

STAR – Ball and Roller Rail Systems

with Gear Rack

STAR – Ball and Roller Rail Systems, with Gear Rack

Product Overview

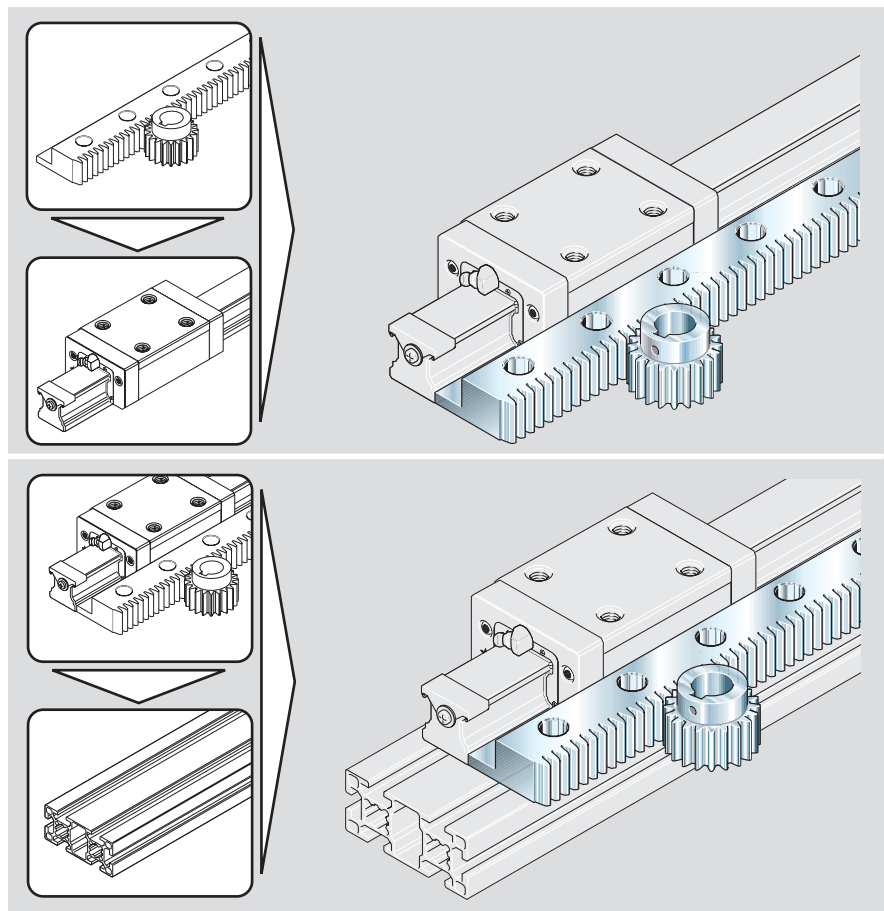
Gear rack, L-type

with straight teeth for narrow runner blocks (ball and roller)

Gear racks and runner blocks **of all sizes** can be combined at random.

Gear rack size		Ball guide size	Roller rail
25, 30, 35		25	25
		30	–
		35	35

Guide and gear rack can be mounted on the ALU-STAR profile system.



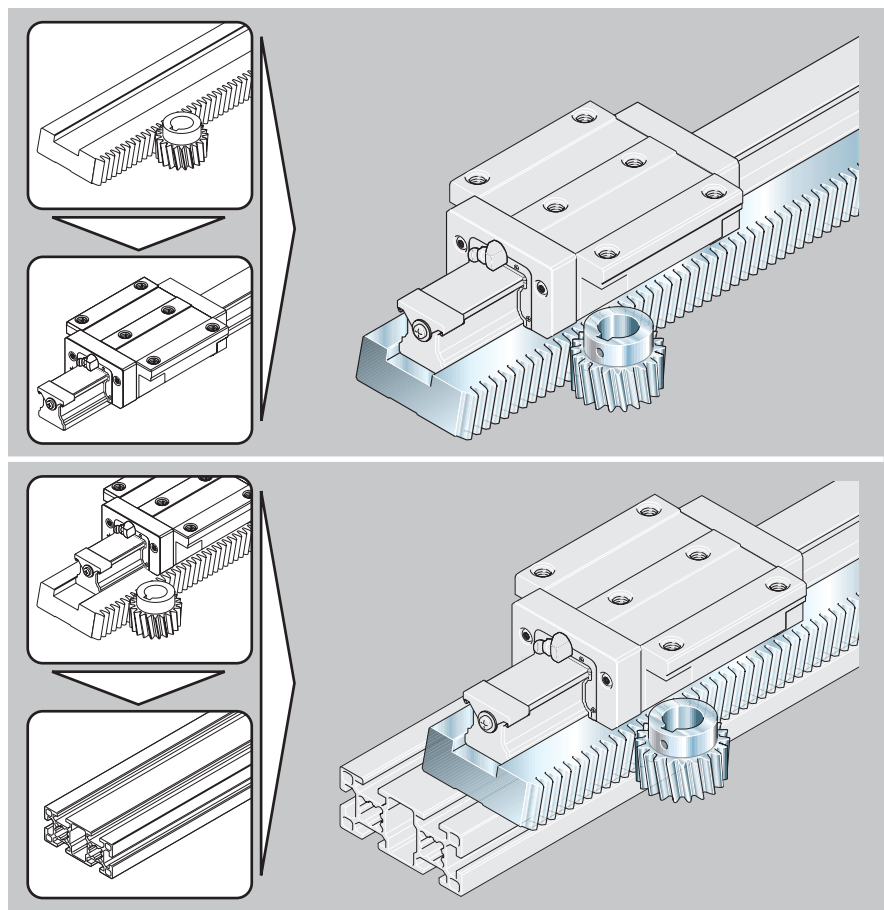
Gear rack, slot-type

with helical teeth for all ball runner blocks

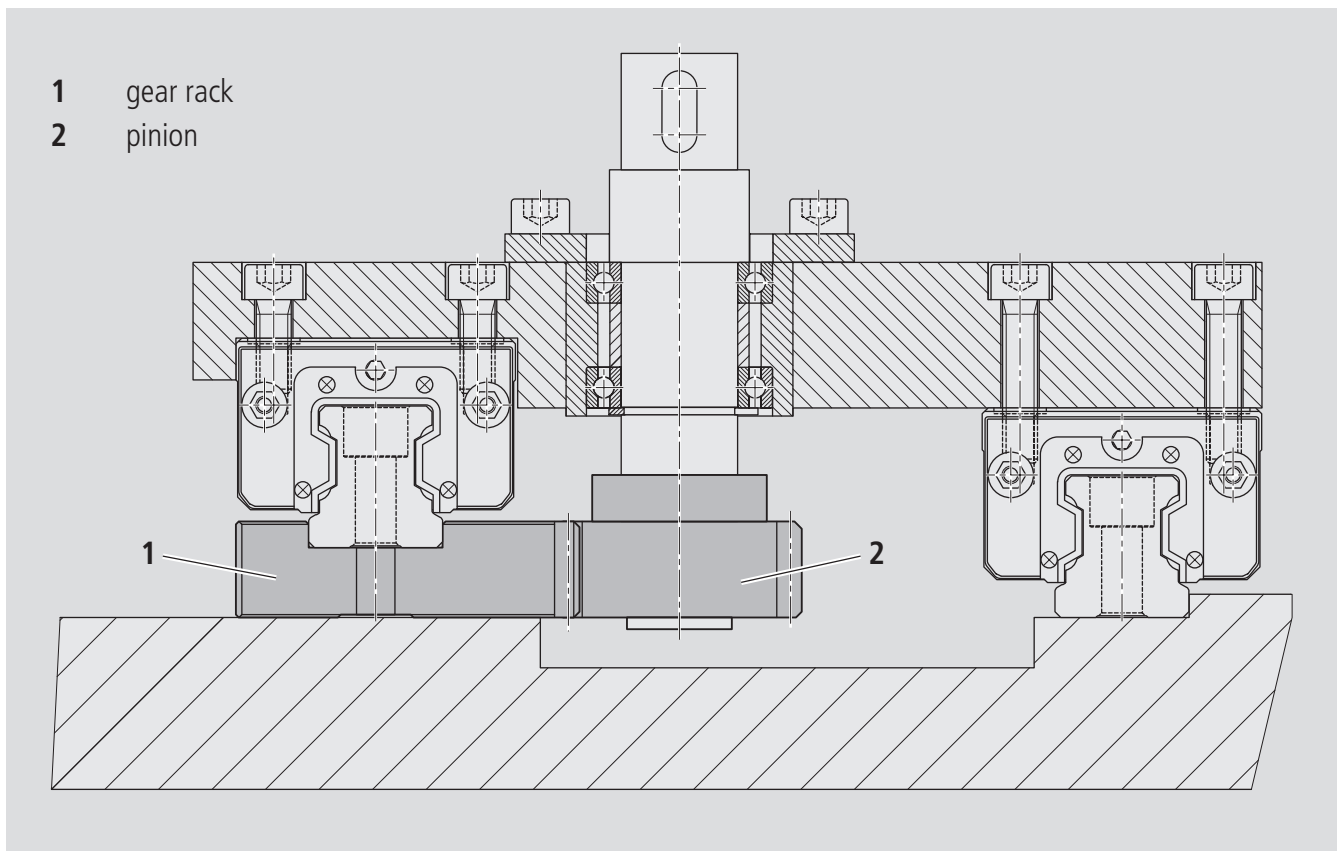
Only gear racks and runner blocks **of the same size** can be combined.

Gear rack size	Ball guide rail size
25	25
30	30
35	35

Guide and gear rack can be mounted on the ALU-STAR profile system.



Application example



Gear racks with pinion drive are an addition to the STAR range of ball and roller rail systems.



RD 82 201



RD 82 301

STAR – Ball and Roller Rail Systems, with Gear Rack

Gear rack, L-type with straight teeth

Gear rack, L-type with straight teeth

Inductively hardened and ground.

Quality grade 7

for narrow ball runner blocks: 1621/1622/

1623/1624/1632/1694/1666/1664

or roller runner blocks 1821/1824

Pinion with straight teeth Type A with keyway

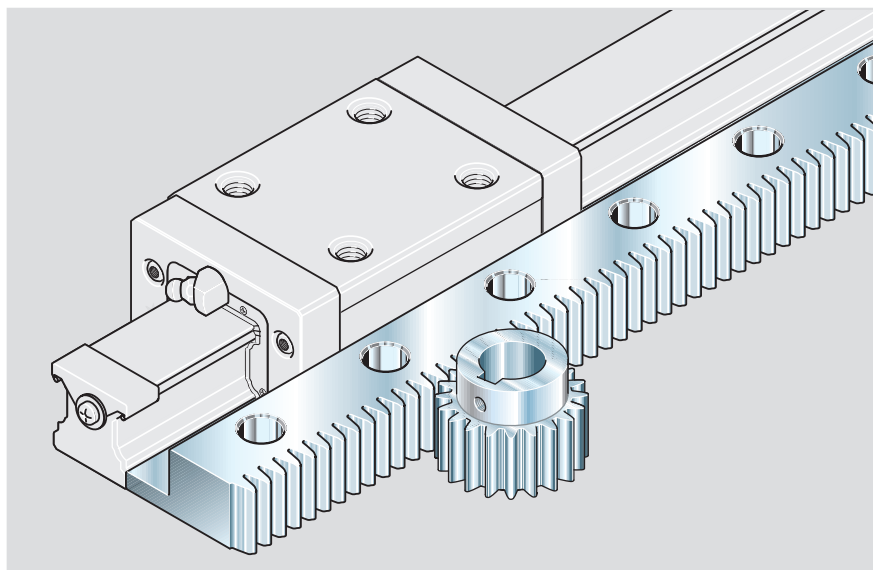
Hardened teeth (HRC 58+2), ground teeth and bore.

Quality grade 6H24.

Type B with bore

Hardened and ground teeth (HRC 58+2), soft bore.

Quality grade 6H24.



Gear rack, L-type with straight teeth

Size	Dimensions [mm]																Order number for Gr ¹⁾ 1200 mm length code	L [mm] length code		Weight for Gr ¹⁾ 1200 mm [kg]
	L	m	H1	H2	T	T1	p	B1	B2	B3	N6	B4	B5	D5	S5	-.4-		-.5-		
25	1200	1.91	5	16.5	60	30	6	28.5	19.5	52.09	7.45	54	40	11	7	2050-203-01	600	300	5.81	
30	1200	2.55	5	19	80	40	8	36	19.5	64.48	7.65	67	50	15	9	2050-703-01	640	320	8.68	
35	1200	3.18	5	22	80	40	10	33	19.5	62.85	10.65	66	50	15	9	2050-303-01	640	320	9.59	

¹⁾ gear rack

Pinion with straight teeth Type A with keyway

Module: 1.91 mm for gear rack size 25

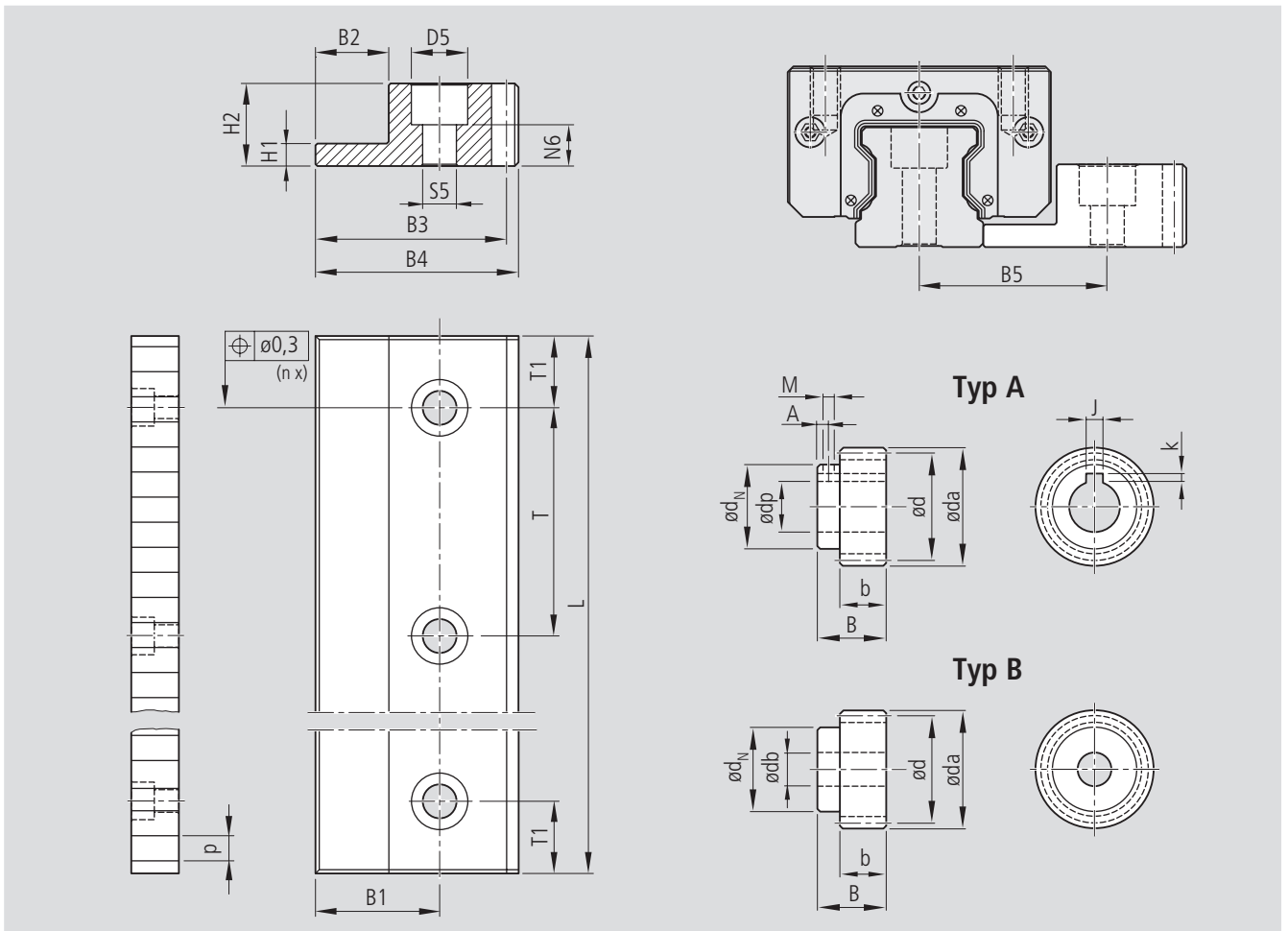
Number of teeth	p	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	6	42.02	38.198	16.5	24.5	18	30	M4	4	6 x 2.8	2051-203-01	0.141	
25		51.57	47.747	16.5	24.5	18	35	M4	4	6 x 2.8	2051-204-01	0.240	
30		61.12	57.297	16.5	24.5	18	40	M4	4	6 x 2.8	2051-205-01	0.361	

Module: 2.55 mm for gear rack size 30

Number of teeth	p	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	8	56	50.93	19	26	20	40	M4	3.5	6 x 2.8	2051-703-01	0.306	
25		68.8	63.662	19	26	20	45	M4	3.5	6 x 2.8	2051-704-01	0.495	
30		81.5	76.395	19	26	20	50	M4	3.5	6 x 2.8	2051-705-01	0.724	

Module: 3.18 mm for gear rack size 35

Number of teeth	p	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	10	70	63.662	22	30	25	50	M5	4	8 x 3.3	2051-303-01	0.551	
25		85.9	79.577	22	30	25	55	M5	4	8 x 3.3	2051-304-01	0.886	
30		101.8	95.493	22	30	25	60	M5	4	8 x 3.3	2051-305-01	1.292	



Pinion with straight teeth Type B with bore

Module: 1.91 mm for gear rack size 25

Number of teeth	p	Dimensions [mm]						Order number	Weight [kg]
		da	d	b	B	d_N	db H7		
20	6	42.02	38.198	16.5	24.5	30	12	2051-223-01	0.171
25		51.57	47.747	16.5	24.5	35	12	2051-224-01	0.271
30		61.12	57.297	16.5	24.5	40	12	2051-225-01	0.391

Module: 2.55 mm for gear rack size 30

Number of teeth	p	Dimensions [mm]						Order number	Weight [kg]
		da	d	b	B	d_N	db H7		
20	8	56	50.93	19	26	40	14	2051-723-01	0.341
25		68.8	63.663	19	26	45	14	2051-724-01	0.531
30		81.5	76.395	19	26	50	14	2051-725-01	0.815

Module: 3.18 mm for gear rack size 35

Number of teeth	p	Dimensions [mm]						Order number	Weight [kg]
		da	d	b	B	d_N	db H7		
20	10	70	63.662	22	30	50	15	2051-323-01	0.631
25		85.9	79.577	22	30	55	15	2051-324-01	0.967
30		101.8	95.493	22	30	60	15	2051-325-01	1.373

Number of teeth	Maximal transmittable torques M_{max} [Nm]		
	module 1.91 mm P=6	module 2.55 mm P=8	module 3.18 mm P=10
20	69	125	195
25	100	180	275
30	130	225	345

STAR – Ball and Roller Rail Systems, with Gear Rack

Gear rack, slot-type with helical teeth

Gear rack, slot-type with helical teeth

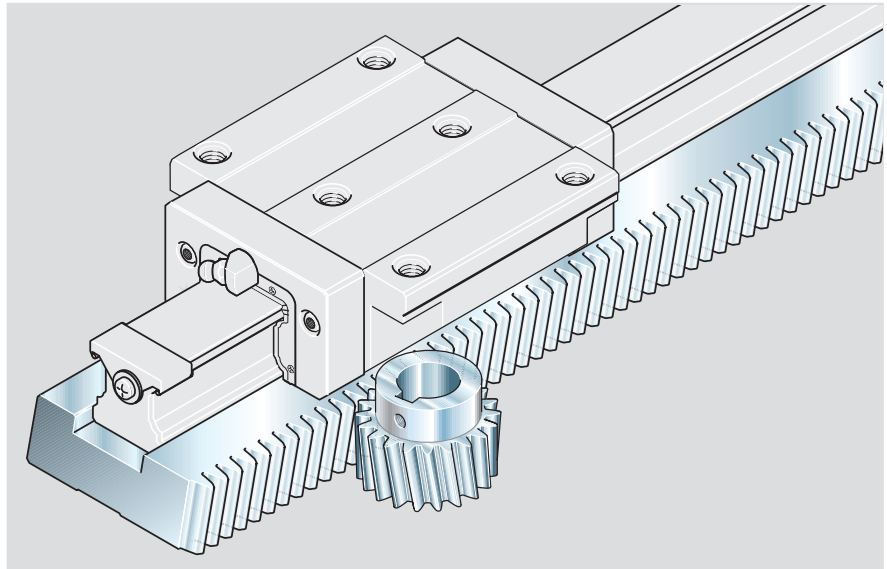
Inductively hardened and ground.
Quality grade 7
for all ball runner blocks

Pinion with helical teeth Type A with keyway

Hardened teeth (HRC 58+2), ground teeth and bore.
Quality grade 6H24.

Type B with bore

Hardened and ground teeth (HRC 58+2), soft bore.
Quality grade 6H24.



Gear rack, slot-type with helical teeth

Size	Dimensions [mm]													Ordernumber for Gr ¹⁾ 1200 mm length code	L [mm] length code		Weight for Gr ¹⁾ 1200 mm [kg]
	L	m _t	H1	H2	T	T1	p _t	B1	B2	B3	B4	B5	S5		--4-	--5-	
25	1200	1.59	12	16.5	60	30	5	11.5	23	21.6	23.1	59	7	2050-213-01	600	300	7.89
30	1200	3.18	14	19	80	40	10	14	28	22.47	25.47	69	9	2050-713-01	640	320	10.38
35	1200	3.18	16	22	80	40	10	17	34	30.85	33.85	85.5	9	2050-313-01	640	320	15.04

¹⁾ gear rack

Pinion with helical teeth

Type A with keyway

Module m_t: 1.59 mm for gear rack size 25, m_n: 1.5

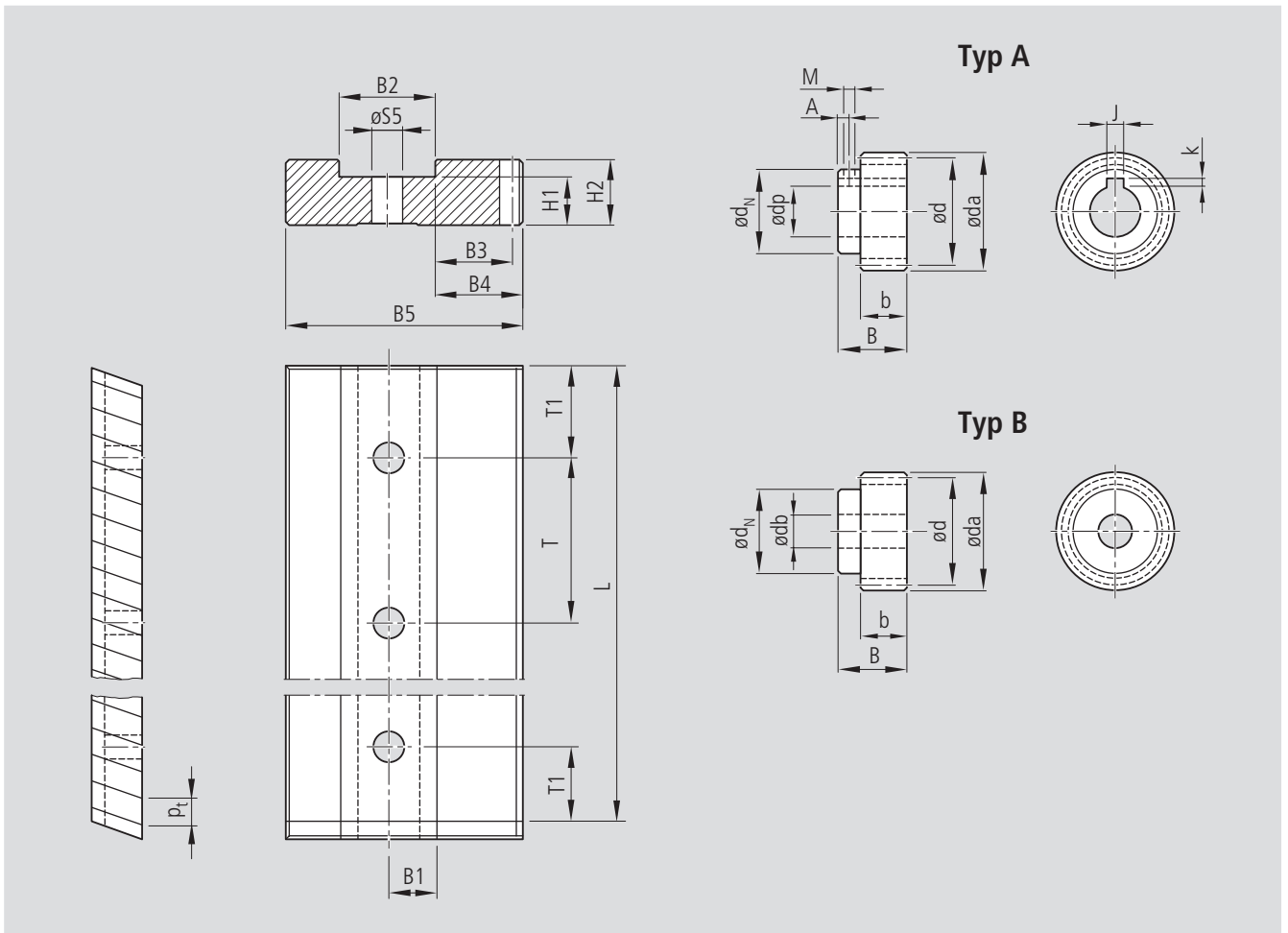
Number of teeth	p _t	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	5	34.8	31.831	16.5	24.5	18	27	M4	4	6 x 2.8	2051-213-01	0.087	
25		42.8	39.789	16.5	24.5	18	30	M4	4	6 x 2.8	2051-214-01	0.154	
30		50.7	47.747	16.5	24.5	18	35	M4	4	6 x 2.8	2051-215-01	0.240	

Module m_t: 3.18 mm for gear rack size 30, m_n: 3

Number of teeth	p _t	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	10	69.7	63.662	19	26	25	50	M5	3.5	8 x 3.3	2051-713-01	0.477	
25		85.6	79.578	19	26	25	55	M5	3.5	8 x 3.3	2051-714-01	0.767	
30		101.5	95.493	19	26	25	60	M5	3.5	8 x 3.3	2051-715-01	1.117	

Module m_t: 3.18 mm for gear rack size 35, m_n: 3

Number of teeth	p _t	Dimensions [mm]									Keyway JP9 Jxk	Order number	Weight [kg]
		da	d	b	B	dp H6	d _N	M	A				
20	10	69.7	63.662	22	30	25	50	M5	3.5	8 x 3.3	2051-313-01	0.551	
25		85.6	79.578	22	30	25	55	M5	3.5	8 x 3.3	2051-314-01	0.886	
30		101.5	95.493	22	30	25	60	M5	3.5	8 x 3.3	2051-315-01	1.292	



Pinion with helical teeth Type B with bore

Module m_t : 1.59 mm for gear rack size 25, m_n : 1.5

Number of teeth	p_t	Dimensions [mm]						Order number	Weight [kg]
		d_a	d	b	B	d_N	db H7		
20	5	34.8	31.831	16.5	24.5	27	12	2051-233-01	0.117
25		42.8	39.789	16.5	24.5	30	12	2051-234-01	0.184
30		50.7	47.747	16.5	24.5	40	12	2051-235-01	0.271

Module m_t : 3.18 mm for gear rack size 30, m_n : 3

Number of teeth	p_t	Dimensions [mm]						Order number	Weight [kg]
		d_a	d	b	B	d_N	db H7		
20	10	69.7	63.662	19	26	50	16	2051-733-01	0.542
25		85.6	79.578	19	26	55	16	2051-734-01	0.831
30		101.5	95.493	19	26	60	16	2051-735-01	1.183

Module m_t : 3.18 mm for gear rack size 35, m_n : 3

Number of teeth	p_t	Dimensions [mm]						Order number	Weight [kg]
		d_a	d	b	B	d_N	db H7		
20	10	69.7	63.662	22	30	50	16	2051-333-01	0.626
25		85.6	79.578	22	30	55	16	2051-334-01	0.961
30		101.5	95.493	22	30	60	16	2051-335-01	1.367

Number of teeth	Maximal transmittable torques M_{max} [Nm]		
	module 1.59 mm Gr ¹⁾ Gr.25 $P_t = 5$	module 3.18 mm Gr ¹⁾ Gr.30 $P_t = 10$	module 3.18 mm Gr ¹⁾ Gr.35 $P_t = 10$
20	68	240	280
25	97	340	405
30	117	430	510

¹⁾ gear rack

STAR – Ball and Roller Rail Systems, with Gear Rack

Lubrication and calculation of the gear rack drive

Lubrication of the gear rack drive

The teeth of the gear rack have to be lubricated with grease after approx. 200 hours of operation or at least once a month. For units in a vertical set-up or units used in difficult operating conditions the lubrication intervals have to be shortened to approx. 100 hours of operation (weekly).

Gear racks and pinions have to be cleaned of dirt and remnants of old grease.

Lubricants for gear racks:

Adhesive grease with fatty additives, e.g. AVIA Aluplex 2RHY from Bantelon or any other equivalent adhesive grease (usually containing graphite).

Alternatively, for cases in which these additives are unwelcome it is possible to use transparent but lower-duty lubricants such as VISCOGEN KL 300 from Optimol.

Calculation

for a horizontal axis

$$F_V = F_R + m \cdot a; [N]$$

$$F_R = \text{friction of all the runner blocks used [N]} \\ = F_1 + F_2$$

$$m = \text{moved mass [kg]}$$

for a vertical axis

$$F_V = \pm m \cdot g + m \cdot a + F_{Ri}; [N]$$

$$g = 9.81 \frac{m}{s^2};$$

$$a = \text{acceleration } \frac{m}{s^2}$$

$$M_{\text{required}} = \frac{F_V \cdot d}{2}; [Nm]$$

$$M_{\text{permissible}} = \frac{M_{\text{max}}}{k \cdot s \cdot f}; [Nm]$$

Type of loading k

Drive	type of loading k of the machine to be driven		
	uniform	medium shocks	servere shocks
uniform	1	1.25	1.75
medium shocks	1.25	1.5	2
servere shocks	1.5	1.75	2.25

Safety factor s

1.1 - 1.4

Service life factor f

Axial distance between rotary bearing and the pinion tooth width center line		type of loading k of the machine to be driven			
		1 x tooth width		2 x tooth width	
Lubrication		continuous	daily	continuous	daily
Peripheral speed [m/s]	[m/min]				
0.5	30	0.85	0.95	1.05	1.15
1.0	60	0.95	1.10	1.15	1.30
1.5	90	1.00	1.20	1.20	1.45
2.0	120	1.05	1.30	1.25	1.60
3.0	180	1.10	1.50	1.40	1.90
5	300	1.25	1.90	1.55	2.30

Condition

$$M_{\text{required}} \leq M_{\text{permissible}}$$

Frictional forces

Ball runner blocks

Frictional forces F_1 , F_2

1. Frictional forces F_1

Ball runner block of **standard length** on a guide rail with cover strip

Frictional forces [N]				
Size	up to approx. 10 μm clearance	Preload class		
		preload 0.02 C	preload 0.08 C	preload 0.13 C
25	13.5	18.5	22.5	26.5
30	15.8	21.8	26.8	32.8
35	20.8	28.8	34.8	42.8

Ball runner block, **long**, on a guide rail with cover strip

Frictional forces [N]				
Size	up to approx. 10 μm clearance	Preload class		
		preload 0.02 C	preload 0.08 C	preload 0.13 C
25	13.5	20.5	25.5	30.5
30	15.8	23.8	29.8	36.8
35	20.8	29.8	37.8	48.8
45	25.4	37.4	49.4	66.4

2. Frictional forces F_2

$$F_2 = F \times 0.003 \text{ [N]} \quad F = \text{resulting external force [N]}$$

Roller runner blocks

Frictional forces F_R

Roller runner block on a guide rail with cover strip

Frictional forces [N]			
Size	preload 0.02 C	Preload class	
		preload 0.08 C	preload 0.13 C
25	30	30	30
35	40	40	40

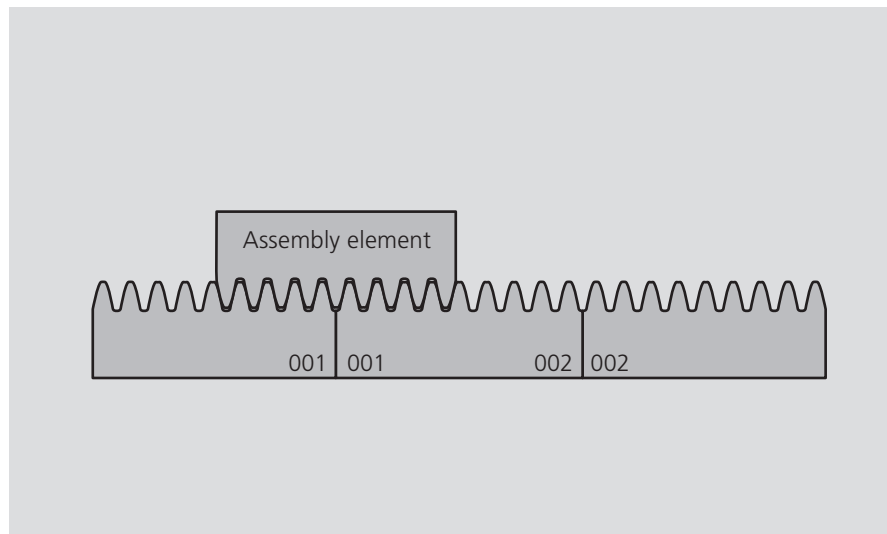
STAR – Ball and Roller Rail Systems, with Gear Rack

Mounting the gear rack drive

Mounting

Composite gear racks:

Composite gear racks are mounted with an assembly element.



Gear rack L-Type Assembly elements

Size	L [mm]	m [mm]	Order number	
			Gear rack	Assembly element
25	200	1.91	2050-203-01	2052-203-01
30	200	2.55	2050-703-01	2052-703-01
35	200	3.18	2050-303-01	2052-303-01

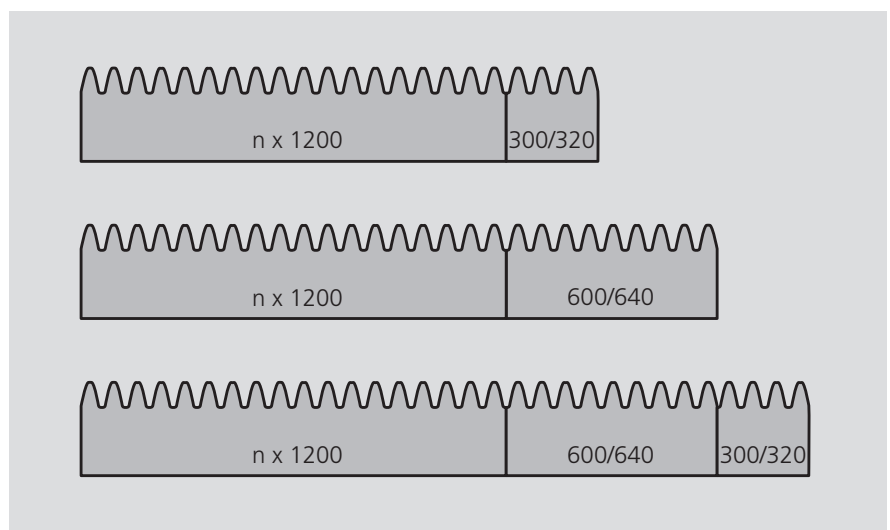
Gear rack slot-type Assembly elements

Size	L [mm]	m _t [mm]	Order number	
			Gear rack	Assembly element
25	200	1.59	2050-213-01	2052-213-01
30	200	3.18	2050-713-01	2052-713-01
35	200	3.18	2050-313-01	2052-713-01

Tooth flank clearance:

To comply with the required level of precision, for normal applications, do not set a value smaller than 0.02 mm over the entire travel path.

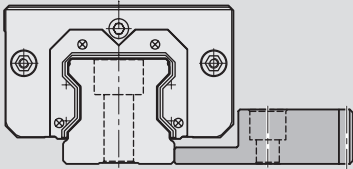
Length grid



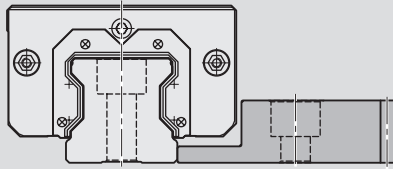
Gear rack, L-type, mounting options

Ball rail guide size 35 / Roller rail guide size 35

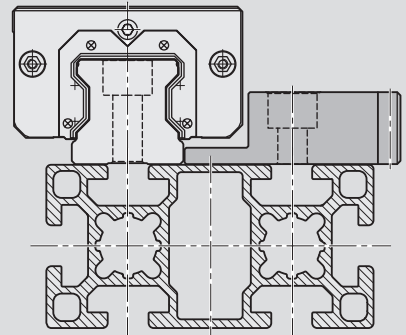
Gear rack size 25



Gear rack size 30



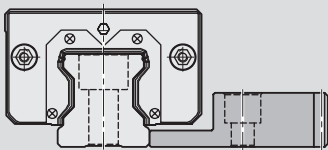
Gear rack size 35



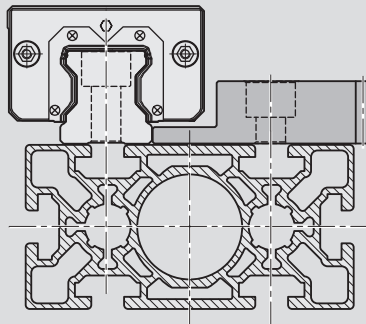
Profil 50 x 100

Ball rail guide size 30

Gear rack size 25

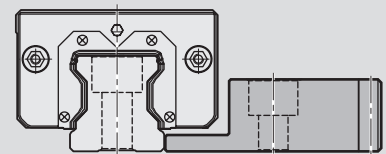


Gear rack size 30



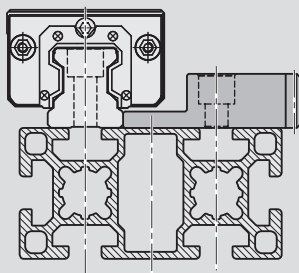
Profile 50 x 100

Gear rack size 35



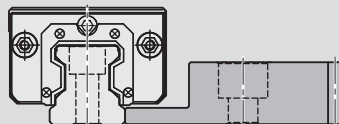
Ball rail guide size 25 / Roller rail guide size 25

Gear rack size 25

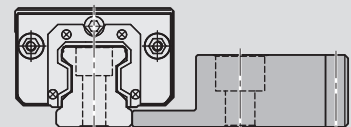


Profile 40 x 80

Gear rack size 30



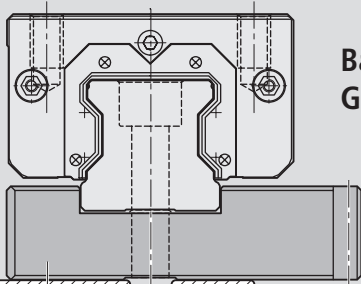
Gear rack size 35



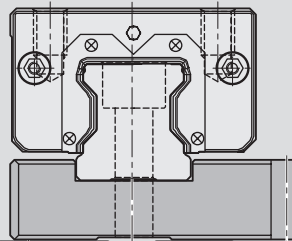
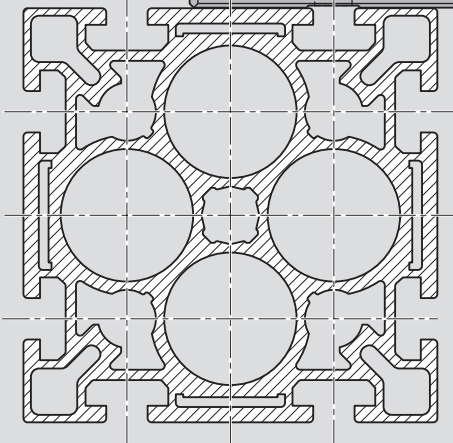
STAR – Ball and Roller Rail Systems, with Gear Rack

Gear rack, slot-type, mounting options

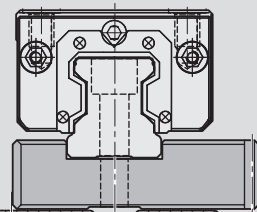
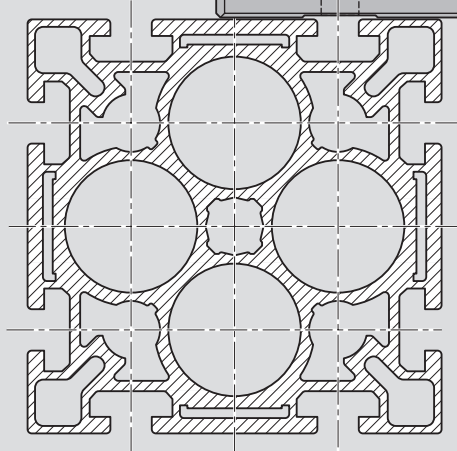
Mounted on a profile 100 x 100



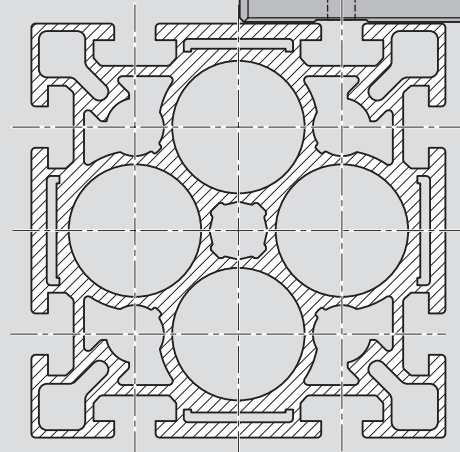
Ball rail guide size 35
Gear rack size 35



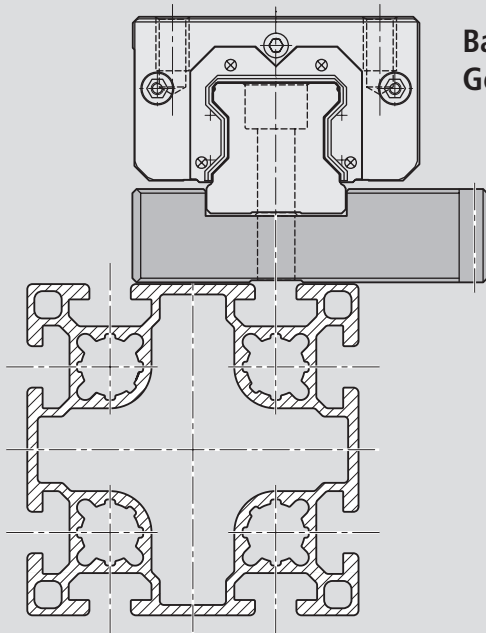
Ball rail guide size 30
Gear rack size 30



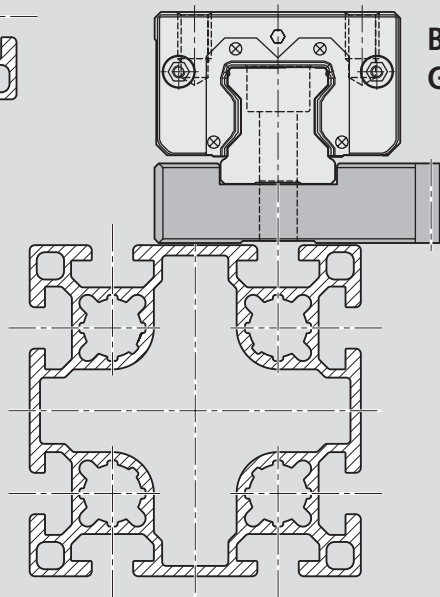
Ball rail guide size 25
Gear rack size 25



Mounted on a profile 80 x 80

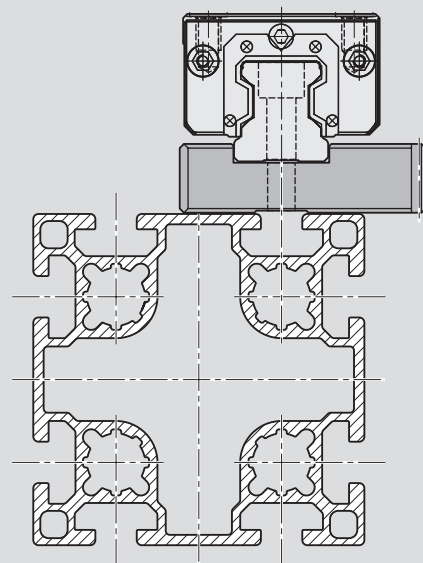


Ball rail guide size 35
Gear rack size 35



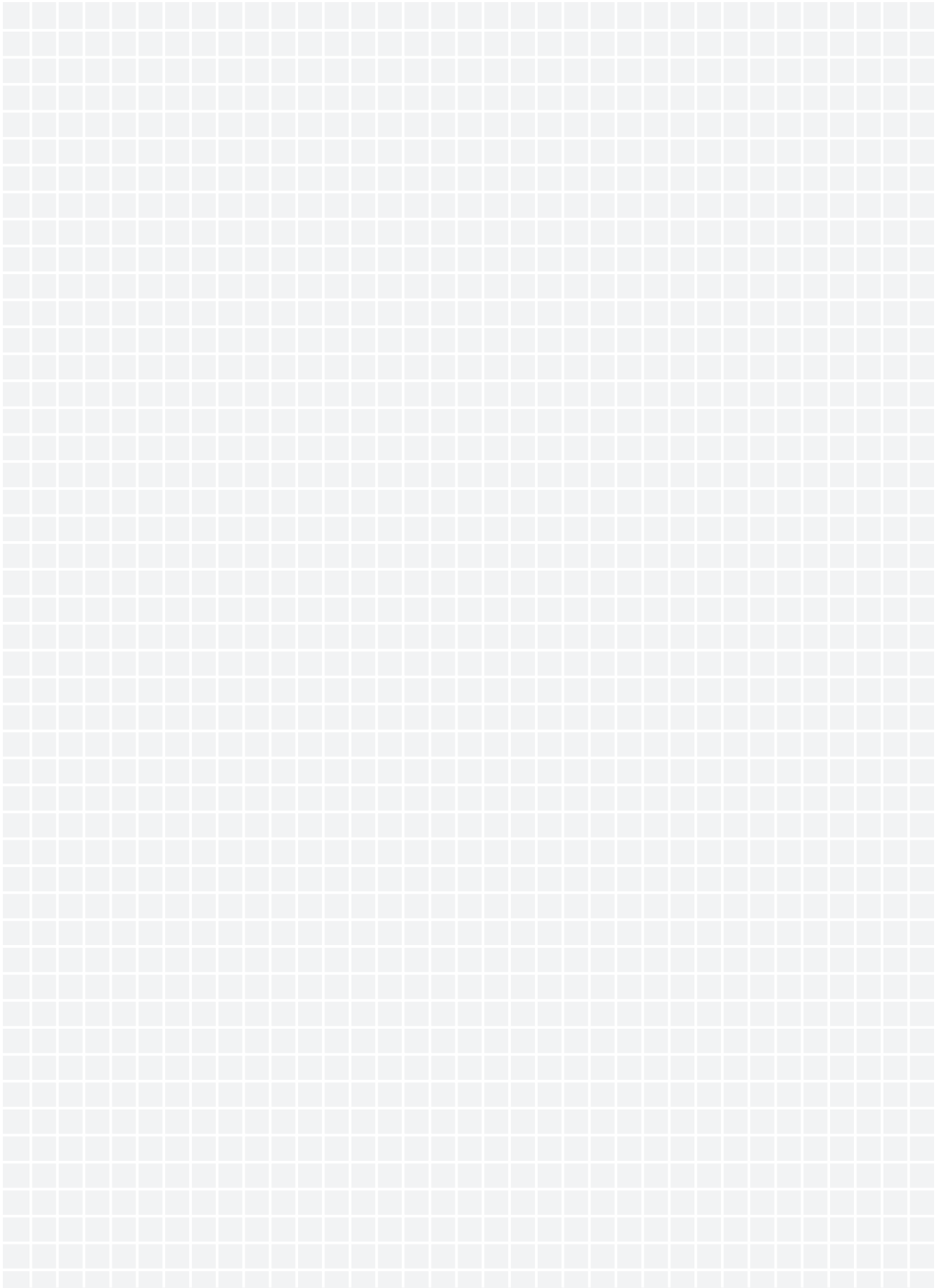
Ball rail guide size 30
Gear rack size 30

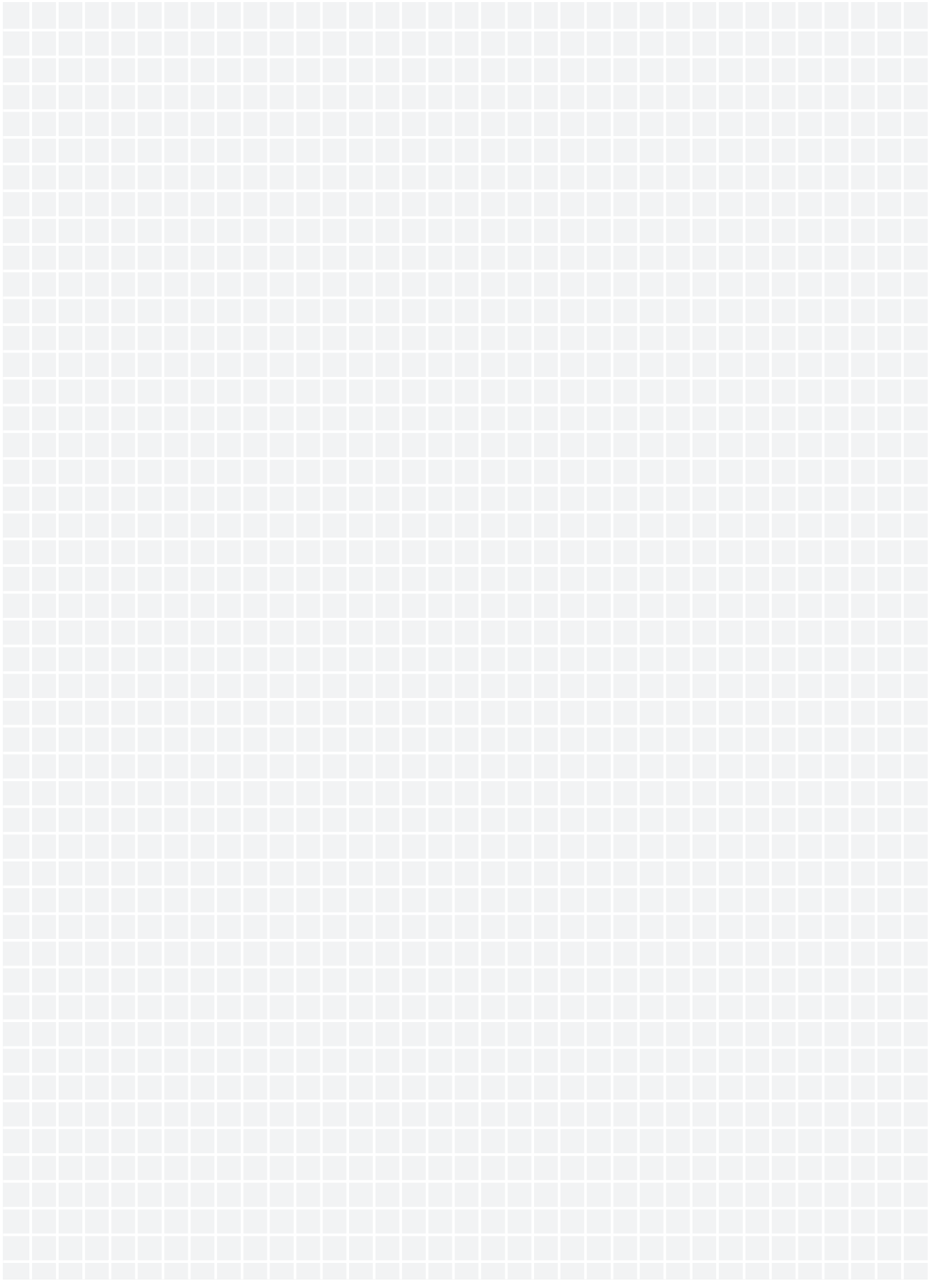
Ball rail guide size 25
Gear rack size 25



STAR – Ball and Roller Rail Systems, with Gear Rack

Notes / Drawings





Great care has been taken during the compilation of this publication to ensure all the information contained is accurate. We accept no responsibility however for any damage resulting from incorrect or incomplete information contained.

For deliveries and other services in the course of commercial business, the general terms and conditions for supplies and services contained in the valid price lists and the confirmations of order apply.

As our products are constantly in the process of further development, they are subject to alternation without notice.

Reproduction of this document, even in extract form, is only permitted with our approval.



DQS - certified according
to DIN EN ISO 9001
(reg. no. 1617)



Bosch Rexroth AG
Linear Motion and Assembly Technologies
D-97419 Schweinfurt

Telefon +49-97 21-9 37-0
Telefax +49-97 21-9 37-275
(general)
Telefax +49-97 21-9 37-250
(direct)
Internet www.rexroth-star.com

STAR – Ball and Roller Rail Systems
with Gear Rack
RE 82 217/2001-08