

Temperature analysis on the novel brake cycle

12.03.2019

1. Temperature analysis on the novel brake cycle

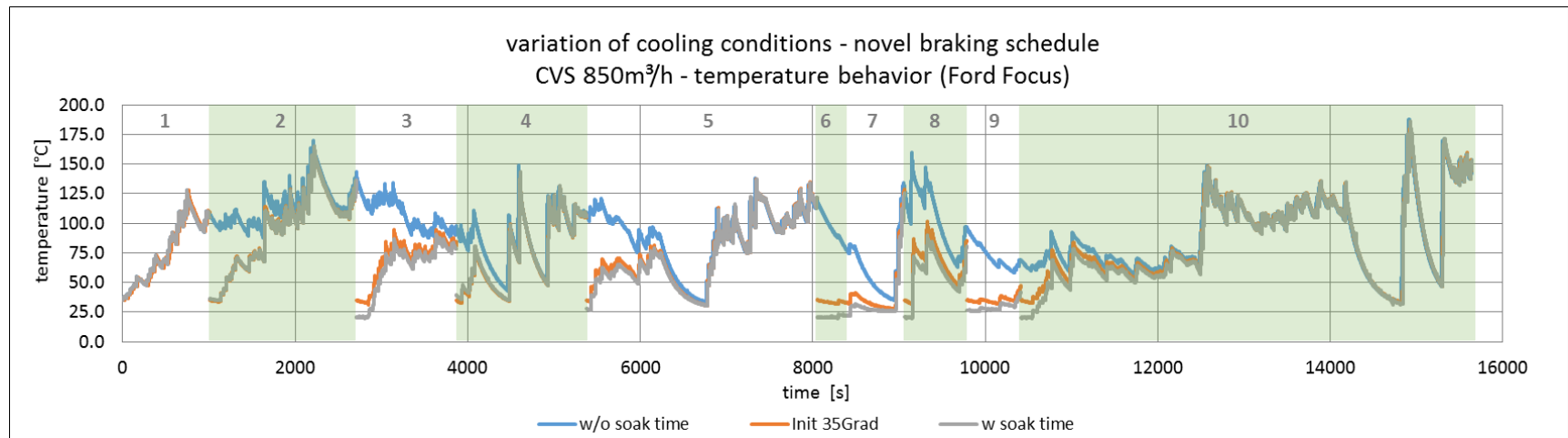
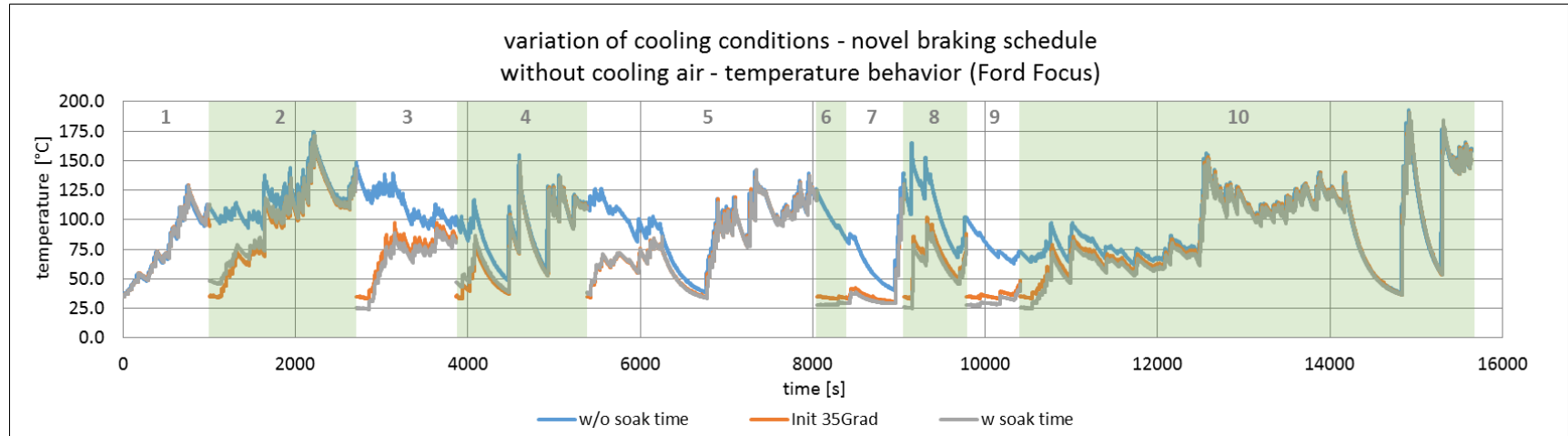
1.1 Methodology

- temperature behavior over the novel brake cycle with a Ford Focus brake, varying the cooling time and the cooling conditions
 - volume flow
 1. without cooling
 2. CVS 850 m³/h
 3. cooling air speed of 25 kph
 4. cooling air speed of 50kph
 - by varying the soak time
 - a. without soak time
 - b. initial temperature of 35 degrees per each section
 - c. soak time as specified
- temperature measurement according to AK-Master: Embedded thermocouple positioned 0.5 mm ± 0.1 mm lower than friction surface in center of friction of brake disc

1. Temperature analysis on the novel brake cycle

1.2 Results

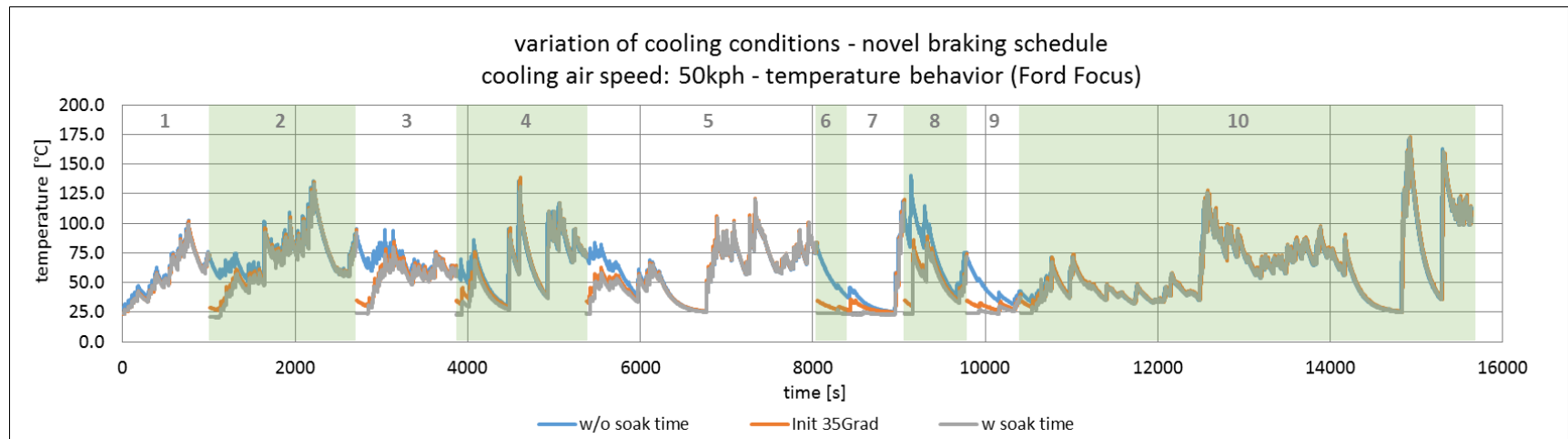
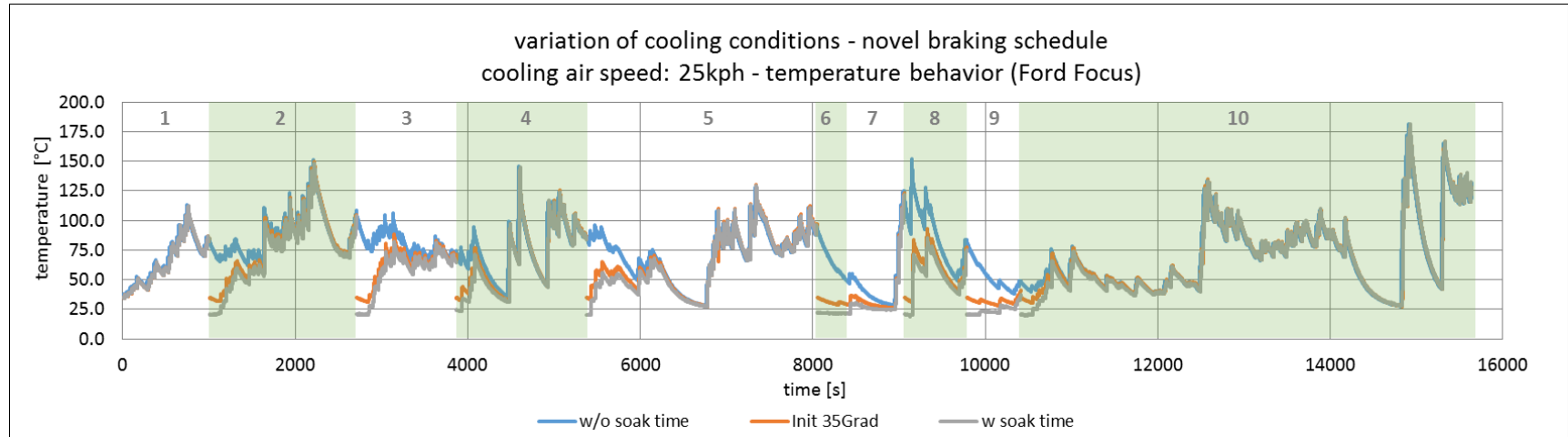
Temperature profile (without cooling sections)



1. Temperature analysis on the novel brake cycle

1.2 Results

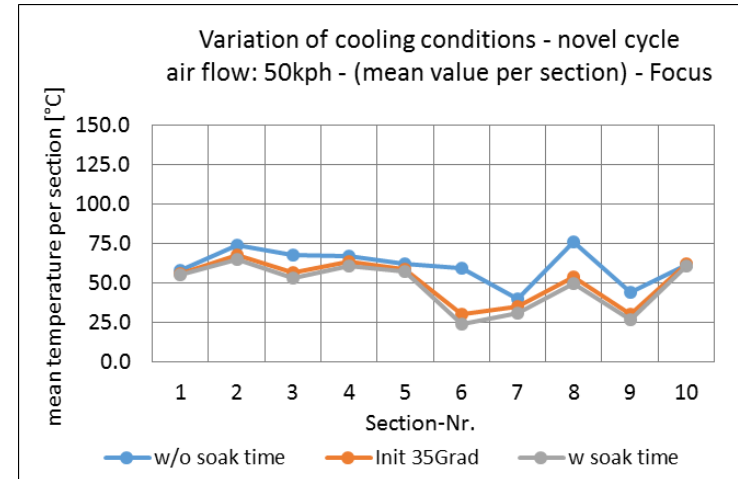
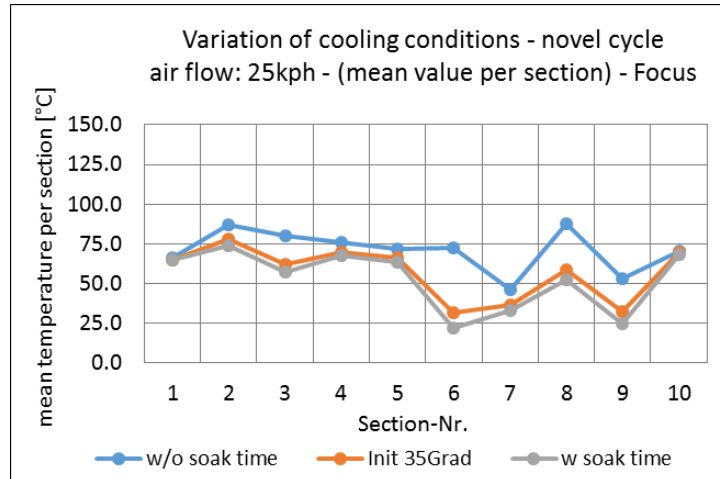
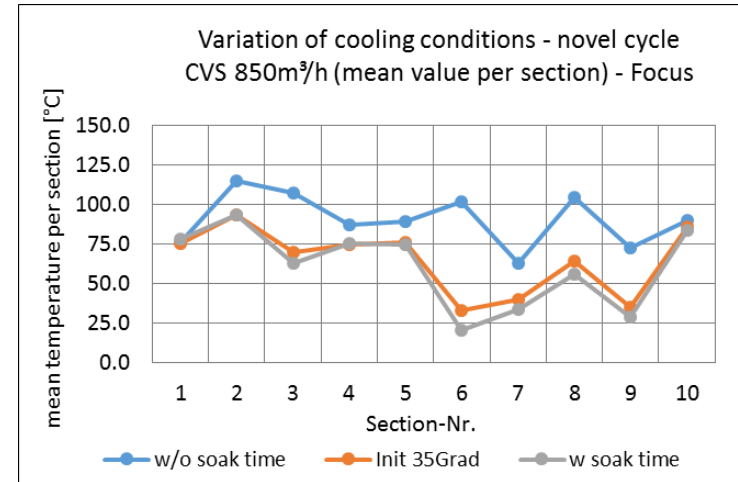
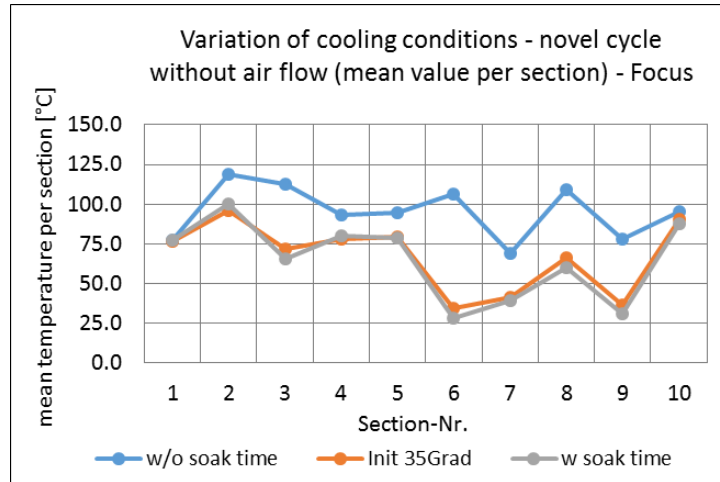
Temperature profile (without cooling sections)



1. Temperature analysis on the novel brake cycle

1.2 Results

Mean value per section



1. Temperature analysis on the novel brake cycle

1.2 Results

Mean value per section

	without cooling air - mean temperature per section [°C]										mean (total) [°C]	time (total)
	1	2	3	4	5	6	7	8	9	10		
w/o soak time	77.1	118.7	112.5	93.1	94.5	106.4	68.7	109.2	77.7	95.5	96.5	4h24min
Init 35Grad	76.2	96.2	71.8	77.8	79.0	33.9	41.3	66.2	36.1	90.1	78.9	10h08min
w soak time	77.0	100.2	65.7	79.8	78.9	28.1	38.7	60.1	30.8	87.6	77.6	41h24min

	CVS 850m³/h - mean temperature per section [°C]										mean (total) [°C]	time (total)
	1	2	3	4	5	6	7	8	9	10		
w/o soak time	76.2	115.0	107.6	87.4	89.2	101.6	63.2	104.2	72.7	90.0	91.6	4h24min
Init 35Grad	75.6	93.6	69.8	74.4	76.2	33.4	39.7	64.4	35.2	86.0	76.0	8h27min
w soak time	77.9	93.6	63.1	75.2	74.5	22.3	33.8	56.2	29.0	83.7	73.4	41h24min

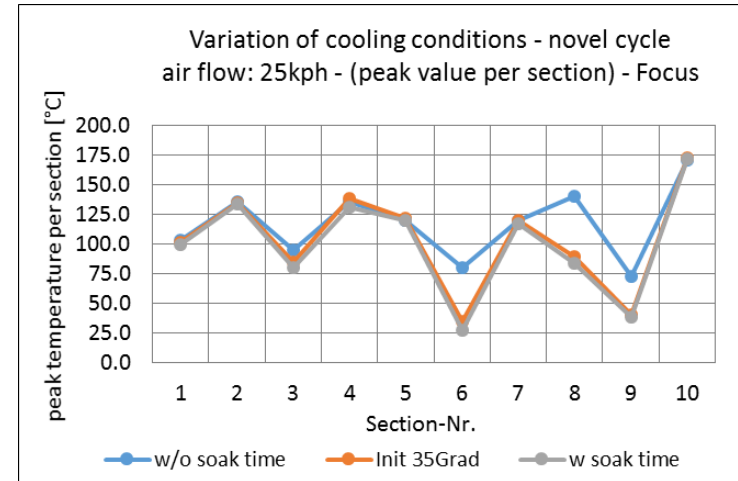
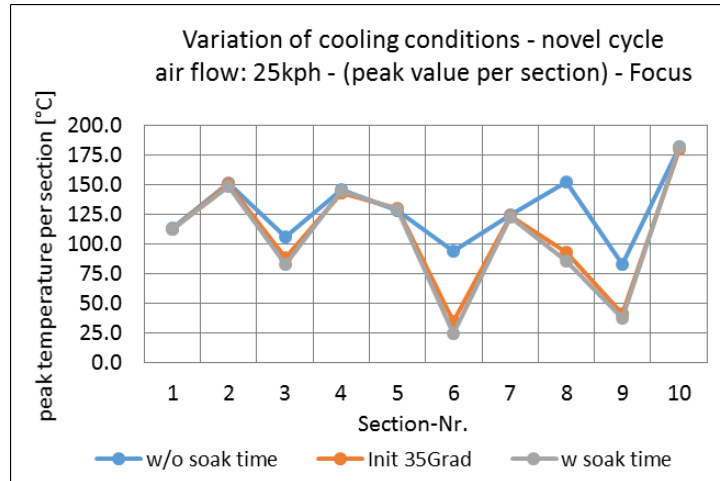
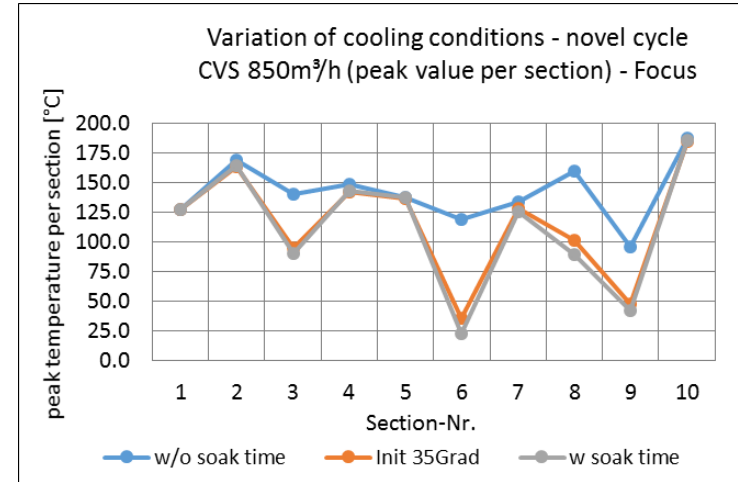
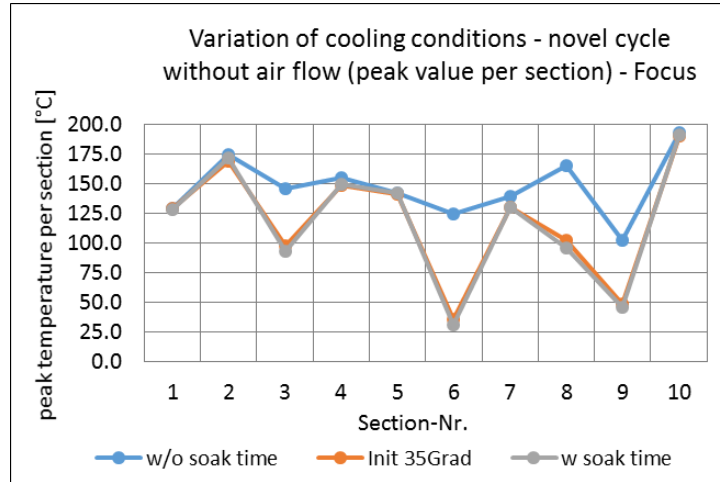
	Cooling air speed: 25kph - mean temperature per section [°C]										mean (total) [°C]	time (total)
	1	2	3	4	5	6	7	8	9	10		
w/o soak time	66.1	87.0	80.2	76.1	71.5	71.9	46.0	87.9	53.1	70.5	72.4	4h24min
Init 35Grad	64.4	77.9	62.0	69.4	65.7	31.5	36.5	58.3	31.7	69.7	64.7	5h30min
w soak time	64.5	74.0	57.0	67.1	63.2	21.4	32.5	52.1	24.6	68.4	61.9	41h24min

	Cooling air speed: 50kph - mean temperature per section [°C]										mean (total) [°C]	time (total)
	1	2	3	4	5	6	7	8	9	10		
w/o soak time	57.8	74.1	67.2	66.7	61.8	59.0	39.5	75.9	44.1	61.5	62.5	4h24min
Init 35Grad	55.6	67.4	56.2	63.3	58.6	30.4	34.7	53.5	30.3	61.8	57.7	5h09min
w soak time	55.0	64.8	53.2	60.3	57.3	21.3	30.9	49.4	24.3	60.7	55.7	41h24min

1. Temperature analysis on the novel brake cycle

1.2 Results

Peak value per section



1. Temperature analysis on the novel brake cycle

1.2 Results

Peak value per section

	without cooling air - mean temperature per section [°C]									
	1	2	3	4	5	6	7	8	9	10
w/o soak time	129.0	174.4	145.6	154.8	141.8	124.4	139.3	165.3	101.7	193.1
Init 35Grad	129.3	168.7	97.8	148.7	140.6	36,5	130.3	102.4	48.7	190.5
w soak time	128.3	171.2	93.1	149.4	142.3	30.9	130.1	96.0	45.4	190.8

	CVS 850m³/h - mean temperature per section [°C]									
	1	2	3	4	5	6	7	8	9	10
w/o soak time	128.0	169.6	140.6	149.1	138.1	119.7	133.9	160.1	96.0	187.7
Init 35Grad	127.8	164.0	95.0	142.6	137.2	36.0	128.8	101.6	47.6	185.0
w soak time	128.0	165.1	90.5	143.8	137.7	24.4	125.9	89.9	42.4	186.3

	Cooling air speed: 25kph - mean temperature per section [°C]									
	1	2	3	4	5	6	7	8	9	10
w/o soak time	113.1	151.0	106.1	145.6	128.2	94.0	124.8	152.0	82.4	181.8
Init 35Grad	111.9	150.1	88.4	142.8	130.0	35.0	123.3	92.8	41.0	180.3
w soak time	112.5	148.1	82.6	145.0	129.3	24.2	122.1	85.4	37.3	181.5

	Cooling air speed: 50kph - mean temperature per section [°C]									
	1	2	3	4	5	6	7	8	9	10
w/o soak time	102.7	135.9	94.4	135.6	119.4	80.3	119.7	140.6	72.6	170.5
Init 35Grad	101.6	135.0	84.9	138.7	121.5	34,7	120.0	89.5	40.5	172.9
w soak time	99.6	133.4	79.9	131.2	120.1	24.1	117.5	84.1	36.9	172.1

2. General conclusions

- Influence of the initial temperature (with soak time as specified / 35 degrees / without soak time):
 - Influencing the temperature at the beginning of a section
 - Cancellation of the temperature difference with increasing duration of the section
 - Approximation of the temperature curves is favored by high cooling capacity
 - At an initial temperature of 35 degrees: approx. 35 minutes soak time in total at maximum cooling capacity (50 kph) necessary
- By approximating the temperature curves with increasing duration of the section, only small differences between the peak temperatures can be measured (initial temperature of 35 degrees and sequence of the cycle as specified)
 - Cycle without soak time: no higher peak temperatures measurable (partly significantly increased mean temperatures)
 - Lowest peak temperatures (global) at maximum cooling capacity (50kph)