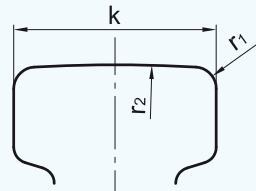


Table 1. **Symbol and unit**

symbol	unit	description	explanation
c1	-	material coefficient	Values in accordance with table 2
c2	-	speed coefficient	Values in accordance with table 3a and 3b
c3	-	operating time coefficient	Values in accordance with table 4
d1	mm	Travelling wheel diameter	Running surface diameter
n	min <sup>-1</sup>	Speed of crane wheel	Values in accordance with table 3b
p	N/mm <sup>2</sup>	pressure	$p = \frac{R}{c_2 \cdot c_3 \cdot d_1 (k - 2r_1)}$
p <sub>zul</sub>	N/mm <sup>2</sup>	Permissible pressure between crane wheel and rail	p <sub>zul</sub> = 5,6 c <sub>1</sub>
k	mm	Rail head width	 <p>For cambered crane rails the ideal effective rail head width will be k - 2r<sub>1</sub>.</p>
r1	mm	Radius of curvature of rail head	
r2	mm	Radius of camber of rail head	
k - 2r <sub>1</sub>	mm	Ideal effective rail head width	Values for crane rails in accordance with table 5
v	m/min	Speed of crane wheel	
R	N	Wheel force	For crane travelling wheels $R = \frac{R_{\min} + 2R_{\max}}{3}$ For trolley travelling wheels R = R <sub>max</sub>
R <sub>max</sub>	N	Maximum wheel force	R <sub>max</sub> and R <sub>min</sub> should be determined from the most frequent operating positions of the loaded trolley
R <sub>min</sub>	N	Minimum wheel force	
R <sub>0</sub>	N	Characteristic wheel force	Values in accordance with table 6

## Calculation of crane rail wheels

The wheel force is calculated using the formula:

$$R \leq p_{zul} \cdot c_2 \cdot c_3 \cdot d_1 \cdot (k - 2r_1) \quad (1)$$

From the above is obtained the crane wheel diameter

$$d_1 \geq \frac{R}{p_{zul} \cdot c_2 \cdot c_3 \cdot (k - 2r_1)} \quad (2)$$

The characteristic wheel force R<sub>0</sub> is obtained from equation (1), where:

$$\begin{aligned} p_{zul} &= 5,6 \text{ N/mm}^2 \\ c_2 &= 1 \\ c_3 &= 1 \end{aligned}$$

are applied for R<sub>0</sub> = 5,6 · d<sub>1</sub> · (k - 2r<sub>1</sub>) (3)

When using the characteristic wheel force the permissible wheel force can be calculated in simplified fashion using the formula:

$$R \leq R_0 \cdot c_1 \cdot c_2 \cdot c_3 \quad (4)$$

## Rail/crane wheel material matching

Table 2. **Permissible pressure p<sub>zul</sub> and material coefficient c<sub>1</sub>**

rail	material minimum tensile strength [N/mm <sup>2</sup> ]	p <sub>zul</sub> [N/mm <sup>2</sup> ]	c <sub>1</sub>
	wheel		
590	≤ 330	2,8	0,50
	410	3,6	0,63
	490	4,5	0,80
	590	5,6	1,00
	≥ 740	7,0	1,25
≥ 690	≥ 800	7,2	1,29
	≥ 900	7,8	1,39
≥ 700	≥ 1000	8,5	1,52

The hardening of the running surfaces with a depth of 0,01·diameter can be considered selecting p<sub>zul</sub>.

Table 3a. speed coefficient c2

wheel-Ø	c2															
	for v in m/min															
	d1	10	12,5	16	20	25	31,5	40	50	63	80	100	125	160	200	250
200	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	0,72	0,66	-	-	-	
250	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	0,72	0,66	-	-	
315	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	0,72	0,66	-	
400	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	0,72	0,66	
500	1,15	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	0,72	
630	1,17	1,15	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	0,77	
710	-	1,16	1,14	1,13	1,12	1,1	1,07	1,04	1,02	0,99	0,96	0,92	0,89	0,84	0,79	
800	-	1,16	1,15	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	0,82	
900	-	-	1,16	1,14	1,13	1,12	1,1	1,07	1,04	1,02	0,99	0,96	0,92	0,89	0,84	
1000	-	-	1,17	1,15	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	0,87	
1100	-	-	-	1,16	1,14	1,13	1,12	1,1	1,07	1,04	1,02	0,99	0,96	0,92	0,89	
1250	-	-	-	1,17	1,15	1,14	1,13	1,11	1,09	1,06	1,03	1	0,97	0,94	0,91	

Tabelle 3b.

wheel speed n from speed coefficient c2	
c2	n≈ [min <sup>-1</sup> ]
0,66	200
0,72	160
0,77	125
0,79	112
0,82	100
0,84	90
0,87	80
0,89	71
0,91	63
0,92	56
0,94	50
0,96	45
0,97	40
0,99	35,5
1	31,5
1,02	28
1,03	25
1,04	22,4
1,06	20
1,07	18
1,09	16
1,1	14
1,11	12,5
1,12	11,2
1,13	10
1,14	8
1,15	6,3
1,16	5,6
1,17	5

Table 4. operating time coefficient c3

operating time of travelling gear (referred to 1 hour)	c3
bis 16%	1,25
über 16 bis 25%	1,12
über 25 bis 40%	1
über 40 bis 63%	0,9
über 63%	0,8

Tabelle 5. ideal effective rail head width (k-2r1)

as per	crane rails		r1	k-2r1
	designation			
	DIN	new	previous	mm
536 Teil 1	A 45	KS 22	4	37
	A 55	KS 32	5	45
	A 65	KS 43	6	53
	A 75	KS 56	8	59
	A 100	KS 75	10	80
	A 120	KS 101	10	100
536 Teil 2	F 100	-	5	90
	F 120	-	5	110

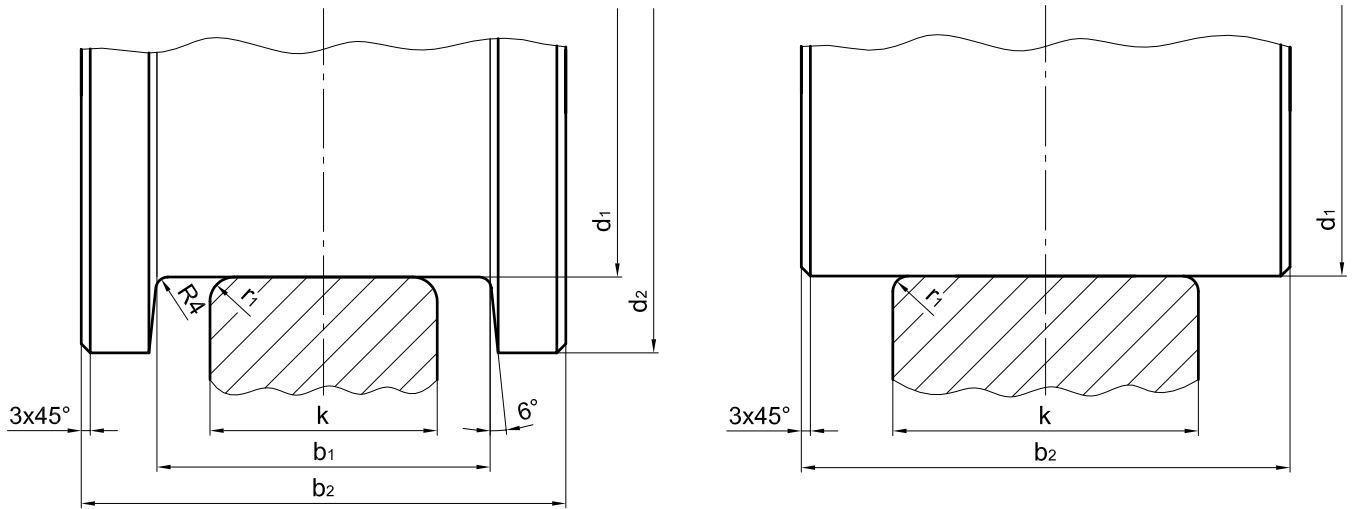
Tabelle 6. characterisitc wheel force R<sub>0</sub>

wheel-Ø	R <sub>0</sub> in N for narroc wheels				R <sub>0</sub> in N for broad wheels					R <sub>0</sub> in N for wheels without wheelflange		
	for crane rail				for crane rail					for crane rail		
	d1	A 45	A 55	A 65	A 75	A 55	A 65	A 75	A 100	A 120	F 100	F 120
200	41000	50000	-	-	-	-	-	-	-	-	-	-
250	52000	63000	-	-	-	-	-	-	-	-	-	-
315	65000	79000	-	-	79000	93000	-	-	-	-	-	-
400	83000	101000	-	-	101000	119000	132000	-	-	202000	-	-
500	104000	126000	-	-	126000	148000	165000	-	-	252000	-	-
630	-	159000	187000	-	-	187000	208000	282000	-	318000	388000	-
710	-	178000	211000	235000	-	-	235000	318000	398000	358000	437000	-
800	-	201000	237000	264000	-	-	264000	358000	448000	403000	493000	-
900	-	-	267000	297000	-	-	297000	403000	504000	454000	554000	-
1000	-	-	297000	330000	-	-	330000	448000	560000	504000	616000	-
1120	-	-	-	-	-	-	-	502000	627000	-	-	-
1250	-	-	-	-	-	-	-	560000	700000	-	-	-



# Running surface profiles of crane wheels and correlation of crane rails to wheel-diameter

DIN 15 072



Crane wheels with wheel flange

Crane wheels without wheel flange

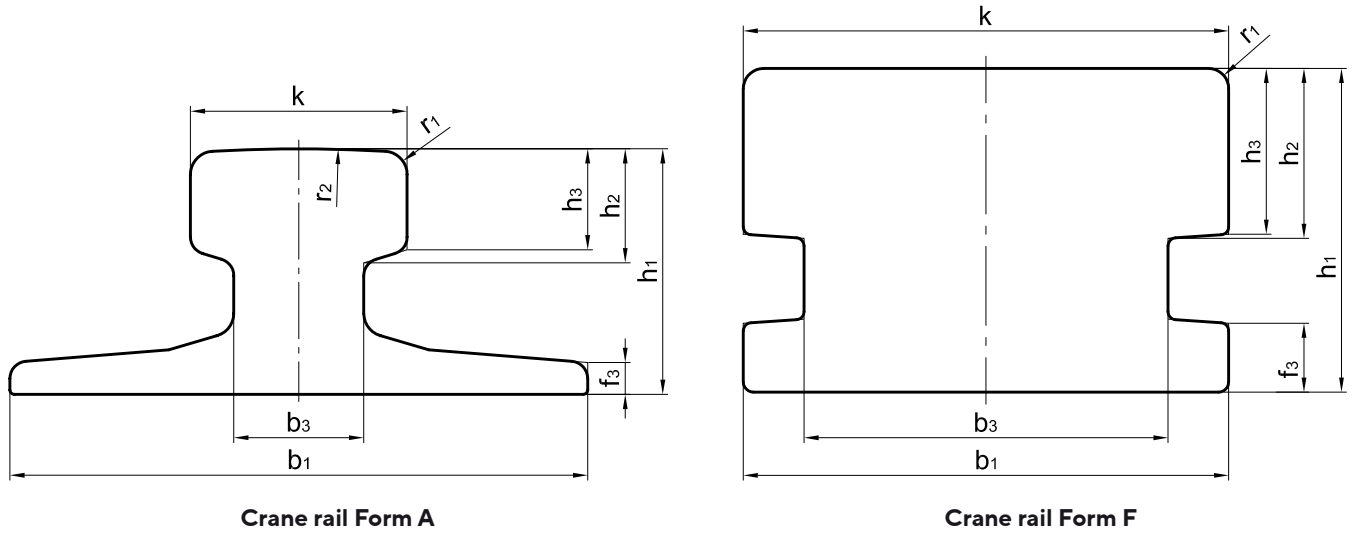
Crane wheel-Ø d1	d2	for crane wheels with narrow wheel flange						for crane wheels with broad wheel flange						for crane wheels without wheel flange				
		for crane rail <sup>1)</sup>				b1	b2	for crane rail <sup>1)</sup>				b1	b2	for crane rail <sup>2)</sup>		b2		
		A 45	A 55	A 65	A 75			A 55	A 65	A 75	A 100			A 120	F 100		F 120	
h9	k				max.	k				max.	k							
<b>200</b>	230	45	-	-	-	55	90	-	-	-	-	-	-	-	-	-	-	-
<b>250</b>	280	45	-	-	-	55	90	-	-	-	-	-	-	-	-	-	-	-
<b>315</b>	350	45	-	-	-	55	90	55	-	-	-	-	65	110	-	-	-	-
<b>400</b>	440	45	55	-	-	65	110	55	65	75	-	-	90	140	100	-	140	-
<b>500</b>	540	45	55	-	-	65	110	55	65	75	-	-	90	140	100	-	140	-
<b>630</b>	680	-	55	65	-	75	120	-	65	75	100	-	110	160	100	120	160	-
<b>710</b>	760	-	-	65	75	90	140	-	-	75	100	120	160	210	100	120	210	-
<b>800</b>	850	-	-	65	75	90	140	-	-	75	100	120	160	210	100	120	210	-
<b>900</b>	950	-	-	65	75	90	140	-	-	75	100	120	160	210	-	120	210	-
<b>1000</b>	1050	-	-	65	75	90	140	-	-	75	100	120	160	210	-	120	210	-
<b>1120</b>	1180	-	-	-	-	-	-	-	-	-	100	120	160	220	-	-	-	-
<b>1250</b>	1310	-	-	-	-	-	-	-	-	-	100	120	160	220	-	-	-	-
r <sub>1</sub>		4	5	6	8	-	-	5	6	8	10	10	-	-	5	5	-	-

1) Crane rail acc. to DIN 536-1.

2) Crane rail acc. to DIN 536-2.

# Champignon rail acc. to DIN 536

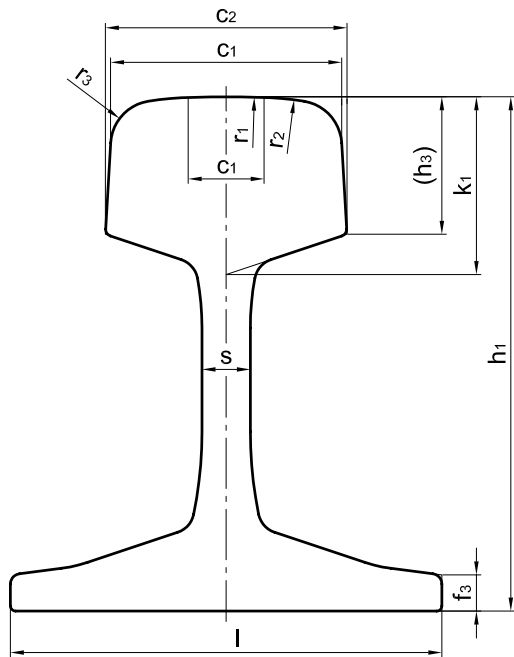
main dimensions for information, dimensions can vary depending on the producer



nominal size	k	b1	b3	h1	h2	h3	f3	r1	r2	ideal effective rail head width $k - 2r_1$ (acc. to DIN 15070)
<b>A 45</b>	45	125	24	55	24	20	8	4	400	37
<b>A 55</b>	55	150	31	65	28,5	25	9	5	400	45
<b>A 65</b>	65	175	38	75	34	30	10	6	400	53
<b>A 75</b>	75	200	45	85	39,5	35	11	8	500	59
<b>A 100</b>	100	200	60	95	45,5	40	12	10	500	80
<b>A 120</b>	120	220	72	105	55,5	47,5	14	10	600	100
<b>A 150</b>	150	220	80	150	64,5	50	14	10	800	130
<b>F 100</b>	100	100	70	80	42	41	17	5	-	90
<b>F 120</b>	120	120	90	80	42	41	17	5	-	110

# Champignon rail acc. to DIN EN 13 674-1 (DIN 5901) and UIC

main dimensions for information, dimensions can vary depending on the producer



Champignon rail (Form S and UIC)

nominal size	c1	c2	c3	l	s	h1	k1	(h3)	f3	r1	r2	r3
<b>S 30</b>	60,3	1)	1)	108	12,3	108	31	24	7	305	1)	8
<b>S 33</b>	58	1)	1)	105	11	134	39	31,75	9,5	225	1)	14
<b>S 41 R 10</b>	67	1)	1)	125	12	138	43	31,83	9,5	400	1)	10
<b>S 41 R 14</b>	67	1)	1)	125	12	138	43	31,83	9,5	400	1)	14
<b>S 49</b>	67	70	19	125	14	149	51,5	39,80	10,5	300	80	13
<b>S 54</b>	67	70	16,703	125	16	154	55	43,30	12	300	80	13
<b>UIC 50</b>	70	72,2	20,025	125	15	152	49,4	36,30	10	300	80	13
<b>UIC 54</b>	70	72,2	20,024	140	16	159	49,4	36,30	11	300	80	13
<b>UIC 60</b>	72	74,3	20,456	150	16,5	172	51	37,50	11,5	300	80	13

1) Dimensions undetermined