

SCHNEEBERGER



Gear Racks

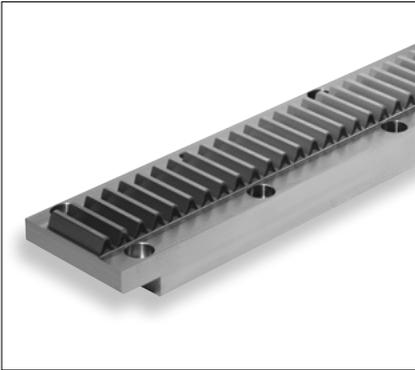
Standard and Customized

Product catalog



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1 Overview



Gear racks

Gear rack drives main feature is their high level of efficiency. They are the best choice for high axial forces.

This drive rigidity is constant over the whole length.

They are also very cost effective for long strokes of more than 2 m.

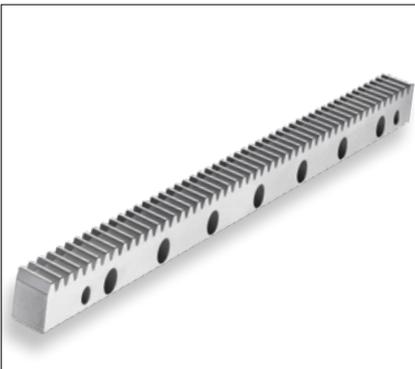
With a rack and pinion system a slideway is driven by the pinion running on a fixed gear rack.

There is a basic difference between straight and helical toothed gear racks.

Apart from typical dimensions, SCHNEEBERGER offers any cross sections with metric or module pitches. The max. one-piece length is 3000 mm. Joining with butt joints is possible for longer lengths.

The tooth rack can be milled or ground depending on the customer's requirements. A particular feature is that different materials and hardening processes can be used. Depending on the load to be applied you have a choice of soft, induction or case hardened or nitride hardened gear racks.

Skill and expertise are our strengths!



Standard gear racks

Straight and helical toothed gear racks are available in typical industrial dimensions from module 2 to module 12. Different materials, hardnesses and accuracy are available depending on the load to be applied.



Customised gear racks

You need a gear rack but standardised dimensions do not fit your system?

No problem.

You can have any gear racks up to module 20. The maximum one-piece length is 3000 mm.

The customer can choose from different materials and therefore configure the gear rack just as required.

Special is our standard.

1.1 Properties

1.1.1 Properties of the gear racks / conversion

Max. length (in mm) per grade, depending on material, hardness and module

material	module	Q4	Q5	Q6	Q7	Q8	Q9	Q11
soft C45 (-W)	2 .. 3	1000	2000	2500	2500	2500		
	4 .. 12			3000	3000	3000		
	>12'			2000	2000	2000		
tempered 42CrMo4+QT (-V)	2 .. 3	1000	2000	2500	2500	2500		
	4 .. 12	1000	2000	3000	3000	3000		
	>12'	1000	2000	2000	2000	2000		
induction hardened C45 (-I), 42CrMo4+QT (-M)	2 .. 3	1000	2000	2500	2500			2500
	4 .. 12	1000	2000	3000	3000			3000
	>12'	1000	2000	2000	2000			2000
case-hardened 16MnCr5 (-C)	2 .. 20	1000	2000	2000	2000			
nitridified 42CrMo4+QT (-N), 16MnCr5 (-O)	2 .. 3						2500	
	4 .. 12						3000	
	>12'						2000	
through-hardened X90CrMoV18 (-H)	2 .. 20	1000	1000	1000	1000			

* depending on weight of raw-material: max. 500 kg

Cross reference of material designations

Germany		Japan	USA	China	Special properties
W.-Nr.	DIN	JIS	AIS/SAE	GB	
1.0503	C45	-	1045	45	
1.7131	16MnCr5	-	5115	18CrMn	can be welded
1.7225	42CrMo4+QT	SCM 440 (H)	4140	42CrMo	
1.4112	X90CrMo V18	SUS 440B	440B	9Cr18 oV	Stainless steel

1.1 Properties

1.1.2 Conversion / hardness / strength

Converting a module m into a pitch p (straight toothed) and Transverse pitch p_s for helical tooth racks

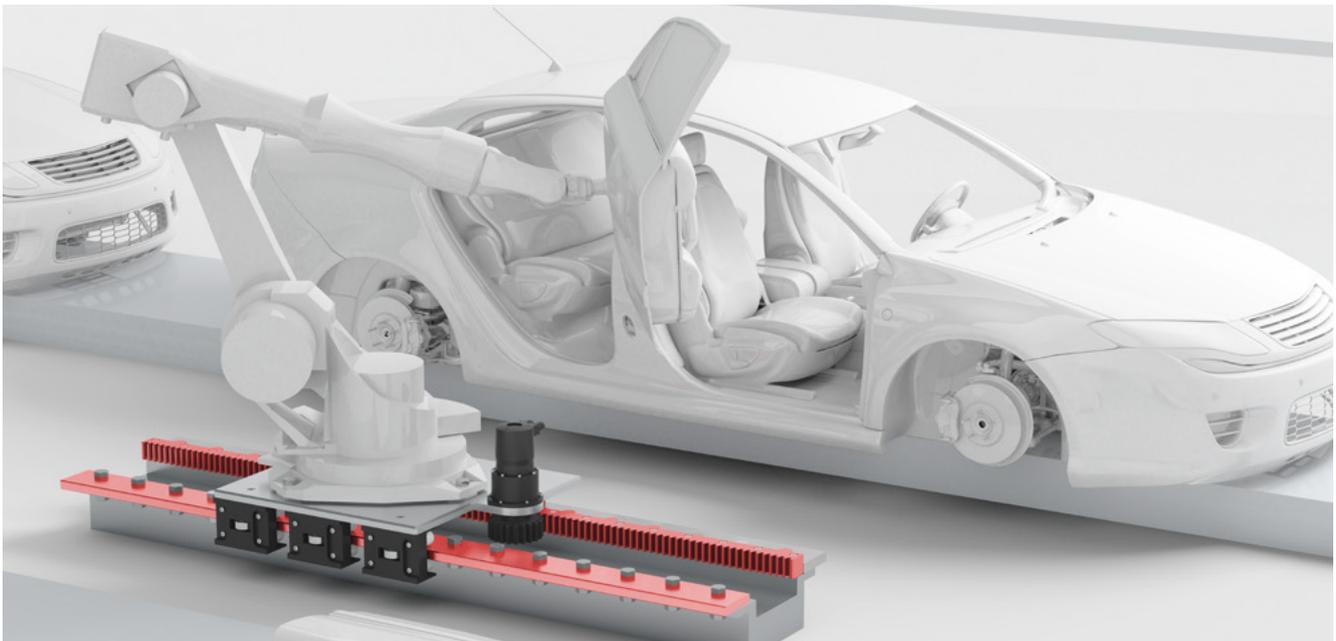
Module m	2	3	4	5	6	8	10	12	16	20
Pitch p (mm)	6,28	9,42	12,57	15,71	18,85	25,13	31,42	37,70	50,27	62,83
Transverse pitch p_s (mm)	6,67	10,00	13,33	16,67	20,00	26,67	33,33	40,00	53,33	66,67

¹⁾ where $\beta=19,5283^\circ$

Converting pitch p (straight toothed) into a module m

Pitch p (mm)	5.00	7.50	10.00	12.50	15.00	20.00
Module m	1.59	2.39	3.18	3.98	4.77	6.37

p Pitch in mm β Helix angle
 p_s Transverse pitch in mm $p = m \cdot \pi$
 m Module $p = m \cdot \pi / \cos \beta$



Traversing axis under robot, equipped with SCHNEEBERGER flat rails and racks

Hardness/ strength of tooth rack

Condition of teeth	Material	Tensile strength R_m N/mm ²	Hardness	
			HRc	HV1
soft	C45	~650		
tempered	42CrMo4+QT	max. 1000		
induction hardened	C45		55 .. 60	
	42CrMo4+QT		59±3	
case hardened	16MnCr5		58±3	
nitrided	42CrMo4+QT, 16MnCr5			550.700
through hardened	X90CrMoV18		56±2	

CUSTOMER-SPECIFIC BEARINGS AND GEAR RACKS

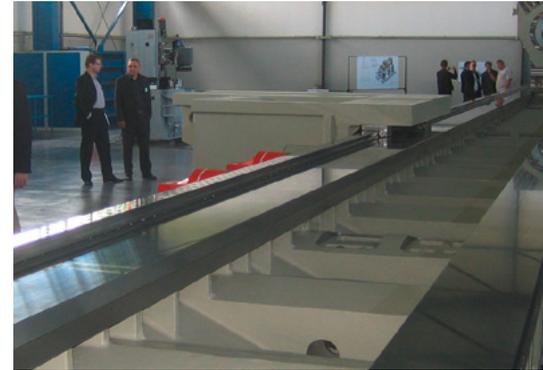
On to new shores.

SCHNEEBERGER involved in climate missions in Antarctica

Wherever large ships and, in particular, their drive systems, are built, our linear technologies are making a decisive contribution. Large multifunctional long bed lathes can be used to turn, mill, grind or even repair huge crankshafts or drive shafts, over a stroke of 40 meters and with minimal tolerance. For these and similar applications, such as when manufacturing rotor heads or wind turbines for power engineering, we provide custom guideways and gear racks. That is how we help to make new sources of energy possible. Our customized guideways and gear racks are used wherever standard guideways do not meet the specifications of the machine manufacturer either because the dimensions are incorrect or were not sufficiently precise.

In summary, we construct guideways that run perfectly smoothly, and guideways of particularly high rigidity or durability. There are no compromises with SCHNEEBERGER.

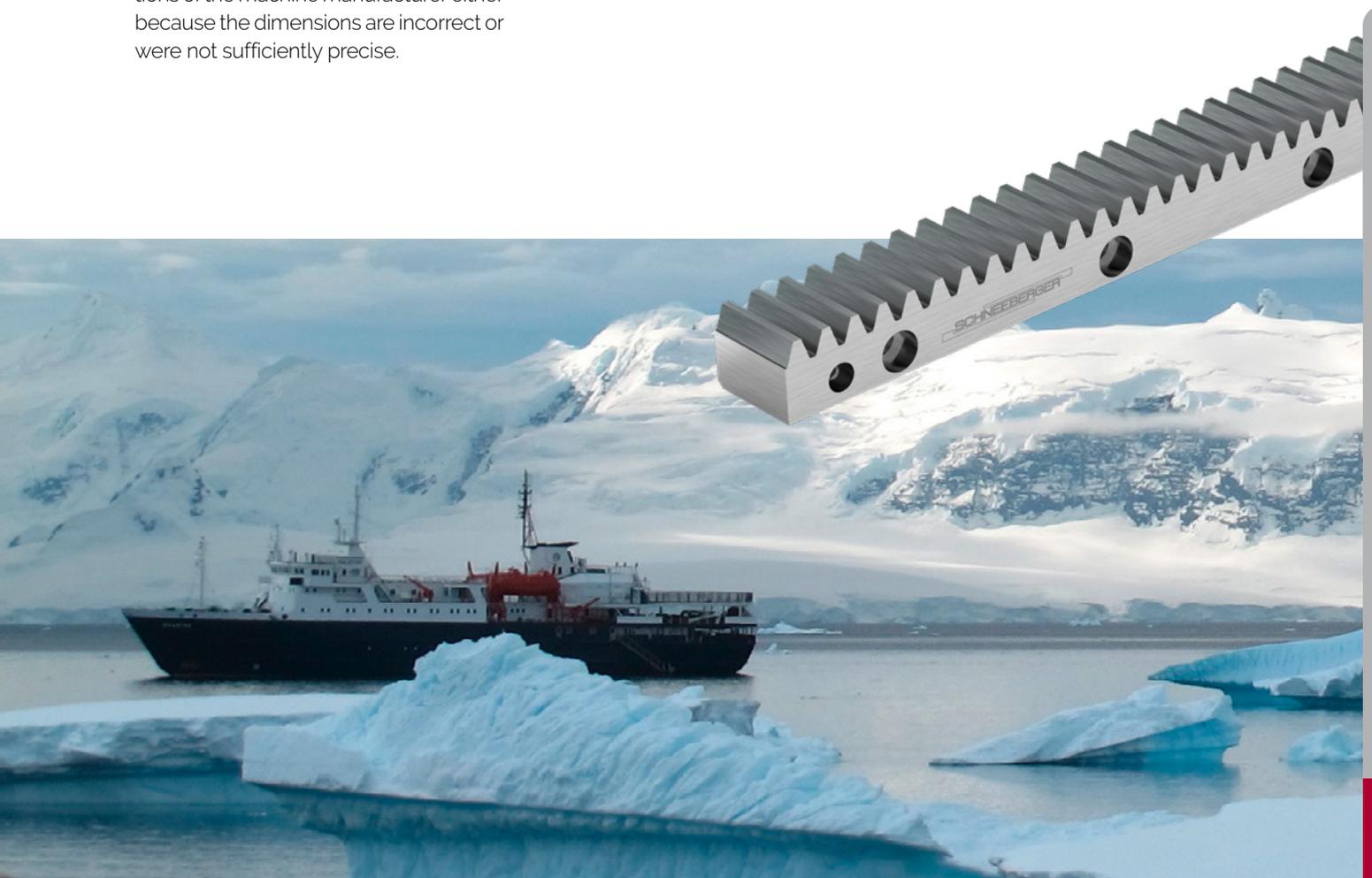
Thanks to our universal machinery and expert engineers, we are able to develop our products quickly and efficiently, even with complex customer specifications; initially in small batches as necessary for testing, and then in large-scale production, with high and constant quality and reliable and uninterrupted service.

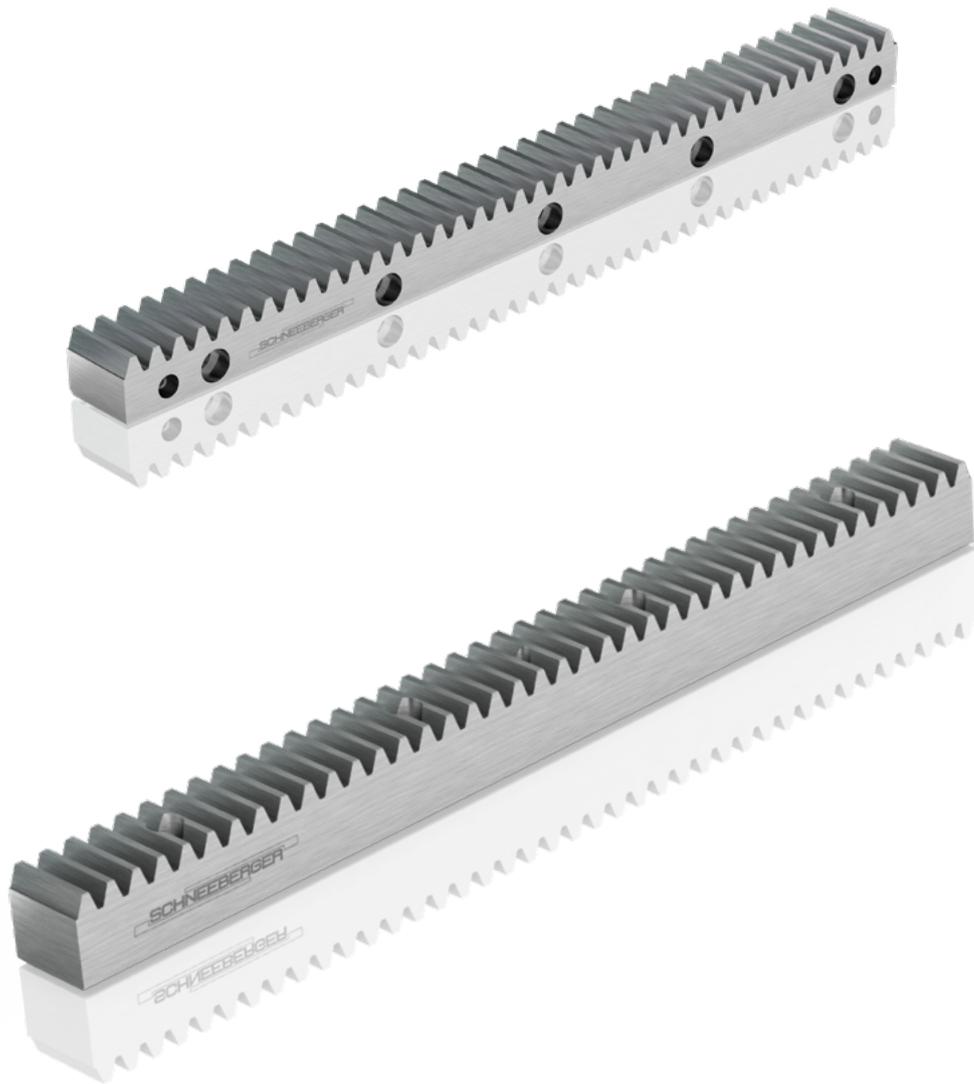


Typical applications

Gear racks provides users with definite competitive advantages in the following industries:

- Machine tools
- Heavy machine construction
- Automation and robotics
- Material handling and material flow systems
- Machine and plant engineering
- Packaging machines
- Printing presses

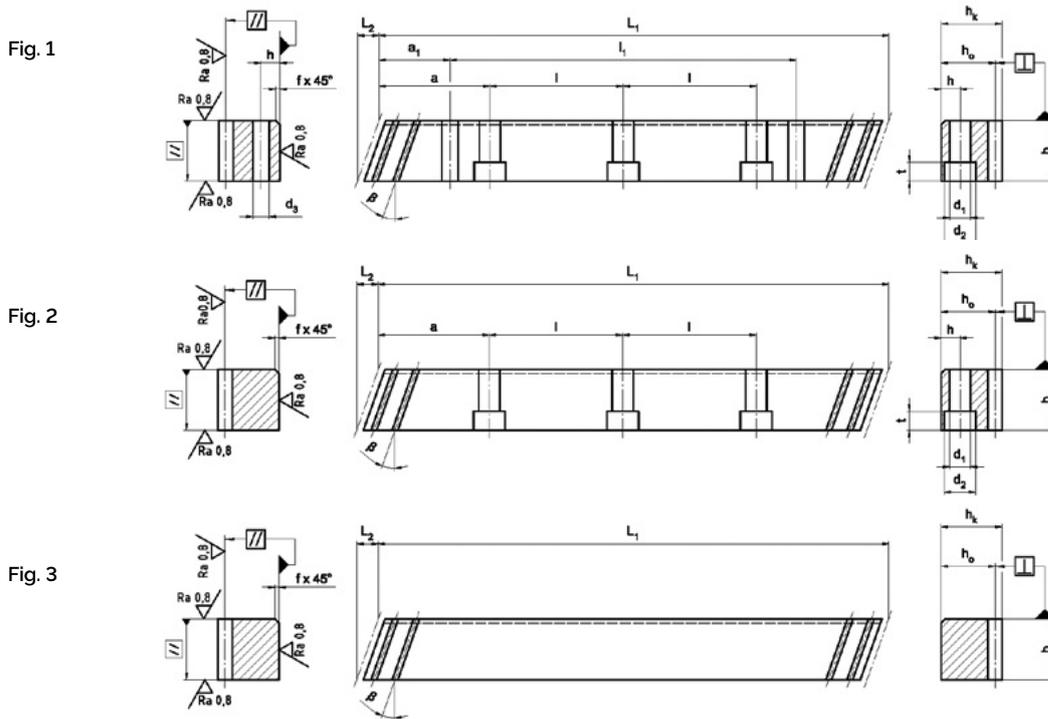




2.1 Standard gear racks

2.1.2 Module pitches Q5 helical toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, soft or hardened	Quality: f_p (mm)	5 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.004 Module > 3 : 0.005
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		$F_p/1000$ (mm)	0.024 for a 1000 mm Length
		$F_p/2000$ (mm)	0.032 for a 2000 mm length



Standard lengths	m^1	p_s^4	L_1	L_2	z^2	b	h_k	h_o	f	a	l	n^3	h	d_1	d_2	t	a_1	l_1	d_3	Dimensions kg
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	
ZST M2 - 24 x 24 x 1000 - S	2	6.67	1000.0	8.5	150	24	24	22	2	62.5	125.00	8	8	7	11	7	31.7	936.6	5.7	4.1
ZST M2 - 24 x 24 x 2000 - S	2	6.67	2000.0	8.5	300	24	24	22	2	62.5	125.00	16	8	7	11	7	31.7	1936.6	5.7	8.2
MST M2 - 24 x 24 x 200 - SL	2	6.67	200.0	8.5	30	24	24	22												0.8
ZST M3 - 29 x 29 x 1000 - S	3	10.00	1000.0	10.3	100	29	29	26	2	62.5	125.00	8	9	10	15	9	35.0	930.0	7.7	5.9
ZST M3 - 29 x 29 x 2000 - S	3	10.00	2000.0	10.3	200	29	29	26	2	62.5	125.00	16	9	10	15	9	35.0	1930.0	7.7	11.8
MST M3 - 29 x 29 x 200 - SL	3	10.00	200.0	10.3	20	29	29	26												1.2
ZST M4 - 39 x 39 x 1000 - S	4	13.33	1000.0	13.8	75	39	39	35	3	62.5	125.00	8	12	10	15	9	33.3	933.4	7.7	10.7
ZST M4 - 39 x 39 x 2000 - S	4	13.33	2000.0	13.8	150	39	39	35	3	62.5	125.00	16	12	10	15	9	33.3	1933.4	7.7	21.4
MST M4 - 39 x 39 x 200 - SL	4	13.33	200.0	13.8	15	39	39	35												2.2
ZST M5 - 49 x 39 x 1000 - S	5	16.67	1000.0	17.4	60	49	39	34	3	62.5	125.00	8	12	14	20	13	37.5	925.0	11.7	13.0
ZST M5 - 49 x 39 x 2000 - S	5	16.67	2000.0	17.4	120	49	39	34	3	62.5	125.00	16	12	14	20	13	37.5	1925.0	11.7	26.0
MST M5 - 49 x 39 x 200 - SL	5	16.67	200.0	17.4	12	49	39	34												2.7
ZST M6 - 59 x 49 x 1000 - S	6	20.00	1000.0	20.9	50	59	49	43	3	62.5	125.00	8	16	18	26	17	37.5	925.0	15.7	18.1
ZST M6 - 59 x 49 x 2000 - S	6	20.00	2000.0	20.9	100	59	49	43	3	62.5	125.00	16	16	18	26	17	37.5	1925.0	15.7	36.2
MST M6 - 59 x 49 x 200 - SL	6	20.00	200.0	20.9	10	59	49	43												3.8
ZST M8 - 79 x 79 x 960 - S	8	26.67	960.0	28.0	36	79	79	71	3	60.0	120.00	8	25	22	33	21	120.0	720.0	19.7	42.5
ZST M8 - 79 x 79 x 1920 - S	8	26.67	1920.0	28.0	72	79	79	71	3	60.0	120.00	16	25	22	33	21	120.0	1680.0	19.7	85.0
MST M8 - 79 x 79 x 213 - SL	8	26.67	213.3	28.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1000 - S	10	33.33	1000.0	35.1	30	99	99	89	3	62.5	125.00	8	32	33	48	32	125.0	750.0	19.7	68.7
ZST M10 - 99 x 99 x 2000 - S	10	33.33	2000.0	35.1	60	99	99	89	3	62.5	125.00	16	32	33	48	32	125.0	1750.0	19.7	137.4
MST M10 - 79 x 79 x 233 - SL	10	33.33	233.3	28.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1000 - S	12	40.00	1000.0	42.6	25	120	120	108	3	40.0	125.00	8	40	39	58	38	102.5	750.0	19.7	111.0
MST M12 - 99 x 99 x 280 - SL	12	40.00	280.0	35.1	7	99	99	87												20.9

¹⁾ m Module

³⁾ n Number of holes

any other lengths on request

²⁾ z Number of teeth ⁴⁾ p_s Transverse pitch ($p_s = m \cdot \pi / \cos \beta$) $\beta = 19.5283^\circ (19^\circ 31' 42'')$

2.1 Standard gear racks

2.1.4 Module pitches Q7 helical toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, soft or hardened	Quality: f_p (mm)	7 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.007 Module > 3 : 0.009
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		$F_p/1000$ (mm)	0.060 for a 1000 mm length
		$F_p/2000$ (mm)	0.075 for a 2000 mm length

Fig. 1

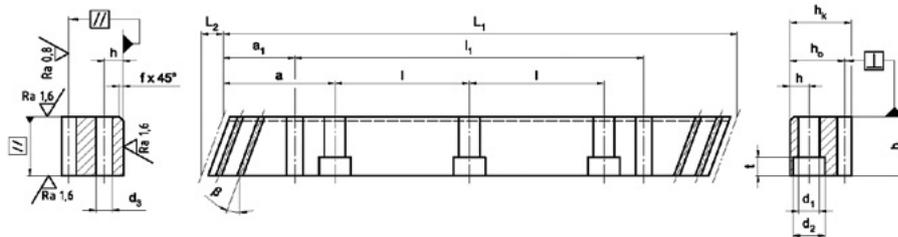


Fig. 2

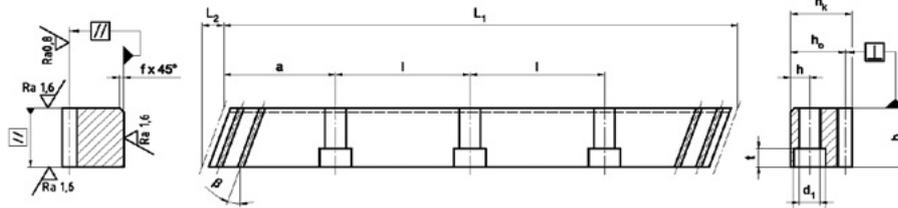
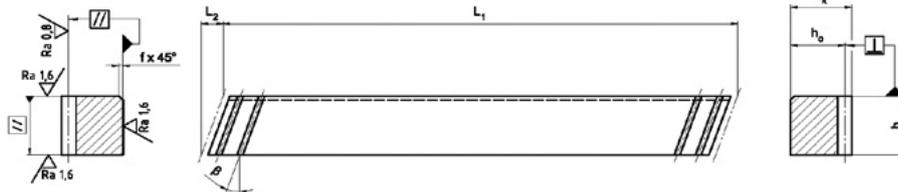


Fig. 3



Standard lengths	m^1 -	$p_s^{4)}$ mm	L_1 mm	L_2 mm	$z^{2)}$ -	b mm	h_k mm	h_o mm	f mm	a mm	l mm	$n^{3)}$ -	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	l_1 mm	d_3 mm	Dimen- sions kg
ZST M2 - 24 x 24 x 1000 - S	2	6.67	1000.0	8.5	150	24	24	22	2	62.5	125.00	8	8	7	11	7	31.7	936.6	5.7	41
ZST M2 - 24 x 24 x 2000 - S	2	6.67	2000.0	8.5	300	24	24	22	2	62.5	125.00	16	8	7	11	7	31.7	1936.6	5.7	8.2
MST M2 - 24 x 24 x 200 - SL	2	6.67	200.0	8.5	30	24	24	22												0.8
ZST M3 - 29 x 29 x 1000 - S	3	10.00	1000.0	10.3	100	29	29	26	2	62.5	125.00	8	9	10	15	9	35.0	930.0	7.7	5.9
ZST M3 - 29 x 29 x 2000 - S	3	10.00	2000.0	10.3	200	29	29	26	2	62.5	125.00	16	9	10	15	9	35.0	1930.0	7.7	11.8
MST M3 - 29 x 29 x 200 - SL	3	10.00	200.0	10.3	20	29	29	26												1.2
ZST M4 - 39 x 39 x 1000 - S	4	13.33	1000.0	13.8	75	39	39	35	3	62.5	125.00	8	12	10	15	9	33.3	933.4	7.7	10.7
ZST M4 - 39 x 39 x 2000 - S	4	13.33	2000.0	13.8	150	39	39	35	3	62.5	125.00	16	12	10	15	9	33.3	1933.4	7.7	21.4
MST M4 - 39 x 39 x 200 - SL	4	13.33	200.0	13.8	15	39	39	35												2.2
ZST M5 - 49 x 39 x 1000 - S	5	16.67	1000.0	17.4	60	49	39	34	3	62.5	125.00	8	12	14	20	13	37.5	925.0	11.7	13.0
ZST M5 - 49 x 39 x 2000 - S	5	16.67	2000.0	17.4	120	49	39	34	3	62.5	125.00	16	12	14	20	13	37.5	1925.0	11.7	26.0
MST M5 - 49 x 39 x 200 - SL	5	16.67	200.0	17.4	12	49	39	34												2.7
ZST M6 - 59 x 49 x 1000 - S	6	20.00	1000.0	20.9	50	59	49	43	3	62.5	125.00	8	16	18	26	17	37.5	925.0	15.7	18.1
ZST M6 - 59 x 49 x 2000 - S	6	20.00	2000.0	20.9	100	59	49	43	3	62.5	125.00	16	16	18	26	17	37.5	1925.0	15.7	36.2
MST M6 - 59 x 49 x 200 - SL	6	20.00	200.0	20.9	10	59	49	43												3.8
ZST M8 - 79 x 79 x 960 - S	8	26.67	960.0	28.0	36	79	79	71	3	60.0	120.00	8	25	22	33	21	120.0	720.0	19.7	42.5
ZST M8 - 79 x 79 x 1920 - S	8	26.67	1920.0	28.0	72	79	79	71	3	60.0	120.00	16	25	22	33	21	120.0	1680.0	19.7	85.0
MST M8 - 79 x 79 x 213 - SL	8	26.67	213.3	28.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1000 - S	10	33.33	1000.0	35.1	30	99	99	89	3	62.5	125.00	8	32	33	48	32	125.0	750.0	19.7	68.7
ZST M10 - 99 x 99 x 2000 - S	10	33.33	2000.0	35.1	60	99	99	89	3	62.5	125.00	16	32	33	48	32	125.0	1750.0	19.7	137.4
MST M10 - 79 x 79 x 233 - SL	10	33.33	233.3	28.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1000 - S	12	40.00	1000.0	42.6	25	120	120	108	3	40.0	125.00	8	40	39	58	38	102.5	750.0	19.7	111.0
MST M12 - 99 x 99 x 280 - SL	12	40.00	280.0	35.1	7	99	99	87												20.9

¹⁾ m Module

³⁾ n Number of holes

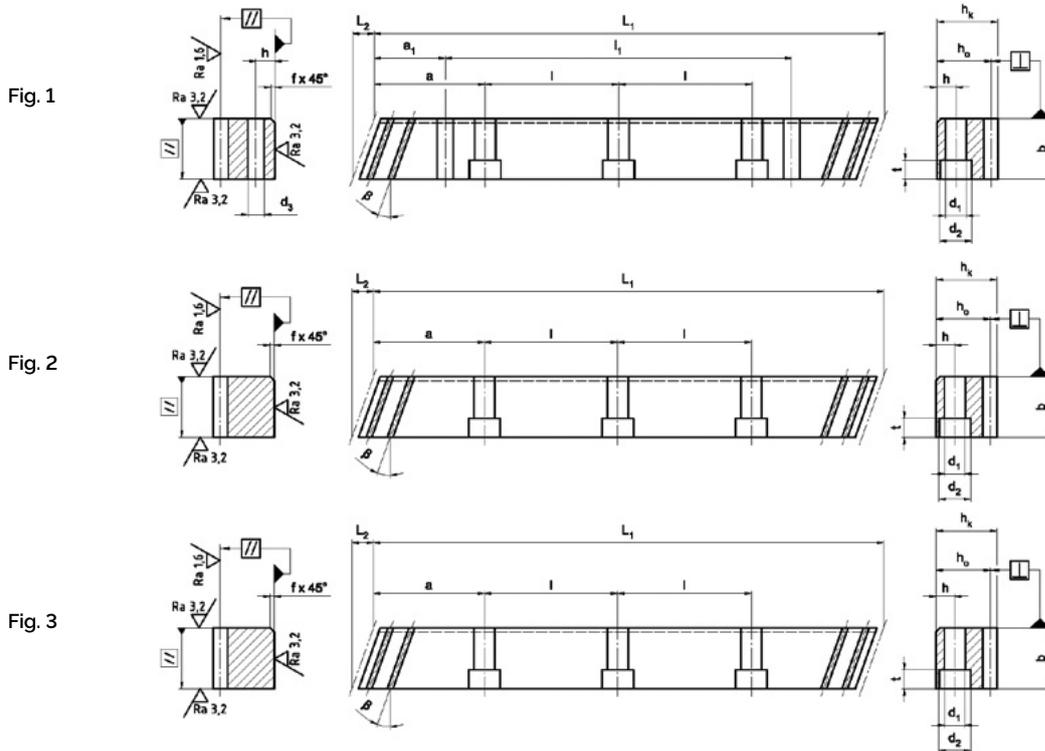
any other lengths on request

²⁾ z Number of teeth ⁴⁾ p_s Transverse pitch ($p_s = m \cdot \pi / \cos \beta$) $\beta = 19.5283^\circ (19^\circ 31' 42'')$

2.1 Standard gear racks

2.1.6 Module pitches Q8 helical toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, nitrided	Quality: F_p (mm)	9 in accordance with DIN 3962, 3963, 3967 Total pitch deviation
Outer surfaces:	ground on all sides	$F_p/1000$ (mm)	0.180 for a 1000 mm length
		$F_p/2000$ (mm)	0.270 for a 2000 mm length



Standard lengths	$m^{1)}$	$p_s^{4)}$	L_1	L_2	$z^{2)}$	b	h_k	h_o	f	a	l	$n^{3)}$	h	d_1	d_2	t	a_1	l_1	d_3	Dimensions kg
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	
ZST M2 - 24 x 24 x 1000 - S	2	6.67	1000.0	8.5	150	24	24	22	2	62.5	125.00	8	8	7	11	7	31.7	936.6	5.7	4.1
ZST M2 - 24 x 24 x 2000 - S	2	6.67	2000.0	8.5	300	24	24	22	2	62.5	125.00	16	8	7	11	7	31.7	1936.6	5.7	8.2
MST M2 - 24 x 24 x 200 - SL	2	6.67	200.0	8.5	30	24	24	22												0.8
ZST M3 - 29 x 29 x 1000 - S	3	10.00	1000.0	10.3	100	29	29	26	2	62.5	125.00	8	9	10	15	9	35.0	930.0	7.7	5.9
ZST M3 - 29 x 29 x 2000 - S	3	10.00	2000.0	10.3	200	29	29	26	2	62.5	125.00	16	9	10	15	9	35.0	1930.0	7.7	11.8
MST M3 - 29 x 29 x 200 - SL	3	10.00	200.0	10.3	20	29	29	26												1.2
ZST M4 - 39 x 39 x 1000 - S	4	13.33	1000.0	13.8	75	39	39	35	3	62.5	125.00	8	12	10	15	9	33.3	933.4	7.7	10.7
ZST M4 - 39 x 39 x 2000 - S	4	13.33	2000.0	13.8	150	39	39	35	3	62.5	125.00	16	12	10	15	9	33.3	1933.4	7.7	21.4
MST M4 - 39 x 39 x 200 - SL	4	13.33	200.0	13.8	15	39	39	35												2.2
ZST M5 - 49 x 39 x 1000 - S	5	16.67	1000.0	17.4	60	49	39	34	3	62.5	125.00	8	12	14	20	13	37.5	925.0	11.7	13.0
ZST M5 - 49 x 39 x 2000 - S	5	16.67	2000.0	17.4	120	49	39	34	3	62.5	125.00	16	12	14	20	13	37.5	1925.0	11.7	26.0
MST M5 - 49 x 39 x 200 - SL	5	16.67	200.0	17.4	12	49	39	34												2.7
ZST M6 - 59 x 49 x 1000 - S	6	20.00	1000.0	20.9	50	59	49	43	3	62.5	125.00	8	16	18	26	17	37.5	925.0	15.7	18.1
ZST M6 - 59 x 49 x 2000 - S	6	20.00	2000.0	20.9	100	59	49	43	3	62.5	125.00	16	16	18	26	17	37.5	1925.0	15.7	36.2
MST M6 - 59 x 49 x 200 - SL	6	20.00	200.0	20.9	10	59	49	43												3.8
ZST M8 - 79 x 79 x 960 - S	8	26.67	960.0	28.0	36	79	79	71	3	60.0	120.00	8	25	22	33	21	120.0	720.0	19.7	42.5
ZST M8 - 79 x 79 x 1920 - S	8	26.67	1920.0	28.0	72	79	79	71	3	60.0	120.00	16	25	22	33	21	120.0	1680.0	19.7	85.0
MST M8 - 79 x 79 x 213 - SL	8	26.67	213.3	28.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1000 - S	10	33.33	1000.0	35.1	30	99	99	89	3	62.5	125.00	8	32	33	48	32	125.0	750.0	19.7	68.7
ZST M10 - 99 x 99 x 2000 - S	10	33.33	2000.0	35.1	60	99	99	89	3	62.5	125.00	16	32	33	48	32	125.0	1750.0	19.7	137.4
MST M10 - 79 x 79 x 233 - SL	10	33.33	233.3	28.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1000 - S	12	40.00	1000.0	42.6	25	120	120	108	3	40.0	125.00	8	40	39	58	38	102.5	750.0	19.7	111.0
MST M12 - 99 x 99 x 280 - SL	12	40.00	280.0	35.1	7	99	99	87												20.9

¹⁾ m Module

³⁾ n Number of holes

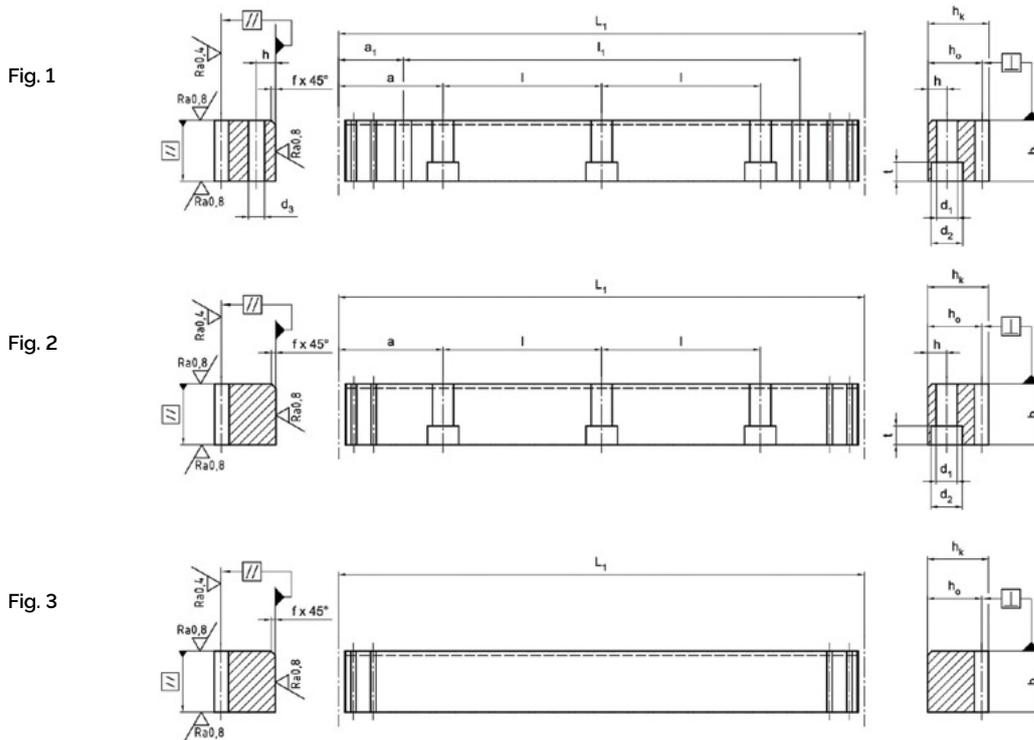
any other lengths on request

²⁾ z Number of teeth ⁴⁾ p_s Transverse pitch ($p_s = m \cdot \pi / \cos \beta$) $\beta = 19.5283^\circ (19^\circ 31' 42'')$

2.1 Standard gear racks

2.1.8 Module pitches Q4 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, soft or hardened	Quality: f_p (mm)	4 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.003 Module > 3 : 0.004
Outer surfaces:	ground on all sides	F_p (mm) $F_p/1000$ (mm)	Total pitch deviation 0.015 for a 1000 mm length



Standard lengths	$m^{1)}$ mm	$p^{4)}$ mm	L_1 mm	$z^{2)}$	b mm	h_k mm	h_o mm	f mm	a mm	l mm	$n^{3)}$	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	l_1 mm	d_3 mm	Dimensions kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	2010	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												12
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	2010	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	2010	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes

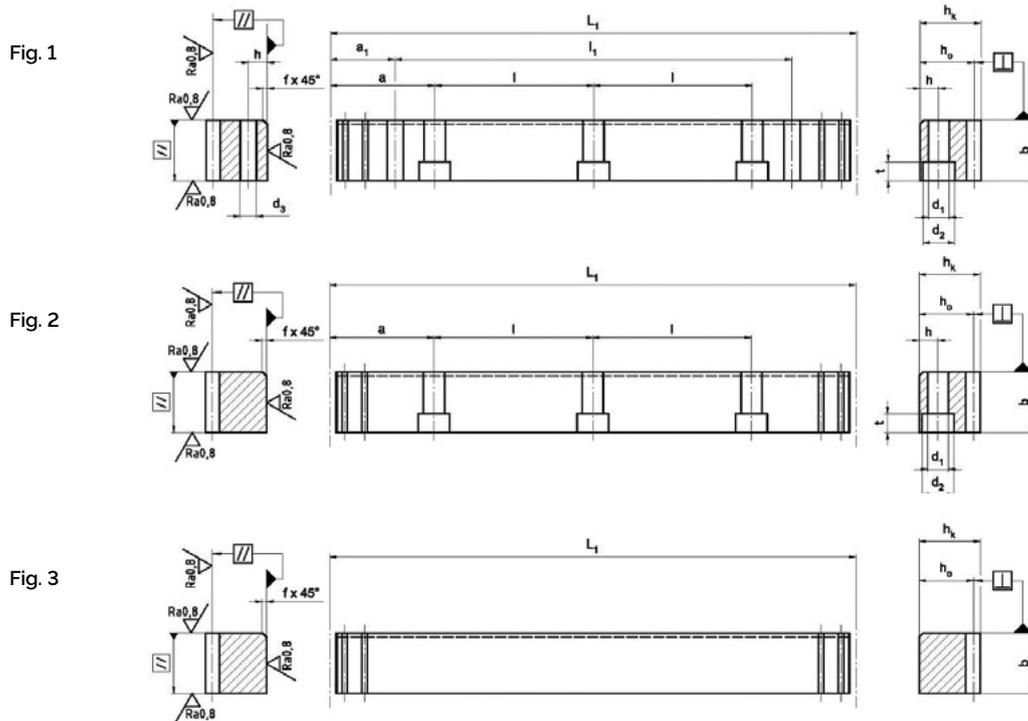
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

2.1 Standard gear racks

2.1.9 Module pitches Q5 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, soft or hardened	Quality: f_p (mm)	5 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.004 Module > 3 : 0.005
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		$F_p/1000$ (mm)	0.024 for a 1000 mm length
		$F_p/2000$ (mm)	0.032 for a 2000 mm length



Standard lengths	$m^{1)}$	$p^{4)}$	L_1	$z^{2)}$	b	h_k	h_o	f	a	l	$n^{3)}$	h	d_1	d_2	t	a_1	l_1	d_3	Dimensions
	-	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												1.2
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	201.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes

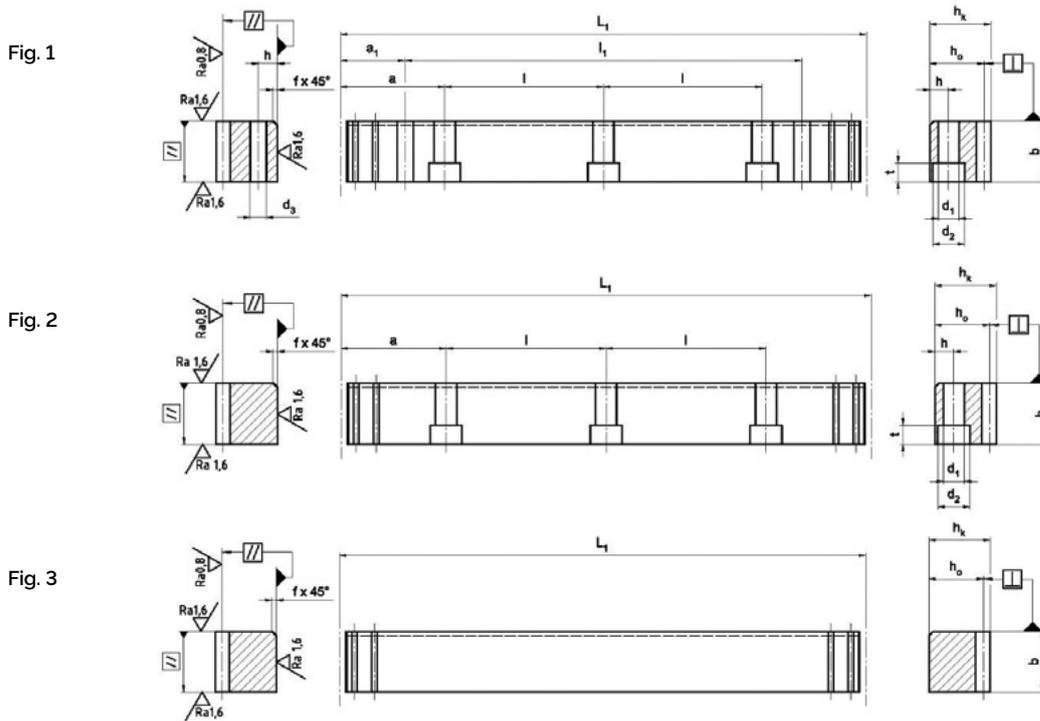
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

2.1 Standard gear racks

2.1.10 Module pitches Q6 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, soft or hardened	Quality: f_p (mm)	6 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.006 Module > 3 : 0.008
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		$F_p/1000$ (mm)	0.035 for a 1000 mm length
		$F_p/2000$ (mm)	0.045 for a 2000 mm length



Standard lengths	m^1	p^4	L_1	z^2	b	h_k	h_0	f	a	l	n^3	h	d_1	d_2	t	a_1	l_1	d_3	Dimensions kg
	-	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												12
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	201.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes

any other lengths on request

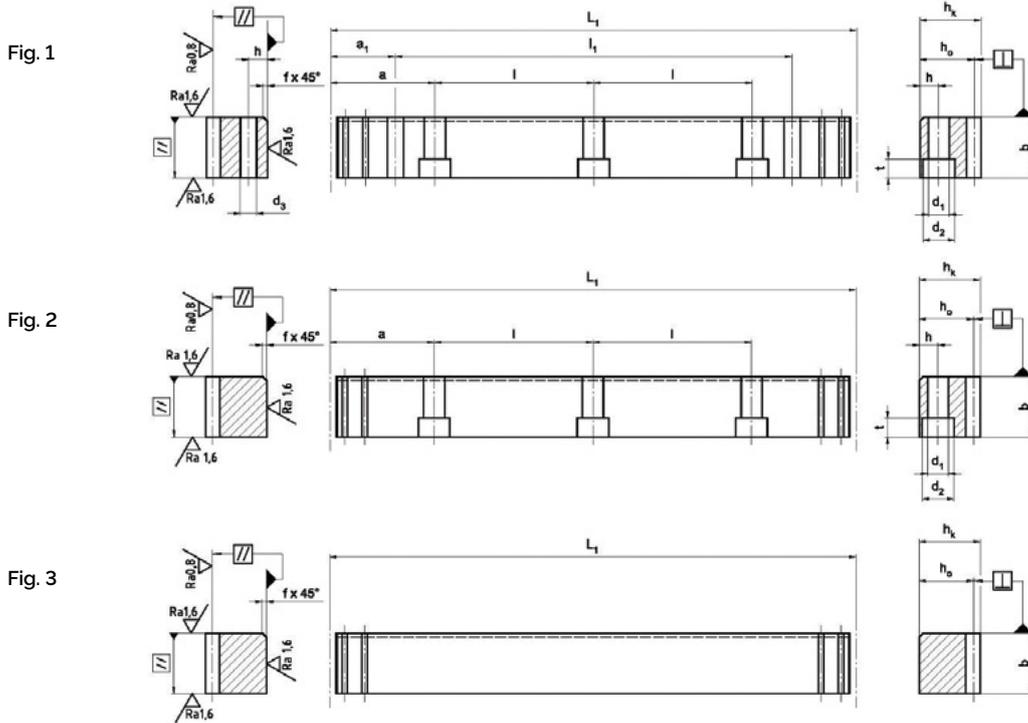
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

2.1 Standard gear racks

2.1.11 Module pitches Q7 straight toothed

Tooth rack: Pressure angle $\alpha=20^\circ$ **Quality:** 7 in accordance with DIN 3962, 3963, 3967
 ground, soft or hardened **f_p (mm)** Single pitch deviation
 Module ≤ 3 : 0.007
 Module > 3 : 0.009

Outer surfaces: ground on all sides **F_p (mm)** Total pitch deviation
 $F_p/1000$ (mm) 0.060 for a 1000 mm length
 $F_p/2000$ (mm) 0.075 for a 2000 mm length



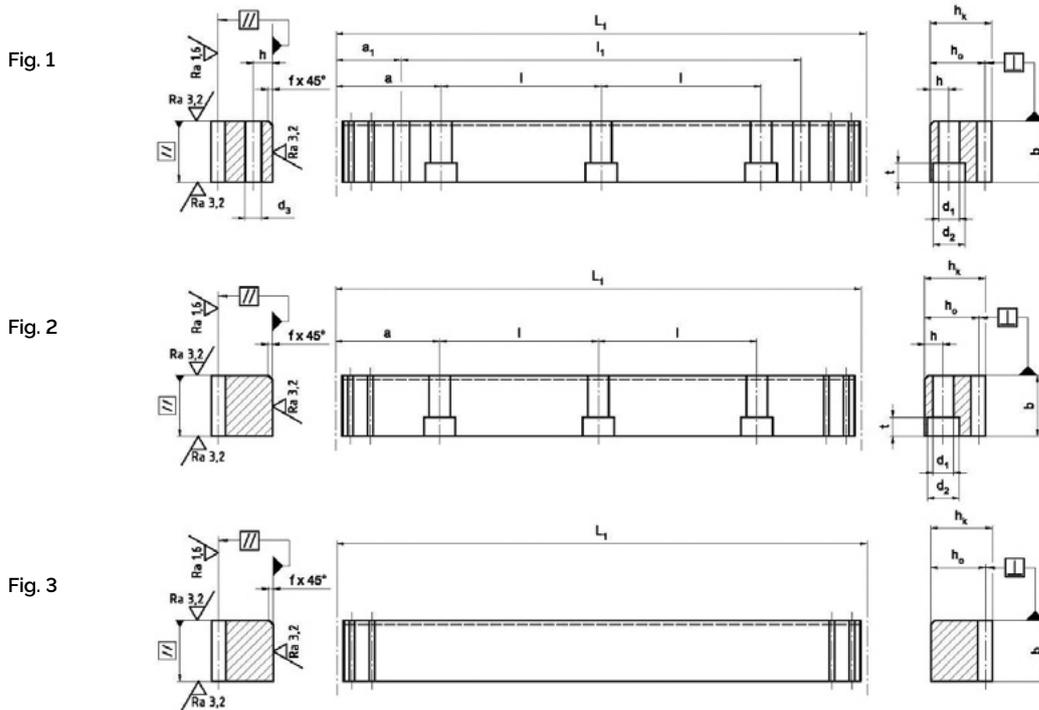
Standard lengths	$m^{1)}$	$p^{4)}$	L_1	$z^{2)}$	b	h_k	h_o	f	a	l	$n^{3)}$	h	d_1	d_2	t	a_1	L_1	d_3	Dimensions
	-	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												1.2
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	201.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes any other lengths on request
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

2.1 Standard gear racks

2.1.12 Module pitches Q8 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ milled, soft	Quality:	8 in accordance with DIN 3962, 3963, 3967
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		$F_p/1000$ (mm)	0.150 for a 1000 mm length
		$F_p/2000$ (mm)	0.225 for a 2000 mm length



Standard lengths	m ¹⁾	p ⁴⁾	L ₁	z ²⁾	b	h _k	h ₀	f	a	l	n ³⁾	h	d ₁	d ₂	t	a ₁	L ₁	d ₃	Dimensions
	-	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												1.2
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	201.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes

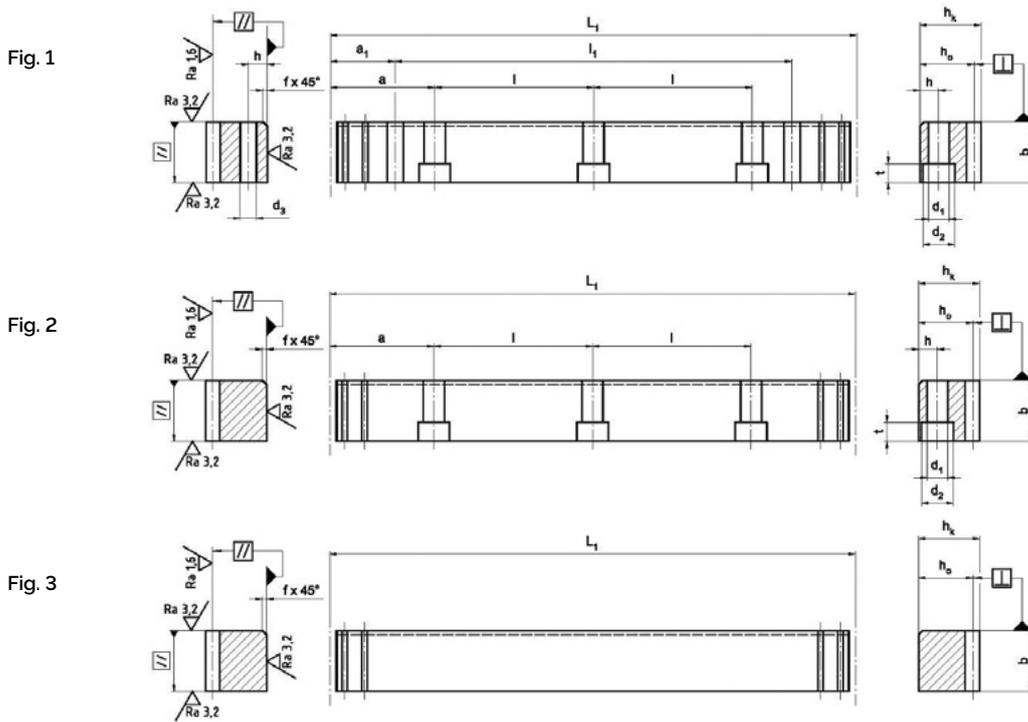
²⁾ z Number of teeth ⁴⁾ p Pitch (p=m*π)

any other lengths on request

2.1 Standard gear racks

2.1.13 Module pitches Q9 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground, nitrided	Quality: F_p (mm)	9 in accordance with DIN 3962, 3963, 3967 Total pitch deviation
Outer surfaces:	ground on all sides	$F_p/1000$ (mm)	0.180 for a 1000 mm length
		$F_p/2000$ (mm)	0.270 for a 2000 mm length



Standard lengths	$m^{1)}$	$p^{4)}$ mm	L_1 mm	$z^{2)}$	b mm	h_k mm	h_o mm	f mm	a mm	l mm	$n^{3)}$	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	l_1 mm	d_3 mm	Dimensions kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	2010	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												12
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	2010	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	2010	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes

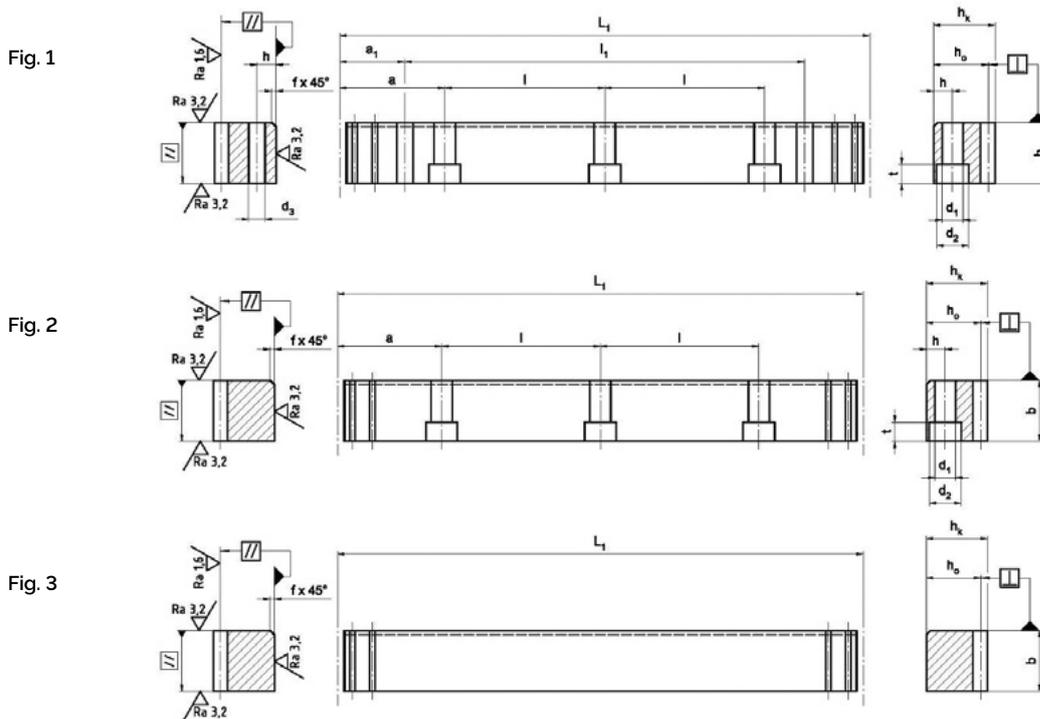
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

2.1 Standard gear racks

2.1.14 Module pitches Q11 straight toothed

Tooth rack:	Pressure angle $\alpha=20^\circ$ milled, induction hardened	Quality: F_p (mm)	11 in accordance with DIN 3962, 3963, 3967 Total pitch deviation
Outer surfaces:	ground on all sides	$F_p/1000$ (mm) $F_p/2000$ (mm)	0.220 for a 1000 mm length 0.330 for a 2000 mm length



Standard lengths	m^1	p^4 mm	L_1 mm	z^2	b mm	h_k mm	h_o mm	f mm	a mm	l mm	n^3	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	l_1 mm	d_3 mm	Dimensions kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
ZST M2 - 24 x 24 x 2010 - G	2	6.28	2010.6	320	24	24	22	2	62.8	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
ZST M3 - 29 x 29 x 2035 - G	3	9.42	2035.8	216	29	29	26	2	63.6	127.23	16	9	10	15	9	34.4	1967.0	7.7	12.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												1.2
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
ZST M4 - 39 x 39 x 2010 - G	4	12.57	2010.6	160	39	39	35	3	62.8	125.66	16	12	10	15	9	37.5	1935.6	7.7	21.4
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
ZST M5 - 49 x 39 x 2010 - G	5	15.71	2010.6	128	49	39	34	3	62.8	125.66	16	12	14	20	13	30.1	1950.4	11.7	26.2
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7
ZST M6 - 59 x 49 x 1017 - G	6	18.85	1017.9	54	59	49	43	3	63.6	127.23	8	16	18	26	17	31.4	955.0	15.7	20.2
ZST M6 - 59 x 49 x 2035 - G	6	18.85	2035.8	108	59	49	43	3	63.6	127.23	16	16	18	26	17	31.4	1973.0	15.7	40.4
MST M6 - 59 x 49 x 207 - G	6	18.85	207.0	11	59	49	43												4.1
ZST M8 - 79 x 79 x 1005 - G	8	25.13	1005.3	40	79	79	71	3	62.8	125.66	8	25	22	33	21	26.6	952.0	19.7	44.3
ZST M8 - 79 x 79 x 2010 - G	8	25.13	2010.6	80	79	79	71	3	62.8	125.66	16	25	22	33	21	26.6	1957.3	19.7	88.6
MST M8 - 79 x 79 x 201 - G	8	25.13	201.0	8	79	79	71												8.9
ZST M10 - 99 x 99 x 1005 - G	10	31.42	1005.3	32	99	99	89	3	62.8	125.66	8	32	33	48	32	125.7	754.0	19.7	68.7
ZST M10 - 99 x 99 x 2010 - G	10	31.42	2010.6	64	99	99	89	3	62.8	125.66	16	32	33	48	32	125.7	1759.2	19.7	137.4
MST M10 - 79 x 79 x 219 - G	10	31.42	219.0	7	79	79	69												10.2
ZST M12 - 120 x 120 x 1017 - G	12	37.70	1017.9	27	120	120	108	3	63.6	127.23	8	40	39	58	38	127.2	763.4	19.7	109.0
MST M12 - 99 x 99 x 263 - G	12	37.70	263.0	7	99	99	87												19.0

¹⁾ m Module ³⁾ n Number of holes
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

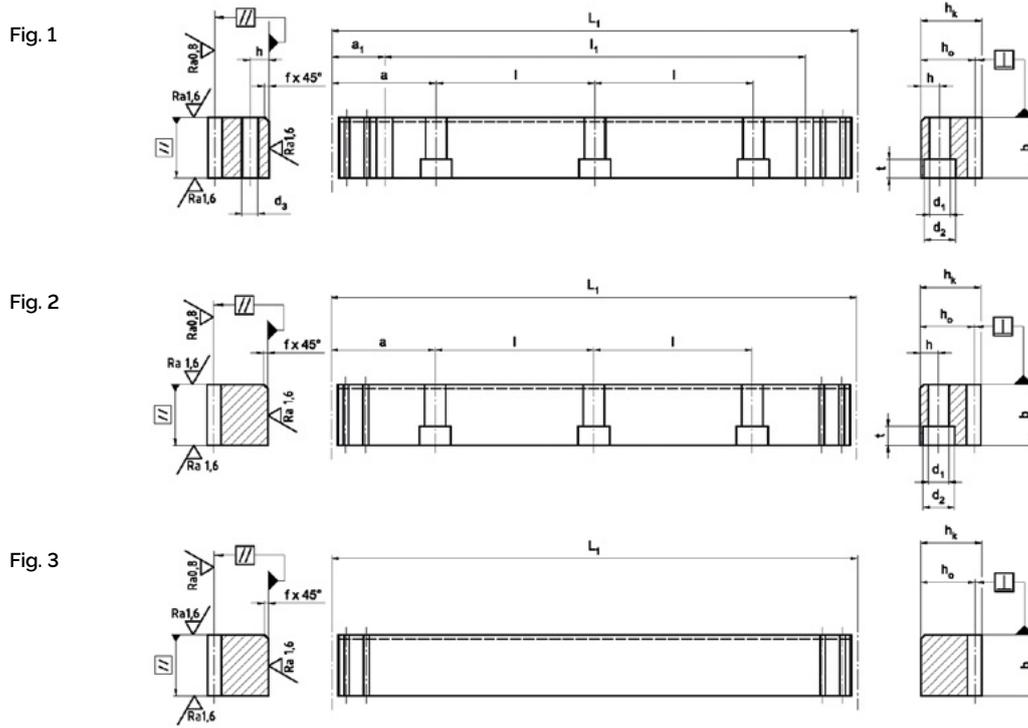
any other lengths on request

2.1 Standard gear racks

2.1.15 Q6 metric pitch, straight toothed

Tooth rack: Pressure angle $\alpha=20^\circ$ ground
Quality: f_p (mm) 6 in accordance with DIN 3962, 3963, 3967
 Single pitch deviation
 Module ≤ 3 : 0.006
 Module > 3 : 0.008

Outer surfaces: ground on all sides
 F_p (mm)
 $F_p/1000$ (mm) Total pitch deviation
 0.035 for a 1000 mm length



Standard lengths	p^1 mm	m -	L_1 mm	z^2 -	b mm	h_k mm	h_o mm	f mm	a mm	l mm	n^3 -	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	l_1 mm	d_3 mm	Dimensions kg
ZST T5 - 24 x 24 x 600 - G	5	1,592	600	120	24	24	22,41	2	60	120	5	8	7	11	7	25	550	5,7	2,5
ZST T5 - 24 x 24 x 1200 - G			1200	240													1150		5,0
MST T5 - 24 x 24 x 120 - G	5	1,592	120	24	24	24	22,41												0,8
ZST T10 - 29 x 29 x 600 - G	10	3,183	600	60	29	29	25,82	2	60	120	5	9	10	15	9	25	550	7,7	3,6
ZST T10 - 29 x 29 x 1200 - G			1200	120													1150		7,2
MST T10 - 29 x 29 x -200 - G	10	3,183	200	20	29	29	25,82												1,2

¹⁾ m Module ³⁾ n Number of holes any other lengths on request
²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

2.1 Standard gear racks

2.1.16 Q6 stainless steel, helical toothed, metric pitch

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground	Quality: f_p (mm)	6 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.006 Module > 3 : 0.008
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
Material:	X90CrMoV18	$F_p/1000$ (mm)	0.035 for a 1000 mm length

Fig. 1

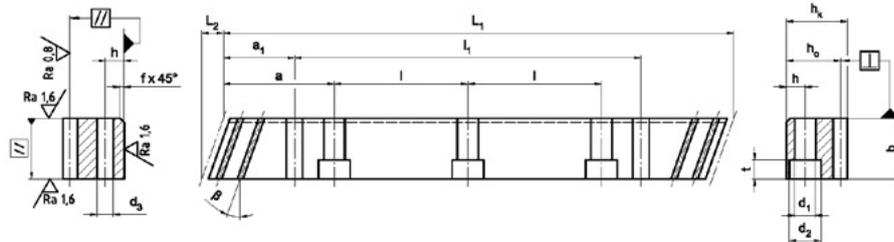


Fig. 2

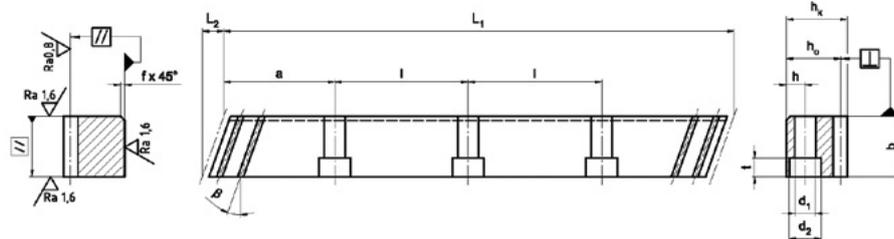
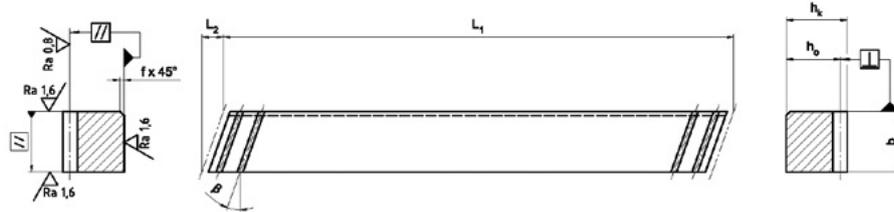


Fig. 3



Standard lengths	$m^{1)}$	$p_s^{4)}$	L_1	L_2	$z^{2)}$	b	h_k	h_o	f	a	l	$n^{3)}$	h	d_1	d_2	t	a_1	l_1	d_3	Dimen- sions kg	
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm		
ZST M2 - 24 x 24 x 1000 - S	2	6.67	1000.0	8.5	150	24	24	22	2	62.5	125.00	8	8	7	11	7	31.7	936.6	5.7	4.1	
MST M2 - 24 x 24 x 200 - SL	2	6.67	200.0	8.5	30	24	24	22													0.8
ZST M3 - 29 x 29 x 1000 - S	3	10.00	1000.0	10.3	100	29	29	26	2	62.5	125.00	8	9	10	15	9	35.0	930.0	7.7	5.9	
MST M3 - 29 x 29 x 200 - SL	3	10.00	200.0	10.3	20	29	29	26													1.2
ZST M4 - 39 x 39 x 1000 - S	4	13.33	1000.0	13.8	75	39	39	35	3	62.5	125.00	8	12	10	15	9	33.3	933.4	7.7	10.7	
MST M4 - 39 x 39 x 200 - SL	4	13.33	200.0	13.8	15	39	39	35													2.2
ZST M5 - 49 x 39 x 1000 - S	5	16.67	1000.0	17.4	60	49	39	34	3	62.5	125.00	8	12	14	20	13	37.5	925.0	11.7	13.0	
MST M5 - 49 x 39 x 200 - SL	5	16.67	200.0	17.4	12	49	39	34													2.7

¹⁾ m Module

³⁾ n Number of holes

any other lengths on request

²⁾ z Number of teeth ⁴⁾ p_s Transverse pitch ($p_s = m \cdot \pi / \cos \beta$) $\beta = 19.5283^\circ (19^\circ 31' 42'')$

2.1 Standard gear racks

2.1.17 Q6 stainless steel, straight toothed, module pitch

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground	Quality: f_p (mm)	6 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.006 Module > 3 : 0.008
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
Material:	X90CrMoV18	$F_p/1000$ (mm)	0.035 for a 1000 mm length

Fig. 1

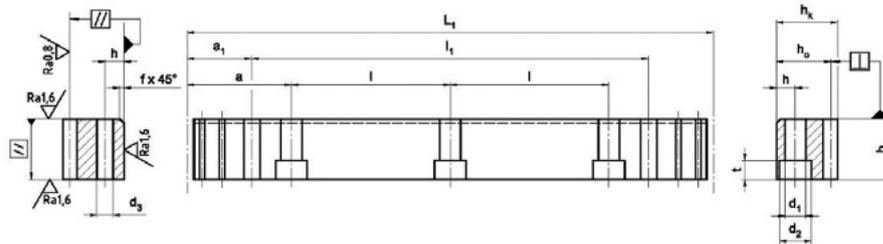


Fig. 2

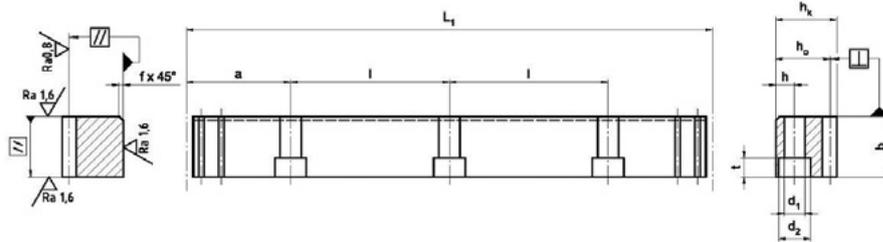
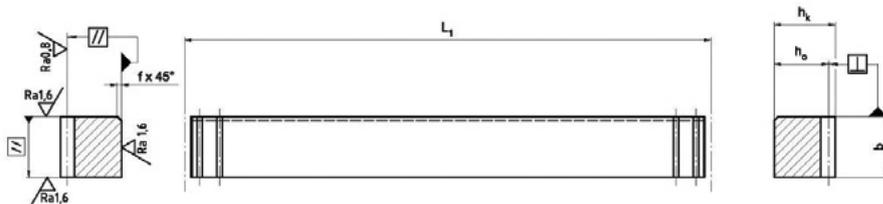


Fig. 3



Standard lengths	m^1	p^4	L_1	z^2	b	h_k	h_o	f	a	l	n^3	h	d_1	d_2	t	a_1	l_1	d_3	Dimensions kg
ZST M2 - 24 x 24 x 1005 - G	2	6.28	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
MST M2 - 24 x 24 x 201 - G	2	6.28	201.0	32	24	24	22												0.8
ZST M3 - 29 x 29 x 1017 - G	3	9.42	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
MST M3 - 29 x 29 x 198 - G	3	9.42	198.0	21	29	29	26												12
ZST M4 - 39 x 39 x 1005 - G	4	12.57	1005.3	80	39	39	35	3	62.8	125.66	8	12	10	15	9	37.5	930.3	7.7	10.7
MST M4 - 39 x 39 x 201 - G	4	12.57	201.0	16	39	39	35												2.2
ZST M5 - 49 x 39 x 1005 - G	5	15.71	1005.3	64	49	39	34	3	62.8	125.66	8	12	14	20	13	30.1	945.0	11.7	13.1
MST M5 - 49 x 39 x 204 - G	5	15.71	204.0	13	49	39	34												2.7

¹⁾ m Module ³⁾ n Number of holes

²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

2.1 Standard gear racks

2.1.18 Q6 stainless steel, straight toothed, metric pitch

Tooth rack:	Pressure angle $\alpha=20^\circ$ ground	Quality: f_p (mm)	6 in accordance with DIN 3962, 3963, 3967 Single pitch deviation Module ≤ 3 : 0.006 Module > 3 : 0.008
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
Material:	X90CrMoV18	$F_p/1000$ (mm)	0.035 for a 1000 mm length

Fig. 1

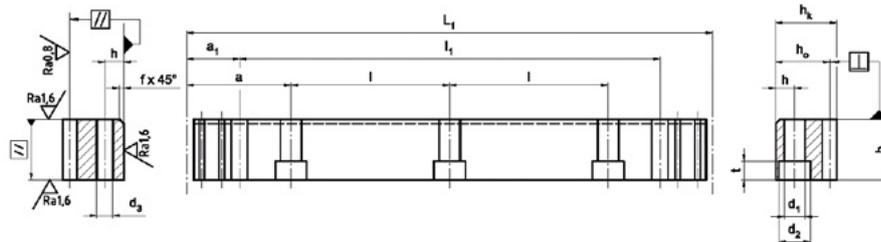


Fig. 2

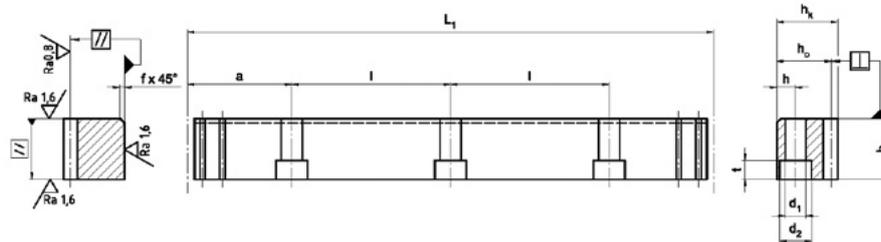
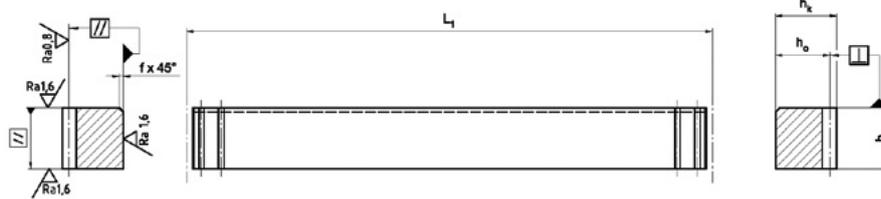


Fig. 3



Standard lengths	$p^{4)}$ mm	m	L_1 mm	$z^{2)}$	b mm	h_k mm	h_o mm	f mm	a mm	l mm	$n^{3)}$	h mm	d_1 mm	d_2 mm	t mm	a_1 mm	L_1 mm	d_3 mm	Dimensions kg
ZST T5 - 24 x 24 x 600 - G	5	1,592	600	120	24	24	22,41	2	60	120	5	8	7	11	7	25	550	5,7	2,5
ZST T5 - 24 x 24 x 1200 - G			1200	240													1150		5,0
MST T5 - 24 x 24 x 120 - G	5	1,592	120	24	24	24	22,41												0,8
ZST T10 - 29 x 29 x 600 - G	10	3,183	600	60	29	29	25,82	2	60	120	5	9	10	15	9	25	550	7,7	3,6
ZST T10 - 29 x 29 x 1200 - G			1200	120													1150		7,2
MST T10 - 29 x 29 x -200 - G	10	3,183	200	20	29	29	25,82												12

¹⁾ m Module ³⁾ n Number of holes

²⁾ z Number of teeth ⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

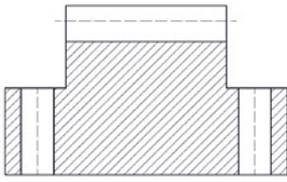
2.2 Customised gear racks



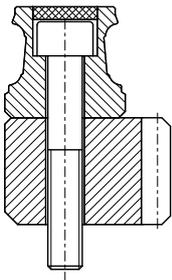
2.2 Customised gear racks

2.2.1 Customised gear racks

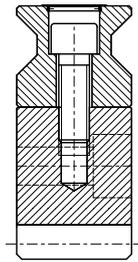
Any gear racks and guide racks can be made to a customer's drawing as long as they are within the specifications listed below.



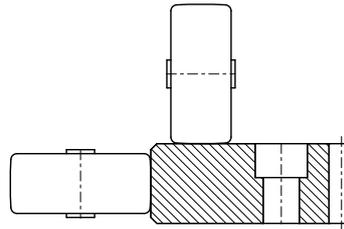
Unit weight:	max. 500 kg
Length:	max. 3000 mm
Tooth rack:	Modules 2 ... 20 Metric 5 mm ... 20 mm
Helix angle β :	-30° ... +30° Left and right ascending
Material:	C45, 42CrMo4+QT, 16MnCr5 X90CrMoV18 (stainless steel)
Hardening process:	Induction hardening Case hardening Through hardening Nitriding
Best accuracy:	Q4



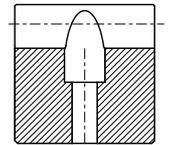
Combination with profiled linear guideway



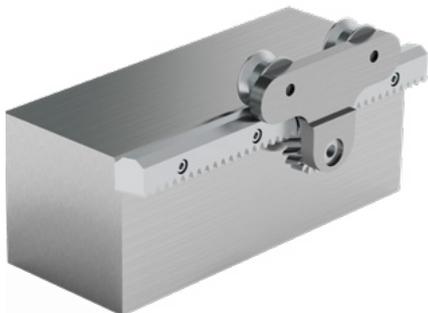
Screw connection from below



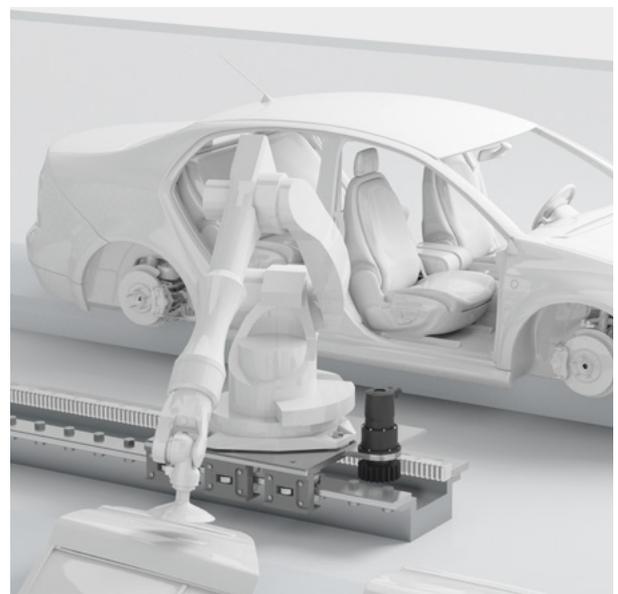
Box way with integrated tooth rack



Screw connection through the tooth rack



Gear rack integrated into linear bearing (guide rack)



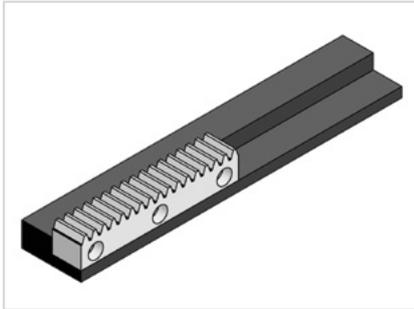
3 Installation

3.1 Gear racks fitting instructions / lubrication

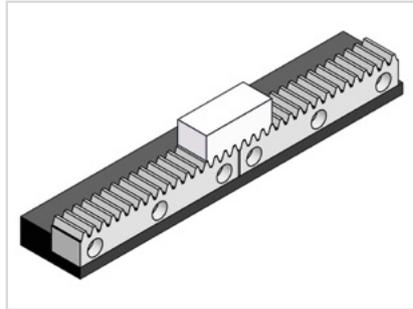
Gear racks can be assembled in any lengths.

When assembling the spacing between two gear racks must be pitch precise.

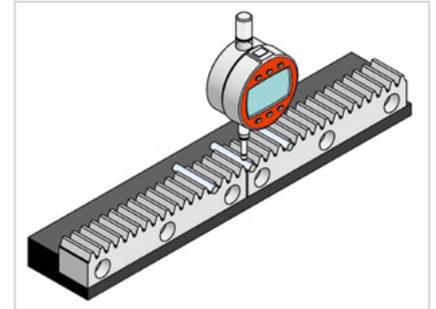
Dowels may be needed for gear racks shorter than 1m.



- Aligning the first gear rack
- Tighten the screws with a torque wrench.
- The torque depends on the friction condition and strength class of the screws.
- For soft or induction hardened gear racks use screws with a strength class of 10.9. For case and through hardened gear racks use strength class 12.9.



- Align the next gear rack with a mounting plate.
- Screw the gear rack on.



- Using a measuring roller check the height deviation at the transition point and if necessary change the position of one gear rack.
- Check that the gear racks are parallel to each other.
- Finally, insert the pins if necessary.

Lubrication - instructions for use

Adequate lubrication using a lubricant adapted to the operating conditions is required to maintain the functionality of the rack drive. Lubrication protects from wear and corrosion and reduces friction.

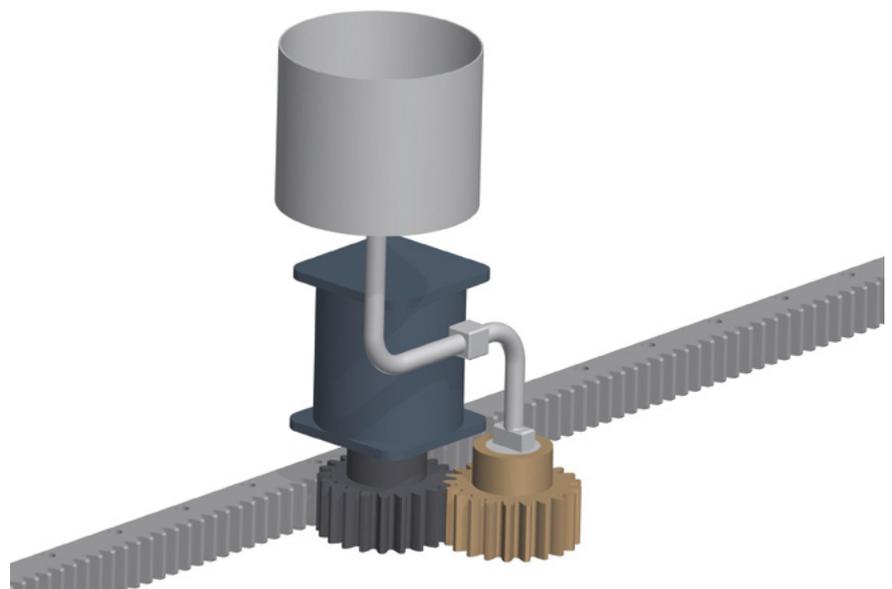
Apart from the initial lubrication during assembly, the machine must be lubricated regularly during operation.

Normally electrically-driven lubrication cartridges are used for lubrication. Lubrication greases NLGI 00 to NLGI 0 are applied to the drive pinion or the gear rack with a felt pinion.

A typical lubricant is Klüber Microlube GB 0.

Too little lubrication shortens the service life of the drive system. Therefore, always ensure that the machine is lubricated adequately.

The detailed version of our mounting instruction is available under www.schneeberger.com/downloads.



4 Order description

4.1 Standard gear racks

Standard gear racks			--	ZST	M6	-59x49x1000	-S	-I	-6	-D
Quantity										
Model	ZST									
Tooth rack	M_---	modular								
	T_---	metric, in mm								
Size	b x hk x L1	in mm								
Tooth rack	S	inclined to the right, 19.5283°								
	G	straight								
Hardness	C	Material 16MnCr5, case hardened								
	I	Material C45, induction hardened								
	W	Material C45, soft								
	N	Material 42CrMo4+QT, nitrided								
	V	Material 42CrMo4+QT, tempered								
	H	Material X90CrMoV18 (stainless steel), through hardened								
Accuracy	4, 5, 6, 7	ground								
	8	milled, soft								
	9	ground, nitrided								
	11	milled, induction hardened								
Drilled holes	D	with pin and fixing holes				Fig. 1				
	OP	without pin holes				Fig. 2				
	OH	without holes				Fig. 3				

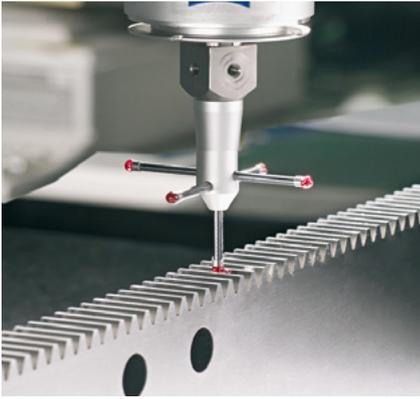
Standard assembly tool			--	MST	M6	-	-SL
Quantity							
Model	MST						
Tooth rack	M_---	modular					
	T_---	metric, in mm					
Grösse	b x hk x L1	in mm					
Tooth rack	SL	inclined to the left, 19.5283°					
	G	straight					

4. Order description

4.2 Customised gear racks

Customised gear racks			--	ZST	M4	-60x50x1820	-SL	-C	-5	-DX	-sp
Quantity											
Model	ZST										
Tooth rack	M_	modular									
	T_	metric, in mm									
Size	b x hk x L1	in mm									
Tooth rack	S	inclined to the right									
	SL	inclined to the left									
	G	straight									
Hardness	C	Material 16MnCr5, case hardened									
	O	Material 16 MnCr5, nitrided									
	I	Material C45, induction hardened									
	W	Material C45, soft									
	M	Material 42CrMo4+QT induction hardened									
	N	Material 42CrMo4+QT, nitrided									
	V	Material 42CrMo4+QT, tempered									
	H	Material X90CrMoV18 (stainless steel), through hardened									
Accuracy	4, 5, 6, 7	ground									
	8	milled, soft									
	9	ground, nitrided									
	10, 11	milled, induction hardened									
Drilled holes	D	with pin and fixing holes	Fig. 1								
	OP	without pin holes	Fig. 2								
	OH	without holes	Fig. 3								
	X	half hole pitch ($l_x = \frac{1}{2} \cdot l$)									
Special features	sp	with special features as in the drawing									

Customised assembly tool			--	MST	M4		-SR	-sp
Quantity								
Model	MST							
Tooth rack	M_	modular						
	T_	metric, in mm						
Size	b x hk x L1	in mm						
Tooth rack	SL	inclined to the left						
	SR	inclined to the right						
	G	straight						
Special features	sp	with special features as in the drawing						



5.1 Quality

All gear racks are manufactured on modern machine tools. The induction and through hardening is also done in-house.

It goes without saying that all SCHNEEBERGER production sites are ISO 9001 certified.

All process steps are self inspected by the machine operator. If required a measurement report is compiled on the quality of the gear rack.

The tooth rack profile complies with DIN 867, the tolerances for accuracy classes are based on DIN 3962, 3963 and 3967.

The tooth rack is measured on a CNC measuring machine.

The special feature of the SCHNEEBERGER standard tooth rack is the tip chamfer. This reduces the risk of injury to a minimum.

Our concern is to provide the best industrial companies with the best products and services because that is the key to our customers' success.



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