between main location and district in the EWS location file. Their names are in two separate columns (Location name 1 and Location name 2). The matrix index can be different for each district, even if the postcode and the main location are identical! In the example above, note the different matrix indexes for the locations 1080 Vienna and 1080 Vienna Josefstadt or 6230 Brixlegg Mehrn and 6230 Brixlegg Zimmermoos. It is therefore important to also specify the district (if known) to obtain the most accurate distance between two locations.

## 2.3 Notes on location search

When searching for a location in the location file, main locations and districts should be separated and different or incorrect spellings should be taken into account. In addition, it should be noted that P.O. box postcodes are not included in the location file!

Examples:

- “Wien-Josefstadt” can be found in the location file with Name1 = “Wien” and Name2 = “Josefstadt”.
- “Bad Traunstein” can be found using precisely this spelling in Name1 (“Bad” and “Traunstein” belong together, with spaces, without hyphen).
- “Saalbach-Hinterglemm” can be found using precisely this spelling in Name1, because it is the main location name.
- “Saalbach Hinterglemm” (without hyphen) or “Saalbach – Hinterglemm” (with spaces before and after the hyphen) would have to be assigned to Name1 = “Saalbach-Hinterglemm”.
- Umlauts, special characters, etc. must be observed.

## 2.4 Digital street network as a basis for calculation

The distance matrices are calculated on the basis of a comprehensive digital street network. This street network includes both roads as well as border crossings and ferries. Each distance results from the calculation of an optimum route. The distance of this route is entered in the matrix field. The vehicle profile of a 40-ton truck is used for routing.

For the distance calculation of EWS Toll Austria, only the road mileage is taken into account that is marked as subject to toll charges in the underlying digital street network.

Since release R2023\_V1.0, the EWS Toll Austria also considers international routes, so that the toll kilometers are based on the road kilometers of the EWS Europe.

## 2.5 Accuracy

Austrian toll charges are distance-based. The result of the multiplication of the EWS toll km and the toll rate per kilometer (rate depends on the respective category) does not have to be the same as the actual amount to be paid. The street network subject to toll charges is divided into so-called toll sections. An amount is defined for each toll section and category. Although these amounts are based on the length of the toll sections, they are rounded values.

Due to the assignment and therefore the equation of locations with their respective nodes, there are inaccuracies in the distance. The distances between location and node can be approx. 10 km to 15 km in EWS Toll Austria. EWS Toll Austria shows excellent accuracy for long-distance transportation and can be recommended for this purpose. On the other hand, there can be significant differences for short distances, especially in conurbation areas.

Distances between nodes are precisely calculated. However, it should be noted that EWS only reflects a possible distance between two locations. In determining this distance, the time factor (fastest route) is given a much higher weighting than the distance factor (shortest route). Distances covered by a ferry are not taken into account (distance = 0 kilometers).

Increased toll rates per kilometer apply to the following sections. These tariffs were set by the Austrian highway financing organization ASFINAG (Autobahnen- und Schnellstraßen-Finanzierungs-Aktiengesellschaft). The reasons for this are, for example, above-average costs for the construction, expansion and structural or operational maintenance of the routes:

	Routes with toll charges	km (rounded)
A9 Pyhrn Bosruck	Spital/Pyhrn – Ardning	10
A9 Pyhrn Gleinalm	Kn. St. Michael – Übelbach	25
A10 Tauern	Flachau – Rennweg	47
A11 Karawanken	St. Jakob/Rosental - Tunnel, south portal*	10
A12 Unterinntal	National border Kiefersfelden - Innsbruck Amras	74.8
A13 Brenner**	Innsbruck Amras – Brenner	35
	Innsbruck Wilten - Brenner	34
S16 Arlberg	St. Anton/Arlberg – Langen/Arlberg	16

\* in the northern direction, toll charges are collected on the Slovenian side

\*\* on the A13, a night tariff of double the daytime tariff applies to category 4 trucks between 10 p.m. and 5 a.m



### 3 Scope of supply of EWS Toll Austria

EWS type	Scope of supply	Memory size
EWS Toll Austria	Location file Austria with 20,908 locations	
	60 characters, utf-8 (BOM)	approx. 5 MB
	Toll Austria distance matrix based on 888 nodes	
	Standard format	approx. 2.5 MB
	Binary format	approx. 0.7 MB

#### 3.1 Updates

Regular updates are carried out to account for the permanent, independent further development of the basic street network and location file data records. EWS Toll Austria is published once a year.

The data structure of the EWS has not changed over recent years. If any changes are made in the future, they will be clearly highlighted.

The location identifications (so-called IDs) change from year to year. It is possible that the same location carries a different ID in the current EWS than in a previous version. Also, a location can have a new node number from one version to the next. This is due to the fact that the number of nodes is continuously updated and therefore also the matrix indexes. For these reasons, we do not recommend permanently linking master data (for example customer locations) to locations or nodes. For the same reason, all data should be re-imported during an update.

#### 3.2 The alternative to the EWS – creating custom distance lists

As an alternative to the EWS distance tables, it is possible to create individual distance lists. The starting point and/or destination must be specified by the customer here. It is possible, for example, to calculate the distances

- from one starting point to all locations in Europe,
- from about 10 starting points in Germany to all remaining locations in Germany,
- from all major cities in Germany to all major cities in a neighboring country,
- depending on the country and data volume, also from all postcodes / locations to all other postcodes / locations in a country,
- for different fleets (cars, trucks),
- and taking certain conditions into account.

Please contact us for more information, prices and delivery formats.

## 4 Interface description

### 4.1 File names and formats

File name	Contents
a2024_60_utf8.ods	Location file Austria, 60 characters, utf-8
a2024_m.dm	Distance matrix Toll Austria
a2024_m.bin	Distance matrix Toll Austria, binary format

### 4.2 Structure of location file

Field	Type	From	To	Length	Contents
1	A	1	3	3	Country code (see legend for content)
2	A	4	12	9	Postcode Not available for every country and every location. In Germany, the 5-digit postcode is entered. Exceptions: a) Border crossings have the country code of the neighboring country as the postcode, preceded by a minus sign (e.g. -F or -CH) b) Ports have the postcode -PORT
3	A	13	72	60	Location name 1; postal name
4	A	73	132	60	Location name 2 Linguistic description, this can be, for example a district, part of a city, or a historical name. However, it can also be the municipality name if it is not the same as the postal name (= Location name 1).
5	A	133	133	1	Set code 1 = Main location 3 = District or historical name 5 = Linguistic description 9 = Border crossing
6	A	134	134	1	Set code addition If the set code from field 5 equals 1 or 3: 0 = Standard 1 = Description in Location name 2 If the set code from field 5 equals 9: 0 = International street crossing 1 = International ferry 5 = National street crossing 6 = National ferry
7	A	135	139	5	GTB/nodes East Germany, only for Germany GTB = 5 digits D-East = 0 followed by 4 digits This field only exists for reasons of compatibility with older versions. It is no longer maintained!

8	A	140	140	1	<p>Cartage class A-Z, only for Germany</p> <p><b>House freight location class according to the directory by the Federal Association of German Freight Forwarders and Logistics Operators (BSL)</b></p> <p>This field only exists for reasons of compatibility with older versions. It is no longer maintained!</p>
9	A	141	149	9	<p>Location identification (ID)</p> <p>The identification is a unique key for Germany or a single country. In the case of the European location file, this identification is only unique when the ID is combined with the country code. The ID of a location can change from year to year, it is not a so-called permanent ID!</p>
10	A	150	154	5	<p>Former 4-digit postcode for Germany</p> <p>incl. code for East and West Germany, e.g. O2251 for Usedom or W8991 for Lindau</p> <p>This field only exists for reasons of compatibility with older versions. It is no longer maintained!</p>
11	A	155	163	9	<p>Administrative number</p> <p>Not available for every country and every location. In Germany, the 8-digit municipality code can be entered:</p> <ul style="list-style-type: none"> <li>1 to 2 digit = federal state</li> <li>3 digit = administrative district</li> <li>4 to 5 digit = district</li> <li>6 to 8 digit = municipality</li> </ul>
12	N	164	165	2	Location size class (see legend for content)
13	N	166	174	9	<p>Horizontal coordinate (optional, at extra cost, price on request)</p> <p>If available, a geodecimal WGS84 coordinate with 5 decimal places (<math>\pm</math>GGGNNNNN) is available as standard.</p>
14	N	175	183	9	<p>Vertical coordinate (optional, at extra cost, price on request)</p> <p>If available, a geodecimal WGS84 coordinate with 5 decimal places (<math>\pm</math>GGGNNNNN) is available as standard.</p>
15	N	184	192	9	<p><b>Index for matrix Germany</b> (for German locations)</p> <p>Reference to distance matrix Germany (relevant in EWS Germany, EWS Germany Toll and EWS Europe Plus).</p> <p>or:</p> <p><b>Index for matrix Austria</b> (for Austrian locations)</p> <p>Reference to the distance matrix Austria (relevant in EWS Austria Toll). <b>Attention: As of release R2023_V1.0, this index is no longer necessarily equal to the index for the matrix Europe (Field 17).</b></p>
16	N	193	201	9	Next node in street network GER/AUT (is always filled in with 0)
17	N	202	210	9	<p>Index for matrix Europe (for all locations)</p> <p>Reference for distance matrix Europe (relevant in EWS Europe and EWS Europe Plus)</p>
18	N	211	219	9	Next node in street network Europe (is always filled in with 0)

## Legend

- **Type:**
  - A = Alphanumeric (always left-justified)
  - N = Numeric (always right-justified)
- **Location size class:**
  - The location size classes do not refer to the actual number of inhabitants, but to the relative importance of a location/city. They are therefore to be understood as guideline values that serve to roughly classify locations.
  - The population figure is unknown.
  - Each district has its own size class. However, it often happens that all or many postcode districts have the same classes.

0: unknown	8: 5000 <= x < 10000
1: < 100	9: 10000 <= x < 20000
2: 100 <= x < 200	10: 20000 <= x < 50000
3: 200 <= x < 500	11: 50000 <= x < 100000
4: 500 <= x < 1000	12: 100000 <= x < 250000
5: 1000 <= x < 2000	13: 250000 <= x < 500000
6: 2000 <= x < 3000	14: x >= 50000
7: 3000 <= x < 5000	

## 4.3 Structure of distance matrix

The first row contains the number of matrix rows and columns.

The distance matrix is stored row by row in the matrix. Each matrix row in the distance matrix starts with the number of the mapped matrix row. Each matrix row is broken down after 12 values, i.e. a matrix row can consist of several text rows. Each matrix row ends with the character string "0000". The following matrix row starts in a new text row.

The matrix values represent the distance in km. A few matrix values can have the value "0". This occurs with nodes that are close together and connected to the same road segment.

Row 24 starts with the row number and the first 12 values, then a new text row starts with a further 11 values and the row termination 0000. Each entry is 6 digits long and is right-aligned within these 6 digits. They are preceded by spaces.

Since the distances are all symmetrical, i.e. the route from A to B is as long as from B to A, the ASCII matrix is constructed as a triangular matrix. If you want to read out the sought distance directly from the matrix, the larger index must always stand for the line and the smaller index must always stand for the column.

The distance from index 4 to index 10 is read out as follows in the example below: The larger index is 10 and represents the row number. Row 10, position 4 (column) contains the sought value of 49 kilometers.

**Example:**

```

24 Matrixzeile(n), 24 Matrixspalte(n)
1 0000
2 0 0000
3 0 0 0000
4 0 0 0 0000
5 0 11 9 0 0000
6 22 22 30 19 38 0000
7 46 46 54 43 62 19 0000
8 46 46 54 43 62 19 0 0000
9 52 52 60 49 68 25 0 0 0000
10 52 52 60 49 68 25 0 0 0 0000
11 27 27 35 24 43 0 0 0 0 0000
12 21 21 29 18 37 0 0 0 0 0 0000
13 23 23 25 4 33 20 44 0 50 50 25 0
0000
14 45 45 48 26 55 42 0 0 0 0 0 0
15 21 21 48 18 55 0 0 0 0 0 0 0
15 0 0000
16 45 45 48 26 55 42 0 0 0 0 0 0
15 0 0 0000
17 40 40 42 21 50 37 0 0 0 0 0 0
10 3 3 3 0000
18 10 10 12 3 20 19 43 10 49 49 24 10
1 23 23 23 18 0000
19 45 45 48 26 55 42 0 0 0 0 0 0
15 0 0 0 3 23 0000
20 14 14 16 16 24 24 47 14 53 53 29 14
5 27 27 27 0 0 0 0000
21 14 14 16 16 24 24 47 0 53 53 29 0
0 0 0 0 0 0 0 0 0 0000
22 14 14 16 16 24 42 0 0 0 0 0 0
15 0 0 0 3 0 0 0 0 0 0000
23 45 45 48 26 55 42 0 0 0 0 0 0
15 0 0 0 3 23 0 0 0 0 0000
24 45 45 48 26 55 42 0 0 0 0 0 0
15 0 0 0 3 23 0 0 0 0 0 0000
    
```

### 4.4 Notes on processing of the EWS matrix

A 800 \* 800 matrix uses approx. 2.5 MB. This is little compared to other EWS matrices and can be processed well. However, efficient storage can also be achieved if all distance values (without matrix diagonals "0000") are written one after the other into a one-dimensional field, a continuous sequential series.

For the above example, the field would look as follows:

Position	1	2	3	4	5	6	7	8	9	10	11	12	13
Wert	0	0	0	0	0	0	0	11	9	0	22	22	30

The position “pos” of a distance value for the indexes “a” and “b” is then calculated using

$$\max(a, b) = \text{the greater value of } a \text{ and } b$$

and

$$\min(a, b) = \text{the smaller value of } a \text{ and } b$$

divided by:

$$\text{pos} = ((\max(a, b) - 1) * (\max(a, b) - 2)) / 2 + \min(a, b)$$

### Example

$$a = 5 \quad b = 3$$

$$\text{pos} = ((\max(5, 3) - 1) * (\max(5, 3) - 2)) / 2 + \min(5, 3)$$

$$\text{pos} = ((5 - 1) * (5 - 2)) / 2 + 3$$

$$\text{pos} = 9$$

The distance value for 5 → 3 is therefore at position 9 and results in 12 km.

If a = b (start node = destination node), then the distance is 0 km and the above formula must be ignored because the 0 values (matrix diagonals “0000”) are not read into the one-dimensional field. The application program should then simply return 0 km.

## 4.5 The binary file

The above-described possibility of generating a one-dimensional field can, depending on the development environment, lead to the field “overflowing” at some point due to the amount of data.

This could be remedied by writing each individual distance value into a **binary file** (the binary file will be only about 0.7 MB in size, in contrast to an ASCII file with 2.5 MB).

The above example from point 4.4 in HEX format:

Position	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>Value (2 bytes)</b>	00 00	00 00	00 00	00 00	00 00	00 00	00 00	0B 00	09 00	00 00	16 00	16 00	1E 00

The above formula can then also be applied to determine the location of the sought distance value in the binary file.

## 4.6 Reference values

There follows some distance information from the new EWS Toll Austria to check your application.

Starting point				Destination				Distance
Postcode	Name1	Name2	Index_A	Postcode	Name1	Name2	Index_A	Toll km
1010	Wien		2	6230	Brixlegg	Zimmermoos	471	415
8262	Ilz		612	3183	Türnitz		84	188
4283	Bad Zell	Aich	230	6890	Lustenau		540	493
6900	Bregenz		543	8010	Graz		590	568