In-Position Technologies

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ZV Rack and Pinion Systems

STÖBER

Geared to a higher standard™

ZV Rack and Pinion Systems

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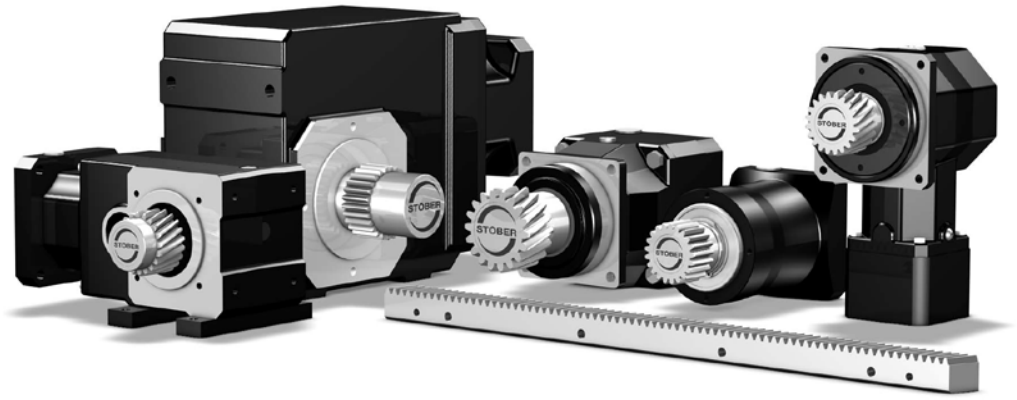


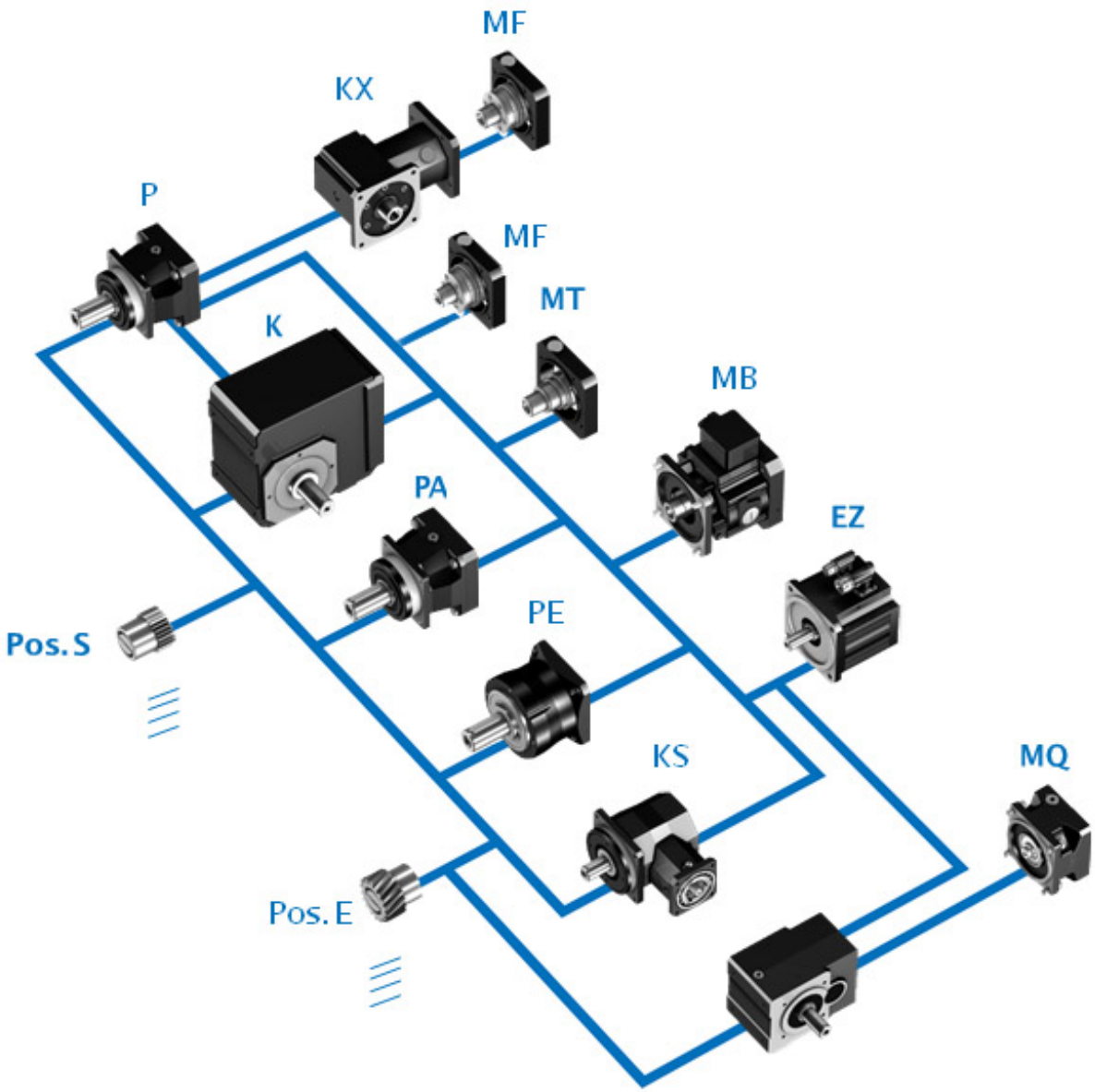
ZV Rack and Pinion Systems

- Drive solutions for automation and robotics, ready for installation
- Suitable gear units of series PE / P / PA / KS / KL / K are available for almost every application
- STÖBER synchronous servo motors can be attached directly
- Feed forces up to 16 kN
- Optimal adaptation of the mass moment of inertia ratios by varying the gear ratios / number of pinion teeth
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Matching lubrication system components (optional)

Pinion

- Case hardened and ground
- Gearing quality 7
- With helical or straight tooth (with crowning)
- Modules 2, 3 and 4
- Two attachment positions on the shaft are possible (tooth flush with shaft end (pos. E) or shaft shoulder (pos. S))
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)

Product Range



P, PA, PE Part Number Breakdown

Z	V	2	16	S	E	P	5	2	2	M	P	D	0250	MT
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

1. **Z** – Rack and pinion design
2. **V** – Attachable pinion
3. **2** – Gearing module
4. **16** – Number of teeth
5. Gearing:
   - **S** – helical gearing 19° 31’ 42’’ left-hand
   - **G** – straight-cut gearing
6. Pinion Position:
   - **E** – Shaft end
   - **S** – Shaft shoulder
7. Gear Unit Type:
   - **PE** – planetary gearbox
   - **P** – planetary gearbox
   - **PA** – planetary gearbox with low backlash
8. **5** – Gear Unit Size
9. **2** – Generation Number
10. Gear Stages:
    - **1** – 1 stage
    - **2** – 2 stage
11. Housing Design:
    - **S** – Standard design
    - **M** – Adjustment plate with shaft design
12. Shaft Design:
    - **P** – Shaft with key
13. Bearing Design:
    - **R** – Normal bearings (P, PE)
    - **D** – Reinforced axial bearings (P, PA)
    - **Z** – Reinforced radial bearings (P)
14. **0250** – Transmission ratio i x 10
15. Input Options:
    - **MT** – square motor adapter
    - **MTL** – large square motor adapter
    - **MB** – motor adapter with brake
    - **EZ** – synchronous servo motors
    - **KX** – angular gear input
    - **K** – angular gear input

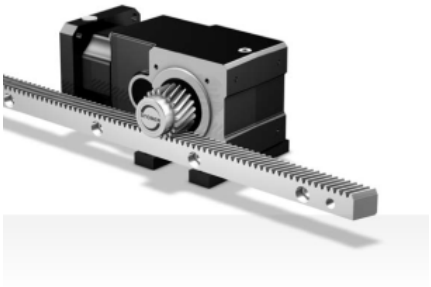
Please use the system of types indicated above in your order. In addition please specify:

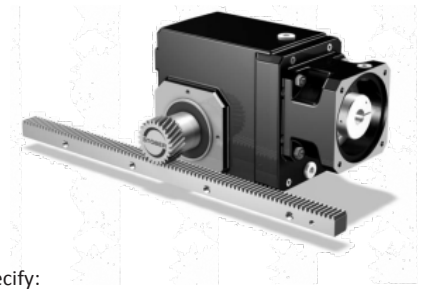
- Radial shaft sealing rings on the drive made of FKM or NBR. Recommendation: FKM for an operating time ≥ 60% (P).
- Reversing operation of the output shaft ±20 to ±90 degrees. (For horizontal installation of P(A))
- Pinion securing mechanism with shrink ring (optional)
- Backlash-free shaft/hub connection (heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Adjustment plate with or without adjustment bar

KS, K, KL Part Number Breakdown

Z	V	2	16	S	E	K	2	0	2	V	G	0250	MT
1	2	3	4	5	6	7	8	9	10	11	12	13	14

1. **Z** – Rack and pinion design
2. **V** – Attachable pinion
3. **2** – Gearing module
4. **16** – Number of teeth
5. Gearing:
   - **S** – helical gearing 19° 31’ 42’’ left-hand
   - **SF** – helical gearing 19° 31’ 42’’ left-hand with attachment kit for lubricating the pinion (K, KL)
   - **G** – straight-cut gearing
   - **GF** – straight-cut gearing with attachment kit for lubricating the pinion (K, KL)
6. Pinion Position:
   - **E** – Shaft end
   - **S** – Shaft shoulder
7. Gear Unit Type:
   - **KS** – right angle servo gearbox
   - **K** – helical bevel gearbox
   - **KL** – helical bevel
8. **2** – Gear Unit Size
9. **0** – Generation Number
10. Gear Stages:
    - **1** – 1 stage
    - **2** – 2 stage
    - **3** – 3 stage
11. Shaft Design:
    - **P** – Shaft with key (KS, KL)
    - **V** – Solid shaft (K)
12. Housing Design:
    - **G** – Pitch circle diameter
    - **GM** – Pitch circle diameter + adjustment plate
13. **0250** – Transmission ratio i x 10
14. Input Options:
    - **MT/MTL** – square motor adapter
    - **MQ** – large square motor adapter
    - **MB** – motor adapter with brake
    - **EZ** – synchronous servo motors





Please use the system of types indicated above in your order. In addition please specify:

- Mounting Position EL1
- Reduced backlash version of K
- Position of the clamping screw for the motor coupling
- Shaft/threaded hole circle on gear unit side 3 or 4 (K, KL)
- Radial shaft sealing rings on the drive made of FKM material. Recommendation: FKM for an operating time 60% for the KS.
- Pinion securing mechanism with shrink ring (optional) for KS, K
- Backlash-free shaft/hub connection (heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Adjustment plate with or without adjustment bar (K, KL)

Technical Explanations Symbols

d0	Pitch circle diameter
dk	Head circle diameter
F_{v2B}	Maximum permitted acceleration feed force
F_{v2NOT}	Emergency Stop feed force (10^3 load change)
m	Gearing module
M_{2B}	Maximum permissible acceleration torque
M_{2NOT}	Emergency-off torque
Pos E	Pinion position E (tooth flush with the shaft end)
Pos S	Pinion position S (tooth flush with the shaft shoulder)
Δs	Linear backlash
x	Profile offset factor
z	Number of teeth on the pinion

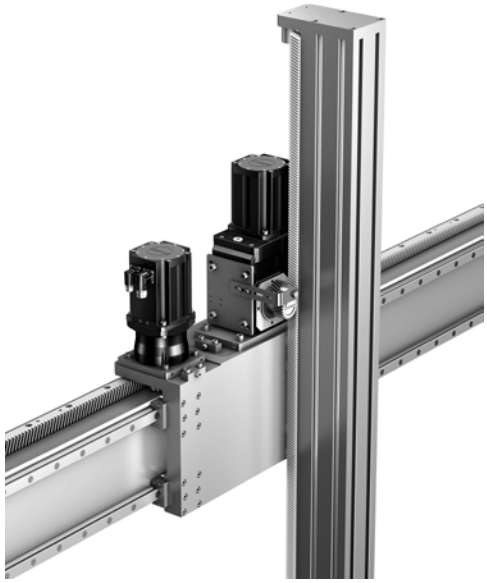
The forces and torques specified in the technical data are maximum values for the respective gear unit sizes without taking into consideration the relevant limits in individual cases based on transmission ratios. Details can be found in the STOBER ServoFit® catalog or the SMS-EZ catalog.

All technical data based on the following requirements:

- A machine side fastening of the gear units using screws with quality 10.9;
- Fitting (H7) of the gear unit housing on the pilot;
- Permanent lubrication with the lubricants recommended by the gear rack manufacturer.

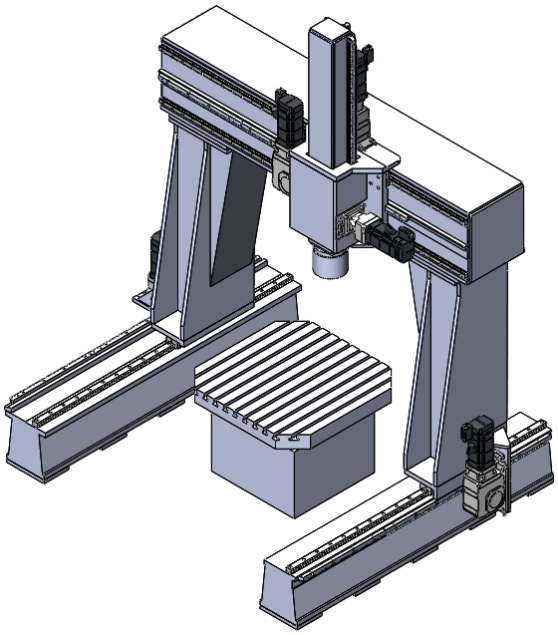
1) Values refer to the following gear rack properties: Material C45, inductively hardened, quality 8. In case of deviating gear rack properties, the maximum permitted values must be coordinated with the gear unit manufacturer.

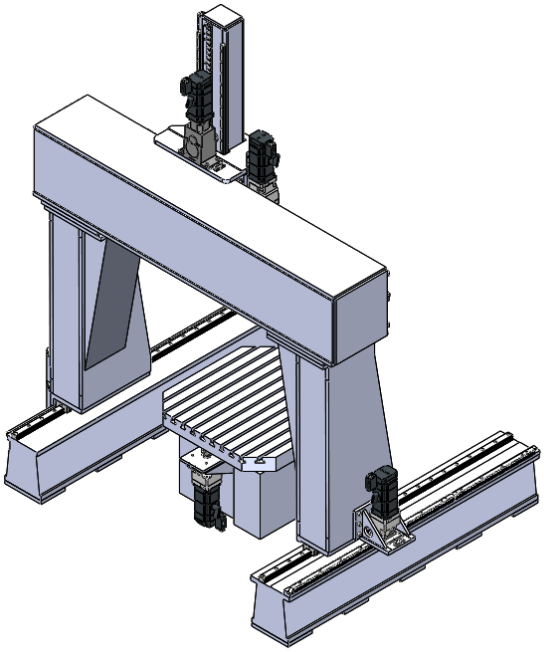
Application Examples



Vertical axis: ZV-K with adjustment plate and attachment kit for lubricating the pinion.

Horizontal axis: ZV-PE with adjustment plate





Complete mechanical systems for your linear applications. STOBER ZV rack and pinion systems are pre-engineered for easy selection.

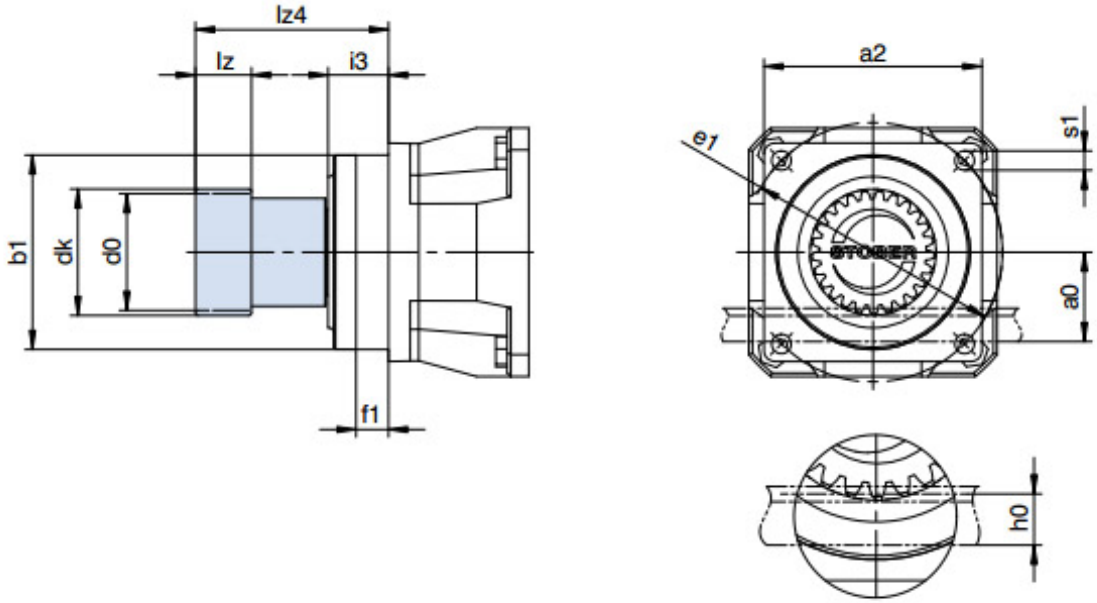
All components are preselected and mated as a system: rack, pinion, gear reducer, lubrication and even adjustable mounting brackets.

ZV-P

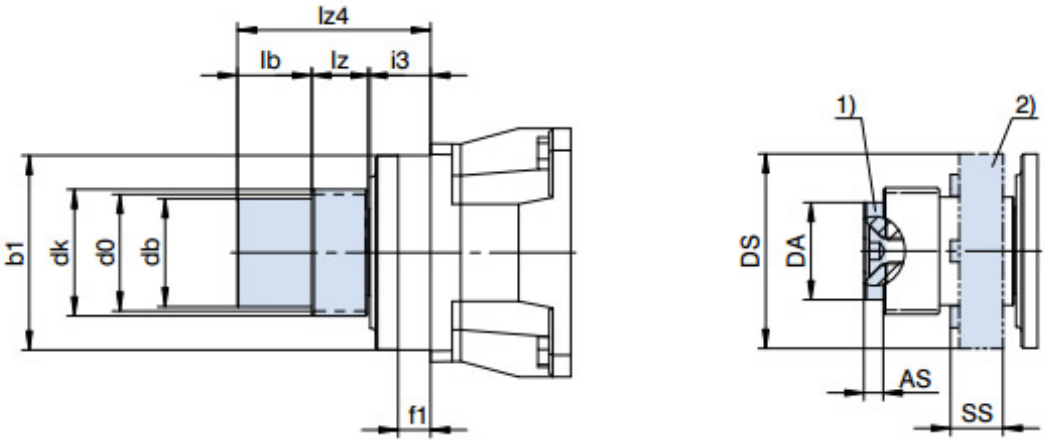
- Sizes P3 to P7
- Acceleration feed force: 1.7 - 14 kN
- Low linear backlash: 20 - 44 µm
- Pinion with module 2, 3 or 4, straight or inclined tooth
- Pinion tooth flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Lubrication device for pinion or gear rack (optional)
- Quiet running
- Symmetrical output drive bearing:
- Deep-groove ball bearing for optimized friction (standard)
- Double angular ball bearings for high axial loads (optional)
- Cylindrical roller bearings for high radial loads and long service life (optional)
- Continual operation without additional cooling, with radial shaft sealing ring made of FKM
- Amount of lubricant independent of installation position
- Lubed for life
- Readily attaches any synchronous servo motor

ZV-P Helical Gearing Dimension Drawings

Pinion Position E



Pinion Position S



Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV216S_P3	2	16	39.98	72	5	60h6	34.0	25	30	39.81	-	75	7.5	22	18	4.5	26	49.5	5.5	-	0.5
ZV220S_P4	2	20	44.02	76	7	70h6	42.4	30	38	47.90	-	85	7.5	22	18	12.5	26	57.5	6.6	-	0.4
ZV225S_P5	2	25	49.33	101	9	90h6	53.1	45	50	58.52	-	120	15.0	22	28	34.5	26	89.5	9.0	-	0.4
ZV318S_P5	3	18	55.55	101	9	90h6	57.3	45	50	65.01	-	120	15.0	26	28	29.5	31	89.5	9.0	-	0.3
ZV322S_P7	3	22	62.21	145	11	130h6	70.0	55	62	78.35	106	165	3.5	26	27	53.5	31	113.5	11.0	34.5	0.4
ZV418S_P7	4	18	74.40	145	11	130h6	76.4	55	62	86.77	106	165	3.5	35	27	43.5	41	113.5	11.0	34.5	0.3

1) Secured axially with bolt and washer
2) Shrink ring optional (ZV-P7)

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog.
Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-P Helical Technical Data

R – normal bearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV216S_P321	2	16	2.0	1.7	34	28	4.0	3.3	69	57	20	34.0
ZV216S_P322	2	16	2.0	1.7	34	28	4.0	3.3	69	57	25	34.0
ZV220S_P421	2	20	4.2	3.2	89	67	8.4	6.3	180	130	25	42.4
ZV220S_P422	2	20	4.2	3.2	89	67	8.4	6.3	180	130	31	42.4
ZV225S_P521	2	25	7.5	5.1	200	130	15	10	400	270	23	53.1
ZV225S_P522	2	25	7.5	5.1	200	130	15	10	400	270	31	53.1
ZV318S_P521	3	18	7.3	5.2	210	150	15	10	420	300	25	57.3
ZV318S_P522	3	18	7.3	5.2	210	150	15	10	420	300	33	57.3
ZV322S_P721	3	22	9.1	6.4	320	220	18	13	640	450	31	70.0
ZV322S_P722	3	22	9.1	6.4	320	220	18	13	640	450	41	70.0
ZV418S_P721	4	18	8.8	6.5	340	250	18	13	670	500	33	76.4
ZV418S_P722	4	18	8.8	6.5	340	250	18	13	670	500	44	76.4

D – reinforced axial bearing

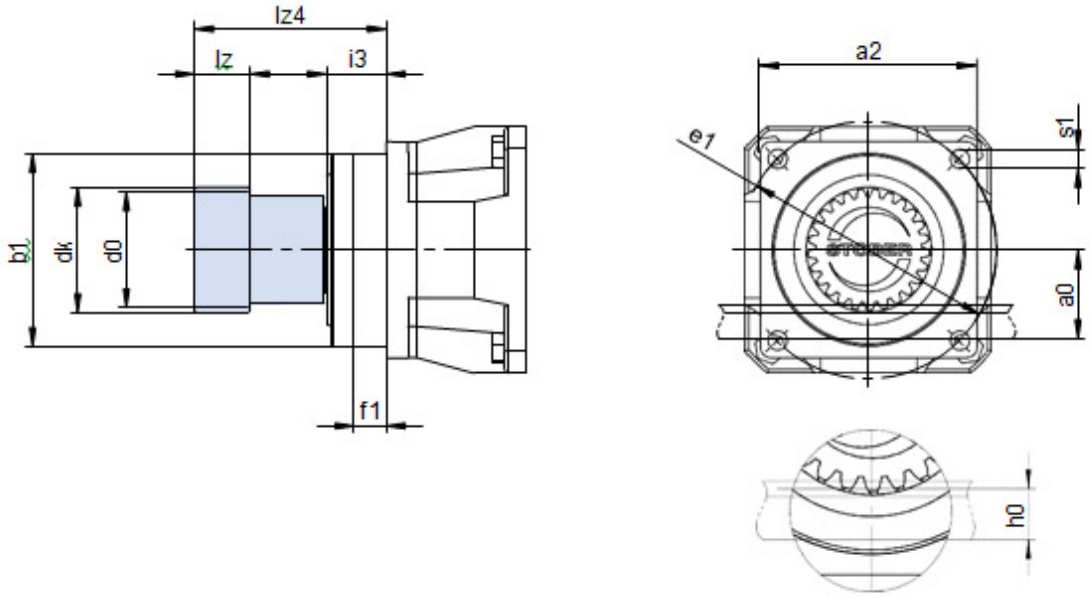
Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV216S_P321	2	16	2.0	1.7	34	28	4.0	3.3	69	57	20	34.0
ZV216S_P322	2	16	2.0	1.7	34	28	4.0	3.3	69	57	25	34.0
ZV220S_P421	2	20	4.8	3.2	100	67	9.7	6.3	200	130	25	42.4
ZV220S_P422	2	20	4.8	3.2	100	67	9.7	6.3	200	130	31	42.4
ZV225S_P521	2	25	9.6	5.1	260	130	19	10	510	270	23	53.1
ZV225S_P522	2	25	9.6	5.1	260	130	19	10	510	270	31	53.1
ZV318S_P521	3	18	10	5.2	300	150	21	10	600	300	25	57.3
ZV318S_P522	3	18	10	5.2	300	150	21	10	600	300	33	57.3
ZV322S_P721	3	22	14	7.0	500	240	28	14	1000	490	31	70.0
ZV322S_P722	3	22	14	7.0	500	240	28	14	1000	490	41	70.0
ZV418S_P721	4	18	15	7.3	570	280	30	15	1130	560	33	76.4
ZV418S_P722	4	18	15	7.3	570	280	30	15	1130	560	44	76.4

Z – reinforced radial bearing

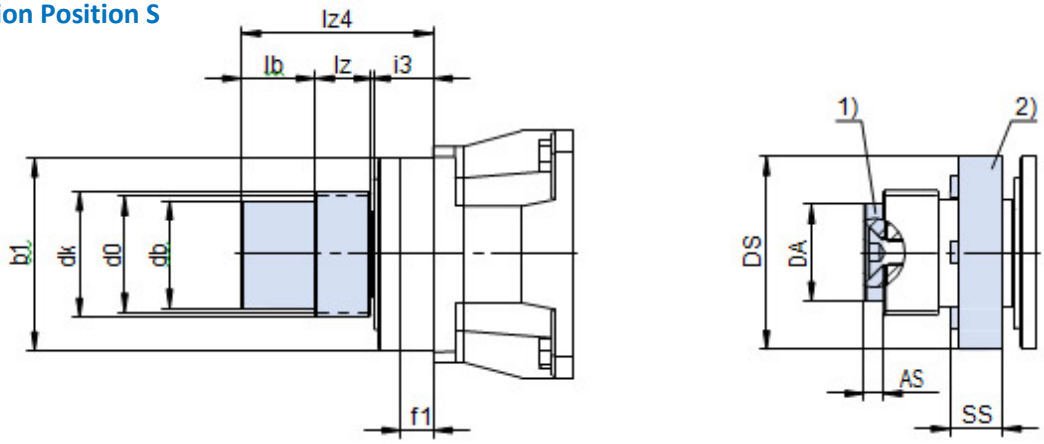
Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV216S_P321	2	16	2.0	1.7	34	28	4.0	3.3	69	57	20	34.0
ZV216S_P322	2	16	2.0	1.7	34	28	4.0	3.3	69	57	25	34.0
ZV220S_P421	2	20	4.8	3.2	100	67	9.7	6.3	200	130	25	42.4
ZV220S_P422	2	20	4.8	3.2	100	67	9.7	6.3	200	130	31	42.4
ZV225S_P521	2	25	8.3	5.1	220	130	17	10	440	270	23	53.1
ZV225S_P522	2	25	8.3	5.1	220	130	17	10	440	270	31	53.1
ZV318S_P521	3	18	9.7	5.2	280	150	19	10	550	300	25	57.3
ZV318S_P522	3	18	9.7	5.2	280	150	19	10	550	300	33	57.3
ZV322S_P721	3	22	12	7.0	430	240	25	14	860	490	31	70.0
ZV322S_P722	3	22	12	7.0	430	240	25	14	860	490	41	70.0
ZV418S_P721	4	18	15	7.3	590	280	31	15	1180	560	33	76.4
ZV418S_P722	4	18	15	7.3	590	280	31	15	1180	560	44	76.4

ZV-P Straight Cut Gearing Dimension Drawings

Pinion Position E



Pinion Position S



Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV217G_P3	2	17	39.98	72	5	60h6	34	25	30	39.81	-	75	7.5	22	18	4.5	26	49.5	5.5	-	0.490
ZV221G_P4	2	21	44.01	76	7	70h6	42	30	38	47.89	-	85	7.5	22	18	12.5	26	57.5	6.6	-	0.507
ZV226G_P5	2	26	49.32	101	9	90h6	52	45	50	58.51	-	120	15.0	22	28	34.5	26	89.5	9.0	-	0.660
ZV319G_P5	3	19	55.55	101	9	90h6	57	45	50	65.02	-	120	15.0	26	28	29.5	31	89.5	9.0	-	0.350
ZV323G_P7	3	23	62.21	145	11	130h6	69	55	62	78.34	106	165	3.5	26	27	53.5	31	113.5	11.0	34.5	0.570
ZV419G_P7	4	19	74.41	145	11	130h6	76	55	62	86.79	106	165	3.5	35	27	43.5	41	113.5	11.0	34.5	0.352

1) Secured axially with bolt and washer
2) Shrink ring optional (ZV-P7)

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog.
Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-P Straight Cut Technical Data

R – normal bearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV217G_P321	2	17	2.7	2.1	46	35	5.4	4.2	91	71	20	34.0
ZV217G_P322	2	17	2.7	2.1	46	35	5.4	4.2	91	71	25	34.0
ZV221G_P421	2	21	4.4	3.9	93	81	8.8	7.7	190	160	24	42.0
ZV221G_P422	2	21	4.4	3.9	93	81	8.8	7.7	190	160	31	42.0
ZV226G_P521	2	26	7.3	5.8	190	150	15	12	380	300	23	52.0
ZV226G_P522	2	26	7.3	5.8	190	150	15	12	380	300	30	52.0
ZV319G_P521	3	19	7.7	6.1	220	170	15	12	440	340	25	57.0
ZV319G_P522	3	19	7.7	6.1	220	170	15	12	440	340	33	57.0
ZV323G_P721	3	23	9.6	6.7	330	230	19	13	660	460	30	69.0
ZV323G_P722	3	23	9.6	6.7	330	230	19	13	660	460	40	69.0
ZV419G_P721	4	19	9.2	6.9	350	260	18	14	700	520	33	76.0
ZV419G_P722	4	19	9.2	6.9	350	260	18	14	700	520	44	76.0

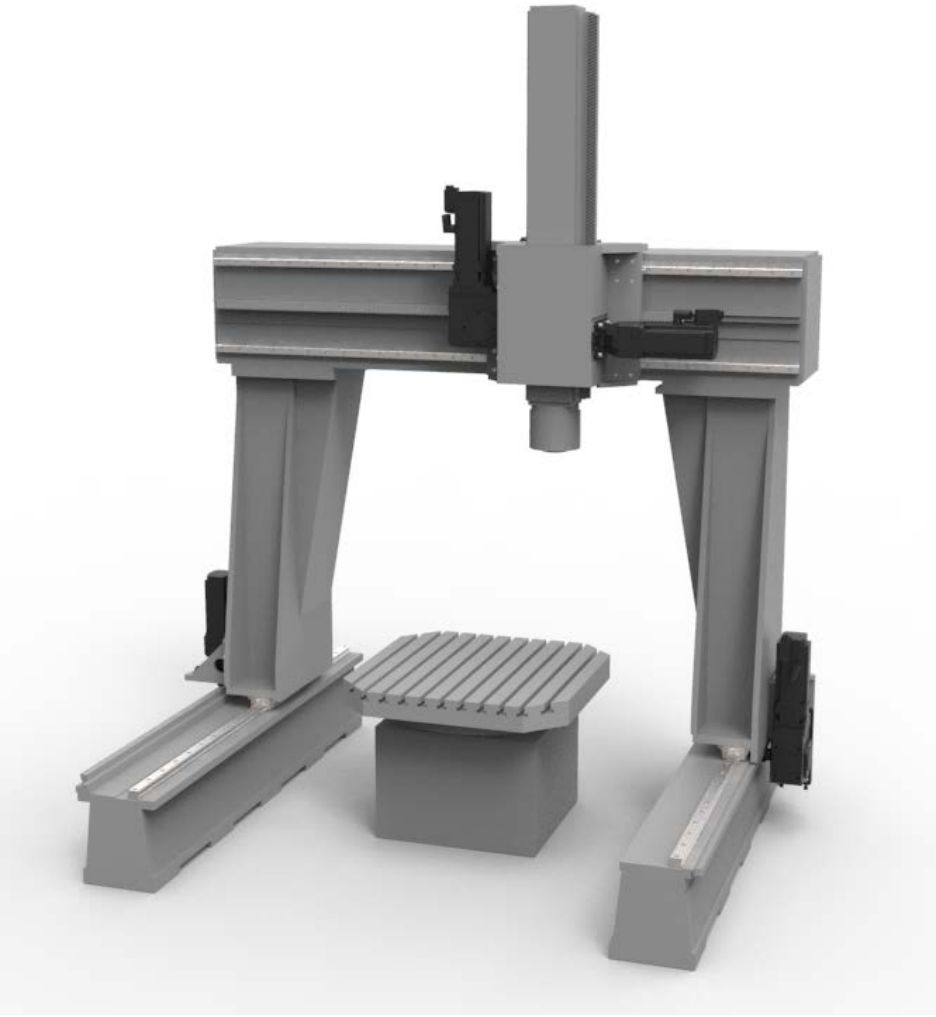
D – Reinforced axial bearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV217G_P321	2	17	2.7	2.1	46	35	5.4	4.2	91	71	20	34.0
ZV217G_P322	2	17	2.7	2.1	46	35	5.4	4.2	91	71	25	34.0
ZV221G_P421	2	21	5.7	3.9	120	81	11	7.7	240	160	24	42.0
ZV221G_P422	2	21	5.7	3.9	120	81	11	7.7	240	160	31	42.0
ZV226G_P521	2	26	8.5	5.8	220	150	17	12	440	300	23	52.0
ZV226G_P522	2	26	8.5	5.8	220	150	17	12	440	300	30	52.0
ZV319G_P521	3	19	10	6.1	300	170	21	12	590	350	25	57.0
ZV319G_P522	3	19	10	6.1	300	170	21	12	590	350	33	57.0
ZV323G_P721	3	23	13	8.0	440	280	25	16	880	550	30	69.0
ZV323G_P722	3	23	13	8.0	440	280	25	16	880	550	40	69.0
ZV419G_P721	4	19	16	8.6	590	330	31	17	1180	650	33	76.0
ZV419G_P722	4	19	16	8.6	590	330	31	17	1180	650	44	76.0

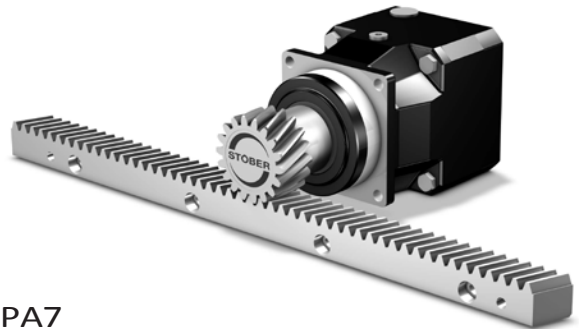
Z – Reinforced radial bearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV217G_P321	2	17	2.7	2.1	46	35	5.4	4.2	91	71	20	34.0
ZV217G_P322	2	17	2.7	2.1	46	35	5.4	4.2	91	71	25	34.0
ZV221G_P421	2	21	5.7	3.9	120	81	11	7.7	240	160	24	42.0
ZV221G_P422	2	21	5.7	3.9	120	81	11	7.7	240	160	31	42.0
ZV226G_P521	2	26	7.3	5.8	190	150	15	12	380	300	23	52.0
ZV226G_P522	2	26	7.3	5.8	190	150	15	12	380	300	30	52.0
ZV319G_P521	3	19	9.0	6.1	260	170	18	12	510	350	25	57.0
ZV319G_P522	3	19	9.0	6.1	260	170	18	12	510	350	33	57.0
ZV323G_P721	3	23	11	8.0	380	280	22	16	760	550	30	69.0
ZV323G_P722	3	23	11	8.0	380	280	22	16	760	550	40	69.0
ZV419G_P721	4	19	17	8.6	660	330	35	17	1320	650	33	76.0
ZV419G_P722	4	19	17	8.6	660	330	35	17	1320	650	44	76.0

ZV Application Examples



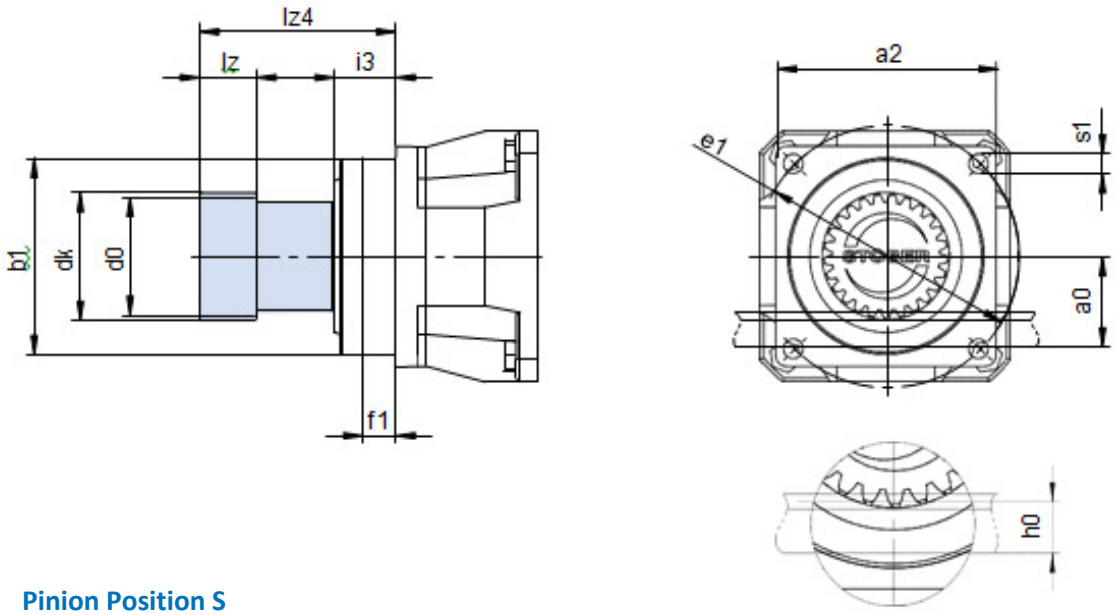
ZV-PA



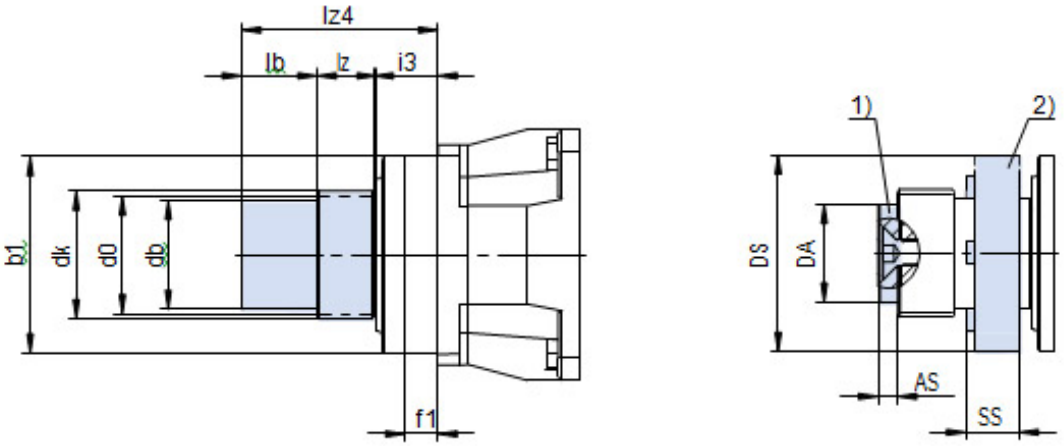
- Sizes PA3 to PA7
- Acceleration feed force: 1.7 - 12 kN
- Lowest linear backlash: 8 - 22 µm
- Pinion with module 2, 3 or 4, straight or helical toothing
- Pinion toothing flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Lubrication device for pinion or gear rack (optional)
- Highest torsional stiffness and ultimate tensile strength
- Quiet running
- Symmetrically friction-optimized output bearings
- Continual operation without additional cooling, with radial shaft sealing ring made of FKM
- Amount of lubricant independent of installation position
- Lubed for life
- Readily attaches any synchronous servo motor

ZV-PA Dimension Drawings

Pinion Position E



Pinion Position S



1) Secured axially with bolt and washer
2) Shrink ring optional (ZV-PA7)

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog. Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-PA Technical Data

S – helical gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV216S_PA321	2	16	2.0	1.7	34	28	4.0	3.3	69	57	10	34.0
ZV216S_PA322	2	16	2.0	1.7	34	28	4.0	3.3	69	57	15	34.0
ZV220S_PA421	2	20	4.8	3.2	100	67	9.7	6.3	200	130	12	42.4
ZV220S_PA422	2	20	4.8	3.2	100	67	9.7	6.3	200	130	19	42.4
ZV225S_PA521	2	25	9.6	5.1	260	130	19	10	510	270	8	53.1
ZV225S_PA522	2	25	9.6	5.1	260	130	19	10	510	270	15	53.1
ZV318S_PA521	3	18	10	5.2	300	150	21	10	600	300	8	57.3
ZV318S_PA522	3	18	10	5.2	300	150	21	10	600	300	17	57.3
ZV322S_PA721	3	22	14	7.0	500	240	28	14	1000	490	10	70.0
ZV322S_PA722	3	22	14	7.0	500	240	28	14	1000	490	20	70.0
ZV418S_PA721	4	18	15	7.3	570	280	30	15	1130	560	11	76.4
ZV418S_PA722	4	18	15	7.3	570	280	30	15	1130	560	22	76.4

G – straight cut gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV217G_PA321	2	17	2.7	2.1	46	35	5.4	4.2	91	71	10	34.0
ZV217G_PA322	2	17	2.7	2.1	46	35	5.4	4.2	91	71	15	34.0
ZV221G_PA421	2	21	5.7	3.9	120	81	11	7.7	240	160	12	42.0
ZV221G_PA422	2	21	5.7	3.9	120	81	11	7.7	240	160	18	42.0
ZV226G_PA521	2	26	8.5	5.8	220	150	17	12	440	300	8	52.0
ZV226G_PA522	2	26	8.5	5.8	220	150	17	12	440	300	15	52.0
ZV319G_PA521	3	19	10	6.1	300	170	21	12	590	350	8	57.0
ZV319G_PA522	3	19	10	6.1	300	170	21	12	590	350	17	57.0
ZV323G_PA721	3	23	13	8.0	440	280	25	16	880	550	10	69.0
ZV323G_PA722	3	23	13	8.0	440	280	25	16	880	550	20	69.0
ZV419G_PA721	4	19	16	8.6	590	330	31	17	1180	650	11	76.0
ZV419G_PA722	4	19	16	8.6	590	330	31	17	1180	650	22	76.0

ZV-PA Dimensional Data

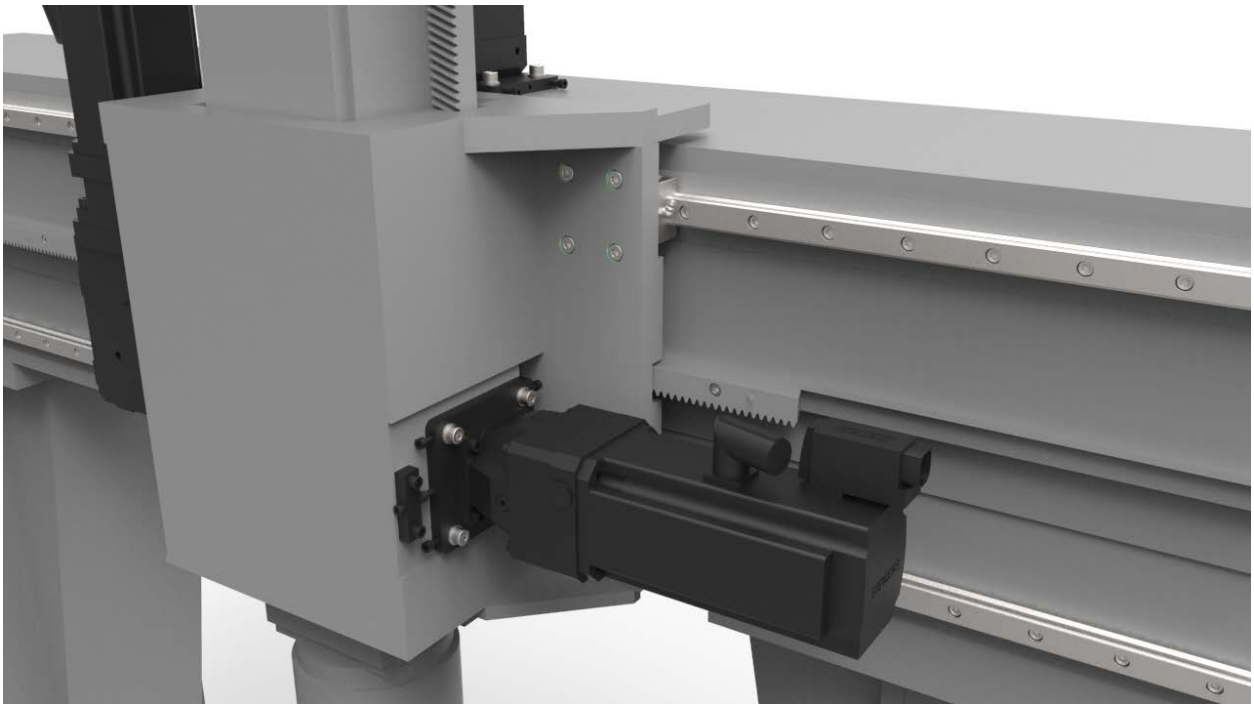
S – helical gearing

Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV216S_PA3	2	16	39.98	72	5	60h6	34.0	25	30	39.81	-	75	7.5	22	18	4.5	26	49.5	5.5	-	0.5
ZV220S_PA4	2	20	44.02	76	7	70h6	42.4	30	38	47.90	-	85	7.5	22	18	12.5	26	57.5	6.6	-	0.4
ZV225S_PA5	2	25	49.33	101	9	90h6	53.1	45	50	58.52	-	120	15.0	22	28	34.5	26	89.5	9.0	-	0.4
ZV318S_PA5	3	18	55.55	101	9	90h6	57.3	45	50	65.01	-	120	15.0	26	28	29.5	31	89.5	9.0	-	0.3
ZV322S_PA7	3	22	62.21	145	11	130h6	70.0	55	62	78.35	106	165	3.5	26	27	53.5	31	113.5	11.0	34.5	0.4
ZV418S_PA7	4	18	74.40	145	11	130h6	76.4	55	62	86.77	106	165	3.5	35	27	43.5	41	113.5	11.0	34.5	0.3

G – straight cut gearing

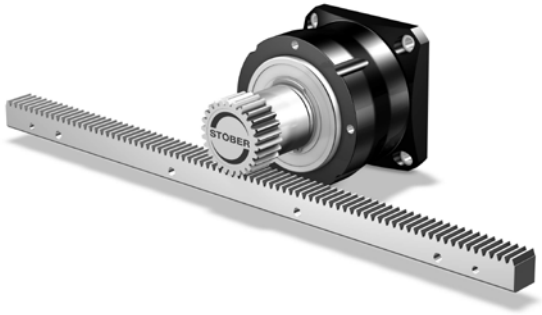
Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV217G_PA3	2	17	39.98	72	5	60h6	34.0	25	30	39.81	-	75	7.5	22	18	4.5	26	49.5	5.5	-	0.490
ZV221G_PA4	2	21	44.01	76	7	70h6	42.0	30	38	47.89	-	85	7.5	22	18	12.5	26	57.5	6.6	-	0.507
ZV226G_PA5	2	26	49.32	101	9	90h6	52.0	45	50	58.51	-	120	15.0	22	28	34.5	26	89.5	9.0	-	0.660
ZV319G_PA5	3	19	55.55	101	9	90h6	57.0	45	50	65.02	-	120	15.0	26	28	29.5	31	89.5	9.0	-	0.350
ZV323G_PA7	3	23	62.21	145	11	130h6	69.0	55	62	78.34	106	165	3.5	26	27	53.5	31	113.5	11.0	34.5	0.570
ZV419G_PA7	4	19	74.41	145	11	130h6	76.0	55	62	86.79	106	165	3.5	35	27	43.5	41	113.5	11.0	34.5	0.352

ZV Application Examples



On this theta axis, the STOBER P series planetary featuring the ZV pinion system also includes the option mounting adapter. Note how the pinion adjustment is included in the system for ease of use.

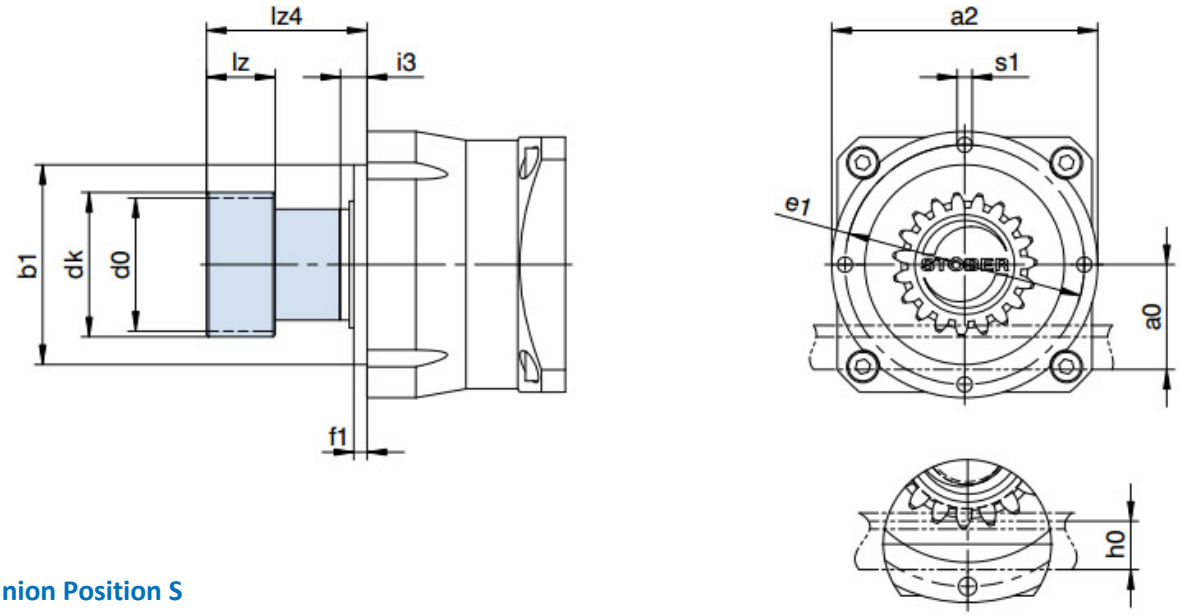
ZV-PE



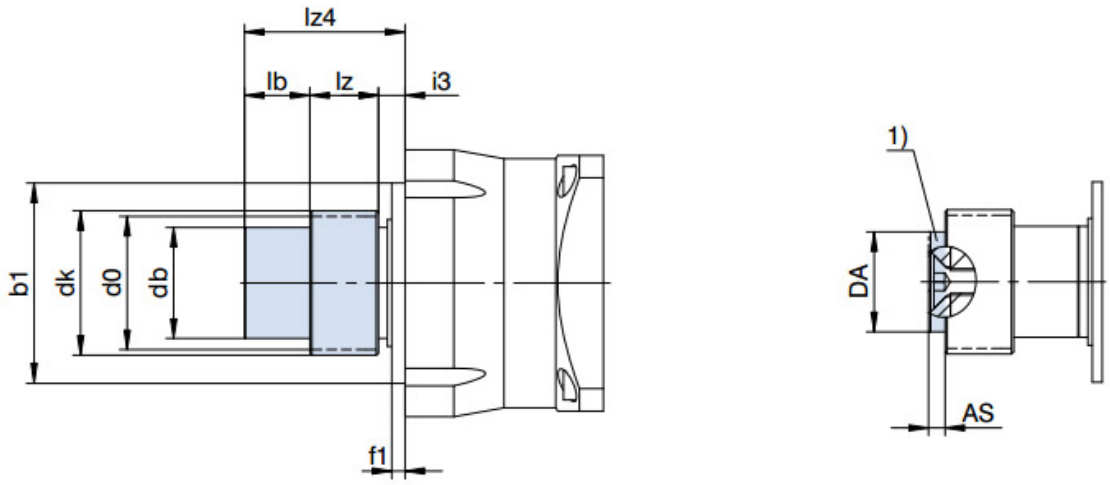
- Sizes PE3 to PE5
- Acceleration feed force: 1.4 - 4.8 kN
- Low linear backlash: 40 - 83 µm
- Pinion with module 2 or 3, straight or inclined teeth
- Pinion tooth flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Lubrication device for pinion or gear rack (optional)
- High torsional stiffness
- Unsurpassed level of smoothness
- Friction-optimized output bearings
- High power density
- Low losses due to contactless sealing at input
- Life-long lubrication with high performance grease, suitable for all mounting positions
- Readily attaches any synchronous servo motor

ZV-PE Dimension Drawings

Pinion Position E



Pinion Position S



1) Secured axially with bolt and washer

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog.

Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:

a0 = ½ d0 + h0 + x*m

ZV-PE Technical Data

S – helical gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d0 [mm]
ZV216S_PE311	2	16	2.0	1.7	35	29	4.1	3.4	69	58	40	34.0
ZV216S_PE312	2	16	2.0	1.7	35	29	4.1	3.4	69	58	49	34.0
ZV220S_PE411	2	20	2.8	2.2	60	47	5.7	4.4	120	94	49	42.4
ZV220S_PE412	2	20	2.8	2.2	60	47	5.7	4.4	120	94	62	42.4
ZV225S_PE511	2	25	6.3	3.9	170	100	13	7.8	340	210	62	53.1
ZV225S_PE512	2	25	6.3	3.9	170	100	13	7.8	340	210	77	53.1
ZV318S_PE511	3	18	6.1	4.0	170	110	12	8.0	350	230	67	57.3
ZV318S_PE512	3	18	6.1	4.0	170	110	12	8.0	350	230	83	57.3

G – straight cut gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d0 [mm]
ZV217G_PE311	2	17	2.1	1.9	37	33	4.3	3.9	73	66	40	34.0
ZV217G_PE312	2	17	2.1	1.9	37	33	4.3	3.9	73	66	49	34.0
ZV221G_PE411	2	21	3.0	2.3	63	49	6.0	4.6	130	98	49	42.0
ZV221G_PE412	2	21	3.0	2.3	63	49	6.0	4.6	130	98	61	42.0
ZV226G_PE511	2	26	6.1	4.1	160	110	12	8.2	320	210	61	52.0
ZV226G_PE512	2	26	6.1	4.1	160	110	12	8.2	320	210	76	52.0
ZV319G_PE511	3	19	6.4	4.2	180	120	13	8.4	360	240	66	57.0
ZV319G_PE512	3	19	6.4	4.2	180	120	13	8.4	360	240	83	57.0

ZV-PE Dimensional Data

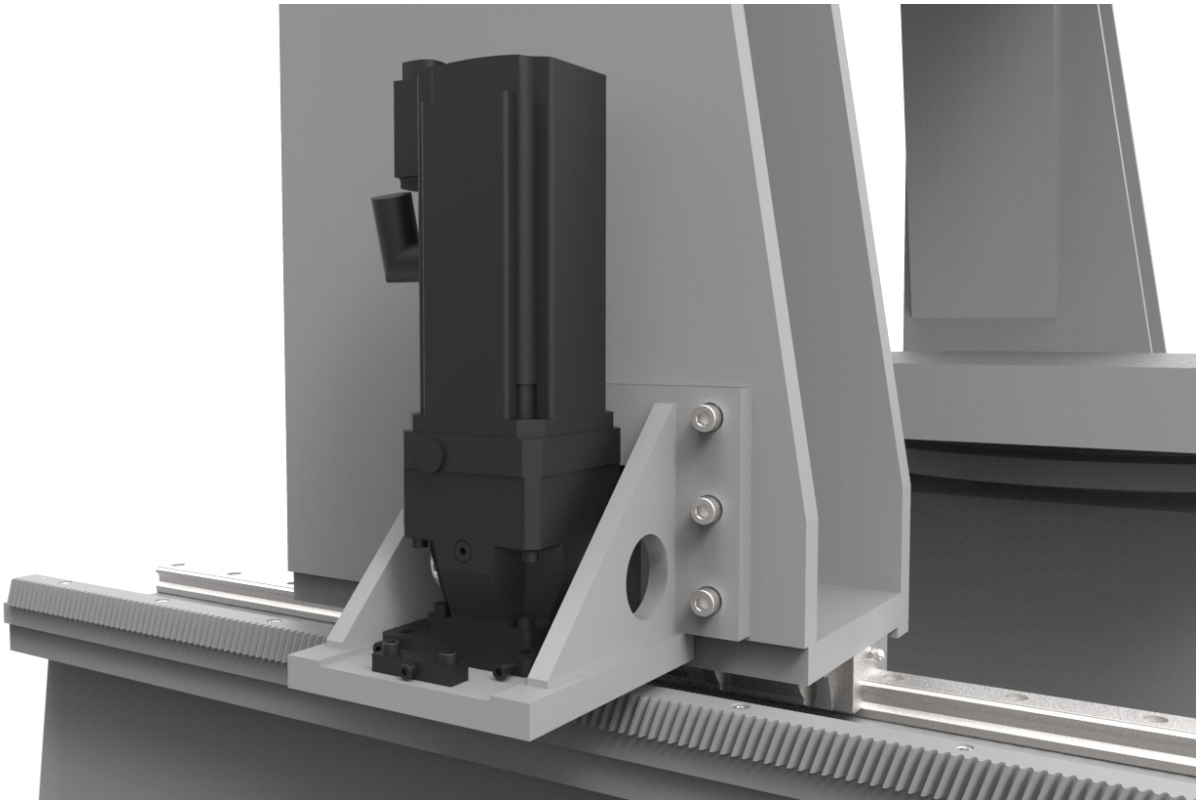
S – helical gearing

Typ	m	z	a0	øa2	AS	øb1	d0	DA	db	dk	øe1	f1	h0	i3	lb	lz	lz4	øs1	x
ZV216S_PE3	2	16	39.98	72	5	52h6	34.0	25	30	39.81	62	5	22	5	4.5	26	37.5	M5	0.5
ZV220S_PE4	2	20	44.02	98	7	68h6	42.4	30	38	47.90	80	5	22	5	12.5	26	48.5	M6	0.4
ZV225S_PE5	2	25	49.33	115	9	90h6	53.1	45	50	58.52	108	6	22	6	34.5	26	72.5	M8	0.4
ZV318S_PE5	3	18	55.55	115	9	90h6	57.3	45	50	65.01	108	6	26	6	29.5	31	72.5	M8	0.3

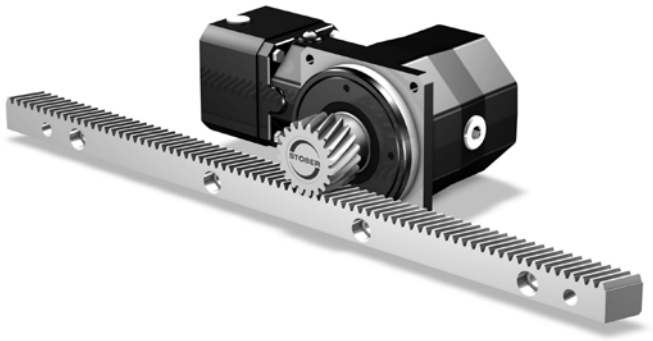
G – straight cut gearing

Typ	m	z	a0	øa2	AS	øb1	d0	DA	db	dk	øe1	f1	h0	i3	lb	lz	lz4	øs1	x
ZV217G_PE3	2	17	39.98	72	5	52h6	34	25	30	39.81	62	5	22	5	4.5	26	37.5	M5	0.490
ZV221G_PE4	2	21	44.01	98	7	68h6	42	30	38	47.89	80	5	22	5	12.5	26	48.5	M6	0.507
ZV226G_PE5	2	26	49.32	115	9	90h6	52	45	50	58.51	108	6	22	6	34.5	26	72.5	M8	0.660
ZV319G_PE5	3	19	55.55	115	9	90h6	57	45	50	65.02	108	6	26	6	29.5	31	72.5	M8	0.350

ZV Application Examples



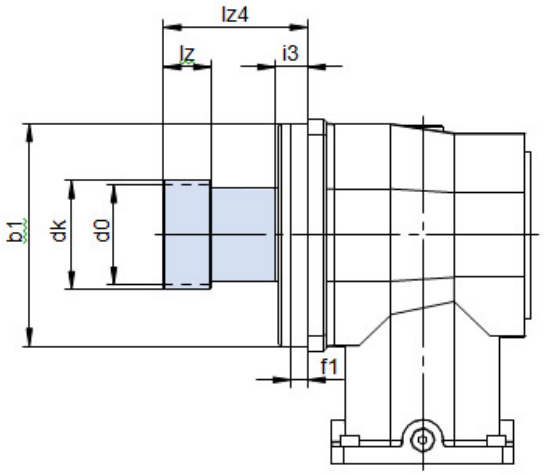
ZV-KS

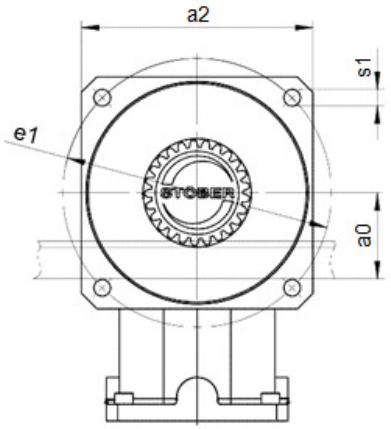


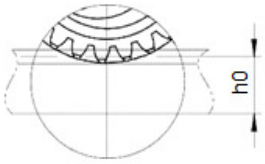
- Sizes KS4 to KS7
- Acceleration feed force: 3.2 - 12 kN
- Low linear backlash: 37 - 44 µm
- Pinion with module 2, 3 or 4, straight or inclined tooth
- Pinion tooth flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Torsionally rigid block design
- Symmetrically friction-optimized output bearings
- Lubed for life
- Readily attaches any synchronous servo motor

ZV-KS Dimension Drawings

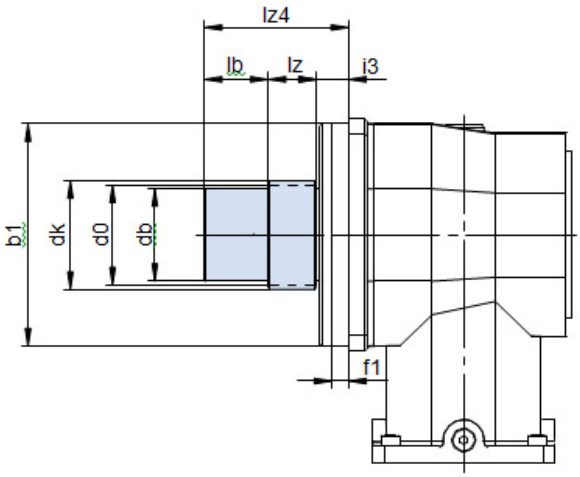
Pinion Position E

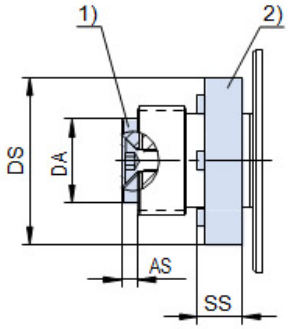






Pinion Position S





1) Secured axially with bolt and washer
2) Shrink ring optional (ZV-KS5 –ZV-KS7)

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog.
Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-KS Technical Data

S – helical gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV220S_KS402	2	20	4.2	3.2	90	68	6.6	6.5	140	140	37	42.4
ZV220S_KS403	2	20	4.2	3.2	90	68	6.6	6.5	140	140	37	42.4
ZV225S_KS502	2	25	7.5	5.1	200	130	11	10	300	270	39	53.1
ZV225S_KS503	2	25	7.5	5.1	200	130	11	10	300	270	39	53.1
ZV318S_KS502	3	18	7.0	5.2	200	150	10	10	300	300	42	57.3
ZV318S_KS503	3	18	7.0	5.2	200	150	10	10	300	300	42	57.3
ZV322S_KS702	3	22	11	6.4	400	220	17	13	600	450	41	70.0
ZV322S_KS703	3	22	11	6.4	400	220	17	13	600	450	41	70.0
ZV418S_KS702	4	18	10	6.7	400	260	16	13	600	510	44	76.4
ZV418S_KS703	4	18	10	6.7	400	260	16	13	600	510	44	76.4

G – straight cut gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV221G_KS402	2	21	4.3	4.0	90	83	6.7	6.7	140	140	37	42.0
ZV221G_KS403	2	21	4.3	4.0	90	83	6.7	6.7	140	140	37	42.0
ZV226G_KS502	2	26	7.7	5.7	200	150	12	11	300	300	38	52.0
ZV226G_KS503	2	26	7.7	5.7	200	150	12	11	300	300	38	52.0
ZV319G_KS502	3	19	7.0	6.0	200	170	11	11	300	300	41	57.0
ZV319G_KS503	3	19	7.0	6.0	200	170	11	11	300	300	41	57.0
ZV323G_KS702	3	23	12	7.2	400	250	17	14	600	500	40	69.0
ZV323G_KS703	3	23	12	7.2	400	250	17	14	600	500	40	69.0
ZV419G_KS702	4	19	11	7.7	400	290	16	15	600	580	44	76.0
ZV419G_KS703	4	19	11	7.7	400	290	16	15	600	580	44	76.0

ZV-KS Dimensional Data

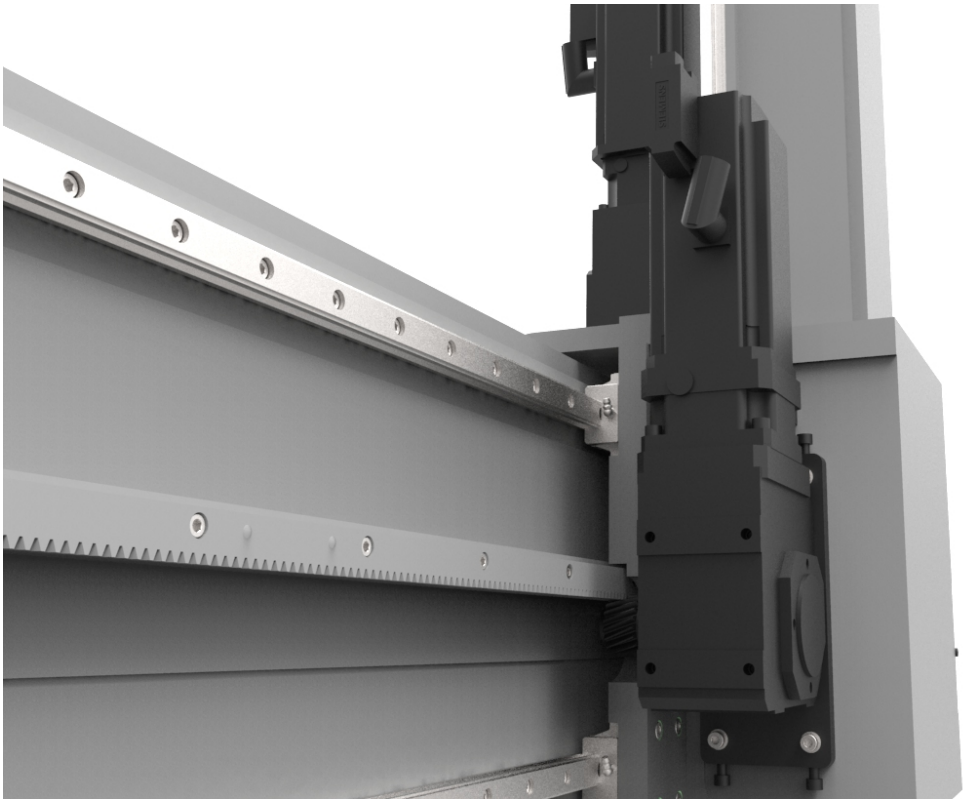
S – helical gearing

Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV220S_KS4	2	20	44.02	101	7	95h6	42.44	30	38	47.90	-	120	8	22	16.0	12.5	26	54.5	6.6	-	0.4
ZV225S_KS5	2	25	49.33	125	9	120h6	53.05	45	50	58.52	90.5	145	9	22	17.5	34.5	26	78.0	9.0	24.3	0.4
ZV318S_KS5	3	18	55.55	125	9	120h6	57.30	45	50	65.01	90.5	145	9	26	17.5	29.5	31	78.0	9.0	24.3	0.3
ZV322S_KS7	3	22	62.21	155	11	150h6	70.03	55	62	78.35	106.0	180	10	26	23.0	53.5	31	107.5	11.0	34.5	0.4
ZV418S_KS7	4	18	74.40	155	11	150h6	76.40	55	62	86.77	106.0	180	10	35	23.0	43.5	41	107.5	11.0	34.5	0.3

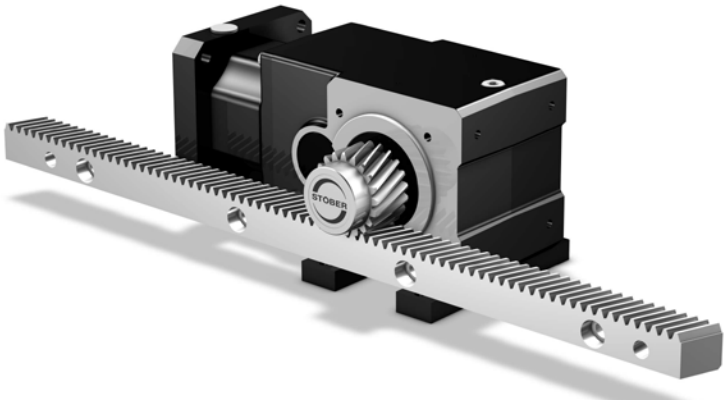
G – straight cut gearing

Typ	m	z	a0	±a2	AS	øb1	d0	DA	db	dk	DS	øe1	f1	h0	i3	lb	lz	lz4	øs1	SS	x
ZV221G_KS4	2	21	44.01	101	7	95h6	42	30	38	47.89	-	120	8	22	16.0	12.5	26	54.5	6.6	-	0.507
ZV226G_KS5	2	26	49.32	125	9	120h6	52	45	50	58.51	90.5	145	9	22	17.5	34.5	26	78.0	9.0	24.3	0.660
ZV319G_KS5	3	19	55.55	125	9	120h6	57	45	50	65.02	90.5	145	9	26	17.5	29.5	31	78.0	9.0	24.3	0.350
ZV323G_KS7	3	23	62.21	155	11	150h6	69	55	62	78.34	106.0	180	10	26	23.0	53.5	31	107.5	11.0	34.5	0.570
ZV419G_KS7	4	19	74.41	155	11	150h6	76	55	62	86.79	106.0	180	10	35	23.0	43.5	41	107.5	11.0	34.5	0.352

ZV Application Examples



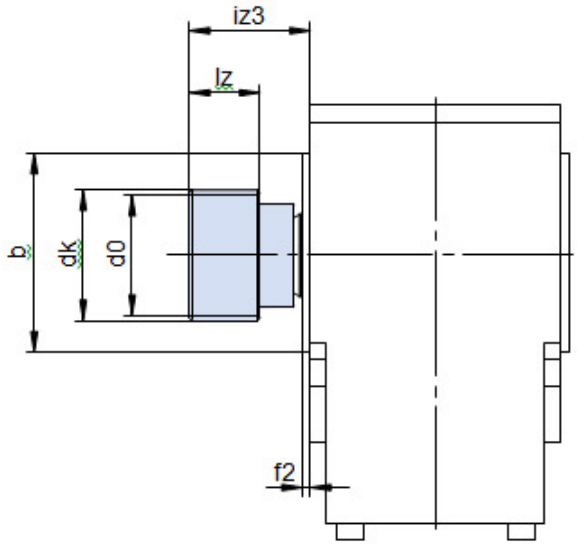
ZV-KL

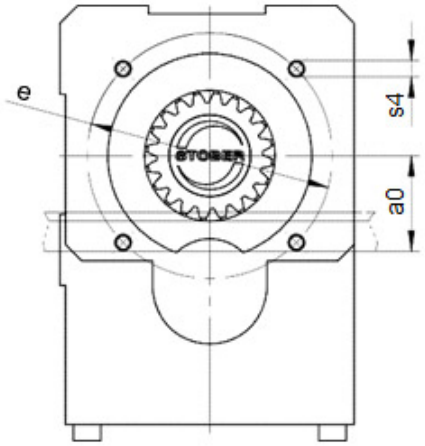


- Sizes KL1 and KL2
- Acceleration feed force: 1.2 - 2,2 kN
- Linear backlash: 98 - 99 µm
- Pinion with module 2, straight or inclined tooth
- Pinion tooth flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Attachment kit for lubricating the pinion (optional)
- Torsionally rigid block design
- No offset between motor and output axle
- Symmetrically friction-optimized output bearings
- Readily attaches any synchronous servo motor

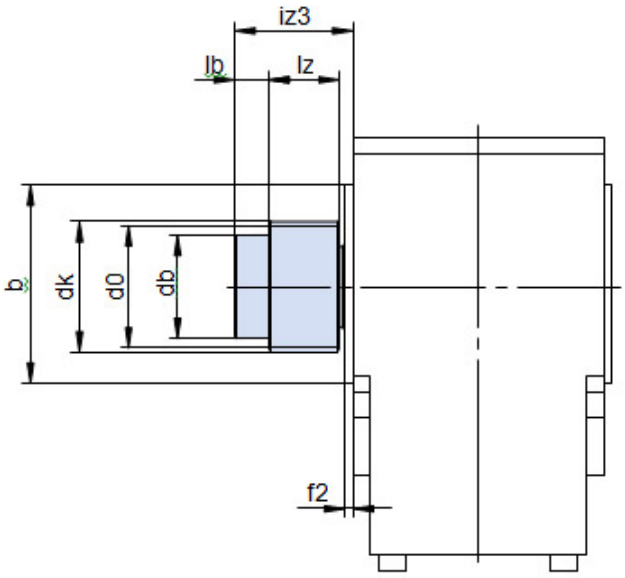
ZV-KL Dimension Drawings

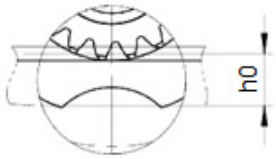
Pinion Position E

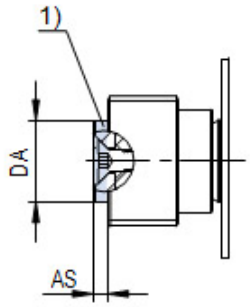




Pinion Position S







1) Secured axially with bolt and washer

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog. Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-KL Technical Data

S – helical gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV216S_KL102	2	16	1.6	1.5	27	26	3.2	3.1	55	52	99	34.0
ZV220S_KL202	2	20	2.9	2.6	62	55	5.8	5.2	120	110	99	42.4

G – straight cut gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d_0 [mm]
ZV217G_KL102	2	17	1.7	1.6	29	27	3.4	3.2	58	55	99	34.0
ZV221G_KL202	2	21	3.0	2.7	64	57	6.1	5.4	130	110	98	42.0

ZV-KL Dimensional Data

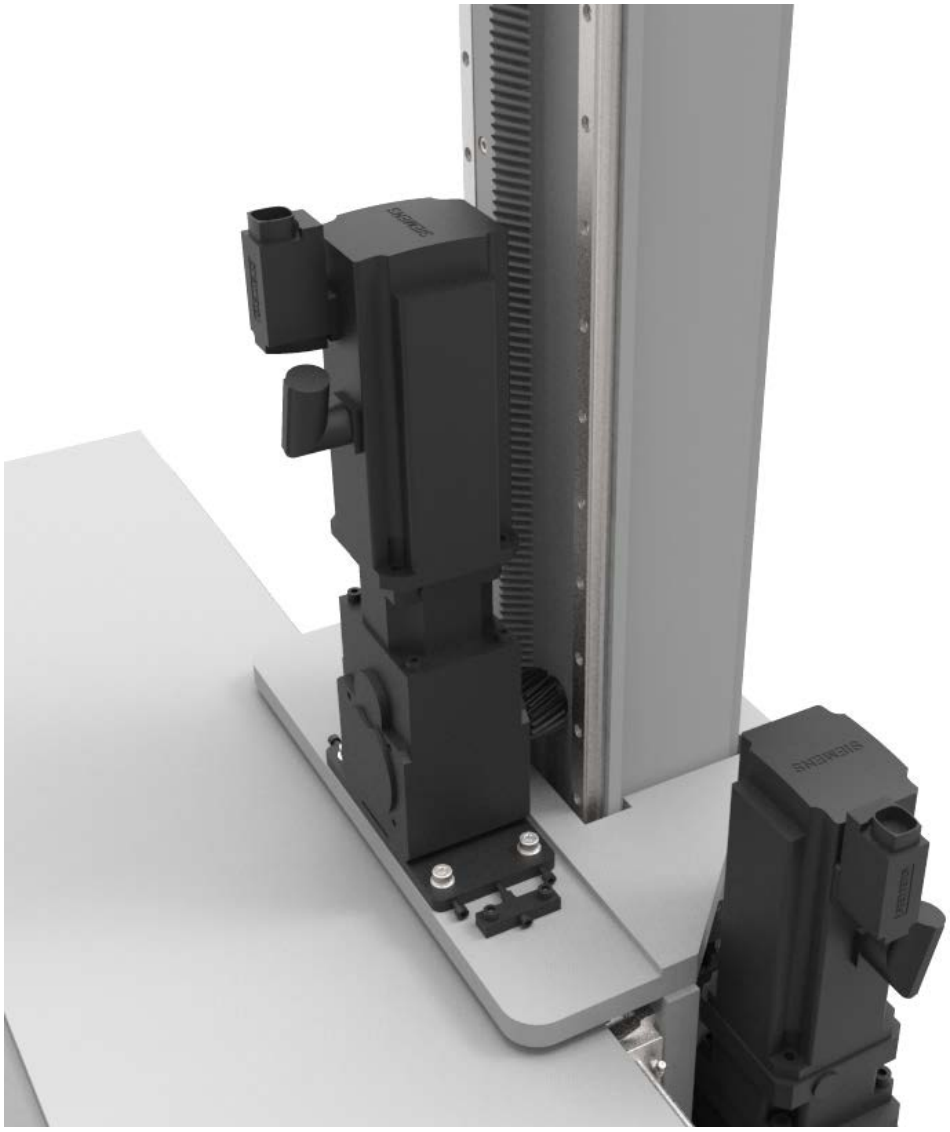
S – helical gearing

Typ	m	z	a0	AS	øb	d0	DA	db	dk	øe	f2	h0	iz3	lb	lz	øs4	x
ZV216S_KL102	2	16	39.98	5	60_{j6}	33.95	25	30	39.81	75	3	22	35.5	4.5	26	M6	0.5
ZV220S_KL202	2	20	44.02	7	75_{j6}	42.44	30	38	47.90	90	3	22	44.5	12.5	26	M6	0.4

G – straight cut gearing

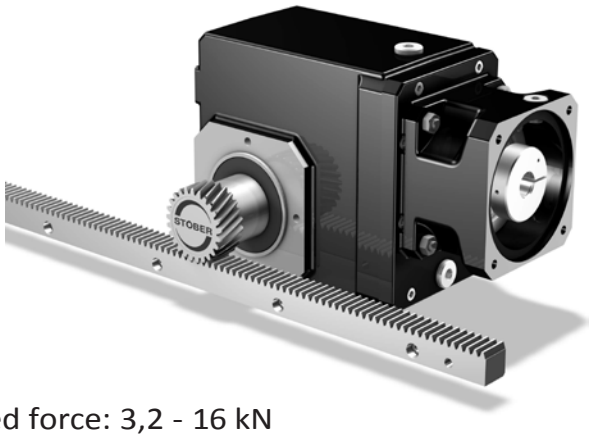
Typ	m	z	a0	AS	øb	d0	DA	db	dk	øe	f2	h0	iz3	lb	lz	øs4	x
ZV217G_KL102	2	17	39.98	5	60_{j6}	34	25	30	39.81	75	3	22	35.5	4.5	26	M6	0.490
ZV221G_KL202	2	21	44.01	7	75_{j6}	42	30	38	47.89	90	3	22	44.5	12.5	26	M6	0.507

ZV Application Examples



STOBER right angle K series is ideal for less than high precision access. An economic solution versus traditional servo planetary reducers. Gravity loaded Z axis shown here make a compact solution. The options adjustment mounting bracket provides an easy and quick design solution.
This solutions is ideal for:
-Pick and Place
-Material handling
-Robot theta axis
-Machine Tending

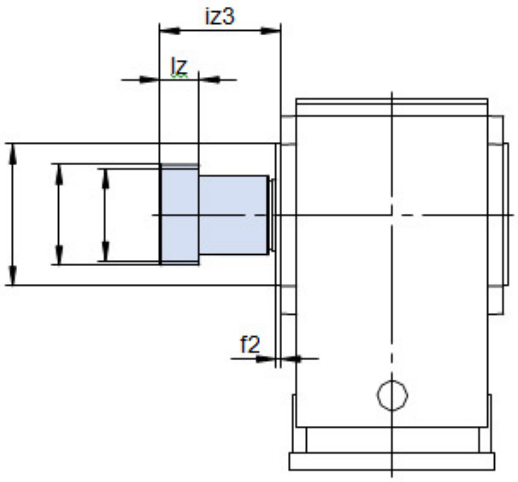
ZV-K

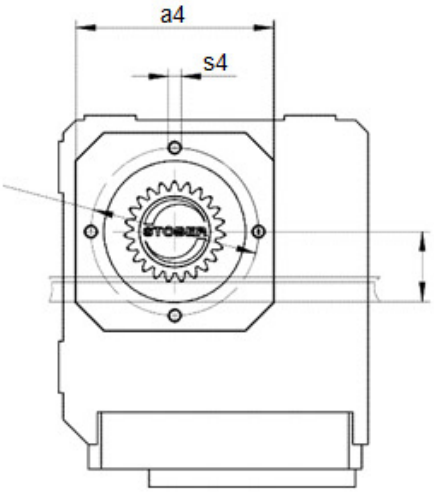


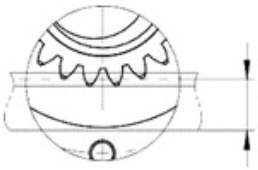
- Sizes K1 to K4
- Acceleration feed force: 3,2 - 16 kN
- Low linear backlash (class I): 11 - 28 µm
- Pinion with module 2, 3 or 4, straight or inclined tooth
- Pinion tooth flush with shaft end or shaft shoulder
- Backlash-free shaft/hub connection (Heat shrink fit with adhesive on a keyed shaft, secured axially with bolt and washer)
- Pinion securing mechanism with shrink ring (optional)
- Installation using adjustment plate on the machine side for fast and easy adjustment of the axial distance of the pinion from the gear rack (optional)
- Attachment kit for lubricating the pinion (optional)
- Torsionally rigid block design
- Symmetrically friction-optimized output bearings
- Readily attaches any synchronous servo motor

ZV-K Dimension Drawings

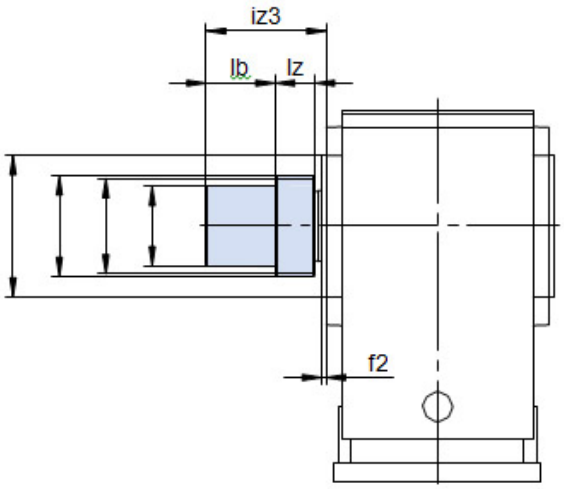
Pinion Position E

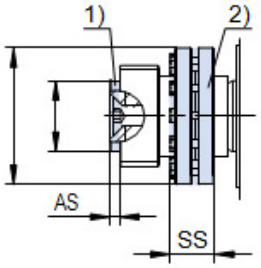






Pinion Position S





1) Secured axially with bolt and washer
2) Shrink ring (Optional for ZV-K3 and ZV-K4, but not in combination with the attachment kit for lubricating the pinion.)

Additional dimensions for gear units and drives can be found in the STOBER ServoFit® catalog or SMS-EZ catalog. Dimension a0 in the dimension tables applies to Atlanta gear racks. In general:
a0 = ½ d0 + h0 + x*m

ZV-K Technical Data

S – helical gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d0 [mm]
ZV220S_K102	2	20	4.9	3.2	110	68	9.8	6.5	210	140	74/37	42.4
ZV225S_K202	2	25	8.3	5.2	220	140	15	10	400	280	77/39/12	53.1
ZV225S_K203	2	25	8.2	5.2	220	140	15	10	390	280	77/46/19	53.1
ZV225S_K302	2	25	10	5.2	280	140	21	10	550	270	77/31/12	53.1
ZV225S_K303	2	25	10	5.2	280	140	21	10	550	270	77/39/19	53.1
ZV318S_K202	3	18	7.7	5.4	220	150	14	11	400	310	83/42/12	57.3
ZV318S_K203	3	18	7.6	5.4	220	150	14	11	390	310	83/50/21	57.3
ZV318S_K302	3	18	11	5.3	310	150	22	11	620	310	83/33/12	57.3
ZV318S_K303	3	18	11	5.3	310	150	22	11	620	310	83/42/21	57.3
ZV322S_K402	3	22	15	6.6	540	230	31	13	1080	460	102/41/15	70.0
ZV322S_K403	3	22	15	6.6	540	230	31	13	1080	460	102/51/25	70.0
ZV418S_K402	4	18	15	6.9	570	270	29	14	1100	530	111/44/17	76.4
ZV418S_K403	4	18	15	6.9	570	270	28	14	1080	530	111/56/28	76.4

G – straight cut gearing

Typ	m	z	F_{v2B} Pos S [kN]	F_{v2B} Pos E [kN]	M_{2B} Pos S [Nm]	M_{2B} Pos E [Nm]	F_{v2NOT} Pos S [kN]	F_{v2NOT} Pos E [kN]	M_{2NOT} Pos S [Nm]	M_{2NOT} Pos E [Nm]	Δs [µm]	d0 [mm]
ZV221G_K102	2	21	6.4	4.0	140	83	11	7.9	240	170	73/37	42.0
ZV226G_K202	2	26	8.5	6.0	220	160	15	12	400	310	76/38/11	52.0
ZV226G_K203	2	26	8.3	6.0	220	160	15	12	390	310	76/45/19	52.0
ZV226G_K302	2	26	9.2	5.9	240	150	18	12	480	310	76/30/11	52.0
ZV226G_K303	2	26	9.2	5.9	240	150	18	12	480	310	76/38/19	52.0
ZV319G_K202	3	19	7.7	6.2	220	180	14	12	400	360	83/41/12	57.0
ZV319G_K203	3	19	7.6	6.2	220	180	14	12	390	360	83/50/21	57.0
ZV319G_K302	3	19	11	6.2	320	180	22	12	640	350	83/33/12	57.0
ZV319G_K303	3	19	11	6.2	320	180	22	12	640	350	83/41/21	57.0
ZV323G_K402	3	23	14	7.4	470	260	28	15	950	510	100/40/15	69.0
ZV323G_K403	3	23	14	7.4	470	260	28	15	950	510	100/50/25	69.0
ZV419G_K402	4	19	16	8.0	600	300	29	16	1100	610	111/44/17	76.0
ZV419G_K403	4	19	16	8.0	590	300	29	16	1080	610	111/55/28	76.0

ZV-K Dimensional Data

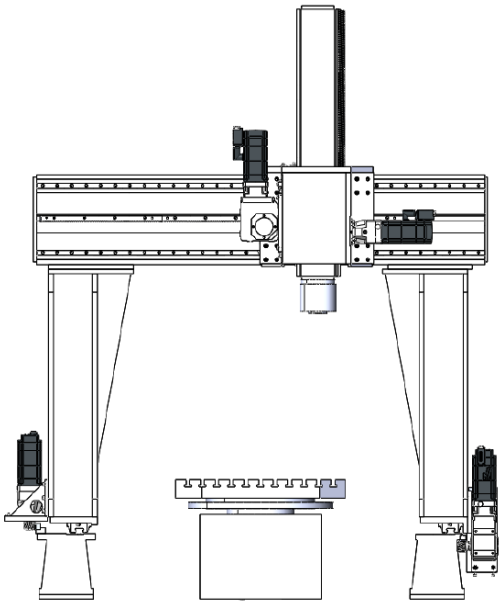
S – helical gearing

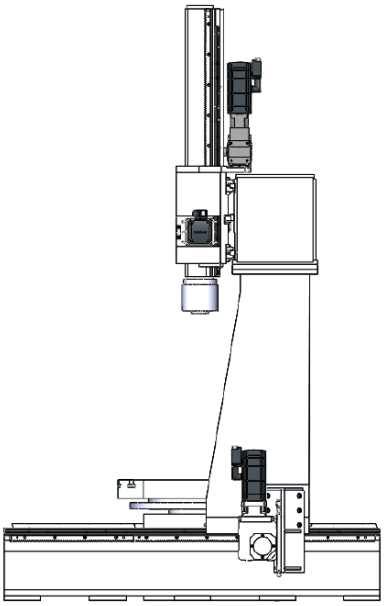
Typ	m	z	a0	±a4	AS	øb	d0	DA	db	dk	DS	øe	f2	h0	iz3	lb	lz	øs4	SS	x
ZV220S_K1	2	20	44.02	105	7	75$_{j6}$	42.44	30	38	47.90	-	90	3.0	22	50.5	12.5	26	M8	-	0.4
ZV225S_K2	2	25	49.33	116	9	82$_{j6}$	53.05	45	50	58.52	-	100	3.0	22	67.5	34.5	26	M8	-	0.4
ZV225S_K3	2	25	49.33	132	9	95$_{j6}$	53.05	45	50	58.52	90.5	115	3.0	22	68.5	34.5	26	M8	24.3	0.4
ZV318S_K2	3	18	55.55	116	9	82$_{j6}$	57.30	45	50	65.01	-	100	3.0	26	67.5	29.5	31	M8	-	0.3
ZV318S_K3	3	18	55.55	132	9	95$_{j6}$	57.30	45	50	65.01	90.5	115	3.0	26	68.5	29.5	31	M8	24.3	0.3
ZV322S_K4	3	22	62.21	152	11	110$_{j6}$	70.03	55	62	78.35	106.0	130	3.5	26	93.0	53.5	31	M10	34.5	0.4
ZV418S_K4	4	18	74.40	152	11	110$_{j6}$	76.40	55	62	86.77	106.0	130	3.5	35	93.0	43.5	41	M10	34.5	0.3

G – straight cut gearing

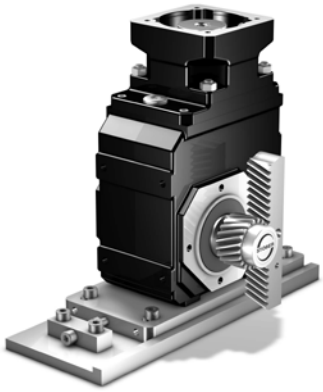
Typ	m	z	a0	±a4	AS	øb	d0	DA	db	dk	DS	øe	f2	h0	iz3	lb	lz	øs4	SS	x
ZV221G_K1	2	21	44.01	105	7	75$_{j6}$	42.00	30	38	47.89	-	90	3.0	22	50.5	12.5	26	M8	-	0.507
ZV226G_K2	2	26	49.32	116	9	82$_{j6}$	52.00	45	50	58.51	-	100	3.0	22	67.5	34.5	26	M8	-	0.660
ZV226G_K3	2	26	49.32	132	9	95$_{j6}$	52.00	45	50	58.51	90.5	115	3.0	22	68.5	34.5	26	M8	24.3	0.660
ZV319G_K2	3	19	55.55	116	9	82$_{j6}$	57.00	45	50	65.02	-	100	3.0	26	67.5	29.5	31	M8	-	0.350
ZV319G_K3	3	19	55.55	132	9	95$_{j6}$	57.00	45	50	65.02	90.5	115	3.0	26	68.5	29.5	31	M8	24.3	0.350
ZV323G_K4	3	23	62.21	152	11	110$_{j6}$	69.00	55	62	78.34	106.0	130	3.5	26	93.0	53.5	31	M10	34.5	0.570
ZV419G_K4	4	19	74.41	152	11	110$_{j6}$	76.00	55	62	86.79	106.0	130	3.5	35	93.0	43.5	41	M10	34.5	0.352

ZV Application Examples





Options: ZV Adjustment Plate

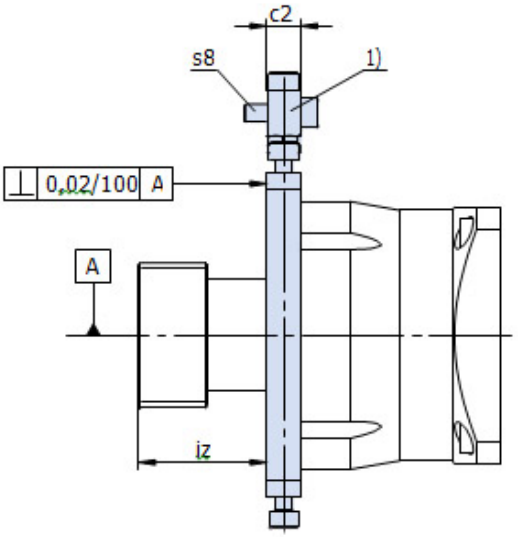


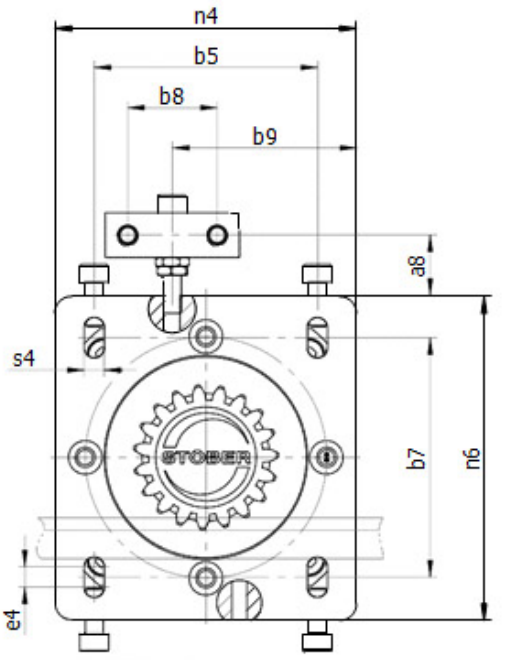
- For fast and easy adjustment of the back- lash or axial distance between the pinion and gear rack with four adjusting screws
- The optionally available adjustment bar can be used to adjust the axial distance in both directions of motion even more quickly and easily with an adjusting screws
- The alignment edge of the adjustment plate ensures correct access between the pinion and gear rack (for series ZV-KL and ZV-K)
- Inexpensive and ready to install
- Assembled together with the gear unit when delivered
- Optional for series:
    - ZV-PE
    - ZV-P
    - ZV-PA
    - ZV-KL
    - ZV-K

ZV Adjustment Plate Dimension Drawing for PE, P, PA Gearboxes

ZV-PE

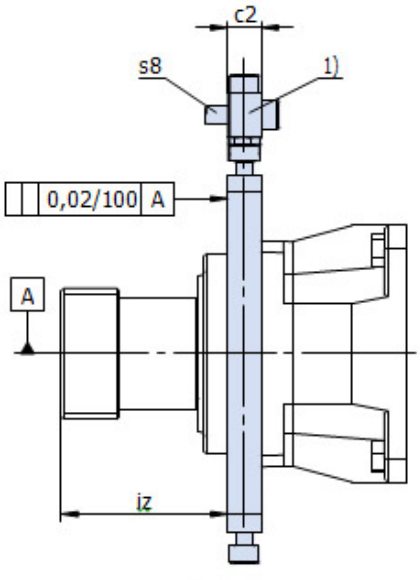
Pinion Position E

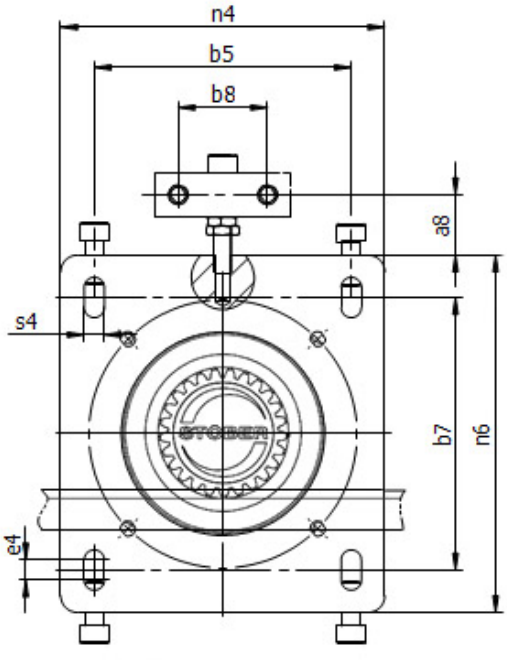




ZV-P(A)

Pinion Position E

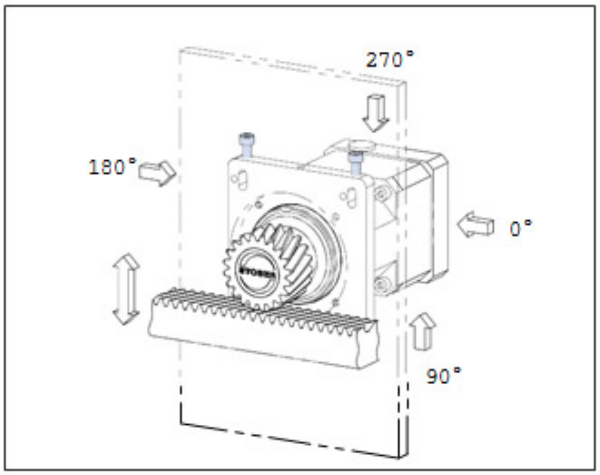




1) Adjustment bar (optional) can also be mounted symmetrically on the opposite side of the adjustment plate

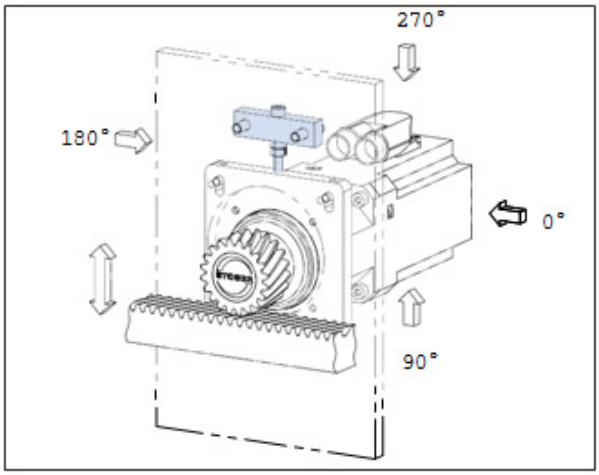
ZV Adjustment Plate Technical Data for PE, P, PA Gearboxes

Position



ZV-P with adjustment plate, access clamping screw 270°

Position



ZV-P with adjustment plate and adjustment bar (optional), access plug connector 270°

The adjustment plate

– is axis-symmetrical
– is mounted on the drive side
– must be mounted so that its slotted holes are aligned at an angle of 90° to the position of the gear rack.

Enter the desired position of the service door for the clamping screw of the motor coupling or the motor plug connector if it is different than the standard position of 270° (see also the above illustrations). Also note carefully the following remark:

If the gear rack is turned to a different position, the adjustment plate and the position of the access to the clamping screw for the motor coupling or the motor plug connector rotate with it.

ZV Adjustment Plate Dimensional Data for PE, P, PA Gearboxes

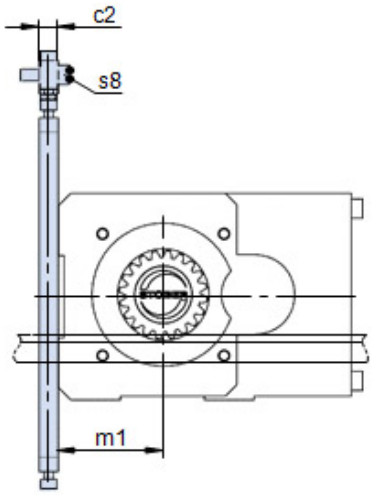
Typ	a8	b5	b7	b8	b9	c2	e4	iz	n4	n6	s4	s8
ZV-PE4	27,5	85	90	40	77,0	10	7	38,5	110	120	4x6,6	M6x20
ZV-PE5	37,0	100	107	40	82,5	15	9	57,5	135	145	4x9,0	M8x25

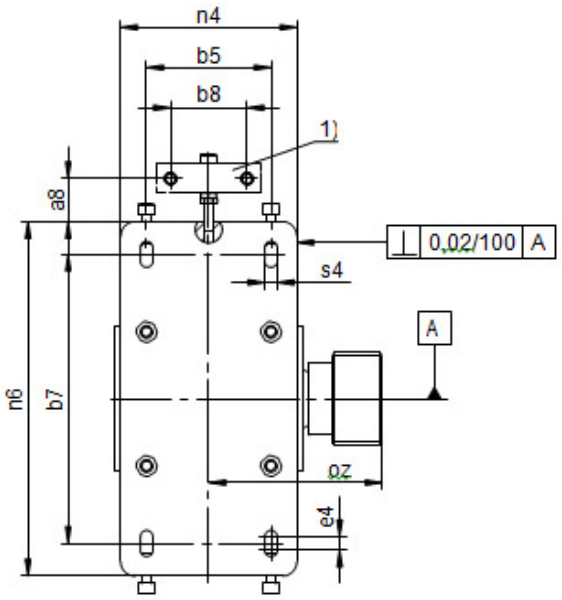
Typ	a8	b5	b7	b8	c2	e4	iz	n4	n6	s4	s8
ZV-P(A)3	27,5	75	80	40	10	7,0	39,5	95	105	4x5,5	M6x20
ZV-P(A)4	27,5	85	90	40	10	7,0	47,5	110	120	4x6,6	M6x20
ZV-P(A)5	37,0	115	122	40	15	9,0	74,5	145	160	4x9,0	M8x25
ZV-P(A)7	37,0	155	88	40	15	11,5	98,5	190	210	4x11,0	M8x25

ZV Adjustment Plate Dimension Drawing for K, KL Gearboxes

ZV-KL

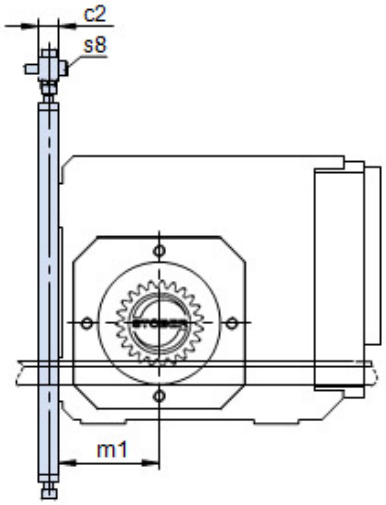
Pinion Position E

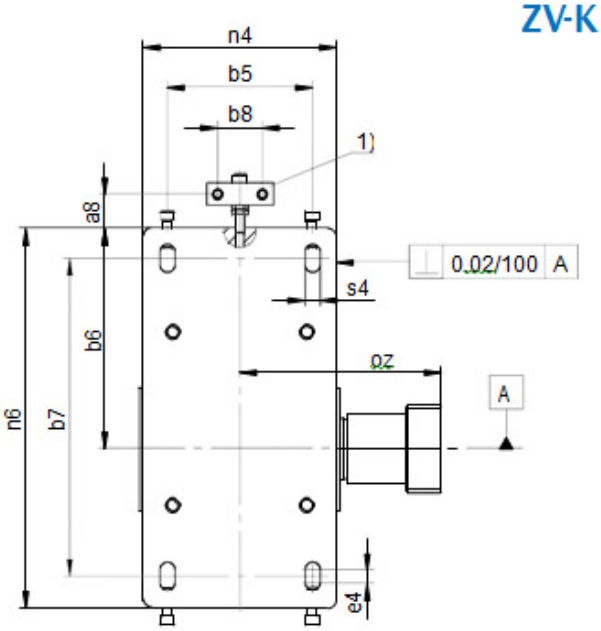




ZV-K

Pinion Position E

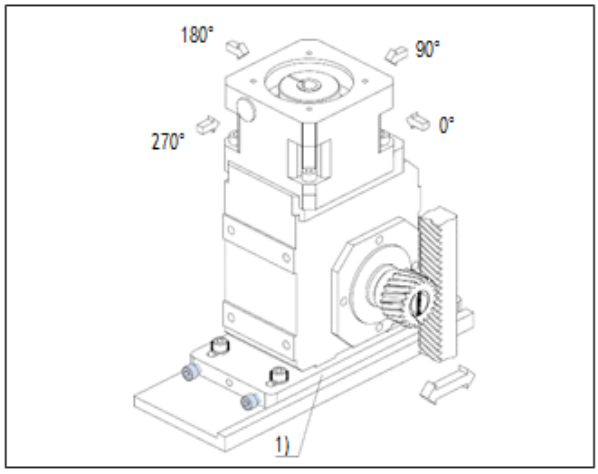




1) Adjustment bar (optional) can also be mounted symmetrically on the opposite side of the adjustment plate

ZV Adjustment Plate Technical Data for K, KL Gearboxes

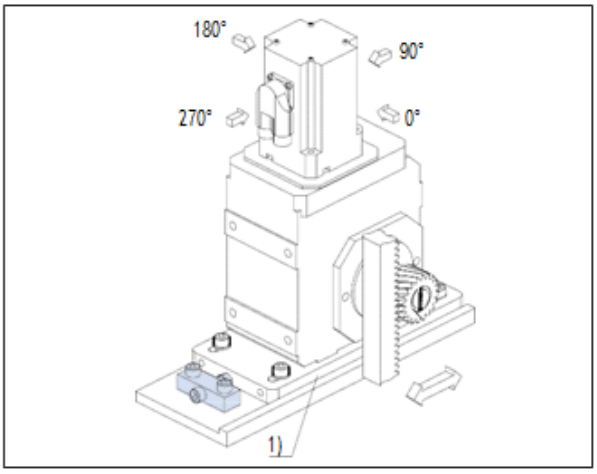
Position



1) Aligning edge

ZV-K with adjustment plate, mounting position EL5, output side 4, access clamping screw 270°

Position



1) Aligning edge

ZV-K with adjustment plate and adjustment bar (optional), mounting position EL5, output side 4, access clamping screw 270°

The gear unit with the adjustment plate attached to gear unit side 5 must be mounted so that the slotted holes of the adjustment plate are aligned at an angle of 90° to the position of the gear rack.

Enter the desired position of the service door for the clamping screw of the motor coupling or the motor plug connector if it is different than the standard position of 270° (see also the above illustrations). Also note carefully the following remark:

If the gear rack is turned to a different position, the adjustment plate and the position of the access to the clamping screw for the motor coupling or the motor plug connector rotate with it.

ZV Adjustment Plate Dimensional Data for K, KL Gearboxes

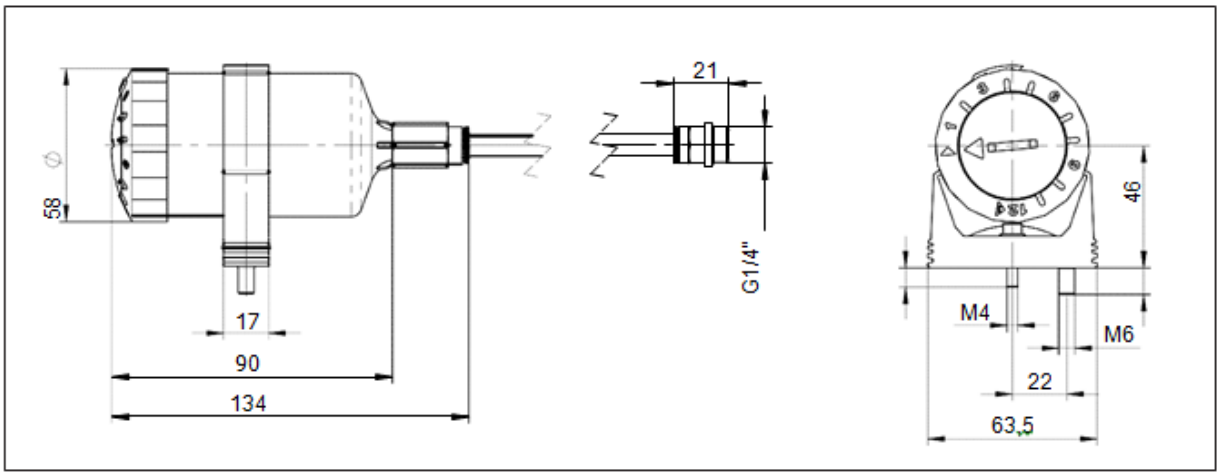
Typ	a8	b5	b7	b8	c2	e4	m1	n4	n6	oz	s4	s8
ZV-KL1	27.5	50	120	40	10	7	46	75	150	73.0	4x6,6	M6x20
ZV-KL2	27.5	65	151	40	10	7	55	92	185	90.5	4x6,6	M6x20

Typ	a8	b5	b6	b7	b8	c2	e4	m1	n4	n6	oz	s4	s8
ZV-K1	37	75	137.5	207.0	40	15	7.0	60	106	245	103.5	4x9,0	M8x25
ZV-K2	37	100	162.5	237.0	40	18	9.0	65	134	280	134.5	4x11,0	M8x30
ZV-K3	37	115	177.5	262.0	40	18	9.0	75	146	305	141.5	4x11,0	M8x30
ZV-K4	37	130	197.5	284.5	40	18	11.5	90	173	340	179.5	4x13,5	M8x30

Options: ZV Lubrication System

- For continuous lubrication of the pinion or gear rack via a felt gear
- Suitable for both decentralized and central lubrication supply
- Available components:
  - Felt gear with fastening axis (fastening provided by customer)
  - Starter kit for decentralized lubrication (fastening provided by customer)
  - Attachment kit for fastening axis with felt gear, for lubricating the pinion, for series ZV-K and ZV-KL, mounted on gear unit side 1 (also available separately).

ZV Lubrication System Starter Kit for Decentralized Lubrication



Starter kit includes:

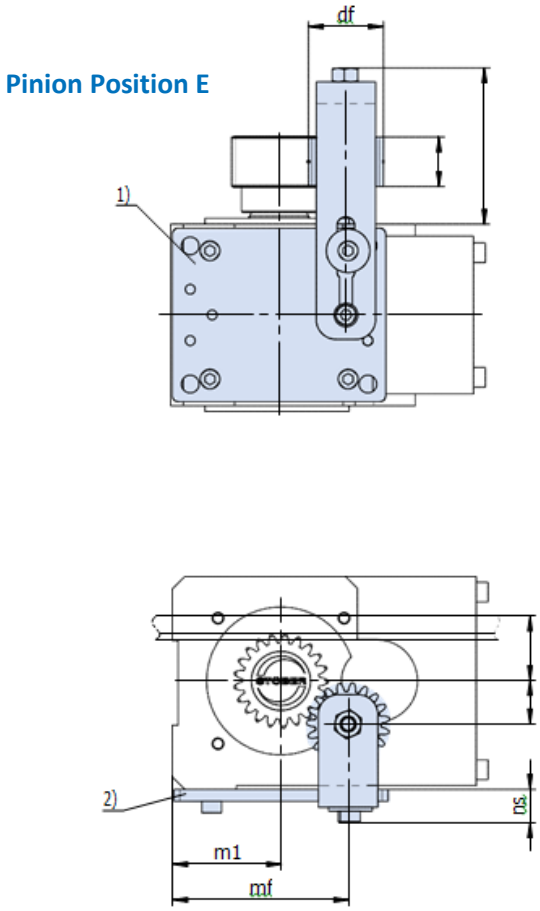
- Lubricant dispenser with fastening clamp and screws
- Hose filled with lubricant (1.5 meters)
- Hose fittings
- Lubricant for initial lubrication of the felt gear, pinion and gear unit

Features of the lubricant dispenser:

- Dispensing time adjustable from 1 to 12 months
- Ready for use immediately
- Activation without tool
- No external power supply required
- Transparent housing for visual check of the lubricant level
- Protection class IP68
- Operating temperature -20° C to 60° C

Starter kit Part Number: 57432
Lube Dispenser Replacement Part Number: 57431

ZV Lubrication System Attachment Kit for Pinion Lubrication for ZV-KL Gearbox



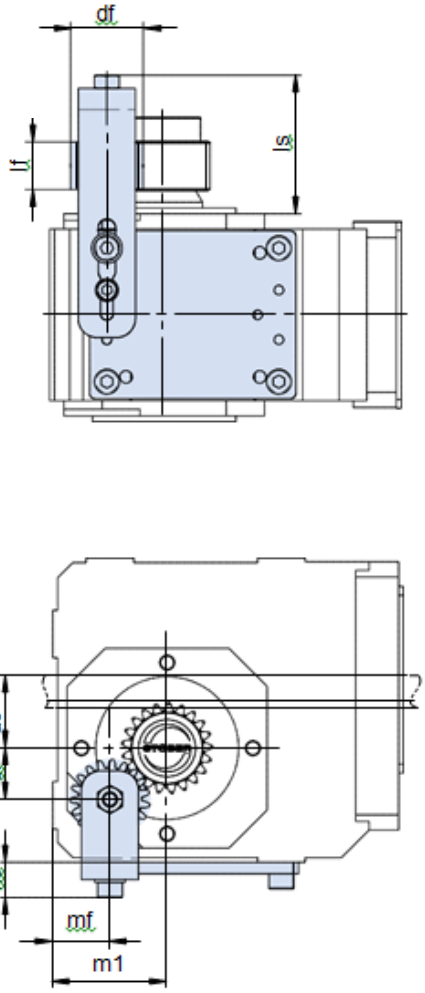
1) The angle with the felt gear can alternatively be mounted at this position as well.
2) There is no base plate for ZV-KL1.

ZV Lubrication System Dimensional Data for ZV-KL Gearbox

Typ	m	a0	af	df	lf	ls (Pos E)	ls (Pos S)	m1	mf	ns
ZV2-KL1	2	39.98	23.4	42	25	70	66	46	73.5	8
ZV2-KL2	2	44.01	22.0	42	25	79	69	55	88.9	17

ZV Lubrication System Attachment Kit for Pinion Lubrication for ZV-K1 Gearbox

Pinion Position S

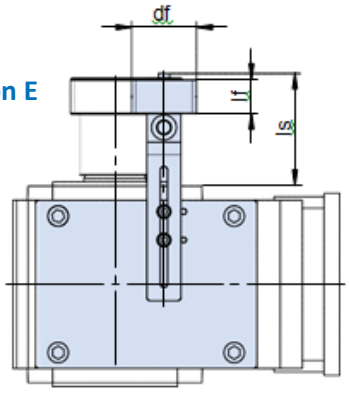


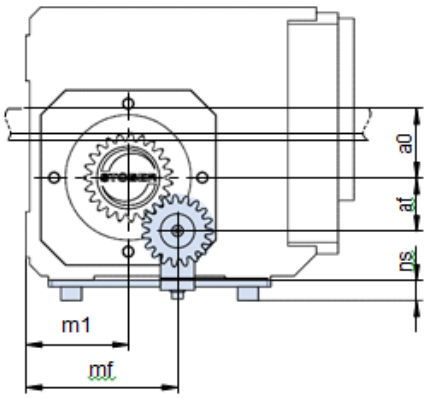
ZV Lubrication System Dimensional Data for ZV-K1 Gearbox

Typ	m	a0	af	df	lf	ls (Pos E)	ls (Pos S)	m1	mf	ns
ZV2-K1	2	44.01	27.0	42	25	85.5	72.5	60	30,0	18.6

ZV Lubrication System Attachment Kit for Pinion Lubrication of ZV-K2 – ZV-K4

Pinion Position E

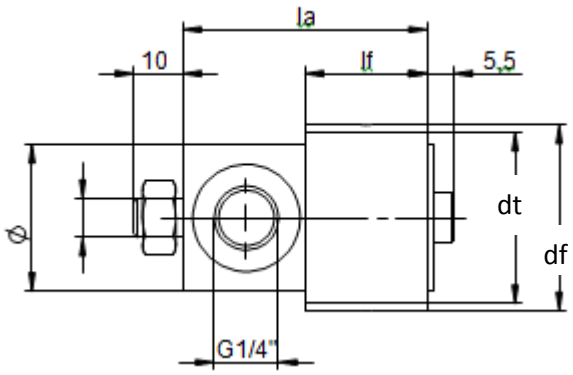




ZV Lubrication System Dimensional Data

Typ	m	a0	af	df	lf	ls (Pos E)	ls (Pos S)	m1	mf	ns
ZV2-K2	2	49.32	21.8	42	25	72.5	67.5	65	105.1	14.0
ZV2-K3	2	49.32	31.8	42	25	73.5	68.5	75	107.7	14.0
ZV3-K2	3	55.55	21.8	63	30	72.5	72.5	65	118.0	14.0
ZV3-K3	3	55.55	31.8	63	30	73.5	73.5	75	122.6	14.0
ZV3-K4	3	62.21	46.8	63	30	98.0	74.0	90	133.2	18.0
ZV4-K4	4	74.41	46.8	84	40	98.0	84.0	90	150.5	18.0

ZV Felt Gear with Fastening Axis



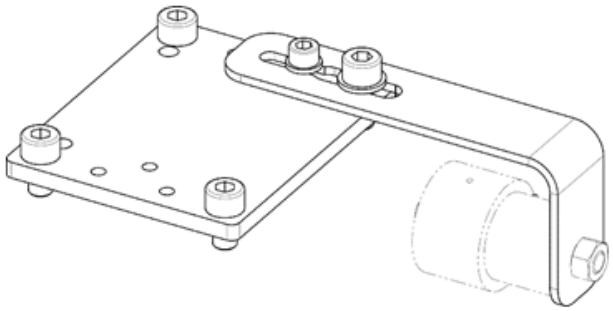
Typ	m	dt	df	lf	la
Typ 1	2	38.0	42	25	50
Typ 2	2	38.2	42	25	50
Typ 3	2	38.2	42	25	50
Typ 1	3	57.0	63	30	55
Typ 2	3	57.3	63	30	55
Typ 3	3	57.3	63	30	55
Typ 1	4	76.0	84	40	65
Typ 2	4	76.5	84	40	65
Typ 3	4	76.5	84	40	65

Typ 1 = fastening axis with felt gear unit, with straight tooth

Typ 2 = fastening axis with felt gear, inclined tooth, right-hand (pinion lubrication)

Typ 3 = fastening axis with felt gear, inclined tooth, left-hand (gear rack lubrication)

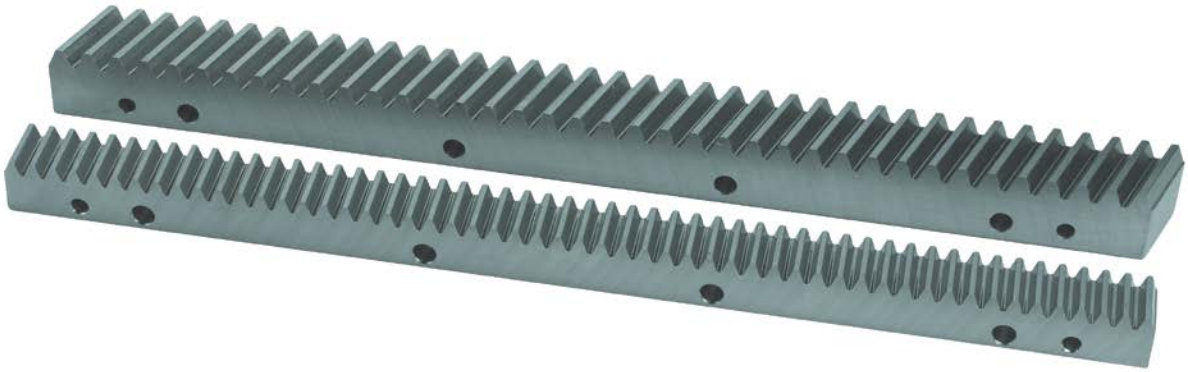
ZV Attachment Kit for Fastening Axis with Felt Gear



Attachment kits are available for:

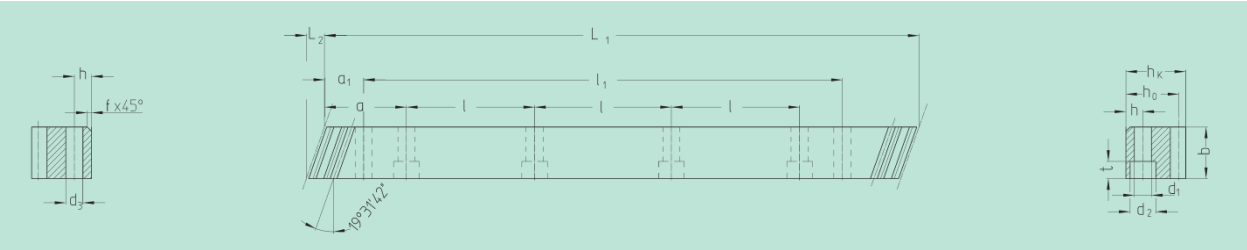
- ZV -KL1
- ZVKL2
- ZV-K1
- ZV-K2
- ZV-K3
- ZV-K4

Rack Options



Helical Rack – HPR Racks Module 2-10

Quality 7



Order Code	Module	L_1	L_2	N° of Teeth	b	h_k	h_0	f	a	l	N° of Holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
29 20 107	2	1000.00	8.5	150	24	24	22	2	62.5	125	8	8	7	11	7	31.7	936.6	5.7	4.10
29 20 157	2	1500.00	8.5	225	24	24	22	2	62.5	125	12	8	7	11	7	31.7	1436.6	5.7	6.15
29 20 207	2	2000.00	8.5	300	24	24	22	2	62.5	125	16	8	7	11	7	31.7	1936.6	5.7	8.20
29 30 107	3	1000.00	10.3	100	29	29	26	2	62.5	125	8	9	10	15	9	35.0	930.0	7.7	5.90
29 30 157	3	1500.00	10.3	150	29	29	26	2	62.5	125	12	9	10	15	9	35.0	1430.0	7.7	8.85
29 30 207	3	2000.00	10.3	200	29	29	26	2	62.5	125	16	9	10	15	9	35.0	1930.0	7.7	11.80
29 40 107	4	1000.00	13.8	75	39	39	35	2	62.5	125	8	12	14	20	13	33.3	933.4	11.7	10.70
29 40 157 [1)]	4	1506.67	13.8	113	39	39	35	2	62.5	125	12	12	14	20	13	33.3	1433.4	11.7	16.00
29 40 207	4	2000.00	13.8	150	39	39	35	2	62.5	125	16	12	14	20	13	33.3	1933.4	11.7	21.40

1) These racks should be used for continuous linking only with the left side (see sketch).

Total pitch error:

GT_f /1000 ≤ 0.052 mm

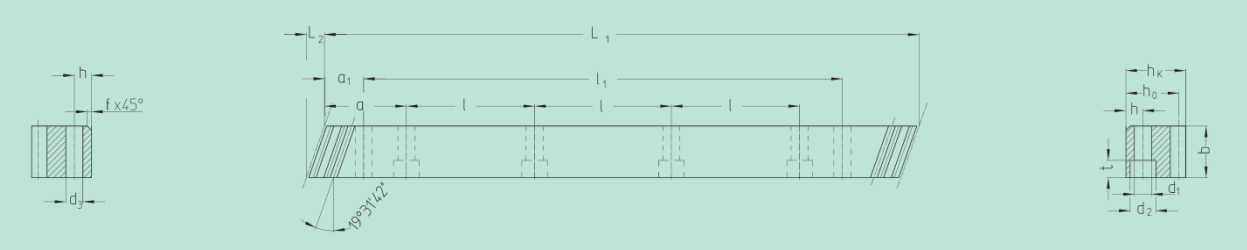
GT_f /1500 ≤ 0.062 mm (≤ 0.041/1000 mm)

GT_f /2000 ≤ 0.068 mm (≤ 0.034/1000 mm)

- Teeth induction-hardened and ground
- Material C45
- Ground on all sides after hardening

Helical Rack – PR Racks Module 1.5-6

Quality 10



Order Code	Module	L_1	L_2	N° of Teeth	b	h_K	h_0	f	a	l	N° of Holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
39 15 050 [2]	1.5	500.00	6.02	100	17	17	15.5	2	62.5	125	4	6	6	10	6	31.7	436.6	5.7	1.30
39 15 100	1.5	1000.00	6.02	200	17	17	15.5	2	62.5	125	8	6	6	10	6	31.7	936.6	5.7	2.60
39 20 050 [2]	2	500.00	8.87	75	25	24	22	2	62.5	125	4	8	7	11	7	31.7	436.6	5.7	2.10
39 20 100	2	1000.00	8.87	150	25	24	22	2	62.5	125	8	8	7	11	7	31.7	936.6	5.7	4.20
39 20 200	2	2000.00	8.87	300	25	24	22	2	62.5	125	16	8	7	11	7	31.7	1936.6	5.7	8.40
39 30 050 [2]	3	500.00	10.64	50	30	29	26	2	62.5	125	4	9	10	15	9	35.0	430.0	7.7	3.00
39 30 100	3	1000.00	10.64	100	30	29	26	2	62.5	125	8	9	10	15	9	35.0	930.0	7.7	6.00
39 30 200	3	2000.00	10.64	200	30	29	26	2	62.5	125	16	9	10	15	9	35.0	1930.0	7.7	12.00
39 40 050 [1] [2]	4	506.67	14.2	38	40	39	35	2	62.5	125	4	12	10	15	9	33.3	433.0	7.7	5.30
39 40 100 [2]	4	1000.00	14.2	75	40	39	35	2	62.5	125	8	12	10	15	9	33.3	933.4	7.7	10.50
39 42 100	4	1000.00	14.2	75	40	39	35	2	62.5	125	8	12	14	20	13	33.3	933.4	11.7	10.50
39 42 150 [1]	4	1506.67	14.2	113	40	39	35	2	62.5	125	12	12	14	20	13	33.3	1433.4	11.7	15.75
39 40 200	4	2000.00	14.2	150	40	39	35	2	62.5	125	16	12	10	15	9	33.3	1933.4	7.7	21.00
39 42 200	4	2000.00	14.2	150	40	39	35	2	62.5	125	16	12	14	20	13	33.3	1933.4	11.7	21.00

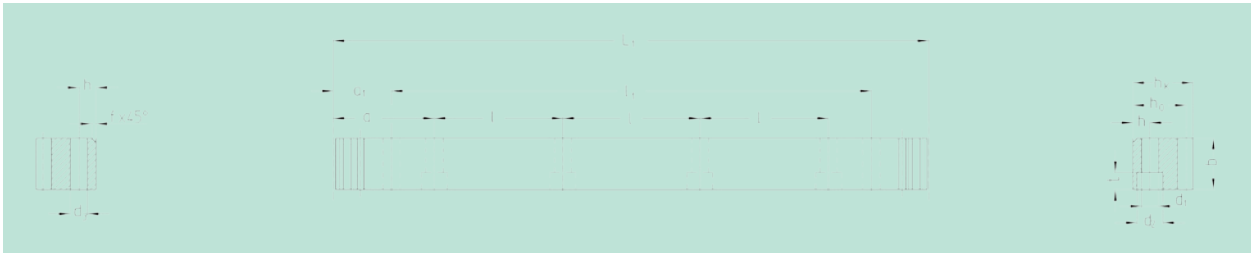
1) These racks should be used for continuous linking only with the left side (see sketch).
2) The screw joint limits the feed force.

Total pitch error: GT_f /1000 ≤ 0.2 mm

- Milled teeth and induction hardened
- Material C45
- Backside machined, profile blasted

Straight Rack – HPR Racks Module 2-8

Quality 7



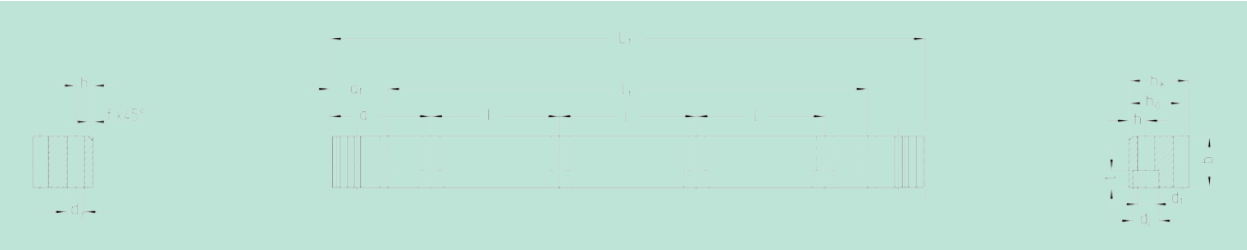
Order Code	Module	L_1	N° of Teeth	b	h_k	h_0	f	a	l	N° of Holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
28 20 107	2	1005.3	160	24	24	22	2	62.8	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
28 30 107	3	1017.9	108	29	29	26	2	63.6	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
28 40 107	4	1005.3	80	39	39	35	2	62.8	125.66	8	12	14	20	13	37.5	930.3	7.7	10.5

Total pitch error: GT_f /1000 ≤ 0.052 mm

- Teeth induction-hardened and ground
- Material C45
- Ground on all sides after hardening

Straight Rack – BR Racks Module 2-6

Quality 10



Order Code	Module	L_1	N° of Teeth	b	h_k	h_0	f	a	l	N° of Holes	h	d_1	d_2	t	a_1	l_1	d_3	kg
34 20 050 [1]	2	502.65	80	25	24	22	2	62.83	125.66	4	8	7	11	7	31.3	440.1	5.7	2.1
34 20 100	2	1005.31	160	25	24	22	2	62.83	125.66	8	8	7	11	7	31.3	942.7	5.7	4.2
34 20 200	2	2010.62	320	25	24	22	2	62.83	125.66	16	8	7	11	7	31.3	1948.0	5.7	8.4
34 30 050 [1]	3	508.94	54	30	29	26	2	63.62	127.23	4	9	10	15	9	34.4	440.1	7.7	3.0
34 30 100	3	1017.88	108	30	29	26	2	63.62	127.23	8	9	10	15	9	34.4	949.1	7.7	6.0
34 30 200	3	2035.75	216	30	29	26	2	63.62	127.23	16	9	10	15	9	34.4	1967	7.7	12.0
34 40 050 [1]	4	502.65	40	40	39	35	2	62.83	125.66	4	12	10	15	9	37.5	427.7	7.7	5.3
34 40 100 [1]	4	1005.31	80	40	39	35	2	62.83	125.66	8	12	10	15	9	37.5	930.3	7.7	10.2
34 40 200 [1]	4	2010.62	160	40	39	35	2	62.83	125.66	16	12	10	15	9	37.5	1935.6	7.7	20.5
34 42 100	4	1005.31	80	40	39	35	2	62.83	125.66	8	12	14	20	13	37.5	930.3	11.7	10.2
34 42 150	4	1507.96	120	40	39	35	2	62.83	125.66	12	12	14	20	13	37.5	1432.9	11.7	15.3
34 42 200	4	2010.62	160	40	39	35	2	62.83	125.66	16	12	14	20	13	37.5	1935.6	11.7	20.5

Total pitch error: GT_f /1000 ≤ 0.2 mm

- Milled teeth and induction hardened
- Material C45
- Backside machined, profile blasted

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1. **GENERAL.** All orders for products supplied by STOBER DRIVES INC. ("STOBER") shall be subject to these terms and conditions of sales. All transactions shall be governed by the laws of the Commonwealth of Kentucky. No modifications hereto will be binding unless agreed to in writing by STOBER.

2. **CUSTOMER.** The term "Customer," as used herein, means the distributor, resale dealer, original equipment manufacturer or first end-user customer that purchases the STOBER products.

3. **WARRANTY.** STOBER products shall be free from defects in material and workmanship for a maximum of 5-years (single shift operation or 30 months multiple shift operation) for ServoFit products (ServoFit Modular System, ServoFit Precision Planetary Gearheads, and ServoFit Geared Motors) and MGS Long Life products; 3-years (single shift operation or 18 months multiple shift operation) for other MGS products; 2-years (single shift operation or 12 months multiple shift operation) for ComTrac products, from the date of shipment to the Customer. For ServoFit products, the motor on ServoFit Geared Motors, as well as all normal wear items, including oil seals and bearings, shall be covered for a period of 2-years (single shift operation or 12 months multiple shift operation). In the event that a product proves to be defective, STOBER's sole obligation shall be, at its option, to repair or replace the product. The repaired or replacement product will be shipped F.O.B. STOBER's facilities, freight prepaid by STOBER.

No employee, agent or representative of STOBER has the authority to waive, alter, vary or add to the terms hereof without the prior written approval of an officer of STOBER. It is expressly agreed that (a) this section constitutes the final expression of the parties' understanding with respect to the warranty and (b) this section is a complete and exclusive statement of the terms of the warranty.

STOBER shall have no obligation under the warranty set forth above in the event that:

(a) The Customer fails, within the warranty period to notify STOBER in writing and provide STOBER with evidence satisfactory to STOBER of the alleged defect within five (5) days after it becomes known to the customer;

(b) After inspection of a product, STOBER determines, in its sole discretion, that it is not defective in material or workmanship;

(c) Repair or replacement of a product is required through normal wear and tear;

(d) Any part in a product or any ingredient contained in a product requires replacement or repair through routine usage or normal wear and tear;

(e)A product is not maintained or used in accordance with STOBER's applicable operating and/or maintenance manuals, whether by the Customer or any third party;

(f) A product has been subject to misuse, misapplication, negligence, neglect (including, but not limited to, improper maintenance or storage), accident, catastrophe, improper installation, modification, adjustment, repair or lubrication, whether by the Customer or any third party, without the prior written consent of STOBER. Misuse shall include, but not be limited to, deterioration in a product due to chemical action and wear caused by the presence of abrasive materials;

(g) The system of connected rotating parts into which the product becomes incorporated is not compatible with the product, or it is not free from critical speed or torsional or other type of vibration within the specified operating range, no matter how induced; or

(h) The transmitted load and imposed torsional thrust and overhung loads are not within the published capacity limits for the unit sold.

Items manufactured by other parties but installed in or affixed to STOBER's products are not warranted by STOBER and bear only those warranties, express or implied, which are given by the manufacturer of such items, if any.THE WARRANTY SET FORTH ABOVE IS INTENDED SOLELY FOR THE BENEFIT OF THE Customer AND DOES NOT APPLY TO ANY THIRD PARTY. ALL CLAIMS MUST BE MADE BY THE Customer AND MAY NOT BE MADE BY ANY THIRD PARTY. THIS WARRANTY MAY NOT BE TRANSFERRED OR ASSIGNED, IN WHOLE OR IN PART, BY THE Customer FOR ANY REASON WHATSOEVER. ANY SUCH ATTEMPTED TRANSFER OR ASSIGNMENT SHALL BE NULL AND VOID.

THIS WARRANTY TAKES THE PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH ARE HEREBY DISCLAIMED AND EXCLUDED BY STOBER, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF USE AND ALL OBLIGATIONS OR LIABILITIES ON THE PART OF STOBER FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE, REPAIR OR PERFORMANCE OF THE PRODUCTS.

4. **MODIFICATIONS.** STOBER reserves the right, without notice to the Customer, to (a) change the specifications of any product, (b) improve a product in any manner that STOBER deems necessary or appropriate and (c) discontinue the manufacture of any product.

5. **PURCHASE ORDERS.** The Customer will submit purchase orders for the products to STOBER in writing, whether by mail or telefax, which shall set forth, at a minimum: (a) an identification of the products ordered, (b) prices for such products, (c) quantities, (d) requested delivery dates and (e) shipping instructions and shipping addresses.

6. **ACCEPTANCE OF ORDERS.** All purchase orders received from the Customer are subject to acceptance by STOBER in writing.

7. **MODIFICATION OF ORDERS.** No accepted purchase order shall be modified or canceled except upon the written agreement of STOBER and the Customer. Mutually agreed cancellations shall be subject to reasonable charges based upon expenses already incurred by STOBER and commitments made by STOBER. Mutually agreed change orders shall be subject to all provisions of these Terms and Conditions of Sale.

8. **PRICE INCREASES.** STOBER may increase its prices for the products by providing the original purchaser of the products with at least thirty (30) days' prior written notice. Increased prices for products shall not apply to purchase orders accepted prior to the effective date of the price increase unless such orders provide for delivery more than thirty (30) days after the date of acceptance of the order.

9. **PRICING AND DELIVERY TERMS.** In accordance with KRS 355.2-319(1)(b), all products are delivered F.O.B. STOBER's warehouse facility in Maysville, Kentucky, or such other facility as STOBER may designate. Orders are then shipped per Customer's shipping instructions as set forth in Customer's purchase order. **CATALOG PRICING DOES NOT INCLUDE SHIPPING, HANDLING AND TAXES.** Once delivered to a common carrier of the Customer's choosing [or of STOBER's choosing if Customer has failed to specify a common carrier on or before five (5) days prior to the requested delivery date] STOBER shall have no further responsibility for the products and all risk of damage, loss or delay shall pass to the Customer. A handling fee is added to freight costs by STOBER to cover the cost of having to pay the carrier within seven (7) days when the terms with the Customer are net 30. The Customer has the option of shipping collect with our carrier or the carrier of choice.

10. **PAYMENT TERMS.** Net 30 days. All orders will be shipped either prepaid by the Customer or C.O.D., at STOBER's option, unless the Customer has established a previously approved credit line. If STOBER approves a credit line for the Customer, all payments shall be due within thirty (30) days of the date of the invoice. If any invoice is not paid in full within such thirty (30) day period, then finance charges shall be assessed at the rate of one and one-half percent (1½%) per month (eighteen percent (18%) per year). If such rate is deemed to be usurious at any time, it shall be reduced to the maximum rate permitted by applicable law. STOBER may stop or withhold shipment of products if the Customer does not fulfill its payment obligations. If STOBER is insecure about payment for any reason, STOBER may require full or partial payment in advance and as a condition to the continuation of its delivery of products.

11. **SECURITY INTEREST.** Unless and until the products are paid for in full, STOBER reserves a security interest in them to secure the unpaid balance of the purchase price. The Customer hereby grants to STOBER a power of attorney, coupled with an interest, to execute and file on behalf of the Customer all necessary financing statements and other documents required or appropriate to protect the security interest granted herein.

12. **ACCEPTANCE OF PRODUCTS.** The Customer will conduct any incoming inspection tests as soon as possible upon arrival of the products, but in no event later than ten (10) days after the date of receipt. Any products not rejected by written notice to STOBER within such period shall be deemed accepted by the Customer. STOBER shall not be liable for any additional costs, expenses or damages incurred by the Customer, directly or indirectly, as a result of any shortage, damage or discrepancy in a shipment.

13. **LIMITATION OF REMEDIES.**

(a) STOBER SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE CAUSED BY DELAY IN FURNISHING THE CUSTOMER WITH PRODUCTS.

(b) IN NO EVENT SHALL STOBER'S LIABILITY INCLUDE ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL LOSSES OR DAMAGES, EVEN IF STOBER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH POTENTIAL LOSS OR DAMAGE.

14. **MADE-TO-ORDER PRODUCTS.** STOBER reserves the right to revoke and amend any price quotations offered to the Customer for made-to-order products, provided that such price quotations have not been accepted by the Customer prior to the date of revocation or amendment.

15. **DIES, TOOLS AND EQUIPMENT.** Charges incurred by the Customer for dies, tools and other equipment shall not confer ownership or the right to possession therein by the Customer. All such dies, tools and equipment shall remain the property of STOBER, and STOBER shall have the exclusive right to possession thereof. STOBER shall maintain such tools and equipment in good working order.

16. **REGULATORY LAWS AND STANDARDS.** STOBER makes no representation that its products conform to state or local laws, ordinances, regulations, codes or standards except as may be otherwise agreed to in writing by STOBER.

17. **SIZES AND WEIGHTS.** STOBER's products are made only in the sizes and to the specifications set forth in its catalogs and other literature. If any alteration is requested, such altered product will be treated as a made-to-order item. STOBER assumes no responsibility for typographical errors which may appear in its catalogs or literature, and cannot accept alteration charges caused by such errors. Since weights shown in STOBER's catalogs are approximate, they cannot be used in determining freight allowances set forth in its catalogs and other literature. Freight allowances will be determined at the time of shipment and shall be based on actual shipping weight.

18. **SYSTEM DESIGN.** Responsibility for system design to ensure proper use and application of STOBER's products within their published specifications and ratings rests solely with the Customer. This includes, but is not limited to, an analysis of loads created by torsional vibrations within the entire system, regardless of how induced.

STOBER DRIVES INC.
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STOBER STÖBER

Geared to
a higher standard™

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