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WORKING TIME RISK Index

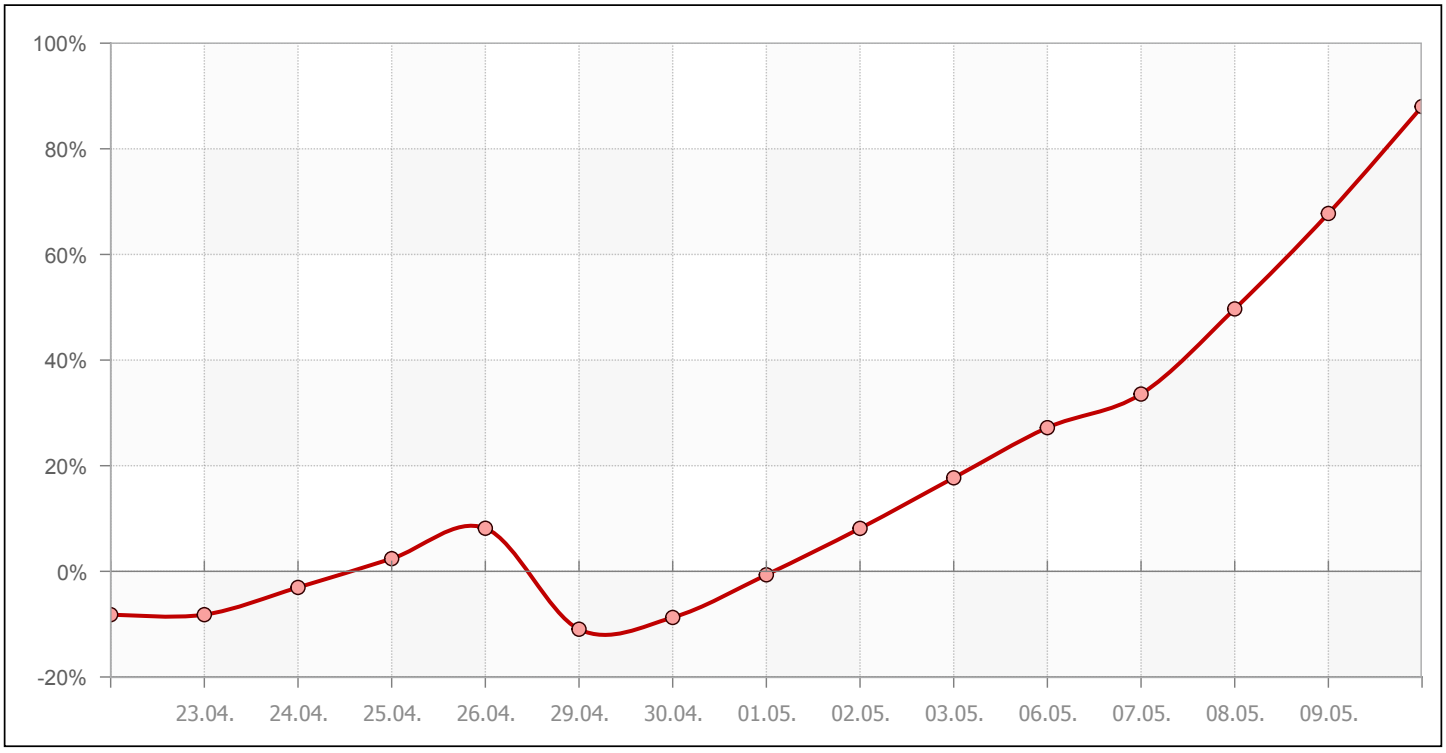
The relative accident risk changes by:

18 %

The risk is calculated in relation to the average risk when working 5 days morning shift with 8h and 30 minutes break each = REFERENCE RISK.

The change in the relative accident risk per working day over time:

In this chart, values for a working period are assigned to the day on which the period starts. Days off are not shown.



Im Jahr 2017 gab es in Österreich 107.512 Arbeitsunfälle und 14.289 Wegeunfälle vom/zum Arbeitsplatz mit insgesamt 149 Toten. Die durchschnittliche Anzahl der Arbeits- und Wegeunfälle pro 100.000 Personen und Jahr lag bei 2.436.
Entspricht diese Anzahl der Unfälle einem Risiko von 100%, dann entspricht eine Erhöhung des Risikos auf 117.52% einer Erhöhung der Anzahl der Arbeitsunfälle und Arbeitswegunfälle um 427 pro 100.000 Personen und Jahr. Quelle: Statistik Austria Arbeitsunfälle 2017.

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Disclaimer

You are using a non-commercial version of the Risk Calculater powered by AUVA. We provide this version for non-commercial use for calculations for up to 100 records.

The Risk Calculator is based on the scientific state of the art.

However, some aspects are not yet considered in the model. Details in the calculation are subject to change according to improvements of the software and to the scientific progress.

We are committed to ensure a high quality of our product. Nevertheless, mistakes can never be completely ruled out.

Please contact us at office@ximes.com, if you want to use the Risk Calculator commercially or for a higher number of records, or if you have any questions or concerns about the correctness of our approach.

Settings

Commuting time in minutes	**30**

Working time data

No.	Date	Start	End	Break start	Break end	Remark	Note
1	22.04.2019	06:00	14:00	10:00	10:30		
2	23.04.2019	06:00	14:00	10:00	10:30		
3	24.04.2019	06:00	14:00	10:00	10:30		
4	25.04.2019	06:00	14:00	10:00	10:30		
5	26.04.2019	06:00	14:00	10:00	10:30		
6	29.04.2019	14:00	22:00	18:00	18:30		
7	30.04.2019	14:00	22:00	18:00	18:30		
8	01.05.2019	14:00	22:00	18:00	18:30		
9	02.05.2019	14:00	22:00	18:00	18:30		
10	03.05.2019	14:00	22:00	18:00	18:30		
11	06.05.2019	22:00	06:00	00:00	00:30		
12	07.05.2019	22:00	06:00	00:00	00:30		
13	08.05.2019	22:00	06:00	00:00	00:30		
14	09.05.2019	22:00	06:00	00:00	00:30		
15	10.05.2019	22:00	06:00	00:00	00:30		

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Computation of risk values

The relative accident risk changes by: 18 %

EXPLANATION RELATIVE RISK: Risk research often uses relative risk, which expresses the factor by which a risk differs between two groups of people.If, for example, the absolute accident risk in an area across all persons is 2% per year, but 3% for a lot of night work, then the relative risk would be 3%/2% = 150% - an increase of 50%.If the risk remains unchanged, the result is 100% relative risk or 1. If, for example, it drops to 1.5%, the relative risk would be reduced to 75%, i.e. minus 25%.
The calculation of the relative risk thus shows the expected change under different conditions(e.g. other dangers of work).

The risk is calculated in relation to the average risk when working 5 days morning shift with 8h and 30 minutes break each = REFERENCE RISK.

Shift assessment

					Risk factors relative to reference risk					
No.	**Date**	**Start**	**End**	**Summary of working times**	Commuting time	Rest time	Shift series	Shift length incl. breaks	**Total**	**Difference**
1	22.04.2019	06:00	14:00	Long rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	93 %	98 %	**92 %**	**-8 %**
2	23.04.2019	06:00	14:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	93 %	98 %	**92 %**	**-8 %**
3	24.04.2019	06:00	14:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	99 %	98 %	**97 %**	**-3 %**
4	25.04.2019	06:00	14:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	104 %	98 %	**102 %**	**2 %**
5	26.04.2019	06:00	14:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	110 %	98 %	**108 %**	**8 %**
6	29.04.2019	14:00	22:00	72.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	91 %	98 %	**89 %**	**-11 %**
7	30.04.2019	14:00	22:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	93 %	98 %	**91 %**	**-9 %**

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WORKING TIME RISK Index

Shift assessment

No.	Date	Start	End	Summary of working times	Risk factors relative to reference risk: Commuting time	Rest time	Shift series	Shift length incl. breaks	Total	Difference
8	01.05.2019	14:00	22:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	101 %	98 %	**99 %**	**-1 %**
9	02.05.2019	14:00	22:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	110 %	98 %	**108 %**	**8 %**
10	03.05.2019	14:00	22:00	16.00h rest time before shift start 4.00h working time, then 0.50h break 3.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	120 %	98 %	**118 %**	**18 %**
11	06.05.2019	22:00	06:00	72.00h rest time before shift start 2.00h working time, then 0.50h break 5.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	126 %	101 %	**127 %**	**27 %**
12	07.05.2019	22:00	06:00	16.00h rest time before shift start 2.00h working time, then 0.50h break 5.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	132 %	101 %	**134 %**	**34 %**
13	08.05.2019	22:00	06:00	16.00h rest time before shift start 2.00h working time, then 0.50h break 5.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	148 %	101 %	**150 %**	**50 %**
14	09.05.2019	22:00	06:00	16.00h rest time before shift start 2.00h working time, then 0.50h break 5.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	166 %	101 %	**168 %**	**68 %**
15	10.05.2019	22:00	06:00	16.00h rest time before shift start 2.00h working time, then 0.50h break 5.50h working time 7.50h Total working time 8.00h Shift length	100 %	100 %	186 %	101 %	**188 %**	**88 %**

Gesamtsumme der Stunden: 112.50
Gesamtsumme von Stunden * Risiko dieser Stunde: 132.21
Ergibt im Schnitt pro Stunde: 117.52%

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Details for each risk factor and shift

EXPLANATION RELATIVE RISK: Risk research often uses relative risk, which expresses the factor by which a risk differs between two groups of people.If, for example, the absolute accident risk in an area across all persons is 2% per year, but 3% for a lot of night work, then the relative risk would be 3%/2% = 150% - an increase of 50%.If the risk remains unchanged, the result is 100% relative risk or 1. If, for example, it drops to 1.5%, the relative risk would be reduced to 75%, i.e. minus 25%.
The calculation of the relative risk thus shows the expected change under different conditions(e.g. other dangers of work).

The risk is calculated in relation to the average risk when working 5 days morning shift with 8h and 30 minutes break each = REFERENCE RISK.

Shift nr. **1** **22/04/2019** **06:00** **14:00** , **Break** **10:00** **10:30**

Summary of working times

Long rest time before shift start

4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.

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The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence **93 %**

The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods.
The aftereffect of earlier shifts corresponds to a total of 0.00 shifts.
Including the current shift this amounts to a total of 100.00% shifts.
In total this amounts to the following risk factor.

The weighted shares of early, late, and night shifts influence the risk for this shift type.

The risk factor for shift 1.00 of type F is 100.00%.
The share of this shift type is 100.00%. Hence the factor is 100.00%.

In total this amounts to a risk factor of 100.00%.
This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%.
This results in a relative risk of 100.00% / 107.00% = 93.46%.

Risk factor rest period **100 %**

The distance to the previous shift is 999.00 hours.
It is reduced to 998.00 hours (net time) by the commuting time.
As the net time amounts to more than 9 hours, the risk is not increased.

Total risk **92 %** **100.00% * 100.00% * 100.00% * 93.46% * 98.22%**
Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **2** **23/04/2019** **06:00** **14:00** , **Break** **10:00** **10:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
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The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
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The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
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The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
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Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**93 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 1.00 shifts. Including the current shift this amounts to a total of 200.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 2.00 of type F is 100.00%. The share of this shift type is 100.00%. Hence the factor is 100.00%. In total this amounts to a risk factor of 100.00%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 100.00% / 107.00% = 93.46%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**92 %**	**100.00% * 100.00% * 100.00% * 93.46% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **3** **24/04/2019** **06:00** **14:00** , **Break** **10:00** **10:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**99 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 2.00 shifts. Including the current shift this amounts to a total of 300.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 3.00 of type F is 105.62%. The share of this shift type is 100.00%. Hence the factor is 105.62%. In total this amounts to a risk factor of 105.62%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 105.62% / 107.00% = 98.71%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**97 %**	**100.00% * 100.00% * 100.00% * 98.71% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **4** **25/04/2019** **06:00** **14:00** , **Break** **10:00** **10:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**104 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 3.00 shifts. Including the current shift this amounts to a total of 400.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 4.00 of type F is 111.56%. The share of this shift type is 100.00%. Hence the factor is 111.56%. In total this amounts to a risk factor of 111.56%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 111.56% / 107.00% = 104.26%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**102 %**	**100.00% * 100.00% * 100.00% * 104.26% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **5** **26/04/2019** **06:00** **14:00** , **Break** **10:00** **10:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**110 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 4.00 shifts. Including the current shift this amounts to a total of 500.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 5.00 of type F is 117.83%. The share of this shift type is 100.00%. Hence the factor is 117.83%. In total this amounts to a risk factor of 117.83%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 117.83% / 107.00% = 110.12%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**108 %**	**100.00% * 100.00% * 100.00% * 110.12% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **6** **29/04/2019** **14:00** **22:00** , **Break** **18:00** **18:30**

Summary of working times

72.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**91 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 0.00 shifts. Including the current shift this amounts to a total of 100.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 1.00 of type S is 97.00%. The share of this shift type is 100.00%. Hence the factor is 97.00%. In total this amounts to a risk factor of 97.00%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 97.00% / 107.00% = 90.65%.
Risk factor rest period	**100 %**	The distance to the previous shift is 72.00 hours. It is reduced to 71.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**89 %**	**100.00% * 100.00% * 100.00% * 90.65% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **7** **30/04/2019** **14:00** **22:00** , **Break** **18:00** **18:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**93 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 1.00 shifts. Including the current shift this amounts to a total of 200.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 2.00 of type S is 99.42%. The share of this shift type is 100.00%. Hence the factor is 99.42%. In total this amounts to a risk factor of 99.42%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 99.42% / 107.00% = 92.92%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**91 %**	**100.00% * 100.00% * 100.00% * 92.92% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **8** **01/05/2019** **14:00** **22:00** , **Break** **18:00** **18:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**101 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 2.00 shifts. Including the current shift this amounts to a total of 300.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 3.00 of type S is 108.22%. The share of this shift type is 100.00%. Hence the factor is 108.22%. In total this amounts to a risk factor of 108.22%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 108.22% / 107.00% = 101.14%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**99 %**	**100.00% * 100.00% * 100.00% * 101.14% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **9** **02/05/2019** **14:00** **22:00** , **Break** **18:00** **18:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**110 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 3.00 shifts. Including the current shift this amounts to a total of 400.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 4.00 of type S is 117.80%. The share of this shift type is 100.00%. Hence the factor is 117.80%. In total this amounts to a risk factor of 117.80%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 117.80% / 107.00% = 110.10%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**108 %**	**100.00% * 100.00% * 100.00% * 110.10% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **10** **03/05/2019** **14:00** **22:00** , **Break** **18:00** **18:30**

Summary of working times

16.00h rest time before shift start
4.00h working time, then 0.50h break
3.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.00h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.00h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **98 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 2.00 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 4.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 6.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 7.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 5.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 6.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 6.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 7.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 82.25%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 86.95%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 100.00%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 47.00%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 67.21%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 71.91%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 76.14%.

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Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 82.25%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 86.95%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 77.53% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h is 78.93% 77.53% / 78.93% = 98.22%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 104.20%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 110.16%.
Time interval 7 with a length of 1.00 hours starting after 3.00 hours has a relative risk of 126.69%.
Time interval 8 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 0.00%.
Time interval 9 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 59.54%.
Time interval 10 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 85.15%.
Time interval 11 with a length of 0.50 hours starting after 5.50 hours has a relative risk of 91.10%.
Time interval 12 with a length of 0.50 hours starting after 6.00 hours has a relative risk of 96.46%.
Time interval 13 with a length of 0.50 hours starting after 6.50 hours has a relative risk of 104.20%.
Time interval 14 with a length of 0.50 hours starting after 7.00 hours has a relative risk of 110.16%.
Time interval 15 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**120 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 4.00 shifts. Including the current shift this amounts to a total of 500.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 5.00 of type S is 128.23%. The share of this shift type is 100.00%. Hence the factor is 128.23%. In total this amounts to a risk factor of 128.23%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 128.23% / 107.00% = 119.84%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**118 %**	**100.00% * 100.00% * 100.00% * 119.84% * 98.22%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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WORKING TIME RISK Index

Shift nr. **11** **06/05/2019** **22:00** **06:00** , **Break** **00:00** **00:30**

Summary of working times

72.00h rest time before shift start
2.00h working time, then 0.50h break
5.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.50h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.50h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **101 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 2.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 3.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 4.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 47.00%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 67.21%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 71.91%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 76.14%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 82.25%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 86.95%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 100.00%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 100.00%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 79.58% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h

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WORKING TIME RISK Index

is 78.93% 79.58% / 78.93% = 100.82%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 59.54%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 85.15%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 91.10%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 96.46%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 104.20%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 110.16%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 126.69%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 126.69%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence **126 %**

The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods.
The aftereffect of earlier shifts corresponds to a total of 0.00 shifts.
Including the current shift this amounts to a total of 100.00% shifts.
In total this amounts to the following risk factor.

The weighted shares of early, late, and night shifts influence the risk for this shift type.

The risk factor for shift 1.00 of type N is 135.00%.
The share of this shift type is 100.00%. Hence the factor is 135.00%.

In total this amounts to a risk factor of 135.00%.
This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%.
This results in a relative risk of 135.00% / 107.00% = 126.17%.

Risk factor rest period **100 %**

The distance to the previous shift is 72.00 hours.
It is reduced to 71.00 hours (net time) by the commuting time.
As the net time amounts to more than 9 hours, the risk is not increased.

Total risk **127 %** **100.00% * 100.00% * 100.00% * 126.17% * 100.82%**
Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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WORKING TIME RISK Index

Shift nr. **12** **07/05/2019** **22:00** **06:00** , **Break** **00:00** **00:30**

Summary of working times

16.00h rest time before shift start
2.00h working time, then 0.50h break
5.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.50h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.50h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **101 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 2.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 3.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 4.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 47.00%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 67.21%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 71.91%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 76.14%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 82.25%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 86.95%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 100.00%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 100.00%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 79.58% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h

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is 78.93% 79.58% / 78.93% = 100.82%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 59.54%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 85.15%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 91.10%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 96.46%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 104.20%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 110.16%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 126.69%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 126.69%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**132 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 1.00 shifts. Including the current shift this amounts to a total of 200.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 2.00 of type N is 141.75%. The share of this shift type is 100.00%. Hence the factor is 141.75%. In total this amounts to a risk factor of 141.75%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 141.75% / 107.00% = 132.48%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**134 %**	**100.00% * 100.00% * 100.00% * 132.48% * 100.82%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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WORKING TIME RISK Index

Shift nr. **13** **08/05/2019** **22:00** **06:00** , **Break** **00:00** **00:30**

Summary of working times

16.00h rest time before shift start
2.00h working time, then 0.50h break
5.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.50h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.50h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **101 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 2.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 3.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 4.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 47.00%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 67.21%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 71.91%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 76.14%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 82.25%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 86.95%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 100.00%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 100.00%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 79.58% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h

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is 78.93% 79.58% / 78.93% = 100.82%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 59.54%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 85.15%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 91.10%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 96.46%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 104.20%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 110.16%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 126.69%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 126.69%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**148 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 2.00 shifts. Including the current shift this amounts to a total of 300.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 3.00 of type N is 158.86%. The share of this shift type is 100.00%. Hence the factor is 158.86%. In total this amounts to a risk factor of 158.86%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 158.86% / 107.00% = 148.47%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**150 %**	**100.00% * 100.00% * 100.00% * 148.47% * 100.82%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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WORKING TIME RISK Index

Shift nr. **14** **09/05/2019** **22:00** **06:00** , **Break** **00:00** **00:30**

Summary of working times

16.00h rest time before shift start
2.00h working time, then 0.50h break
5.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.50h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.50h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **101 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 2.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 3.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 4.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 47.00%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 67.21%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 71.91%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 76.14%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 82.25%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 86.95%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 100.00%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 100.00%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 79.58% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h

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WORKING TIME RISK Index

is 78.93% 79.58% / 78.93% = 100.82%.
The single values are also relative to this reference.

The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 59.54%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 85.15%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 91.10%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 96.46%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 104.20%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 110.16%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 126.69%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 126.69%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence	**166 %**	The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods. The aftereffect of earlier shifts corresponds to a total of 3.00 shifts. Including the current shift this amounts to a total of 400.00% shifts. In total this amounts to the following risk factor. The weighted shares of early, late, and night shifts influence the risk for this shift type. The risk factor for shift 4.00 of type N is 178.03%. The share of this shift type is 100.00%. Hence the factor is 178.03%. In total this amounts to a risk factor of 178.03%. This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%. This results in a relative risk of 178.03% / 107.00% = 166.39%.
Risk factor rest period	**100 %**	The distance to the previous shift is 16.00 hours. It is reduced to 15.00 hours (net time) by the commuting time. As the net time amounts to more than 9 hours, the risk is not increased.
Total risk	**168 %**	**100.00% * 100.00% * 100.00% * 166.39% * 100.82%** Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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Shift nr. **15** **10/05/2019** **22:00** **06:00** , **Break** **00:00** **00:30**

Summary of working times

16.00h rest time before shift start
2.00h working time, then 0.50h break
5.50h working time
7.50h Total working time
8.00h Shift length

Risk factor commuting **100 %** The commuting time is 30 minutes each way.

Risk factor shift length excl. breaks ***94 %*** *Effect of the shift length ignoring the breaks. This risk factor is adjusted in the next step where breaks are considered. This factor is therefore not directly included in the overall calculation.*

The risk factor shift length (excl. breaks) is calculated as average value of the following hourly raw risk values.
After 1.00h of the shift incl. breaks (1.00 hours excl. breaks): 100%
After 2.00h of the shift incl. breaks (2.00 hours excl. breaks): 100%
After 3.50h of the shift incl. breaks (3.00 hours excl. breaks): 100%
After 4.50h of the shift incl. breaks (4.00 hours excl. breaks): 100%
After 5.50h of the shift incl. breaks (5.00 hours excl. breaks): 100%
After 6.50h of the shift incl. breaks (6.00 hours excl. breaks): 100%
After 7.50h of the shift incl. breaks (7.00 hours excl. breaks): 100%
After 8.00h of the shift incl. breaks (7.50 hours excl. breaks): 100%

Risk factor shift length incl. breaks **101 %** The risk factor shift length is changed by breaks as follows.
Starting point are the hourly risk values reported for the risk factor shift length (excl. breaks).
Before shift start a 30-minutes break is assumed, which is part of the calculation.

Decrease of the risk factor by the assumed 30-minutes break before shift start:
The risk from the start of hour 0.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 1.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Reduction of the risk-decreasing effect of the assumed 30-minutes break during the following 3.00 work hours:
The risk from the start of hour 0.00 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 0.50 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 1.00 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 1.50 since shift start was 47.00%. The change by 162.00% results in 76.14%.

Decrease of the risk factor by 1 breaks from the input data:
Break number 1 with a length of 0.50 hours decreases the risk factor as follows.
Das Risiko ab Beginn der 2.00. Stunde seit Arbeitsbeginn bleibt unverändert bei 0.00% (Pause).
The risk from the start of hour 2.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 3.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 4.50 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.
The risk from the start of hour 5.00 since shift start was 100.00%. The change for 0.50 hours by 47.00% results in 47.00%.

Abschwächung der risikosenkenden Wirkung der Pause in den nachfolgenden 3.00 Arbeitsstunden:
The risk from the start of hour 2.50 since shift start was 47.00%. The change by 100.00% results in 47.00%.
The risk from the start of hour 3.00 since shift start was 47.00%. The change by 143.00% results in 67.21%.
The risk from the start of hour 3.50 since shift start was 47.00%. The change by 153.00% results in 71.91%.
The risk from the start of hour 4.00 since shift start was 47.00%. The change by 162.00% results in 76.14%.
The risk from the start of hour 4.50 since shift start was 47.00%. The change by 175.00% results in 82.25%.
The risk from the start of hour 5.00 since shift start was 47.00%. The change by 185.00% results in 86.95%.

Overview on the raw risk values:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 47.00%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 67.21%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 71.91%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 76.14%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 47.00%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 67.21%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 71.91%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 76.14%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 82.25%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 86.95%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 100.00%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 100.00%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 100.00%.

The average raw risk value of 79.58% as multiple of the raw risk value of the reference early shift of 8h length and with a break of 0.5h

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The result are the following risk values per time unit:
Time interval 1 with a length of 0.50 hours starting after 0.00 hours has a relative risk of 59.54%.
Time interval 2 with a length of 0.50 hours starting after 0.50 hours has a relative risk of 85.15%.
Time interval 3 with a length of 0.50 hours starting after 1.00 hours has a relative risk of 91.10%.
Time interval 4 with a length of 0.50 hours starting after 1.50 hours has a relative risk of 96.46%.
Time interval 5 with a length of 0.50 hours starting after 2.00 hours has a relative risk of 0.00%.
Time interval 6 with a length of 0.50 hours starting after 2.50 hours has a relative risk of 59.54%.
Time interval 7 with a length of 0.50 hours starting after 3.00 hours has a relative risk of 85.15%.
Time interval 8 with a length of 0.50 hours starting after 3.50 hours has a relative risk of 91.10%.
Time interval 9 with a length of 0.50 hours starting after 4.00 hours has a relative risk of 96.46%.
Time interval 10 with a length of 0.50 hours starting after 4.50 hours has a relative risk of 104.20%.
Time interval 11 with a length of 0.50 hours starting after 5.00 hours has a relative risk of 110.16%.
Time interval 12 with a length of 1.00 hours starting after 5.50 hours has a relative risk of 126.69%.
Time interval 13 with a length of 1.00 hours starting after 6.50 hours has a relative risk of 126.69%.
Time interval 14 with a length of 0.50 hours starting after 7.50 hours has a relative risk of 126.69%.

Risk factor shift sequence **186 %**

The risk factor shift sequence considers the current shift and earlier shifts incl. rest periods.
The aftereffect of earlier shifts corresponds to a total of 4.00 shifts.
Including the current shift this amounts to a total of 500.00% shifts.
In total this amounts to the following risk factor.

The weighted shares of early, late, and night shifts influence the risk for this shift type.

The risk factor for shift 5.00 of type N is 199.52%.
The share of this shift type is 100.00%. Hence the factor is 199.52%.

In total this amounts to a risk factor of 199.52%.
This value is relative to an average risk of 5 early shifts with 8h length, a break of 0.5h and two days of rest amounting to 107.00%.
This results in a relative risk of 199.52% / 107.00% = 186.47%.

Risk factor rest period **100 %**

The distance to the previous shift is 16.00 hours.
It is reduced to 15.00 hours (net time) by the commuting time.
As the net time amounts to more than 9 hours, the risk is not increased.

Total risk **188 %** **100.00% * 100.00% * 100.00% * 186.47% * 100.82%**
Base risk * Commuting time * Rest period * Shift sequence * Shift length incl. breaks

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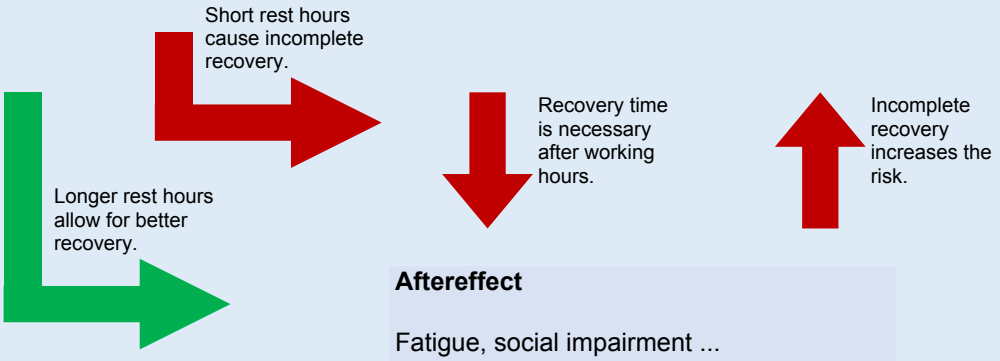
Schematic overview on the calculation model

Rest period	Commuting	Working times	Sequence of shifts
Short rest hours increase the risk.	Long communting increases the risk.	Long working hours increase the risk. Risk is influenced by time of of day Breaks of up to 60 minutes reduce the risk.	



Aftereffect

Fatigue, social impairment ...

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Documentation of the calculation model

The Risk Calculator provides estimates of the daily relative accident risk for entered working time data on the basis of reference working time models and calculations of various risk factors such as shift length, shift sequence, breaks, travel time and rest period length.

In this Risk Report, the entered working time data is first listed and irregularities and errors are displayed. This makes it easier to understand any irregularities in the calculations later on. The report then provides an overview of the accident risk for each shift, divided into the subfactors travel time, shift length, breaks, shift sequence and rest period. Each sub-risk of each shift is then broken down and explained in detail in a detailed report.

Our working time accident risk model is based on detailed scientific estimates which are available for essential parts of the calculations (e.g. Fischer et al. 2017). In addition, assumptions were made based on exchange with experts and our own decades of experience.

The scientific estimates as well as our additional assumptions were developed on the basis of data from regular working hours with longer, mostly weekly rest periods. Accordingly, the calculation of very irregular or extreme models (e.g. very long or very short days, very many days without longer rest periods) is associated with uncertainties. Such questions are continuously researched and the model will gradually implement new results.

In addition to the model presented here, there are several other recognised recommendations on the organisation of working time and in particular shift work (e.g. Beermann 2005; Rothe et al. 2017). Should the model presented here produce results that contradict these recommendations, we would ask you to exercise caution and send information to us at office@ximes.com. Deviations require detailed examination and will lead to a refinement of the model or to additional explanations. Even though we do not see any contradiction at present, it is possible that the model still has potential for gradual further development.Further developments are to be expected - due to scientific advances but also from learning in application or from the elimination of weaknesses. Changes will be documented in a description of the versions.

All our calculation bases and calculation methods are accessible to interested parties and for critical review by other scientists. The calculation settings are listed to a large extent in the report. No liability can be accepted for any errors.

Relative accident risk

The relative accident risk expresses the relative probability of an accident due to different working times with the same type of work and working conditions relative to a reference working time model. It is therefore a risk increase or decrease for entered working times compared to the reference working time model.

Depending on how the entered working times deviate from the reference working time model, higher or lower risks may arise. These deviations should be understood relative to the 100% normal value, which describes the risk of a shift plan following one of the reference working time models. A value of 110% means a risk increased by 10% compared to the reference working time model. A value of 47% means a risk reduced by 53% compared to the reference working time model.

The calculation of the relative accident risk consists of five sub-factors: the factor shift length, the factor breaks, the factor rest time, the factor driving time and the factor shift sequence.

These individual risk factors are linked multiplicatively. For example, a risk factor A of 120% and a risk factor B of 90% result in a total risk of 120% * 90% = 108%. The multiplicative linkage was taken from risk models in the literature (e.g. Fischer et al. 2017), which are based on the assumptions that various factors together have an effect on fatigue and that increasing fatigue typically leads to an exponentially growing risk of errors and accidents.

The calculations of the risk values of the individual factors are largely based on detailed scientific estimates that are available for essential parts of the calculations, such as the factor layer length and layer sequence (e.g. Fischer et al. 2017; Spencer et al. 2006).

For other areas there are some well-founded studies (see literature references and the respective detailed topics), but at present no extensive meta-analyses. These include the risk factors rest time and the effects of breaks on the risk factor layer length. Studies that indicate a certain effect to be very likely were included.

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Most relevant studies on working time concern classical working time models in which it is clear to which type a shift is to be assigned (day, early, late or night shift). In practice, however, many working time models have different times (e.g. short shifts in the late evening, split shifts). It is important to prevent that small details in the allocation of shifts lead to large errors in the modelling. Based on expert assessments and well-founded qualitative knowledge from decades of practical experience, we have therefore developed our own interpolations, which lead to the fact that individual parts of a layer can be assigned to different layer types. This avoids sudden changes in risk.

Overall, the calculations should not overestimate the risks alarmistically, but should not ignore known effects either, but rather take them into account conservatively in cases of doubt.

Reference working time models

The calculated risk values should make risks visible when comparing different working time models or different shift schedules and help to improve the organisation and selection of working time.

In order to do justice to reality, we provide various reference working time models. Depending on the application, a specific reference working time model can be selected, which then corresponds to the normal value of 100%.

For example, if you need to choose between different models of shift work, it may be more helpful to compare it with a known and proven reference working time model for shift work. When comparing different day work models, comparison with another reference work time model may be more useful.

A comparison with one of the following models is recommended:

1. Day with break as reference: 8-hour shifts with a 30-minute break in the middle on five consecutive days, followed by two days off. This is the reference working time model used for comparison and it has the average risk of 0%.
2. Day without break as reference: 8-hour services without a break on five consecutive days, followed by two days off. The relative risk of this working time model is 13%
3. Continuous shift work: An ergonomically optimised standard shift plan for fully continuous shift work and for full-time or near-full-time employment that is rated as good by ergonomists. The shift sequence consists of two days early shift from 6 a.m. to 2 p.m., followed by two days late shift from 2 p.m. to 10 p.m., followed by two days night shift from 10 p.m. to 6 a.m. and then three days off. Each shift has a 30-minute break in the middle. The relative risk of this working time model is 8%.

Risk factor commuting times

Commuting times are times that are required to get to the workplace.

For the calculation of the risk from the commuting time, two journeys per shift, the outward and the return journey are relevant. Intermediate journeys home, for example during longer breaks, are not considered.

The calculation of this risk factor is based on the results in Spencer et al. (2006) and on the simulation runs of the risk index calculator provided by the authors.

In Spencer et al. (2006), no increase in risk was modelled for travel times of less than 40 minutes. Travel times exceeding 100 minutes were considered conservatively in such a way that the risk continues to increase linearly (as from 90 to 100 minutes). From the data available both - a slight and a strong increase in the risk- seem possible, and further tests based on further empirical data are required.

The risk factor commuting time is calculated equally for all days, since the increase in fatigue due to consecutive days is already taken into account in the risk factor shift sequence.

Settings

```
Die Risikoberechnung für Fahrtzeiten ab 40 Minuten bis max. 100 Minuten in 10 Minutenintervallen:
Ab Minute:       40      50      60      70      80      90     100
Risiko Morgen:  100.00% 101.10% 102.50% 103.80% 105.00% 106.10% 107.00%
```

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```
Risiko Abend:   100.00% 101.00% 102.30% 103.50% 104.60% 105.60% 106.50%
Risiko Nacht:   100.00% 101.30% 102.90% 104.30% 105.60% 106.80% 107.90%
Danach steigt es weiter linear in 10 Minutenschritten.
```

Risk factor shift length

The length of a shift refers to the time from the beginning to the end of the shift.

The risk does not change for shifts of up to 8 hours in length. From 8 hours on, an increased risk is to be expected.

The calculation of this risk factors is based on results from Fischer et al. (2017), where hourly risk factors for shifts up to a length of 12 hours are described. The risk factors were exponentially adjusted for shift lengths of more than 12 hours.

To avoid a higher risk estimate for the beginning of a shift than after a break, modeling of the beginning of a shift is similar to the time directly after a break (in addition to rest period and shift sequence).

The risk factor layer length is calculated from the mean value of the hourly risk values.

The hourly risk factors are as follows:

- 9th hour: 135%
- 10th hour: 160%
- 11th hour: 190%a
- 12th hour: 220%
- from 13th hour: 273%

Risk factor breaks

Breaks are interruptions of work that are too short to allow the journey home and sleep.

Risk-reducing effects are known for breaks of up to 60 minutes. In our model, breaks have a greater risk reducing effect the longer they are, up to a length of 60 minutes. After that, they do not further reduce the risk.

The calculation of the risk factor breaks is based on Fischer et al. 2017. The effects estimated for up to 120 minutes after the end of breaks were extrapolated up to 3 hours to reduce the number of jumps.

When a new break begins, no effect of an earlier break is modelled.

To avoid a higher risk estimate for the beginning of a shift than after a break, modeling of the beginning of a shift is similar to the time directly after a break (in addition to rest period and shift sequence).

The risk factor consists of two parts: The factor break length and the factor distance to break. The break length factor is lower the longer the break. The factor distance to break increases with the distance to break up to 180 minutes after end of break (after that there is no risk reducing effect anymore). The risk factor is calculated by multiplying these two factors.

```
Eine Ruhezeit vor der Arbeit wird wie eine 30-minütige Pause behandelt.

Die Mindestlänge einer Pause, um berücksichtigt zu werden, beträgt 10 Minuten.
In den 1. 0.5 Stunden sinkt das Risiko auf: 47% des Wertes ohne Pause.
In den 2. 0.5 Stunden sinkt das Risiko weiter auf:  35% des Wertes ohne Pause.
Keine weitere Reduktion des Risikos für Pausen über 1.0 Std.

Für Pausen BIS inkl.: 0.5  Stunden sinkt die Nachwirkung der Pause  wie folgt:
Im 1. Intervall mit 0.5 Stunde Länge ist das Risiko: 47% des Wertes ohne Pause (Faktor =100%).
Im 2. Intervall mit 0.5 Stunde Länge ist das Risiko: 67% des Wertes ohne Pause (Faktor =143%).
Im 3. Intervall mit 0.5 Stunde Länge ist das Risiko: 72% des Wertes ohne Pause (Faktor =153%).
Im 4. Intervall mit 0.5 Stunde Länge ist das Risiko: 76% des Wertes ohne Pause (Faktor =162%).
Im 5. Intervall mit 0.5 Stunde Länge ist das Risiko: 82% des Wertes ohne Pause (Faktor =175%).
```

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```
Im 6. Intervall mit 0.5 Stunde Länge ist das Risiko: 87% des Wertes ohne Pause (Faktor =185%).
Danach endet die risikoreduzierende Wirkung der Pause.

Für Pausen AB: 0.5  Stunden sinkt die Nachwirkung der Pause  wie folgt:
Im 1. Intervall mit 0.5 Stunde Länge ist das Risiko: 35% des Wertes ohne Pause (Faktor =100%).
Im 2. Intervall mit 0.5 Stunde Länge ist das Risiko: 53% des Wertes ohne Pause (Faktor =151%).
Im 3. Intervall mit 0.5 Stunde Länge ist das Risiko: 60% des Wertes ohne Pause (Faktor =170%).
Im 4. Intervall mit 0.5 Stunde Länge ist das Risiko: 67% des Wertes ohne Pause (Faktor =191%).
Im 5. Intervall mit 0.5 Stunde Länge ist das Risiko: 77% des Wertes ohne Pause (Faktor =220%).
Im 6. Intervall mit 0.5 Stunde Länge ist das Risiko: 87% des Wertes ohne Pause (Faktor =248%).
Danach endet die risikoreduzierende Wirkung der Pause.
```

Risk factor shift sequence and shift types

This risk factor depends on the classification of the shift to one or more shift types, on the number of predecessor shifts and on the rest times between the shifts.

Our definitions of the shift types are based on standard schedules for 8-hour shifts in the literature (Fischer et al. (2017), Spencer et al. (2006)). We define the following three shift types.

Morning shift (M) von 6:00 bis 14:00, length > 6h
Late/evening shift (E) von 14:00 bis 22:00, length > 6h
Night shift (N) von 22:00 bis 6:00, length > 6h

Working times that are inside one of these definitions can be classified as one shift type in a straightforward manner, e.g., a shift with more than 6h of working time that starts after 6:00 and ends before 14:00, is a morning shift.

However, often working times are outside these definitions. A shift may have a working time of less than 6h or its beginning or end may fall in different shift type definitions. For these cases, it is important for the risk calculation to classifiy such shifts in a continuous way to more than one shift type. In practice, it does not make much difference, whether a shift has a length of 5h and 59min or 6h. Also, the larger part of a shift from 3:00 to 10:00 falls into the definition of a morning shift, but its impact on sleep quality is more similar to that of a night shift. In general, night shifts impact sleep and recovery and late shifts impact social interaction. (Spencer et al. (2006), Gärtner et al. (2008))

In order to fulfill the requirements for the risk calculation of all possible shift times and lengths, we classify each shift according to its characteristics to one or more types. The classifications are based on our own expertise and experience, on external experts and on results reported by Spencer et al. (2006).

The risk factor for each shift is calculated based on three components:

The shares of the shift classified to a morning, late, and night shift, the length of the rest period between predecessor shifts and before the shift (Blasche et al. (2017), Gärtner et al. (2008)), and the number and length of the predecessor shifts with shares of the same type (Fischer et al. (2017)).

The shares are calculated in three steps.

1. Calculation of the share "Night shift" (RN) according to the table "Einteilung Nachtschicht". If RN + RS > 100%, then RS = 100% - RN.
2. Calculation of the share "Late shift" (RS) according to the table "Einteilung Spätschicht". If RN + RS > 100%, then RS = 100% - RN.
3. Calculation of the share "Morning shift" as 100% - RN - RS.

The length of the rest time before each predecessor shift defines which share of the shift is included in the calculation.

- up to 24h of rest time: 100%
- 24h to 36h of rest time: 80%
- 36h to 48h of rest time: 40%
- 48h to 72h of rest time: 15%
- 72h to 96h of rest time: 5%

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- more than 96h of rest time: 0%

The number and length of predecessor shifts of the same type is included in the calculation through multiplication with the following values.

Shift type Morning:
- Risk factor with no predecessor: 1
- Risk factor with 1 predecessor: 1
- Risk factor for each further predecessor: Value of predecessor * 1.0562

Shift type Late:
- Risk factor with no predecessor: 0.97
- Risk factor with 1 predecessor: 0.9942
- Risk factor for each further predecessor: Value of predecessor * 1.0885

Shift type Night:
- Risk factor with no predecessor: 1.35
- Risk factor with 1 predecessor: 1.4175
- Risk factor for each further predecessor: Value of predecessor * 1.1207

Settings

NACHTSCHICHTANTEIL:

Definition von Start und Ende
Nacht Start:
Uhrzeit: 0.00 - 100.00%
Uhrzeit: 1.00 - 100.00%
Uhrzeit: 4.00 - 60.00%
Uhrzeit: 6.00 - 0.00%

Nacht Ende:
Uhrzeit: 22.00 - 0.00%
Uhrzeit: 1.00 - 20.00%
Uhrzeit: 3.00 - 80.00%
Uhrzeit: 6.00 - 100.00%

Wird der ganze Zeitraum überdeckt ist es 100%.
Reicht nur ein Teil hinein, wird dieser Wert genommen.
Liegen beide Zeiten im Bereich, wird der kleinere Wert genommen.
Zwischen Definitionspunkten wird linear interpoliert.
Wenn Von und Bis ident sind, wird es as 24 Std. interpretiert.

Das führt zu:
Nacht

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Bis	19:00-20:00	100%	100%	87%	73%	60%	30%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%
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Bis	21:00-22:00	100%	100%	87%	73%	60%	30%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%
Bis	22:00-23:00	100%	100%	87%	73%	60%	30%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%
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SPÄTSCHICHTANTEIL:

Definition von Start und Ende
Evening Start:
Uhrzeit: 17.00 - 100.00%
Uhrzeit: 22.00 - 80.00%
Uhrzeit: 6.00 - 0.00%

Evening Ende:

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Uhrzeit: 16.00 - 0.00%
Uhrzeit: 18.00 - 30.00%
Uhrzeit: 20.00 - 80.00%
Uhrzeit: 22.00 - 100.00%

Wird der ganze Zeitraum überdeckt ist es 100%.
Reicht nur ein Teil hinein, wird dieser Wert genommen.
Liegen beide Zeiten im Bereich, wird der kleinere Wert genommen.
Zwischen Definitionspunkten wird linear interpoliert.
Wenn Von und Bis ident sind, wird es as 24 Std. interpretiert.

Das führt zu:
Evening
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	Von	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
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Bis	16:00-17:00	60%	50%	40%	30%	20%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	96%	92%	88%	84%	80%	70%
Bis	17:00-18:00	15%	15%	15%	15%	15%	10%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	100%	96%	92%	88%	84%	80%	15%
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```
Falls Spät und Nachtschicht mehr als 100% ergäbe, wird der Spätanteil reduziert.
```

Risk factor rest periods

Rest periods are work interruptions that enable sleep, return journey from work, eating, social interactions, a period of rest before sleep and private life.

The length from which a work interruption no longer counts as a pause but as a rest period can be set as a parameter (rest period limit value). Travel times reduce the rest time.

The following results from the literature play a role in the calculation: For rest periods of less than 9 hours, the risk increases (cf. Spencer et al. (2006)). Constant 8-hour shifts entail 16 hours of rest and were the basis for many studies on working time (cf. Fischer et al. 2017). A rest period of more than 16 hours with a constant 8-hour working time offers additional possibilities for longer sleep and recreational activities and thus reduces the after-effect of earlier working hours. Spencer et al. (2006) suspect that at least 16 hours of rest are required between consecutive night shifts to allow sufficient sleep. Furthermore, there are indications in the literature that with day work of 8-9 hours with normal night sleep, one day of rest is sufficient for recovery. In the case of longer shifts, strongly shortened sleep, alternating shifts or many night shifts in succession, at least 3 days rest are required for recovery (Blasche et al. (2017), Haluza et al. (2019), Spencer et al. (2006)). Even longer rest periods lead to significantly better or complete recovery (rest periods > 48 hours have a strong, if not complete effect).

Rest periods can therefore, depending on the length, reduce or increase the risk. These facts are reflected in our calculations as follows.

>

- For rest periods between the threshold rest period and 9 hours, the risk factor increases by 6% per hour (cf. Spencer et al. (2006)).
- The risk factor does not change for rest periods between 9 and 24 hours.
- For rest periods longer than 24 hours, the risk factor is reduced using a two-component model that we developed ourselves based on the above findings.

The following considerations are taken into account when creating the two-component model:

1. The length of the rest period determines which portion of the preceding strata has an influence on the risk factor. For example, a rest period of 36 hours reduces the after-effect of 4 layers in a sequence of more than 4 preceding layers. A longer rest period accordingly reduces the after-effect of more preceding layers in a sequence.
2. The recovery effect of the rest period is stronger at the beginning and then decreases continuously. If the recovery effect were constant, then very long recovery times would be necessary after very high loads.
   Short rest periods between shift sequences with high load are not sufficient for complete recovery. This fact can lead to an

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exponential growth of the risk in the calculation. This would partly lead to unrealistic risk assessments and contradicts the design recommendations (e.g. by Kundi in Gärtner et al. 2008).

Following these considerations, we first calculate, depending on the length of the rest period, how many of the shifts preceding a rest period have an after-effect on the current risk assessment. Then the decay of this after-effect is taken into account via the two-component model:

1. Reduction of the risk by a factor that decreases with time, namely: 20% from hour 24, 60% from hour 36, 85% from hour 48, 95% from hour 72, 100% from hour 96.
2. Reduction of risk by 30% per additional 24 hours.

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Versions

New versions will be listed here if the calculation model or the usage changes significantly. This is the case, for example, if the model is extended, improved or corrected.
Such changes are desirable and probable in terms of quality. They are consciously supported by us by providing a comprehensible representation of the calculation method.

Version 2.0 (2019-07-30)

- Improved processing of explanation texts
- Corrected error in application of value for commuting time

Version 1.2 (2019-06-08)

- Extension of the calculation of travel time risks for times over 100 minutes.

Version 1.1 (2019-06-06)

- Adjustment of the calculation of the after-effect of breaks so that breaks > 30 minutes and breaks with 30 minutes have a similar course.
- Calculation of risks set in relation to 5 days morning shift with 8h and 30 minutes break each and two days off.

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