





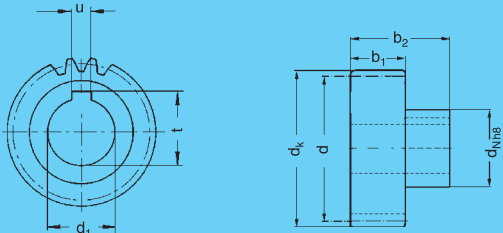
	系列 Series	節距 Pitch	齒面熱處理 Heat-treatment of teeth	精度系數 Tolerance of teeth	頁碼 Page
	24 .. ...	5, 10, 13,33	表面淬火 case-hardened	7 e 25	ZG-2
	07 .. ...	5, 10	軟材 soft	8 e 25	ZG-2
	TR-系列齒輪 TR pinion		簡述 Short description		ZGA-1
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直齒類，磨削加工齒，20° 壓力角。

Straight tooth system, ground teeth, 20° transverse pressure angle



16MnCr5, 1.7131
表面淬火 case-hardened
精度等級 Gearing grade
7 e 25

訂貨號 Order code	模數 Module	齒數 N° of teeth z	d	dk	d <sub>1</sub> <sup>H6</sup>	d <sub>N</sub>	b <sub>1</sub>	b <sub>2</sub>	u	t	kg	軸襯 見 GF-5 shrink-disc on page GF-5
節距 / Pitch 5 mm												
24 06 425	1,591	25	39,79	42,9	16	30	25	51	5	18,3	0,31	80 83 030
24 00 430	1,591	30	47,75	50,9	22	36	25	54	6	24,8	0,43	80 84 036
24 03 440	1,591	40	63,66	66,8	25	44	25	56	8	28,3	0,78	80 80 044
節距 / Pitch 10 mm												
24 70 420	3,183	20	63,66	70,0	22	36	31	60	6	24,8	0,83	80 84 036
24 71 425	3,183	25	79,58	85,9	25	44	31	62	8	28,3	1,40	80 80 044
24 73 425	3,183	25	79,58	85,9	32	55	31	68	10	35,3	1,50	80 80 055
節距 / Pitch 13,33 mm												
24 93 420	4,244	20	84,89	93,3	32	55	40	77	10	35,3	2,00	80 80 055
24 95 425	4,244	25	106,10	114,6	40	62	40	77	12	43,3	2,90	80 86 062

直齒類，銑削加工齒，20° 壓力角。

Straight tooth system, milled teeth, 20° transverse pressure angle



軟材 / soft
Ck45 1.0503
精度等級 Gearing grade
8 e 25

訂貨號 Order code	模數 Module m	齒數 N° of teeth z	d	dk	d <sub>1</sub>	d <sub>N</sub>	b <sub>1</sub>	b <sub>2</sub>	kg
節距 / Pitch 5 mm									
07 06 012	1,591	12	19,1	22,3	6	14	12	25	0,03
07 06 015	1,591	15	23,9	27,0	6	18	12	25	0,06
07 06 018	1,591	18	28,6	31,8	8	20	12	25	0,07
07 06 020	1,591	20	31,8	35,0	8	20	12	25	0,10
07 06 025	1,591	25	39,8	43,0	8	25	12	25	0,14
07 06 030	1,591	30	47,7	50,9	10	30	12	25	0,20
07 06 040	1,591	40	63,6	66,8	10	40	12	25	0,36
07 06 050	1,591	50	79,6	82,7	12	50	12	25	0,56
07 06 060	1,591	60	95,5	98,6	12	60	12	25	0,82
節距 / Pitch 10 mm									
07 08 012	3,183	12	38,2	44,6	10	25	25	40	0,22
07 08 015	3,183	15	47,7	54,1	12	30	25	40	0,38
07 08 018	3,183	18	57,3	63,7	15	40	25	40	0,50
07 08 020	3,183	20	63,7	70,0	15	40	25	40	0,60
07 08 025	3,183	25	79,6	85,9	15	50	25	40	0,96
07 08 030	3,183	30	95,5	101,9	20	60	25	40	1,46
07 08 040	3,183	40	127,3	133,7	20	80	25	40	2,68

可以很快進行追加工（打孔，開鍵槽，攻絲等）。

Further finishing (turning bores, keywaying, threading, etc.) is possible within short time.



斜齒類 TR-系列齒輪 ZE 5.1. – ZE 5.5  
Helical tooth TR pinion on page ZE 5.1. – ZE 5.5  
直齒類 TR-系列齒輪 ZF 1.1. – ZF 1.5  
Straight tooth TR pinion on page ZF 1.1. – ZF 1.5

### 簡述

ATLANTA-TR系列齒輪是依據EN ISO9409-1-A標準特殊設計的  
法蘭安裝齒輪軸。

TR系列齒輪與ATLANTA齒條相配合具有高精度和優秀的直綫驅  
動性能。

由于TR系列齒輪軸的緊湊的結構，它可以在很低的驅動扭矩下  
獲得非常高的驅動力。（TR系列齒輪=降低扭矩齒輪）使用TR系  
列齒輪在很多場合可以選用更小更便宜的減速箱-見ZGA-2頁。

所有齒輪的精度等級為5級。TR系列齒輪依據最大的軸承負荷能  
力的最佳設計。與齒條相配合使用（見型錄的同服驅動系統）它  
們可確保以最小的背隙下達到最高精度運行。

TR系列齒輪的直徑中心只是大致的，安裝法蘭的外圓是磨削過的  
可以當做參子口來調整運行的同心度。

TR系列齒輪具有的高剛性，低慣量和低圓周背隙，使其可以實現  
高剛性的響應和優秀的動力性能。

TR系列齒輪的齒型具有直齒類和斜齒類。并且直齒類和斜齒類間  
相互交換而不需要調整中心距。

由于法蘭的可拆卸設計，使維修和更換變得更加容易。

毛氈齒輪潤滑器和電控潤滑系統可以與TR系列齒輪及齒條組合  
使用-見ATLANTA伺服驅動系統型錄。

TR系列齒輪的典型特徵簡述：

- 緊湊的設計
- 低扭矩下的高驅動力
- 精度等級5級
- 可使用的參考子口便于檢查運行同心度
- 以最大軸承負載能力而設計的齒輪
- 容易更換
- 直齒類和斜齒類具有相同的中心距。

### Short description

ATLANTA TR pinions have been especially designed with an in-  
terface analogous to EN ISO 9409-1-A. Like all other ATLANTA  
catalogue items they are normally available from stock.

TR pinions have been designed to achieve highly precise and  
highly dynamic linear drives in combination with ATLANTA toothed  
racks

Due to the compact dimensions of the TR pinions it is possible to  
attain very high peripheral forces at low driving torques. (TR pinion  
= torque reduction pinion). With these TR pinions it is in many  
cases possible to choose a smaller and cheaper gear unit – see  
example on page ZGA-2.

All pinions are manufactured to meet gearing grade 5. The teeth of  
the TR pinions are optimally designed for maximum load-bearing  
capacity. In combination with the corresponding racks (see cata-  
logue Servo Drive System) they ensure very quietly running drives  
with extremely small backlash.

The centering diameters of TR pinions serve only for rough center-  
ing. The outside diameter of the mounting flange is ground and  
can therefore be used as a reference collar to optimize concentric  
running.

The combination of the high stiffness of the TR pinions with their  
low moments of inertia and minimal circumferential backlash makes  
it possible to realize very stiffly responding, highly dynamic drives.

The teeth of the TR pinions with straight or helical tooth systems  
are designed in such a way that it is possible to change between  
drives with straight tooth systems and drives with helical tooth  
systems without having to adjust the center distances.

Due to the screwed flange design the pinions can be easily re-  
placed in case of repair.

A lubrication system with felt gear-wheels and electronically con-  
trolled lubricators is available to supply lubricant to the TR pinions  
and racks – see the ATLANTA Servo Drive System catalogue.

Concise description of essential features of the TR pinions:

- compact design
- high peripheral forces at low driving torques
- gearing grade 5
- reference collar to check concentric running
- gearing designed for max. load bearing capacity
- easy to replace
- equal center distances for versions with straight and  
helical tooth systems





### 計算實例/優點

以下計算實例為2個齒輪的水平運動。此外選擇了相匹配的行星減速機。這個例子與以前的ATLANTA伺服驅動系統ZH-9頁是一樣的。

### Calculation example / Advantages

The following example recalculates 2 pinions for a horizontal travelling operation axis. Further the suitable planetary gearboxes will be chosen. The example is similar to the calculation given in ATLANTA Servo Drive System catalogue p. ZH-9.

### 已知值 / Values given

被移動質量 / mass to be moved	m	= 10000 kg
速度 / speed	v	= 0,7 m/s
加速時間 / acceleration time	t <sub>b</sub>	= 0,67 s
摩擦係數 / efficient of friction	μ	= 0,05
電機轉速 / motor rpm	n <sub>Mot</sub>	= 1500 min <sup>-1</sup>

重力加速度 / acceleration due to gravity	g	= 9,81 m/s <sup>2</sup>
載荷係數 / load factor (1)	K <sub>A</sub>	= 1,25
壽命係數 / life-time factor (1)	f <sub>n</sub>	= 1,0
安全係數 / safty coefficient (1)	S <sub>B</sub>	= 1,3

(1) 推薦值見ATLANTA伺服驅動系統型錄的 ZH-9 頁。  
/ guide values see catalogue ATLANTA Servo-Antriebsystem page ZH-9

### 計算過程 / Calculation process

加速度 / acceleration

$$a = \frac{v}{t_b} = \frac{0,7m/s}{0,67s} = 1,05 m/s^2$$

軸驅動力 / peripheral force at the pinion

$$F_u = m * g * \mu + m * a = 10000 kg * 9,81 m/s^2 * 0,05 + 10000 kg * 1,05 m/s^2 = 15400 N$$

### 常規齒輪軸 / conventionally pinion

模數 / Module	m	= 5
齒數 / No. of teeth	z	= 36
齒輪-ø / pitch-circle-ø of pinion	d	= 190,98 mm

$$T_{2\text{ erf/req.}} = \frac{F_u \cdot d}{2} = \frac{15400N \cdot 0,19098m}{2} = 1470,5 Nm$$

$$n_{\text{Ritzel/pinion}} = \frac{v}{\pi \cdot d} = \frac{700mm/s \cdot 60s/min}{\pi \cdot 198,98mm} = 70 \text{ min}^{-1}$$

$$T_{2\text{ zul/perm}} = \frac{T}{\frac{K_A \cdot S_B \cdot f_n}{A \cdot B \cdot n}} = \frac{3300Nm}{1,25 \cdot 1,0 \cdot 1,3} = 2030 Nm$$

$$i_{\text{max-Getr/gearbox}} = \frac{n_{\text{Motor}}}{n_{\text{Ritzel / pinion}}} = \frac{1500 \text{ min}^{-1}}{70 \text{ min}^{-1}} = 21,42$$

- => 行星減速機 / planetary-gearbox
- 減速機直徑 / gearbox-size appr. ø250mm
  - 減速比 / ratio i=20 (2-stufig / 2-stages)

### TR系列齒輪 / TR Pinion

模數 / Module	m	= 5
齒數 / No. of teeth	z	= 12
齒輪節圓直徑-ø / pitch-circle ø of pinion	d	= 63,66 mm

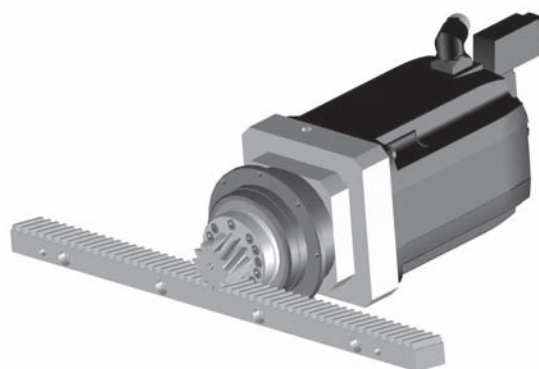
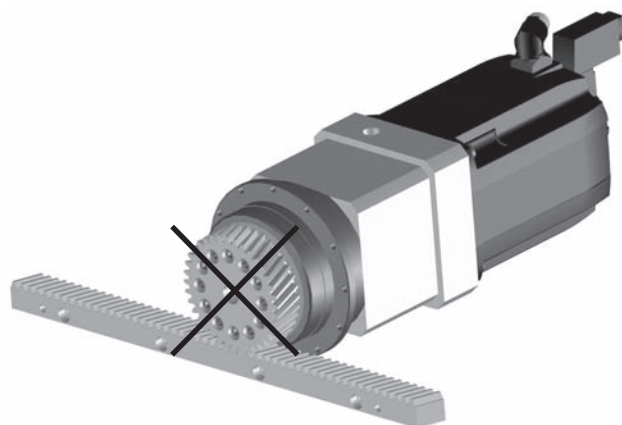
$$T_{2\text{ erf/req.}} = \frac{F_u \cdot d}{2} = \frac{15400N \cdot 0,06366m}{2} = 490,2 Nm$$

$$n_{\text{Ritzel/pinion}} = \frac{v}{\pi \cdot d} = \frac{700mm/s \cdot 60s/min}{\pi \cdot 63,66mm} = 210 \text{ min}^{-1}$$

$$T_{2\text{ zul/perm}} = \frac{T}{\frac{K_A \cdot S_B \cdot f_n}{A \cdot B \cdot n}} = \frac{1050Nm}{1,25 \cdot 1,0 \cdot 1,3} = 646,2 Nm$$

$$i_{\text{max-Getr/gearbox}} = \frac{n_{\text{Motor}}}{n_{\text{Ritzel / pinion}}} = \frac{1500 \text{ min}^{-1}}{210 \text{ min}^{-1}} = 7,14$$

- => 行星減速機 / planetary-gearbox
- 減速機直徑 / gearbox-size appr. ø200mm
  - 減速比 / ratio i=7 (1-stufig / 1-stage)



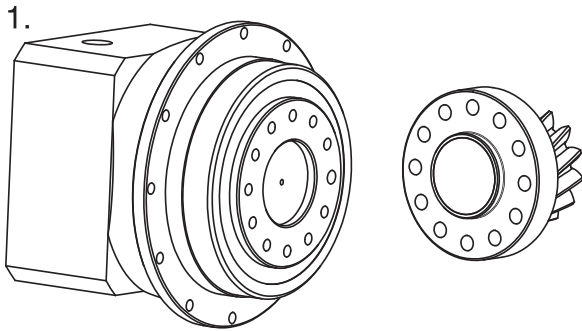
### TR系列齒輪的優勢

#### Advantages of the TR Pinion version

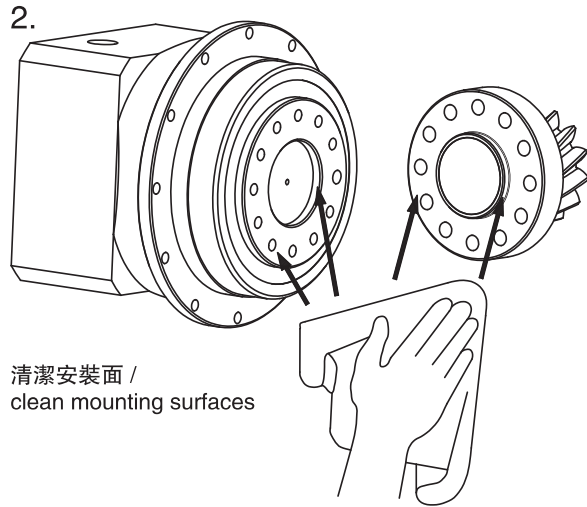
- 更便宜的減速機
- 更小的安裝空間
- 更低的重量
- 齒輪便于更換
- 同心度便于調整
- cheaper planetary gearbox
- smaller space requirements
- lower weight
- pinion can be replaced
- adjustable concentricity



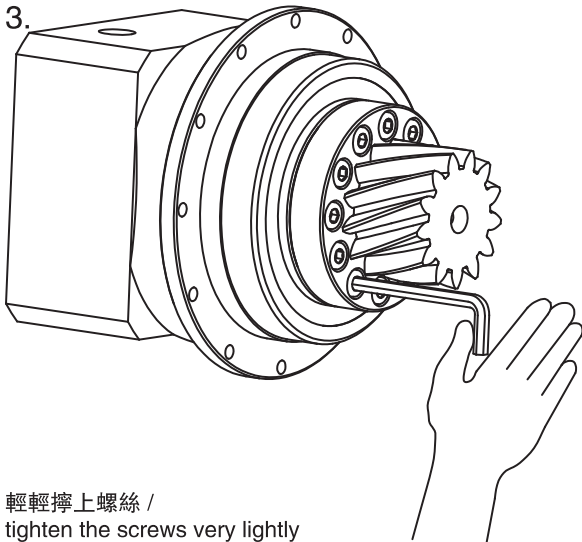
### 安裝說明 Mounting instructions



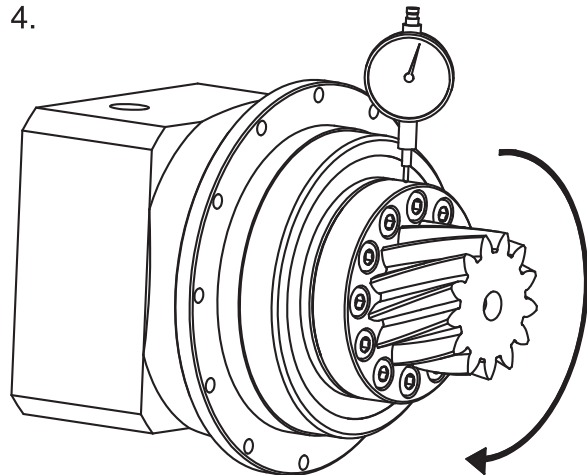
減速箱是否正確? / right gearbox  
TR系列齒輪是否正確? / right TR Pinion?



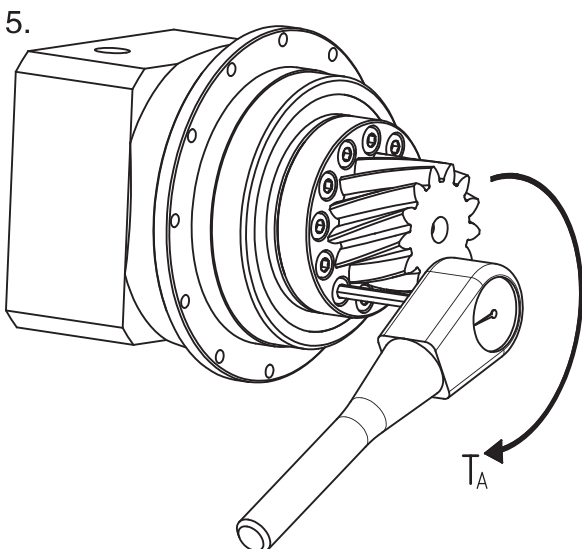
清潔安裝面 /  
clean mounting surfaces



輕輕擰上螺絲 /  
tighten the screws very lightly



測量TR系列齒輪的同軸度 /  
align the TR Pinion



對角次序并多次鎖緊螺絲，鎖緊扭矩見 $T_A$ ! /  
crosswise tighten the screws up to  $T_A$  – several passes!

#### 法蘭安裝孔

Flange bolt circle- $\varnothing$	50	63	80	125	140	160
$T_A$ [Nm]	16	16	40	70	340	660
G [mm]	M6	M6	M8	M10	M16	M20

