

## Spur Gears Made from Brass and Steel with One-Sided Hub, Helical Tooth System

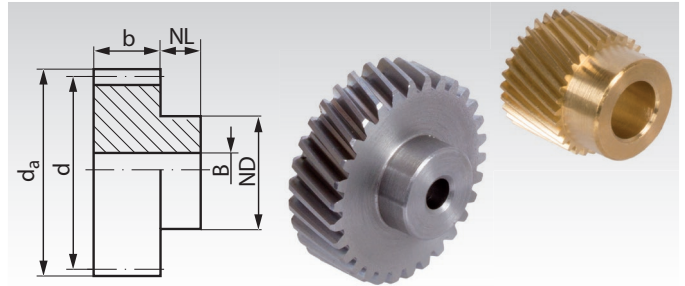
Material: Module 0,3/0,5: Brass Ms58 (2.0401).  
 Module 1,0: Steel 11SMnPb30.

20° helical tooth system. Pressure angle 20°. Milled teeth.

These gears are designed to be used in combination with the helical-toothed gear racks page 257. If this gear is used to drive a mating gear instead, this mating gear must have the same lead angle and the opposite tooth direction (left hand).

Ordering Details: e.g.:

Product No. 269 012 00, Spur Gear, Helical Tooth System, Module 0.3, 12 Teeth Right Hand



Photos: right hand

### Module 0.3 from Ms58 (2.0401) Tooth Width b = 5 mm

Product No. Right Hand	Number of teeth	b mm	d <sub>a</sub> mm	d mm	NL mm	ND mm	BH7 mm	perm. MT* Ncm	Weight g
269 012 00	12	5	4,4	3,83	4	3	2,0	0,7	0,5
269 015 00	15	5	5,4	4,79	4	4	2,5	1,0	0,7
269 018 00	18	5	6,4	5,75	4	5	3	1,6	1,2
269 020 00	20	5	7,0	6,39	4	6	3,5	2,0	1,4
269 024 00	24	5	8,3	7,66	4	7	4,5	3,0	1,9
269 030 00	30	5	10,2	9,58	5	9	5	5,0	4,0

### Module 0.5 from Ms58 (2.0401) Tooth Width b = 10 mm

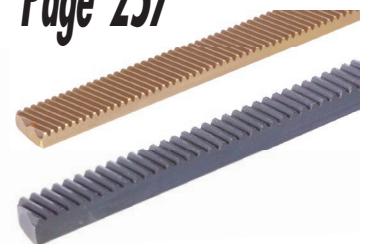
Product No. Right Hand	Number of teeth	b mm	d <sub>a</sub> mm	d mm	NL mm	ND mm	BH7 mm	perm. MT* Ncm	Weight g
269 218 00	18	10	10,6	9,58	6	8	4	9,6	6,7
269 222 00	22	10	12,7	11,71	6	10	6	15,0	9,6
269 225 00	25	10	14,3	13,30	6	12	6	20,5	17,6
269 230 00	30	10	17,0	15,96	6	14	8	31,0	24,3
269 234 00	34	10	19,1	18,09	6	16	8	42,0	27,0
269 240 00	40	10	22,3	21,28	8	18	8	60,0	38,0

### Module 1.0 from Steel 11SMnPb30 Tooth Width b = 10 mm

Product No. Right Hand	Product No. Left Hand	Number of teeth	b mm	d <sub>a</sub> mm	d mm	NL mm	ND mm	BH7 mm	perm. MT* Ncm	Weight g
214 210 00	214 310 00	10	10	12,6	10,64	6	8	4	11	7,3
214 215 00	214 315 00	15	10	18,0	15,96	6	12	5	26	17,9
214 218 00	214 318 00	18	10	21,2	19,16	6	12	5	39	24,4
214 220 00	214 320 00	20	10	23,3	21,28	6	15	5	50	32,5
214 224 00	214 324 00	24	10	27,5	25,54	6	15	5	78	44,4
214 225 00	214 325 00	25	10	28,6	26,60	6	15	5	85	47,8
214 230 00	214 330 00	30	10	33,9	31,93	6	15	5	131	66,9
214 236 00	214 336 00	36	10	40,3	38,31	6	18	6	201	96,9
214 240 00	214 340 00	40	10	44,6	42,57	6	18	6	258	118,3
214 250 00	214 350 00	50	10	55,2	53,21	8	18	6	436	184,4

\*Basis of calculations see page 197.

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Gear racks  
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**Reworking within  
24h-service possible.  
Custom made parts  
on request.**

## Precision Spur Gears, Helical Tooth System, Case Hardened, with Ground Teeth Flanks

Material: Steel 16MnCr5.

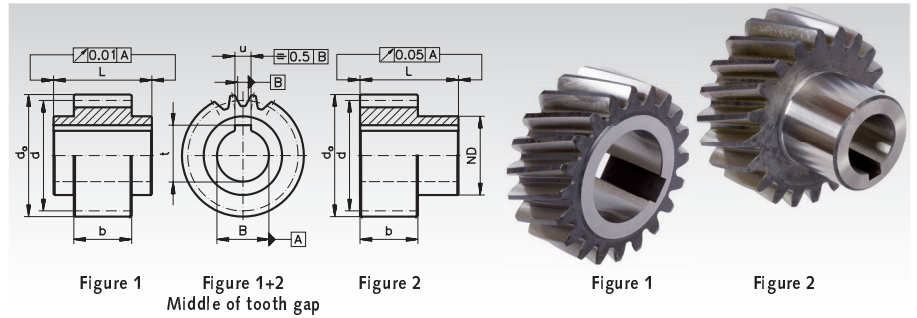
Tooth quality 7e25.

Helical tooth system, left hand 19° 31' 42".

Case hardened, approx. 60 HRC.

Keyways in accordance with DIN 6885/1, tolerance P9.

Teeth, bores and faces ground. Matching helical-toothed gear racks page 264.



Ordering Details: e.g.: Product No. 251 020 20, Spur gear, Steel 16 MnCr5, Module 2.0, 20 Teeth, ground

### Module 2.0 (Pitch 6.667mm), Tooth Width b = 28 mm

Product No.	Number of teeth	b mm	Figure	d <sub>a</sub> mm	d mm	d x π mm	BH <sup>6</sup> mm	ND mm	L mm	u mm	t mm	perm. MT* Nm	Weight kg
251 020 20	20	28	1	46,4	42,44	133,33	20	30	30	6	22,8	115	0,3
251 020 22	20	28	1	46,4	42,44	133,33	22	30	30	6	24,8	115	0,3
251 021 16	21	28	1	48,6	44,56	140,00	16	25	30	5	18,3	130	0,3
251 021 22	21	28	2	48,6	44,56	140,00	22	36	56	6	24,8	130	0,2
251 025 20	25	28	1	57,1	53,05	166,67	20	30	30	6	22,8	195	0,4
251 025 25	25	28	1	57,1	53,05	166,67	25	36	30	8	28,3	195	0,4
251 028 35	28	28	1	63,4	59,42	186,67	35	48	30	10	38,3	220	0,4
251 030 16	30	28	1	67,7	63,66	200,00	16	25	30	5	18,3	235	0,7
251 030 20	30	28	1	67,7	63,66	200,00	20	30	30	6	22,8	235	0,6
251 030 22	30	28	2	67,7	63,66	200,00	22	36	56	6	24,8	235	0,6
251 030 25	30	28	1	67,7	63,66	200,00	25	36	30	8	28,3	235	0,8
251 030 30	30	28	2	67,7	63,66	200,00	30	50	60	8	33,3	235	0,8
251 030 32	30	28	2	67,7	63,66	200,00	32	55	65	10	35,3	235	0,8
251 032 20	32	28	1	71,9	67,91	213,33	20	30	30	6	22,8	275	0,8
251 032 25	32	28	1	71,9	67,91	213,33	25	36	30	8	28,3	275	0,7
251 032 35	32	28	1	71,9	67,91	213,33	35	48	30	10	38,3	275	0,6
251 036 35	36	28	1	80,4	76,39	240,00	35	48	30	10	38,3	290	0,8
251 039 32	39	28	2	86,8	82,76	260,00	32	55	65	10	35,3	310	1,3
251 040 35	40	28	1	88,9	84,88	266,67	35	48	30	10	38,3	330	1,1

### Module 3.0 (Pitch 10.00mm), Tooth Width b = 28 mm

Product No.	Number of teeth	b mm	Figure	d <sub>a</sub> mm	d mm	d x π mm	BH <sup>6</sup> mm	ND mm	L mm	u mm	t mm	perm. MT* Nm	Weight kg
253 020 22	20	28	2	69,7	63,66	200,00	22	36	56	6	24,8	275	0,6
253 020 25	20	28	2	69,7	63,66	200,00	25	44	60	8	28,3	275	0,7
253 020 30	20	28	1	69,7	63,66	200,00	30	45	30	8	33,3	275	0,8
253 020 32	20	28	2	69,7	63,66	200,00	32	55	65	10	35,3	275	0,8
253 020 35	20	28	1	69,7	63,66	200,00	35	48	30	10	38,3	275	0,7
253 022 25	22	28	1	76,0	70,03	220,00	25	36	30	8	28,3	345	0,8
253 022 30	22	28	1	76,0	70,03	220,00	30	45	30	8	33,3	345	0,7
253 022 35	22	28	1	76,0	70,03	220,00	35	48	30	10	38,3	345	0,7
253 025 22	25	28	2	85,6	79,58	250,00	22	36	56	6	24,8	440	1,0
253 025 25	25	28	1	85,6	79,58	250,00	25	36	30	8	28,3	440	1,0
253 025 30	25	28	1	85,6	79,58	250,00	30	45	30	8	33,3	440	1,0
253 025 32	25	28	2	85,6	79,58	250,00	32	55	65	10	35,3	440	1,2
253 025 35	25	28	1	85,6	79,58	250,00	35	48	30	10	38,3	440	0,9
253 025 40	25	28	1	85,6	79,58	250,00	40	70	50	12	43,3	440	1,1

#### Note

These gears are designed to be used in combination with the helical-toothed gear racks page 264. If this gear is used to drive a mating gear instead, this mating gear must have the same lead angle and the opposite tooth direction (right hand).

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**Spur Gears Metric Pitch, Straight Teeth Page 248**

## Precision Spur Gears, Helical Tooth System, Case Hardened with Ground Teeth Flanks

Material: Steel 16MnCr5.

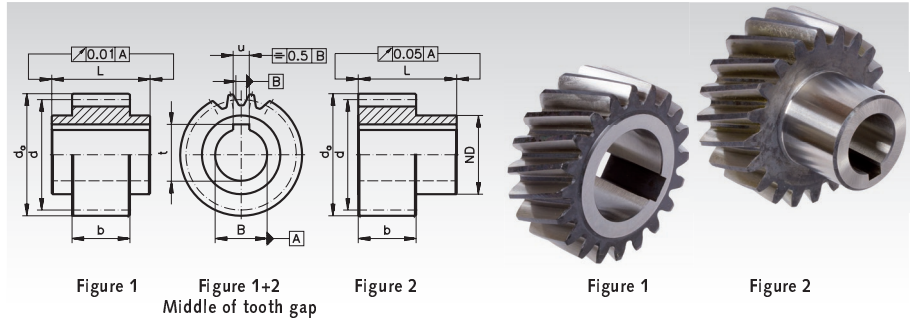
Tooth quality 7e25.

Helical tooth system, left hand 19° 31' 42".

Case hardened, approx. 60 HRC.

Keyways in accordance with DIN 6885/1, tolerance P9.

Teeth, bores and faces ground. Matching helical-toothed gear racks page 264.



Ordering Details: e.g.: Product No. 254 015 35, Spur gear, Steel 16 MnCr5, Module 4.0, 15 Teeth, Ground

### Module 4.0 (Pitch 13.333mm), Tooth Width b = 40 mm

Product No.	Number of teeth	b mm	Figure	d <sub>a</sub> mm	d mm	d x π mm	BH <sup>6</sup> mm	ND mm	L mm	u mm	t mm	perm. MT* Nm	Weight kg
254 015 35	15	40	1	71,7	63,66	200,00	35	52	50	10	38,3	670	1,4
254 018 32	18	40	2	84,4	76,39	240,00	32	55	75	10	35,3	900	1,5
254 020 35	20	40	1	92,9	84,88	266,67	35	52	50	10	38,3	975	1,9
254 020 45	20	40	1	92,9	84,88	266,67	45	65	50	14	48,8	975	1,6
254 021 32	21	40	2	97,1	89,13	280,00	32	55	75	10	35,3	1050	2,0
254 021 35	21	40	2	97,1	89,13	280,00	35	55	75	10	38,3	1050	1,9
254 021 40	21	40	2	97,1	89,13	280,00	40	62	75	12	43,3	1050	1,9
254 021 45	21	40	2	97,1	89,13	280,00	45	68	75	14	48,8	1050	1,7
254 022 35	22	40	1	101,4	93,37	293,33	35	52	50	10	38,3	1100	2,3
254 022 45	22	40	1	101,4	93,37	293,33	45	65	50	14	48,8	1100	2,0
254 024 32	24	40	2	109,9	101,86	320,00	32	55	75	10	35,3	1150	2,6
254 024 35	24	40	2	109,9	101,86	320,00	35	55	75	10	38,3	1150	2,5
254 024 40	24	40	2	109,9	101,86	320,00	40	62	75	12	43,3	1150	2,5
254 024 45	24	40	2	109,9	101,86	320,00	45	68	75	14	48,8	1150	2,3
254 024 55	24	40	2	109,9	101,86	320,00	55	80	80	16	59,3	1150	2,4
254 025 35	25	40	1	114,1	106,10	333,33	35	52	50	10	38,3	1200	3,1
254 025 45	25	40	1	114,1	106,10	333,33	45	65	50	14	48,8	1200	2,8

### Module 5.0 (Pitch 16.666mm), Tooth Width b = 50 mm

Product No.	Number of teeth	b mm	Figure	d <sub>a</sub> mm	d mm	d x π mm	BH <sup>6</sup> mm	ND mm	L mm	u mm	t mm	perm. MT* Nm	Weight kg
255 018 45	18	50	2	105,5	95,49	300,00	45	68	85	14	48,8	1575	2,7
255 024 45	24	50	2	137,3	127,32	400,00	45	68	85	14	48,8	2085	4,9
255 024 55	24	50	2	137,3	127,32	400,00	55	80	90	16	59,3	2085	4,9
255 024 75	24	50	2	137,3	127,32	400,00	75	110	110	20	79,9	2085	5,6

#### Note

These gears are designed to be used in combination with the helical-toothed gear racks page 264. If this gear is used to drive a mating gear instead, this mating gear must have the same lead angle and the opposite tooth direction (right hand).

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## Gear Racks Made from Steel, Helical Toothed, Tempered, Teeth Milled

**Material:** high-quality, specially treated bright steel with approx. 900 N/mm<sup>2</sup> tensile strength.

Tooth quality 8e27.

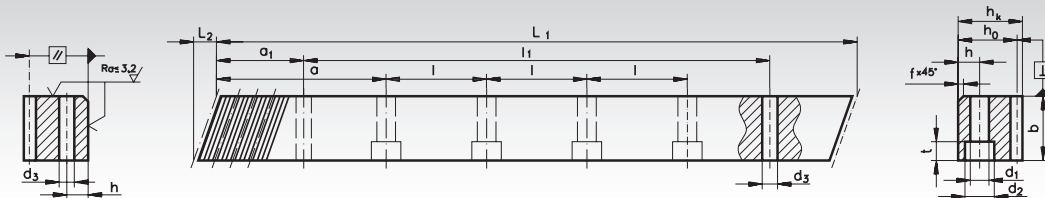
Helical tooth system, right hand 19° 31' 42".

For continuous linking.

Matching left hand-toothed counterparts, to simplify the mounting, are available at cost.

Matching helical-toothed spur gears page 252.

Ordering Details: e.g.: Product No. 251 603 11, Gear Rack, Helical Toothed, Tempered, Module 2.0, 500 mm



### Module 2.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of bores	h mm	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg
251 603 11	500,00	8,9	75	25	24	22	2	62,50	125	4	8	7	11	7	31,7	436,6	5,7	0,044	2100	2,10
251 605 11	1000,00	8,9	150	25	24	22	2	62,50	125	8	8	7	11	7	31,7	936,6	5,7	0,044	2100	4,30
<b>without Bores</b>																				
251 603 10	500,00	8,9	75	25	24	22	2											0,044	2100	2,10
251 605 10	1000,00	8,9	150	25	24	22	2											0,044	2100	4,30
<b>Counterpart for mounting</b>																				
251 600 00	200,00	8,8	30	25	24	22														0,85

### Module 3.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of bores	h mm	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg
253 603 11	500,00	10,6	50	30	29	26	2	62,50	125	4	9	10	15	9	35,0	430,0	7,7	0,046	4500	3,00
253 605 11	1000,00	10,6	100	30	29	26	2	62,50	125	8	9	10	15	9	35,0	930,0	7,7	0,046	4500	6,10
<b>without Bores</b>																				
253 603 10	500,00	10,6	50	30	29	26	2											0,046	4500	3,00
253 605 10	1000,00	10,6	100	30	29	26	2											0,046	4500	6,10
<b>Counterpart for mounting</b>																				
253 600 00	200,00	10,6	20	30	29	26														2,70

### Module 4.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of bores	h mm	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg
254 603 11	506,67	14,2	38	40	39	35	2	62,50	125	4	12	10	15	9	33,3	433,0	7,7	0,048	8700	5,50
254 605 11	1000,00	14,2	75	40	39	35	2	62,50	125	8	12	10	15	9	33,3	933,4	7,7	0,048	8700	10,90
<b>without Bores</b>																				
254 603 10	506,67	14,2	38	40	39	35	2											0,048	8700	5,50
254 605 10	1000,00	14,2	75	40	39	35	2											0,048	8700	10,90
<b>Counterpart for mounting</b>																				
254 600 00	200,00	14,2	15	40	39	35														2,70

### Module 5.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of bores	h mm	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg
255 603 11	500,00	17,4	30	50	39	34	3	62,50	125	4	12	14	20	13	37,5	425,0	11,7	0,050	15000	6,50
255 605 11	1000,00	17,4	60	50	39	34	3	62,50	125	8	12	14	20	13	37,5	925,0	11,7	0,050	15000	13,00
<b>without Bores</b>																				
255 603 10	500,00	17,4	30	50	39	34	3											0,050	15000	6,50
255 605 10	1000,00	17,4	60	50	39	34	3											0,050	15000	13,00
<b>Counterpart for mounting</b>																				
255 600 00	200,00	17,4	12	49	39	34														3,00

<sup>1)</sup> GT<sub>f</sub> /300 = total pitch error, i.e. the max. permissible deviation (per 300 mm) of the measured length of the rack compared to the theoretical length L<sub>300</sub>, with L<sub>300</sub> = (m / cos β) • π • z<sub>300</sub>.

\* Tangential force at tooth, calculated for z  $\geq$  20. With a smaller number of teeth, the tangential force has to be reduced by 10%.

## Precision Gear Racks Made from Steel, Helical Tooth System, Teeth Hardened and Ground

**Material:** 16MnCr5, Material-No. 1.7131, teeth induction hardened to about 60 HRC after hardening ground all around. As only the teeth are hardened subsequent drilling and pinning is easily possible.

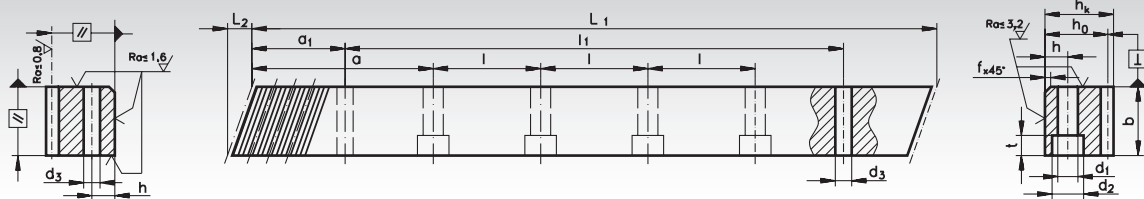
As only the teeth are hardened subsequent drilling and pinning is easily possible. Tooth quality 8e27.

Helical tooth system, right hand  $19^{\circ} 31' 42''$ .

For continuous linking.

Matching helical-toothed spur gears page 252.

Ordering Details: e.g.: Product No. 251 603 01, Gear Rack, Helical Tooth System, hardened, Teeth Ground, Module 2.0, 500 mm



### Module 2.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of h bores	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg	
251 603 01	500,00	8,5	75	24	24	22	2	62,50	125	4	8	7	11	7	31,7	436,6	5,7	0,022	8500	2,10
251 605 01	1000,00	8,5	150	24	24	22	2	62,50	125	8	8	7	11	7	31,7	936,6	5,7	0,022	8500	4,10
<b>without Bores</b>																				
251 603 00	500,00	8,5	75	24	24	22	2										0,022	8500	2,10	
251 605 00	1000,00	8,5	150	24	24	22	2										0,022	8500	4,10	
<b>Counterpart for mounting</b>																				
251 600 00	200,00	8,5	30	24	24	22														0,85

### Module 3.0

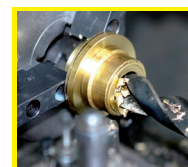
Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of h bores	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg	
253 603 01	500,00	10,3	50	29	29	26	2	62,50	125	4	9	10	15	9	35	430,0	7,7	0,024	15000	2,90
253 605 01	1000,00	10,3	100	29	29	26	2	62,50	125	8	9	10	15	9	35	930,0	7,7	0,024	15000	5,90
<b>without Bores</b>																				
253 603 00	500,00	10,3	50	29	29	26	2										0,024	15000	2,90	
253 605 00	1000,00	10,3	100	29	29	26	2										0,024	15000	5,90	
<b>Counterpart for mounting</b>																				
253 600 00	200,00	10,3	20	29	29	26														1,20

### Module 4.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of h bores	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg	
254 603 01	506,67	13,8	38	39	39	35	3	62,50	125	4	12	10	15	9	33,3	433,0	7,7	0,024	25000	5,40
254 605 01	1000,00	13,8	75	39	39	35	3	62,50	125	8	12	10	15	9	33,3	933,4	7,7	0,024	25000	10,70
<b>without Bores</b>																				
254 603 00	506,67	13,8	38	39	39	35	3										0,024	25000	5,40	
254 605 00	1000,00	13,8	75	39	39	35	3										0,024	25000	10,70	
<b>Counterpart for mounting</b>																				
254 600 00	200,00	13,8	15	39	39	35														2,70

<sup>1)</sup> GT<sub>f</sub> /300 = total pitch error, i.e. the max. permissible deviation (per 300 mm) of the measured length of the rack compared to the theoretical length L<sub>300</sub>, with L<sub>300</sub> = (m / cos β) • π • z<sub>300</sub>.

\* Tangential force at tooth, calculated for z ≥ 20. With a smaller number of teeth, the tangential force has to be reduced by 10%.



**Reworking within  
24h-service possible.  
Custom made parts  
on request.**

## Precision Gear Racks Made from Steel, Helical Toothed, Teeth Hardened and Ground

**Material:** C45K, Material-No. 1.0503, made from specially treated bright steel with approx. 650 N/mm<sup>2</sup> tensile strength. Teeth induction hardened to 50 to 55 HRC, after hardening ground all around. As only the teeth are hardened subsequent drilling and pinning is easily possible. Tooth quality 6h25.

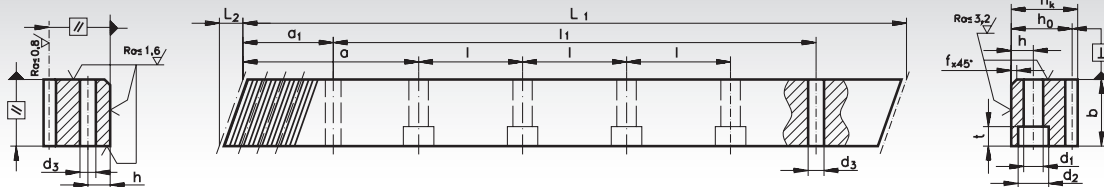
Helical tooth system, right hand 19° 31' 42".

For continuous linking.

Matching helical-toothed spur gears page 252.



Ordering Details: e.g.: Product No. 255 603 01, Gear Rack, Helical Toothed, Hardened, Teeth Ground, Module 5.0, 500 mm



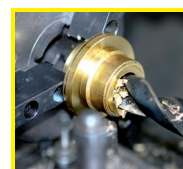
### Module 5.0

Product No. with Bores	L <sub>1</sub> mm	L <sub>2</sub> mm	Number of teeth	b mm	h <sub>k</sub> mm	h <sub>0</sub> mm	f mm	a mm	l mm	No. of h bores	d <sub>1</sub> mm	d <sub>2</sub> mm	t mm	a <sub>1</sub> mm	l <sub>1</sub> mm	d <sub>3</sub> mm	GT <sub>f</sub> /300 <sup>1)</sup> mm	Fu* N	Weight kg	
																				mm
255 603 01	500,00	17,4	30	49	39	34	3	62,50	125	4	12	14	20	13	37,5	425,0	11,7	0,025	32000	6,50
255 605 01	1000,00	17,4	60	49	39	34	3	62,50	125	8	12	14	20	13	37,5	925,0	11,7	0,025	32000	13,00
<b>without Bores</b>																				
255 603 00	500,00	17,4	30	49	39	34	3											0,025	32000	6,50
255 605 00	1000,00	17,4	60	49	39	34	3											0,025	32000	13,00
<b>Counterpart for mounting</b>																				
255 600 00	200,00	17,4	12	49	39	34												0,025	32000	3,00

<sup>1)</sup> GT<sub>f</sub> / 300 = total pitch error, i.e. the max. permissible deviation (per 300 mm) of the measured length of the rack compared to the theoretical length L<sub>300</sub>, with L<sub>300</sub> = (m / cos β) • π • z<sub>300</sub>.

\* Tangential force at tooth, calculated for z ≥ 20. With a smaller number of teeth, the tangential force has to be reduced by 10%.

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Spur Gears  
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**Reworking within  
24h-service possible.  
Custom made parts  
on request.**