



Gear racks

Standard and customized

Latest version of the catalogs

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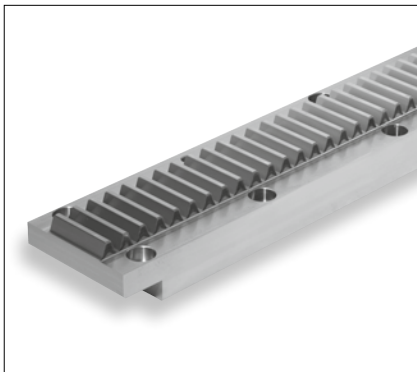


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1.1 Overview

Range of versions



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.

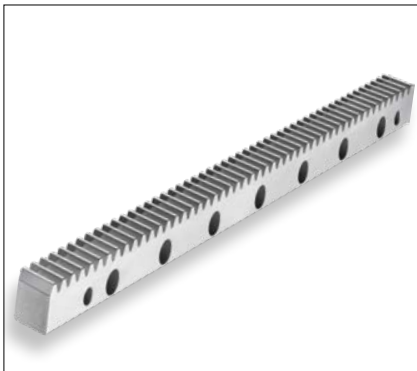
With a rack and pinion system a slideway is driven by the pinion running on a fixed gear rack.

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.

1.2 Overview

Properties of the gear racks/ conversion

Modular tooth pitch (-M)

Tooth rack	Material condition	Material (-hardness-)	Modules	max. length for following qualities						
				Q4	Q5	Q6	Q7	Q8	Q9	Q11
helical (-S-)	soft	C45 (-W-)	2 ... 16	1000	2000	3000	3000	3000		
	tempered	42CrMo4+QT (-V-)	2 ... 16	1000	2000	3000	3000	3000		
	induction hardened	C45 (-I-), 42CrMo4+QT (-M-)	2 ... 16	1000	2000	2000	2000			
			2 ... 5						3000	
	case hardened	16MnCr5 (-C-)	2 ... 16	1000						
			2 ... 16		2000	2000	2000			
	nitrided	42CrMo4+QT (-N-), 16MnCr5 (-O-)	2 ... 16						2000	
through hardened	X90CrMo V18 (-H-)	2 ... 5	1000	1000	1000	1000				
straight (-G-)	soft	C45 (-W-)	2 ... 16	1018	2035	3000	3000	3000		
	tempered	42CrMo4+QT (-V-)	2 ... 16	1018	2035	3000	3000	3000		
	induction hardened	C45 (-I-), 42CrMo4+QT (-M-)	2 ... 16	1018	2035	2035				
			2 ... 4		2035	2035	2035			
	case hardened	16MnCr5 (-C-)	2 ... 16	1018						
			2 ... 16		2035	2035	2035			
	nitrided	42CrMo4+QT (-N-), 16MnCr5 (-O-)	2 ... 16						2035	
through hardened	X90CrMo V18 (-H-)	2 ... 5	1018	1018	1018	1018				

Metric tooth pitch (-T)

Tooth rack	Material condition	Material (-hardness-)	Pitch (mm)	max. length for following qualities						
				Q4	Q5	Q6	Q7	Q8	Q9	Q11
straight (-G-)	soft	C45 (-W-)	5 ... 20	1018	2035	3000	3000	3000		
	tempered	42CrMo4+QT (-V-)	5 ... 20	1018	2035	3000	3000	3000		
	induction hardened	C45 (-I-), 42CrMo4+QT (-M-)	5 ... 20	1018	1018	2035	2035			
			5 ... 10						3000	
	case hardened	16MnCr5 (-C-)	5 ... 20	1018						
			5 ... 20		2035	2035	2035			
	nitrided	42CrMo4+QT (-N-), 16MnCr5 (-O-)	5 ... 20						2035	
through hardened	X90CrMo V18 (-H-)	5 ... 15		1018	1018	1018				

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

1.3 Overview

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 $p_s^{1)}$ (mm)	6,67	10,00	13,33	16,67	20,00	26,67	33,33	40,00	53,33	66,67

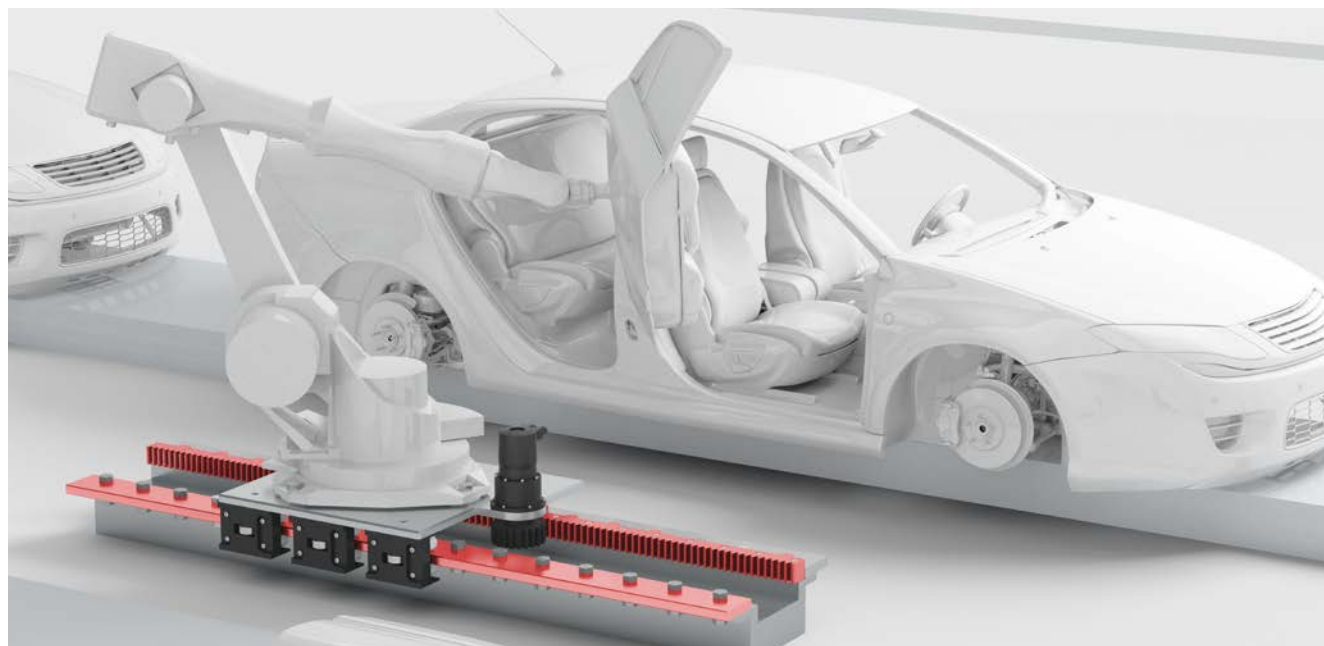
¹⁾ where $\beta=19.5283^\circ$

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
 p_s Transverse pitch in mm
 m Module

β Helix angle
 $p=m*\pi$
 $p=m*\pi/\cos\beta$



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

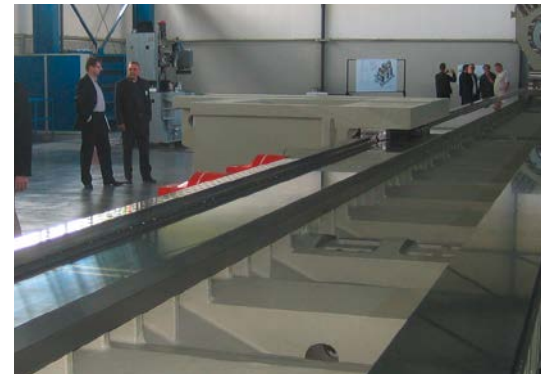
Wherever large ships and, in particular, their drive systems, are built, our linear technologies are making a decisive contribution. Large multifunctional long bed lathes can be used to turn, mill, grind or even repair huge crankshafts or drive shafts, over a stroke of 40 meters and with minimal tolerance.

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 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 4 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0.003
Module > 3 : 0.0804

F_p (mm) Total pitch deviation
 $F_p/1000$ (mm) 0,015 for a 1000 mm Length

Fig. 1

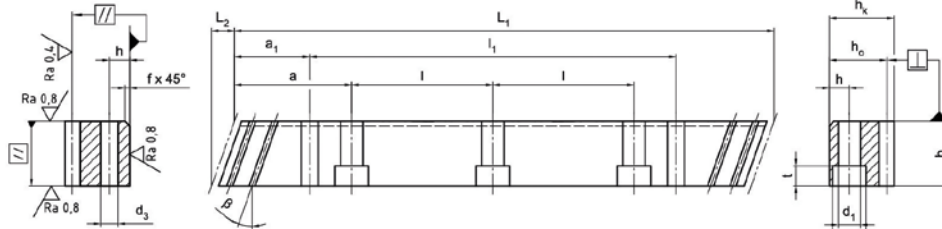


Fig. 2

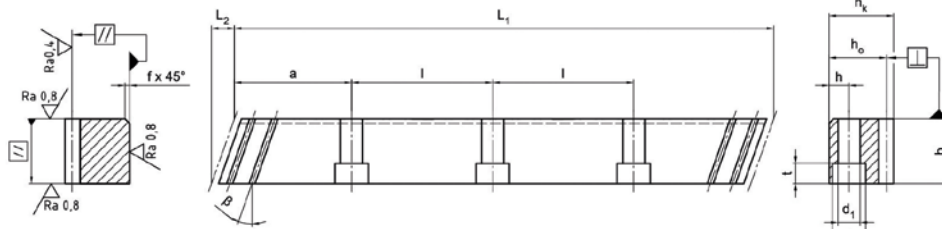
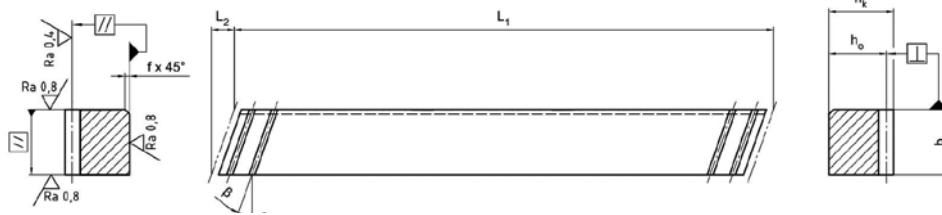


Fig. 3



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	Dimensions
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m² / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 5 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0,004
Module > 3 : 0,005

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

Fig. 1

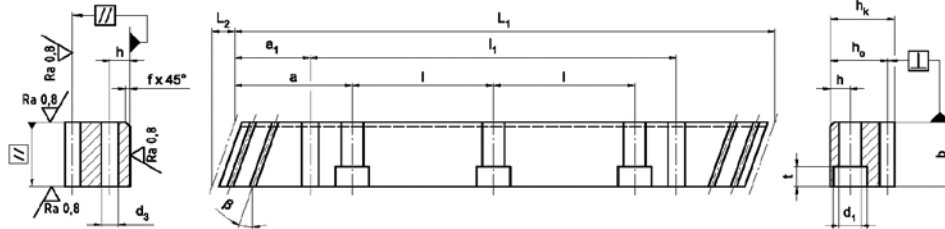


Fig. 2

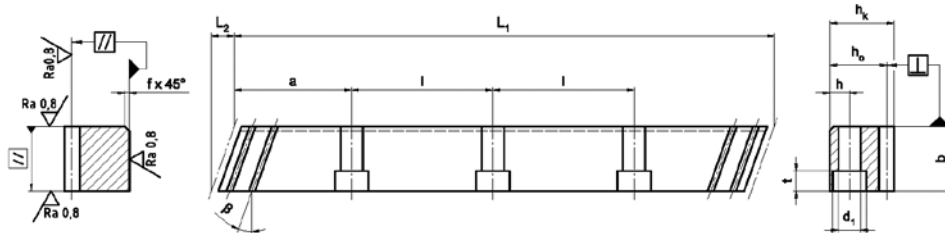
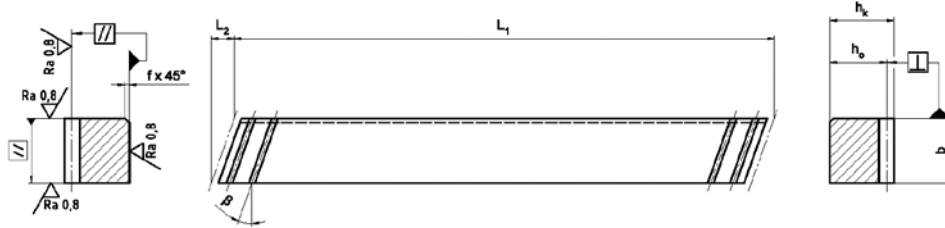


Fig. 3



Standard lengths	m ¹⁾	p _s ⁴⁾	L ₁	L ₂	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	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m*π/cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

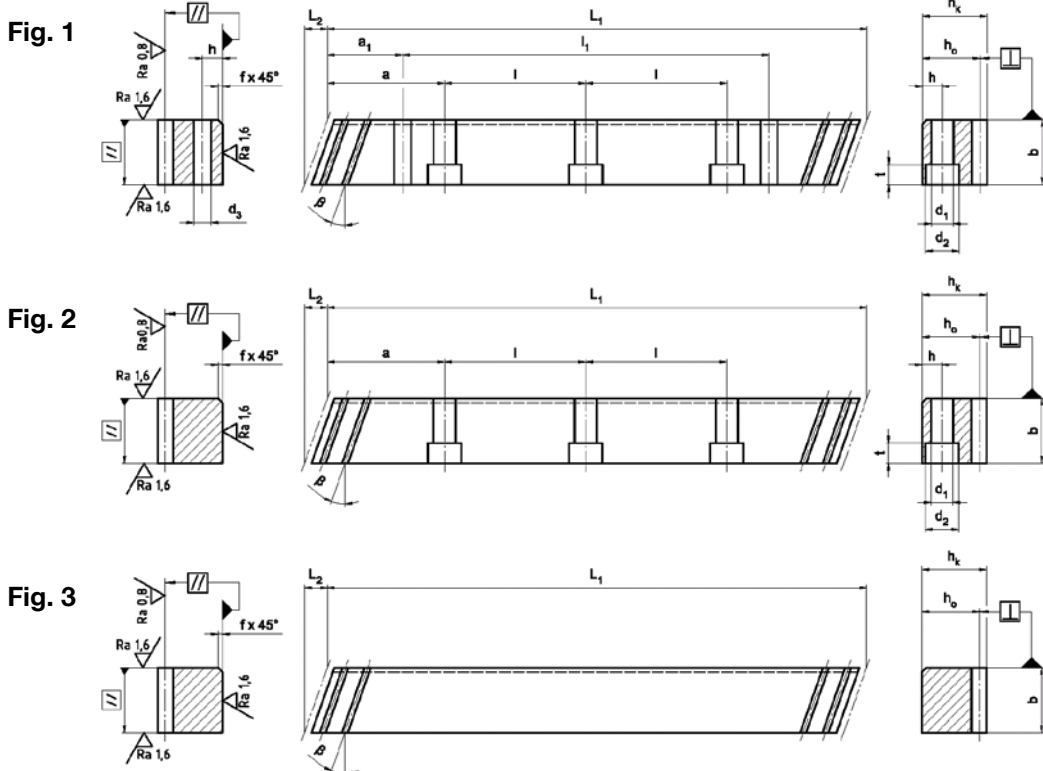
Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 6 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008

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 _s ⁴⁾	L ₁	L ₂	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	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m * π / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

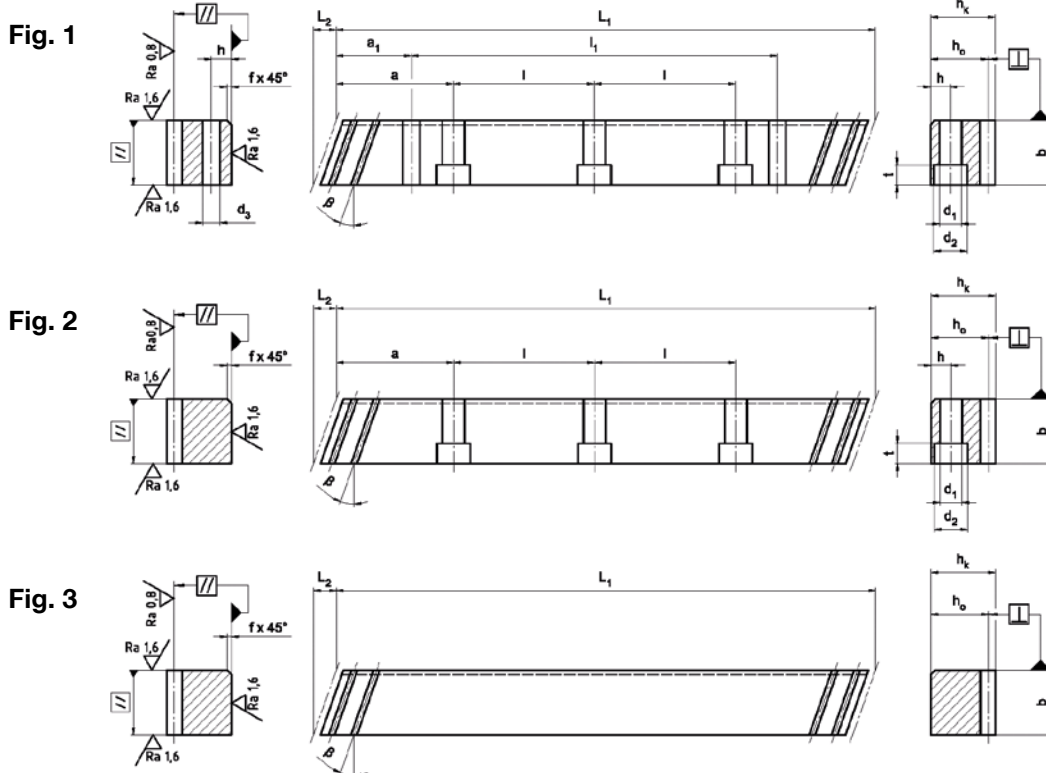
Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 5 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0,007
Module > 3 : 0,009

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 _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
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m*π/cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
milled, soft

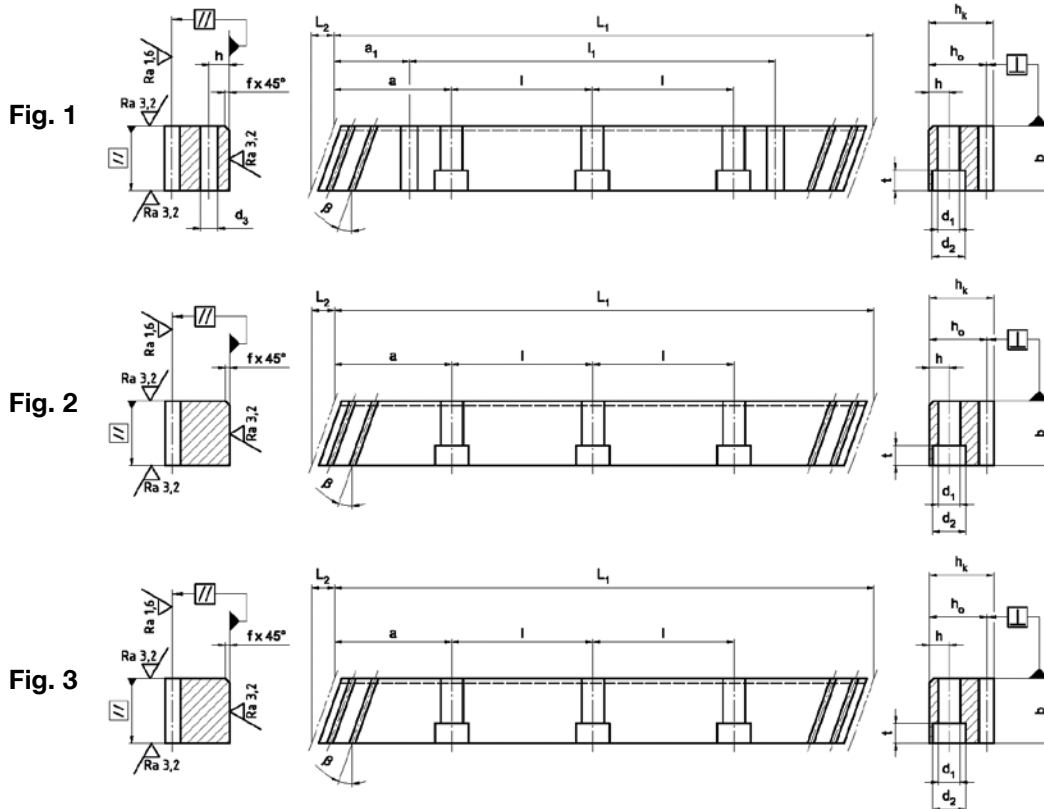
Outer surfaces: ground on all sides

Quality: 8 in accordance with DIN 3962, 3963, 3967

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 _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
	-	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	-	mm	mm	mm	mm	mm	mm	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m * π / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, nitrided

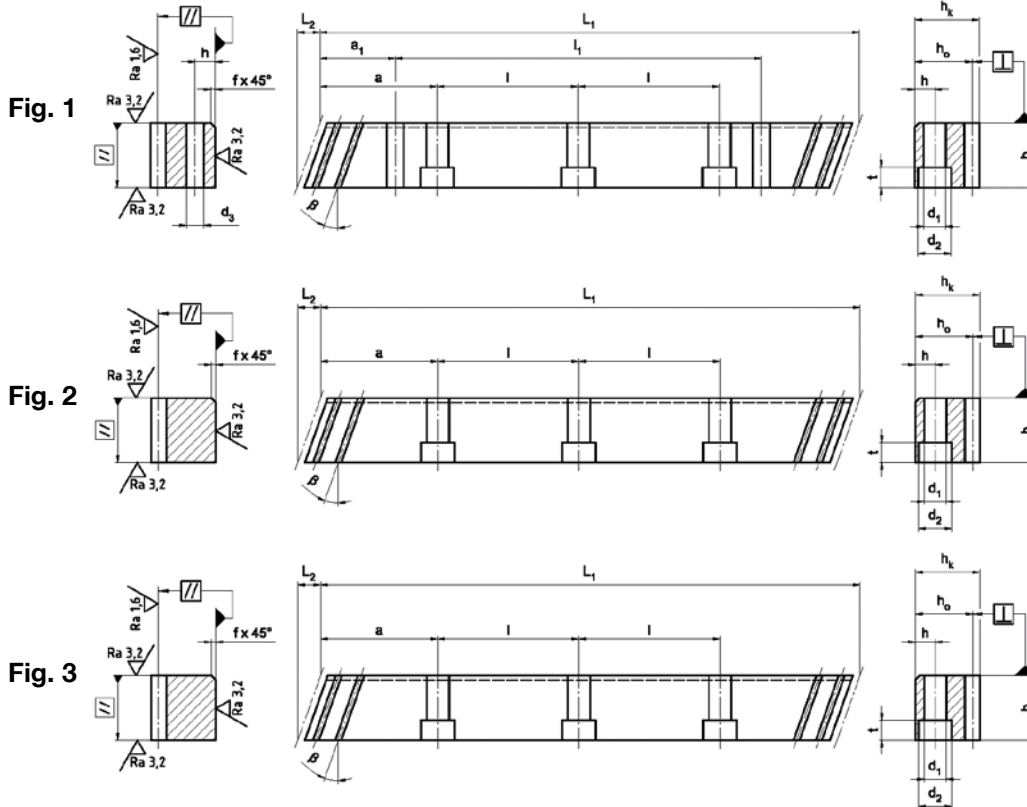
Outer surfaces: ground on all sides

Quality: 9 in accordance with DIN 3962, 3963, 3967

F_p (mm) Total pitch deviation

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 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	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m * π / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.1 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
milled, induction hardened

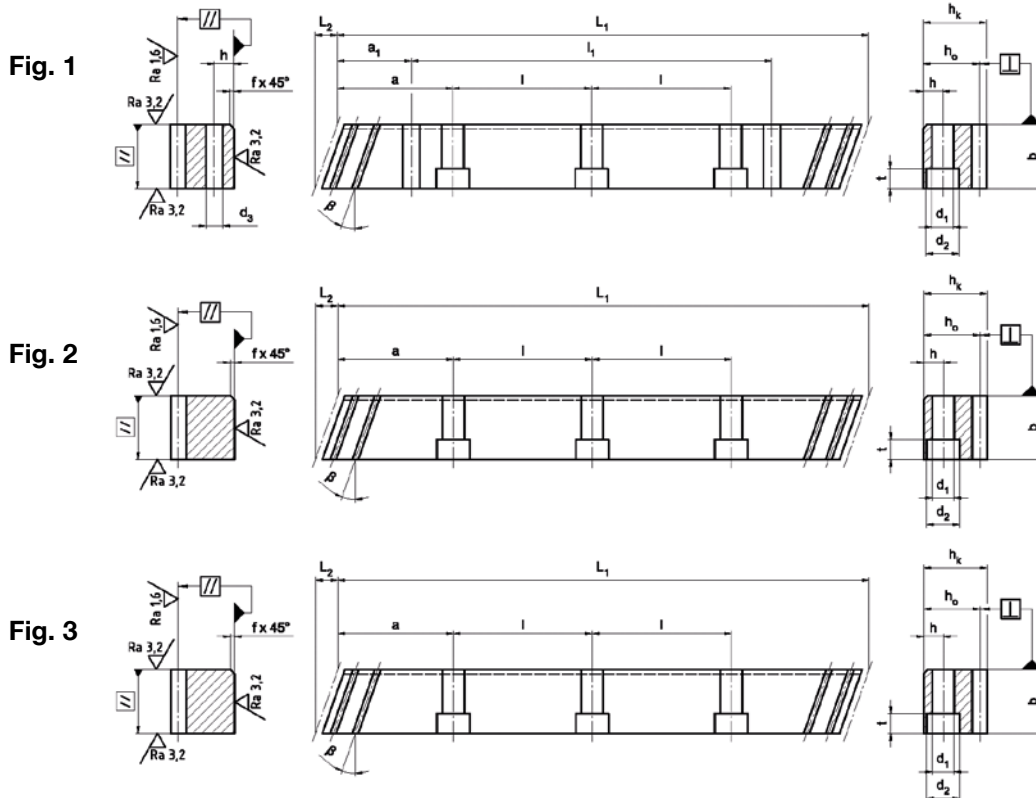
Outer surfaces: ground on all sides

Quality: 11 in accordance with DIN 3962, 3963, 3967

F_p (mm) Total pitch deviation

F_p/1000 (mm) 0,220 for a 1000 mm Length

F_p/2000 (mm) 0,330 for a 2000 mm Length



Standard lengths	m ¹⁾	p _s ⁴⁾	L ₁	L ₂	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	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m¹⁾ / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.2 Technical principles

Module pitches straight toothed

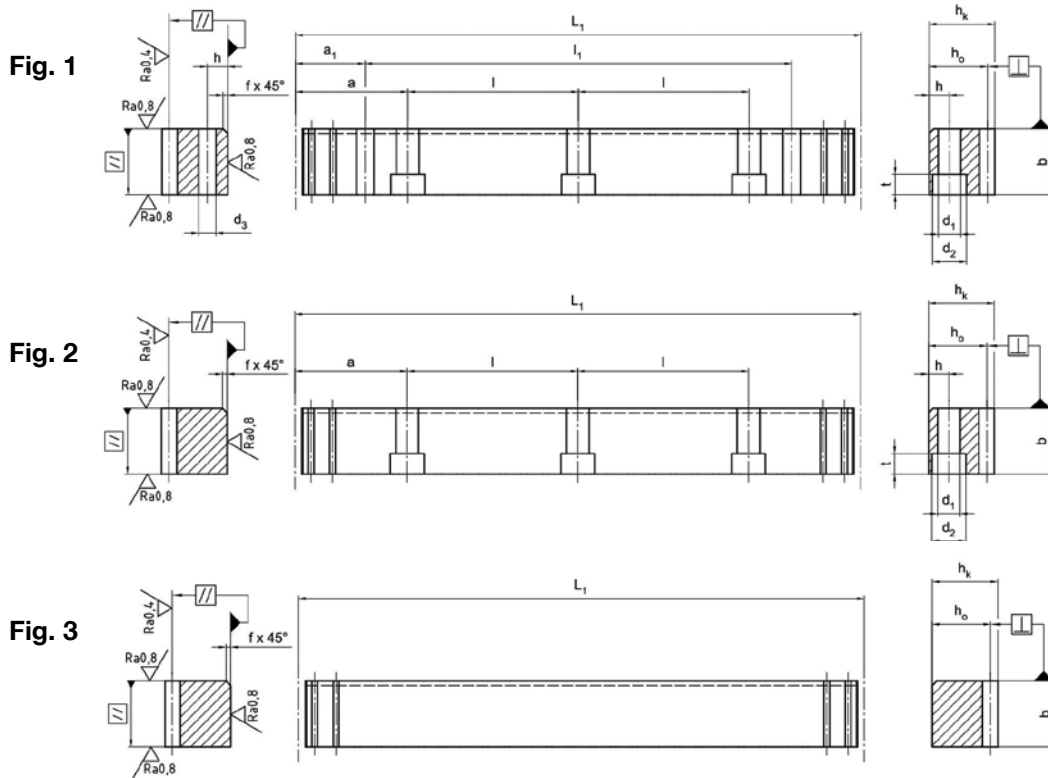
Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 4 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0.003
Module > 3 : 0.004

F_p (mm) Total pitch deviation
 $F_p/1000$ (mm) 0,015 for a 1000 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

2.2 Technical principles

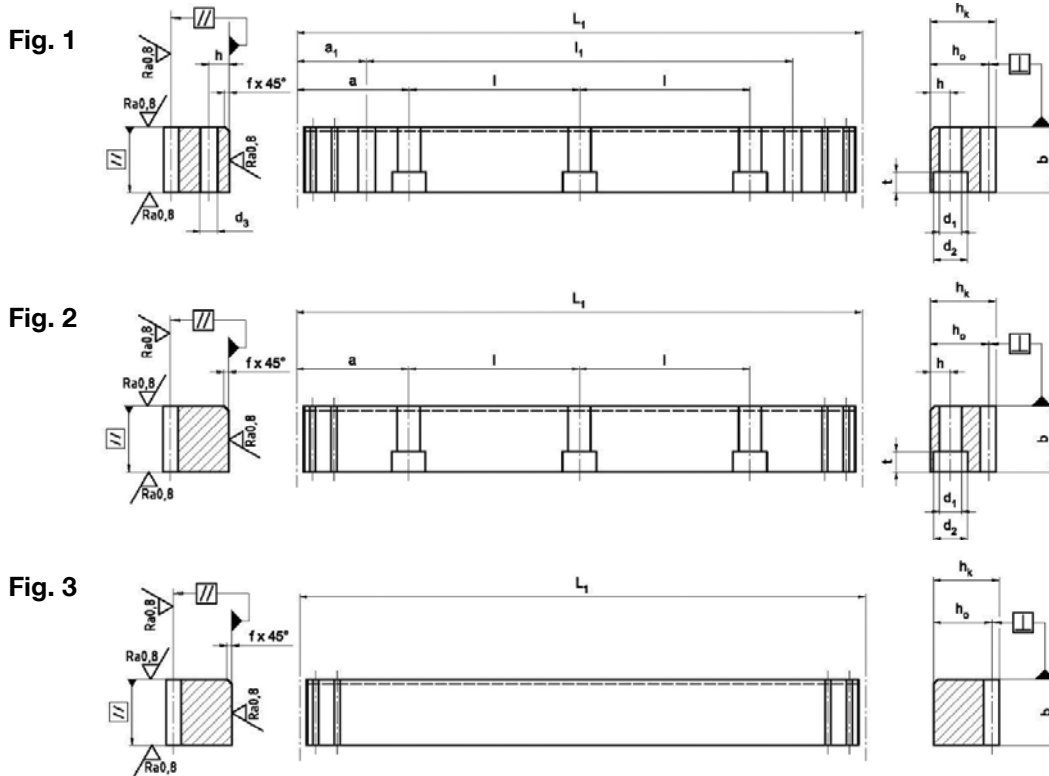
Module pitches straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 5 in accordance with DIN 3962, 3963, 3967
 f_p (mm) Single pitch deviation
Module ≤ 3 : 0,004
Module > 3 : 0,005

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 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 ($p=m \cdot \pi$)

any other lengths on request

2.2 Technical principles

Module pitches straight toothed

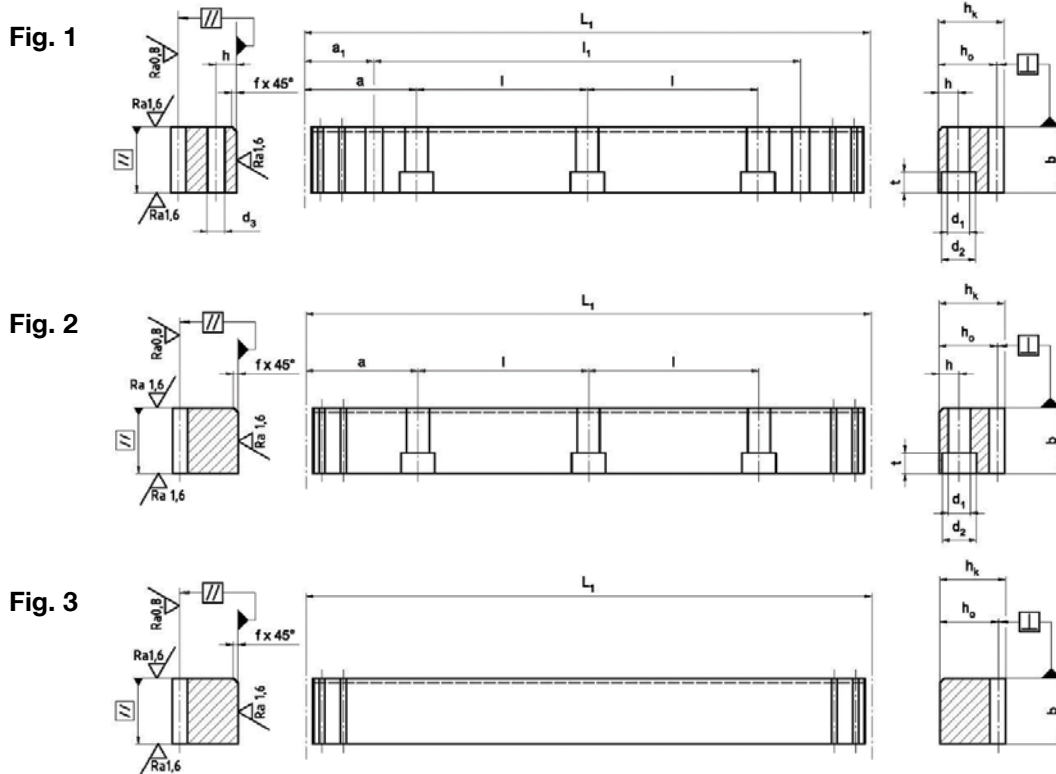
Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 6 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008

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												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

2.2 Technical principles

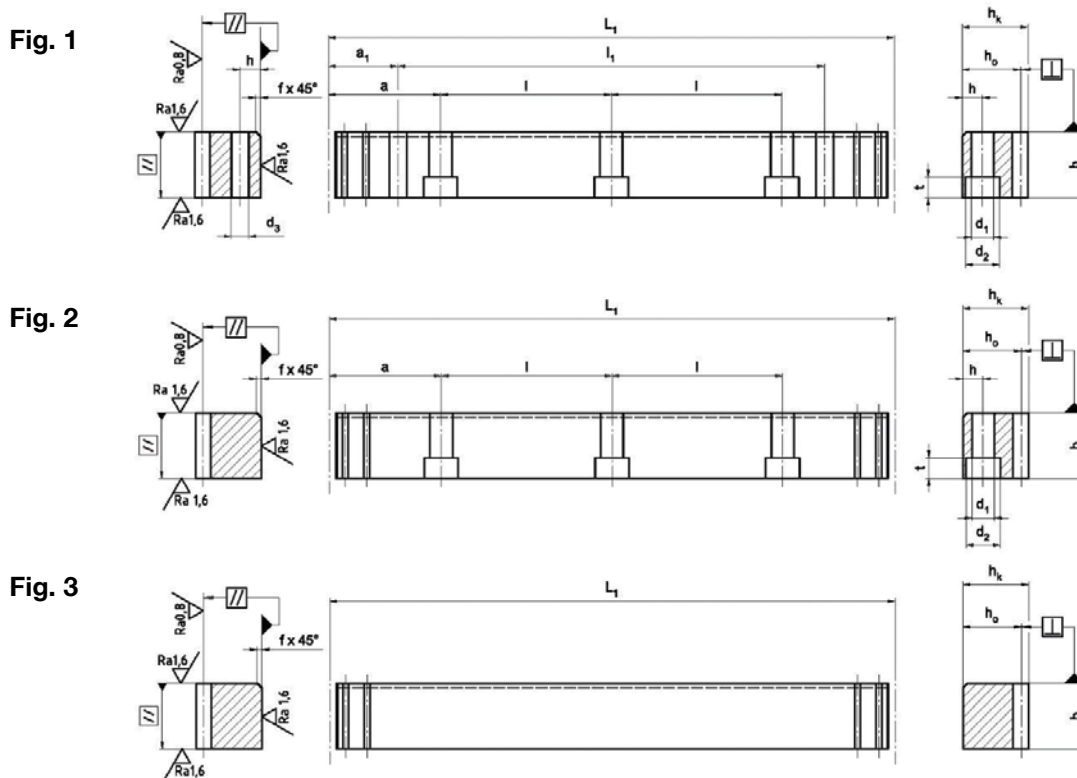
Module pitches straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, soft or hardened

Outer surfaces: ground on all sides

Quality: 7 in accordance with DIN 3962, 3963, 3967
 f_p (mm) Single pitch deviation
Module ≤ 3 : 0,007
Module > 3 : 0,009

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	$m^{1)}$		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
	-	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												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

2.2 Technical principles

Module pitches straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
milled, soft

Outer surfaces: ground on all sides

Quality: 8 in accordance with DIN 3962, 3963, 3967

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

Fig. 1

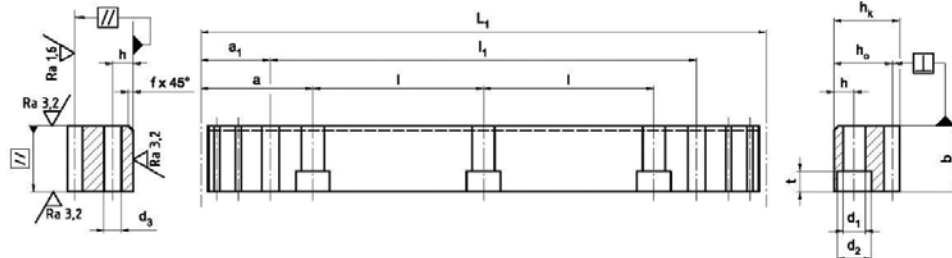


Fig. 2

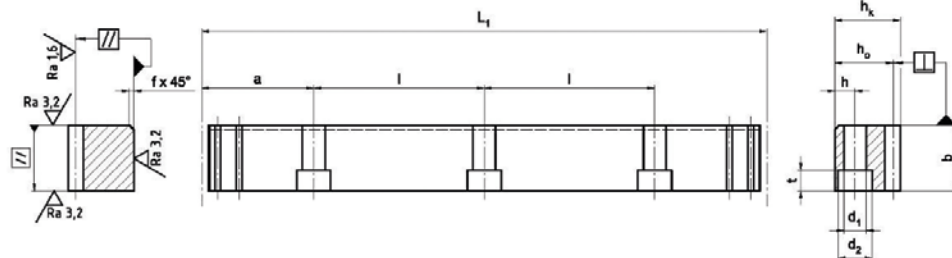
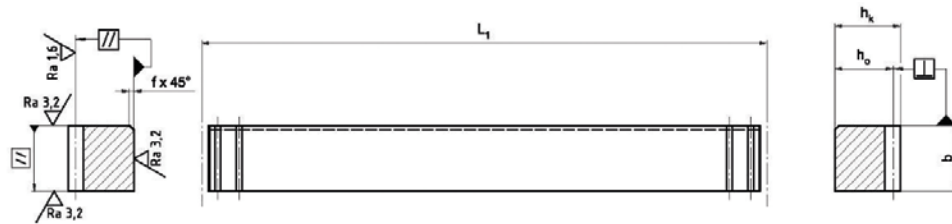


Fig. 3



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
	-	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

2.2 Technical principles

Module pitches straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground, nitrided

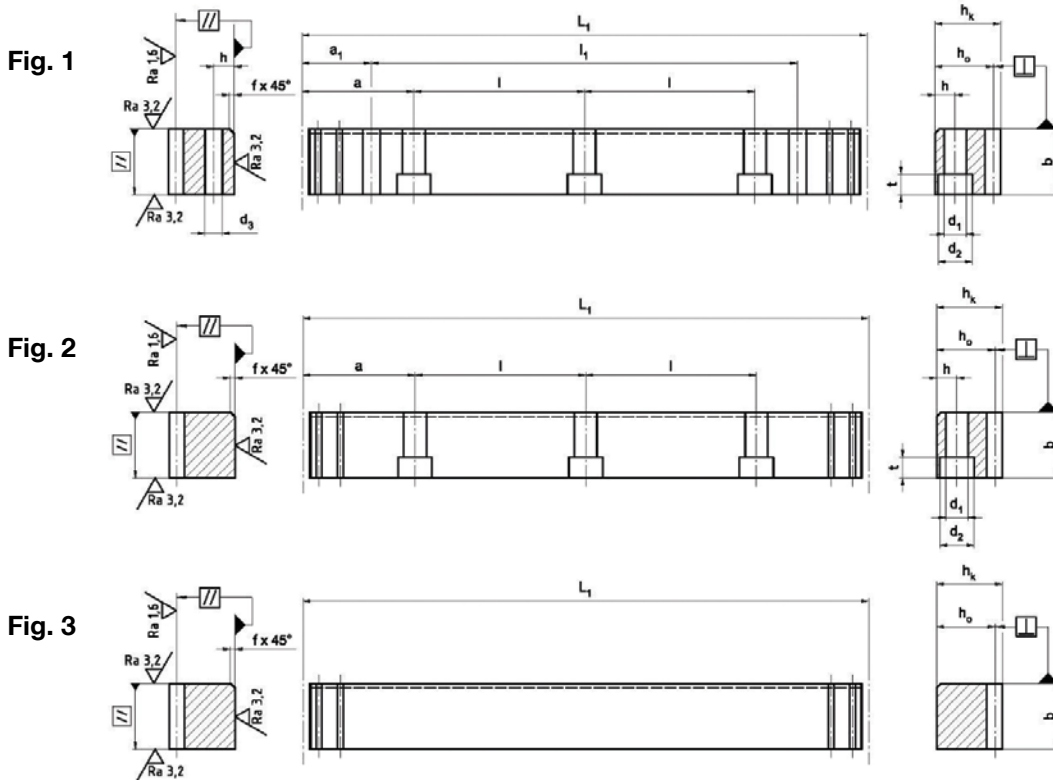
Outer surfaces: ground on all sides

Quality: 9 in accordance with DIN 3962, 3963, 3967

F_p (mm) Total pitch deviation

$F_p/1000$ (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⁾	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

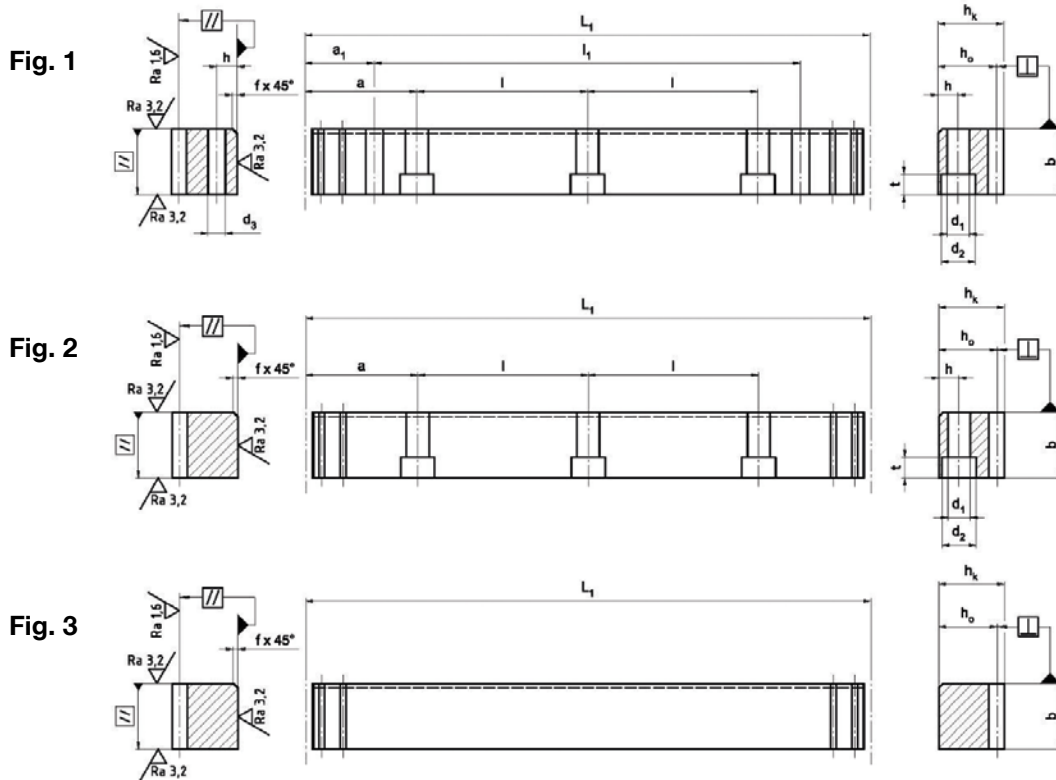
⁴⁾ p Pitch ($p=m \cdot \pi$)

any other lengths on request

2.2 Technical principles

Module pitches straight toothed

Tooth rack:	Pressure angle $\alpha = 20^\circ$ milled, induction hardened	Quality:	11 in accordance with DIN 3962, 3963, 3967
Outer surfaces:	ground on all sides	F_p (mm)	Total pitch deviation
		F_p/1000 (mm)	0,220 for a 1000 mm Length
		F_p/2000 (mm)	0,330 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 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

2.3 Technical principles

Metric pitch, straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground

Outer surfaces: ground on all sides

Quality: 6 in accordance with DIN 3962, 3963, 3967

f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008

F_p (mm) Total pitch deviation
 $Fp/1000$ (mm) 0,035 for a 1000 mm Length

Fig. 1

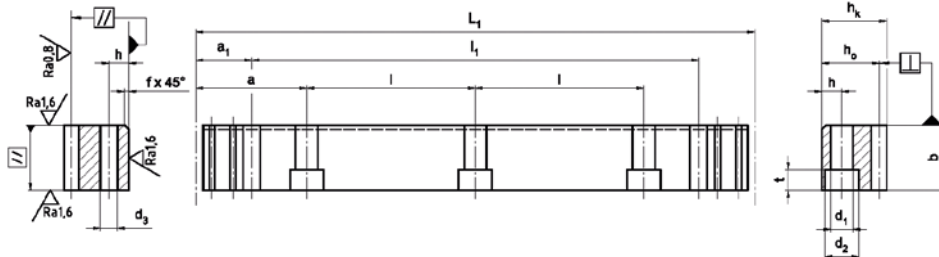


Fig. 2

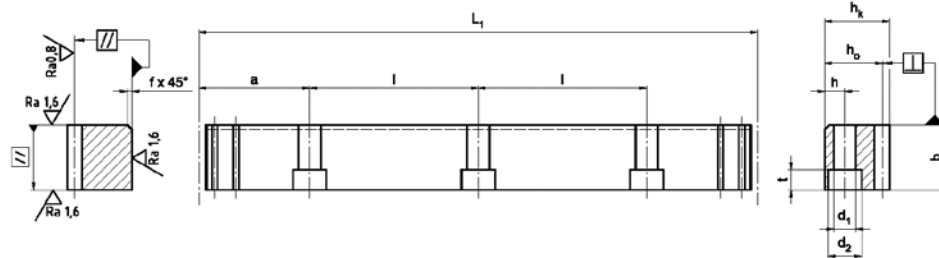
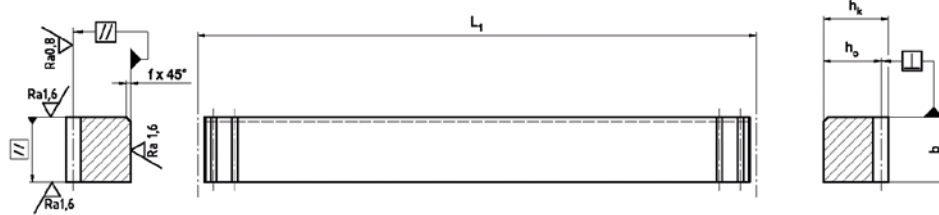


Fig. 3



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							10						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							10						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

²⁾ z Number of teeth

⁴⁾ p Pitch ($p=m \cdot \pi$)

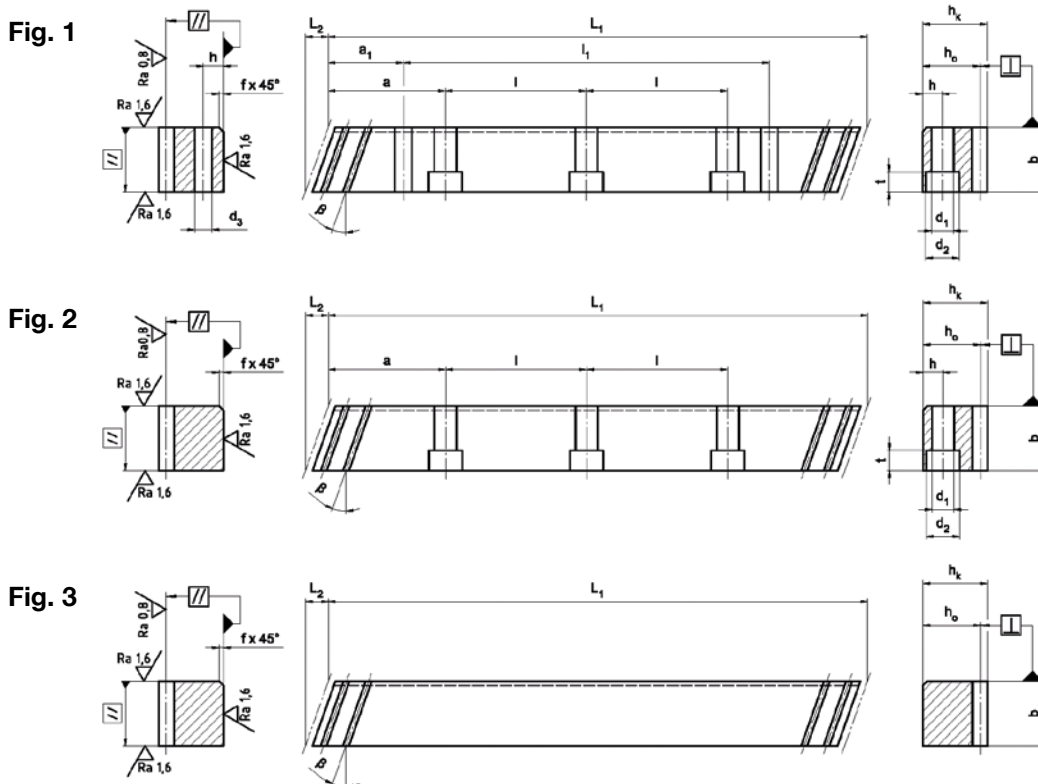
any other lengths on request

2.4 Technical principles

Module pitches helical toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground
Outer surfaces: ground on all sides
Material: X90CrMoV18

Quality: 6 in accordance with DIN 3962, 3963, 3967
 f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008
 F_p (mm) Total pitch deviation
 $F_p/1000$ (mm) 0,035 for a 1000 mm Length



Standard lengths	m ¹⁾	p _s ⁴⁾	L ₁	L ₂	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	mm	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	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

²⁾ z Number of teeth

⁴⁾ p_s Transverse pitch (p_s = m * π / cos β) β = 19.5283° (19°31'42")

any other lengths on request

2.5 Technical principles

Module pitches straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground
Outer surfaces: ground on all sides
Material: X90CrMoV18

Quality: 6 in accordance with DIN 3962, 3963, 3967
 f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008
 F_p (mm) Total pitch deviation
 $F_p/1000$ (mm) 0,035 for a 1000 mm Length

Fig. 1

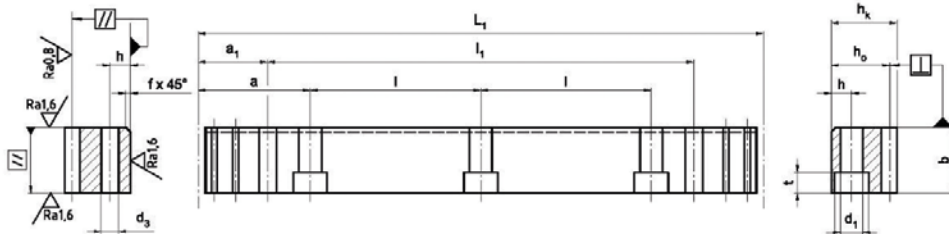


Fig. 2

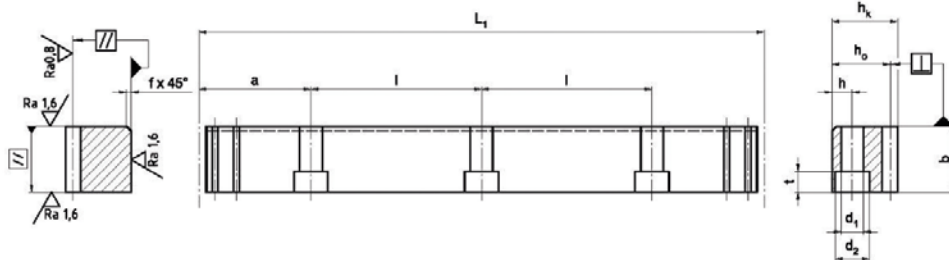
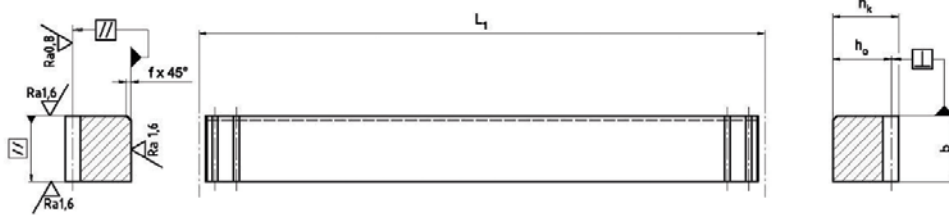


Fig. 3



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
	-	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
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												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
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* π)

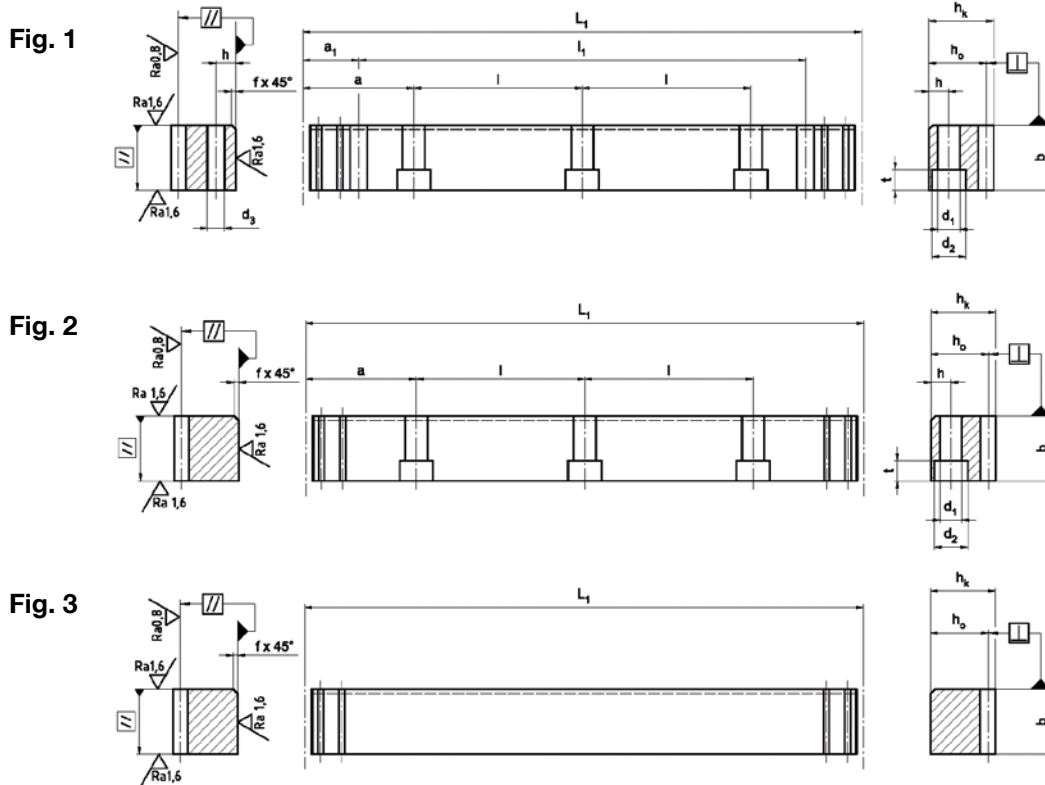
any other lengths on request

2.6 Technical principles

Metric pitch, straight toothed

Tooth rack: Pressure angle $\alpha = 20^\circ$
ground
Outer surfaces: ground on all sides
Material: X90CrMoV18

Quality: 6 in accordance with DIN 3962, 3963, 3967
 f_p (mm) Single pitch deviation
Module ≤ 3 : 0.006
Module > 3 : 0.008
 F_p (mm) Total pitch deviation
 $F_p/1000$ (mm) 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								10							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								10								1150
MST T10 - 29 x 29 x 200 - G	10	3.183	200	20	29	29	25,82													1.2

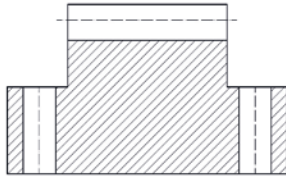
1) m Module 3) n Number of holes
2) z Number of teeth 4) p Pitch ($p=m \cdot \pi$)

any other lengths on request

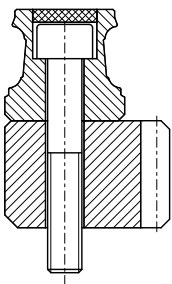
2.7 Technical principles

Customised gear racks

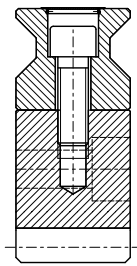
Any gear racks and guide racks can be made to a customer's drawing as long as they are within the specifications listed below.



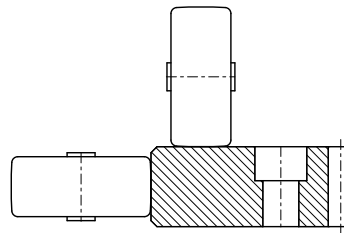
Unit weight:	max. 500 kg
Length:	max. 3000 mm
Tooth rack:	Modules 2 ... 20 Metric 5 mm ... 20 mm
Helix angle β	-30° ... +30° Left and right ascending
Material:	C45, 42CrMo4+QT, 16MnCr5 X90CrMoV18 (stainless steel)
Hardening process:	Induction hardening Case hardening Through hardening Nitriding
Best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



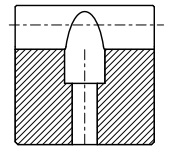
Combination with profiled linear guideway



Screw connection from below



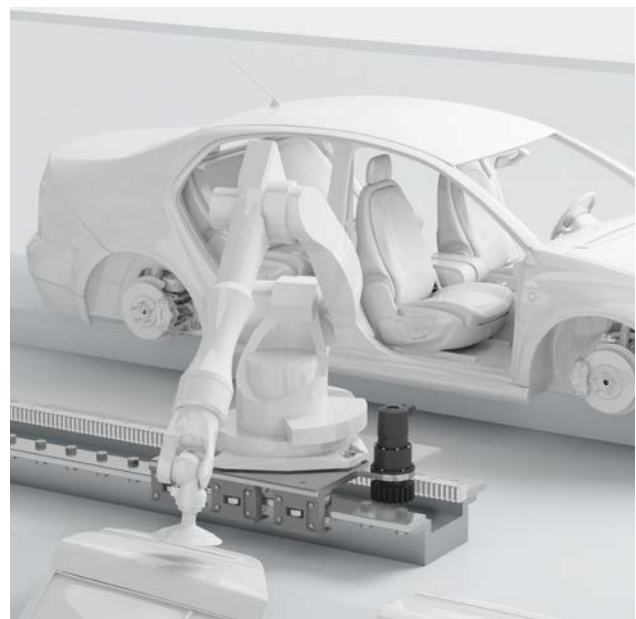
Box way with integrated tooth rack



Screw connection through the tooth rack



Gear rack integrated into linear bearing (guide rack)



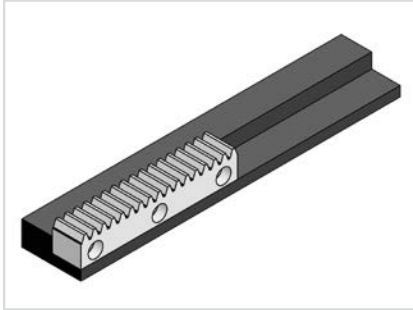
3.1 Installation

Gear rack fitting instructions / lubrication

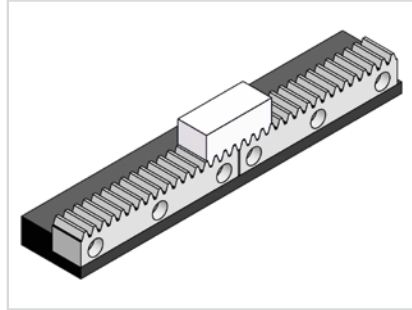
Gear racks can be assembled in any lengths.

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

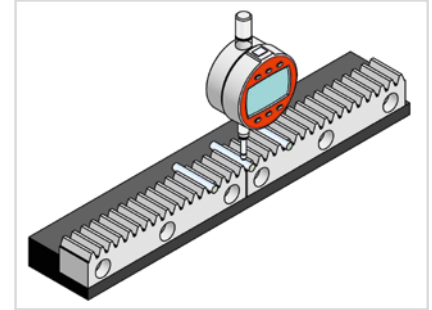
Dowels may be needed for gear racks shorter than 1m.



- 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.

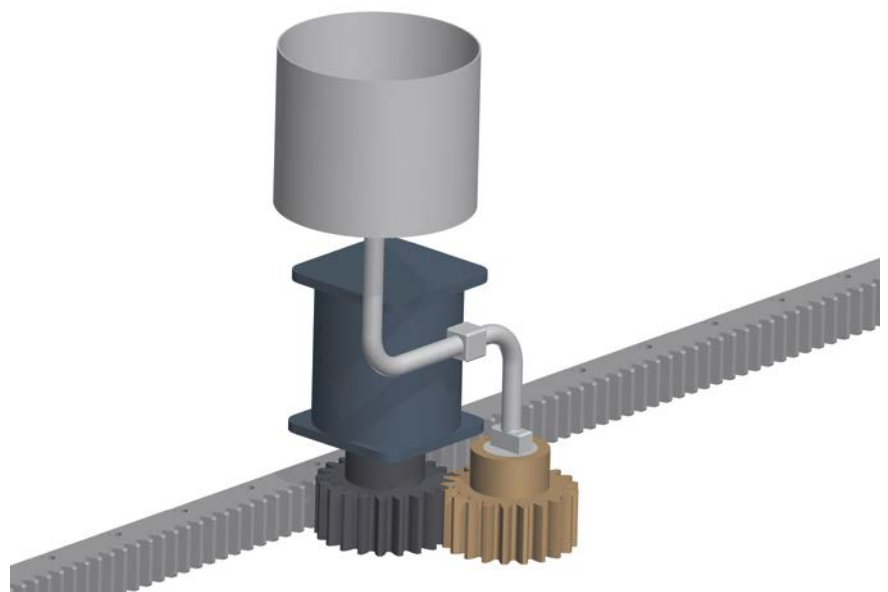
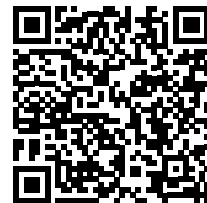
Apart from the initial lubrication during assembly, the machine must be lubricated regularly during operation.

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.



4.1 Order description

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 h _k x L ₁	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 h _k x L ₁	in mm					
Tooth rack	SL	inclined to the left, 19.5283°					
	G	straight					

4.1 Order description

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 h _k x L ₁	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									
	S	special material									
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 ($l_x = \frac{1}{2} * l$)									
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 h _k x L ₁	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

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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PROSPECTUSES

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