



# Precision Linear Actuators ECT Series Manual

**Version History**

Edition Number	Edition Date	Reason for Revision
1	2008-05-05	First edition
2	2018-02-01	T-Series manual replaced with updated version

Technical changes to improve the performance of the equipment may be made without notice!  
Printed in Sweden.

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## Content

This manual is a compilation of manuals and documents that cover the installation, service and maintenance of the individual components that are used to build the different ECT Precision Linear Actuators. The page numbering in the individual manuals are kept, the below page numbers are the page number in this pdf - document where the start of the manual in question can be found.

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# T-Series Precision Linear Actuators

## Installation and Service Manual

DW110353GB-1805 – EDITION 7

[www.thomsonlinear.com](http://www.thomsonlinear.com)

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*Linear Motion. Optimized.*

**Version History**

Edition Number	Edition Date	Reason for Revision
1	2004	First edition
2	2005-02-10	Updated with new T90 versions
3	2006-05-19	Figure numbering corrected
4	2007-04-17	Lubrication instructions updated
5	2010-05-05	T60 and T130 with 50 diameter screw added, style updated
6	2013-08-29	Data corrected in various places.
7	2018-01-29	Magnet and magnet sensor data updated

Technical changes to improve the performance of the equipment may be made without notice!

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1. Type designation system

T60, T90 and T130					
1	2	3	4	5	6
T09-B	2525	M	P	045	S1
<p><b>1. Model</b>                      T06-B = T60 unit                      T09-B = T90 unit                      T13-B = T130 unit</p> <p><b>2. Ball screw diameter, lead and tolerance class</b>                      2505 = 25 mm, 05 mm, T7 (only possible for T06-B and T09-B)                      2510 = 25 mm, 10 mm, T7 (only possible for T06-B and T09-B)                      2525 = 25 mm, 25 mm, T7 (only possible for T06-B and T09-B)                      2550 = 25 mm, 50 mm, T7 (only possible for T06-B)                      3220 = 32 mm, 20 mm, T7 (only possible for T09-B)                      3232 = 32 mm, 32 mm, T7 (only possible for T09-B)                      4010 = 40 mm, 10 mm, T7 (only possible for T13-B)                      4020 = 40 mm, 20 mm, T7 (only possible for T13-B)                      4040 = 40 mm, 40 mm, T7 (only possible for T13-B)                      5010 = 50 mm, 10 mm, T7 (only possible for T13-B)</p> <p><b>3. Engineering unit</b>                      M = metric</p>			<p><b>4. Type of adapter</b>                      N = M16 × 1,5 outside thread (only possible for T06-B25 ** and T09-B25 **)                      P = M16 × 2 inside thread (only possible for T09-B25 **)                      Q = M20 × 1,5 outside thread (only possible for T09-B32 **)                      R = M20 × 1,5 inside thread (only possible for T09-B32 **)                      S = M27 × 2 outside thread (only possible for T13-B40 **)                      T = M27 × 2 inside thread (only possible for T13-B40 **)                      U = M33 × 2 outside thread (only possible for T13-B40 ** and T13-B5010)                      V = M33 × 2 inside thread (only possible for T13-B40 ** and T13-B5010)                      X = M30 × 2 inside thread (only possible for T13-B40 **)</p> <p><b>5. Ordering length (L order)</b>                      ** = distance in cm</p> <p><b>6. Protection option<sup>1</sup></b>                      S1 = wash down protection</p> <p><sup>1</sup> Leave blank if no protection option required.</p>		

Table 1: Type designation system

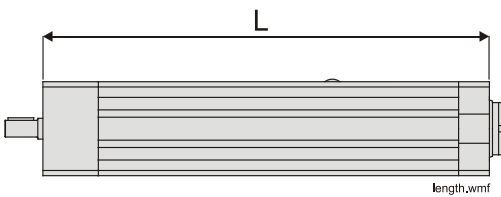
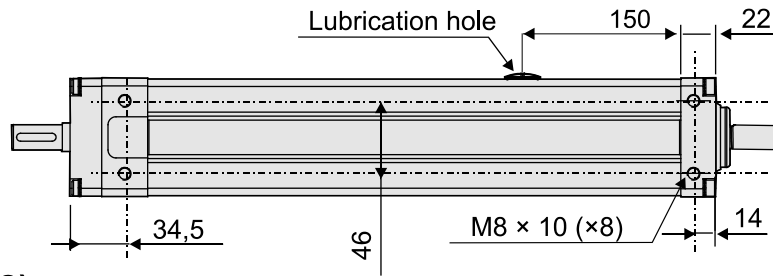
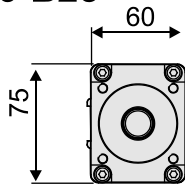


Figure 1: definition of ordering length L

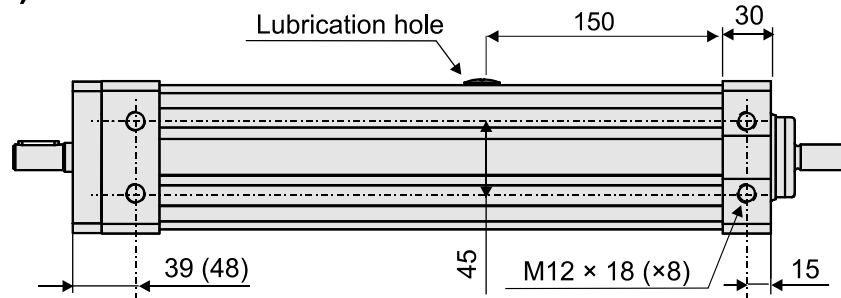
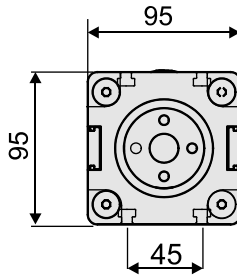
## 2. Installation

### 2.1 Mounting instructions

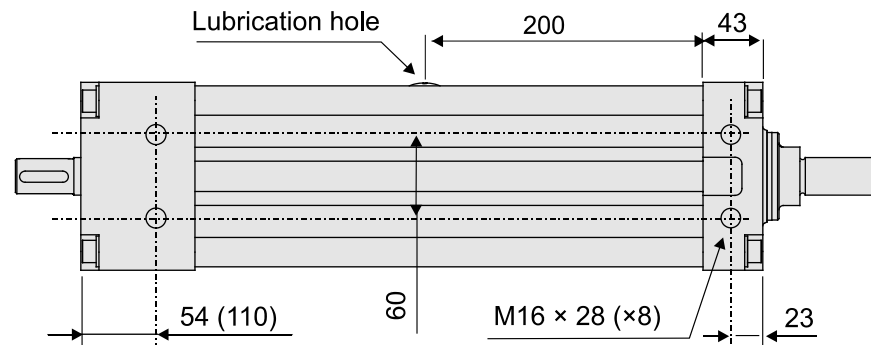
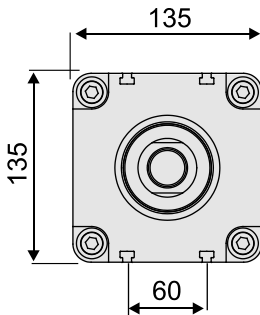
#### 1 T06-B25



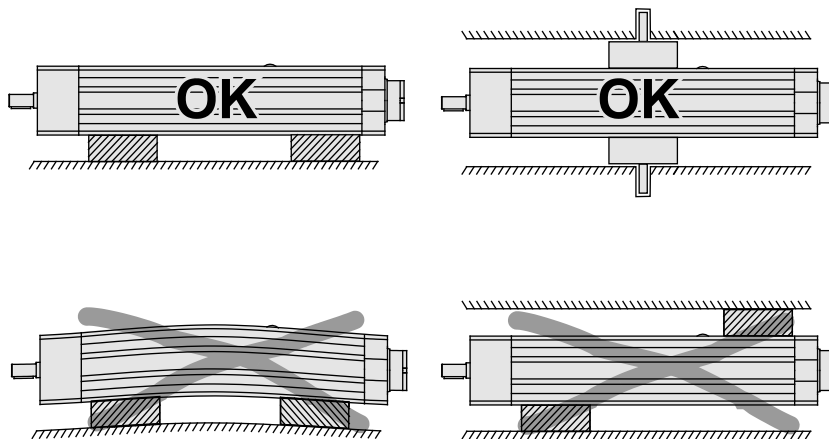
#### T09-B25 (T09-B32)



#### T13-B40 (T13-B50)



## 2



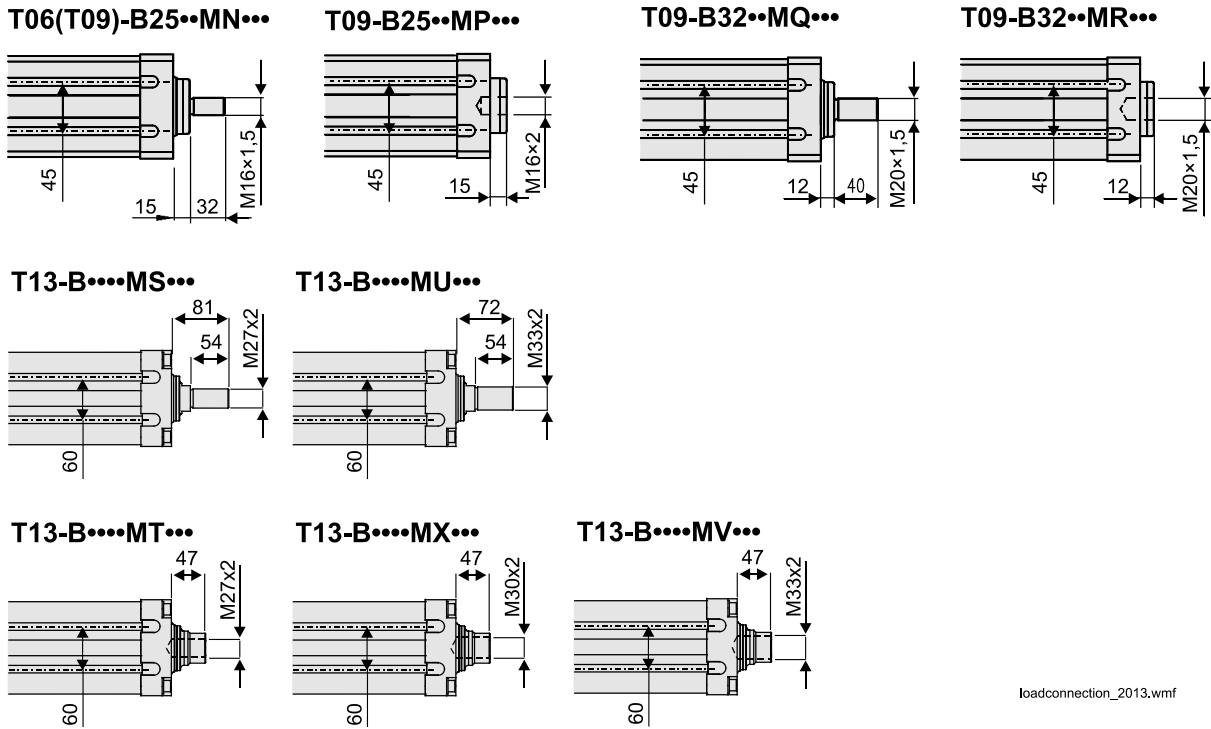
mounting\_2013.wmf

Figure 2: mounting instructions

1. The actuators have threaded holes in the front and rear housings and T-slots along the profile that can be used for mounting. Be sure to mount the actuator so that the lubrication hole is accessible.
2. Only mount the actuator to one side if not trunnion mounting is used. Do not mount the actuator so that the profile is deformed.



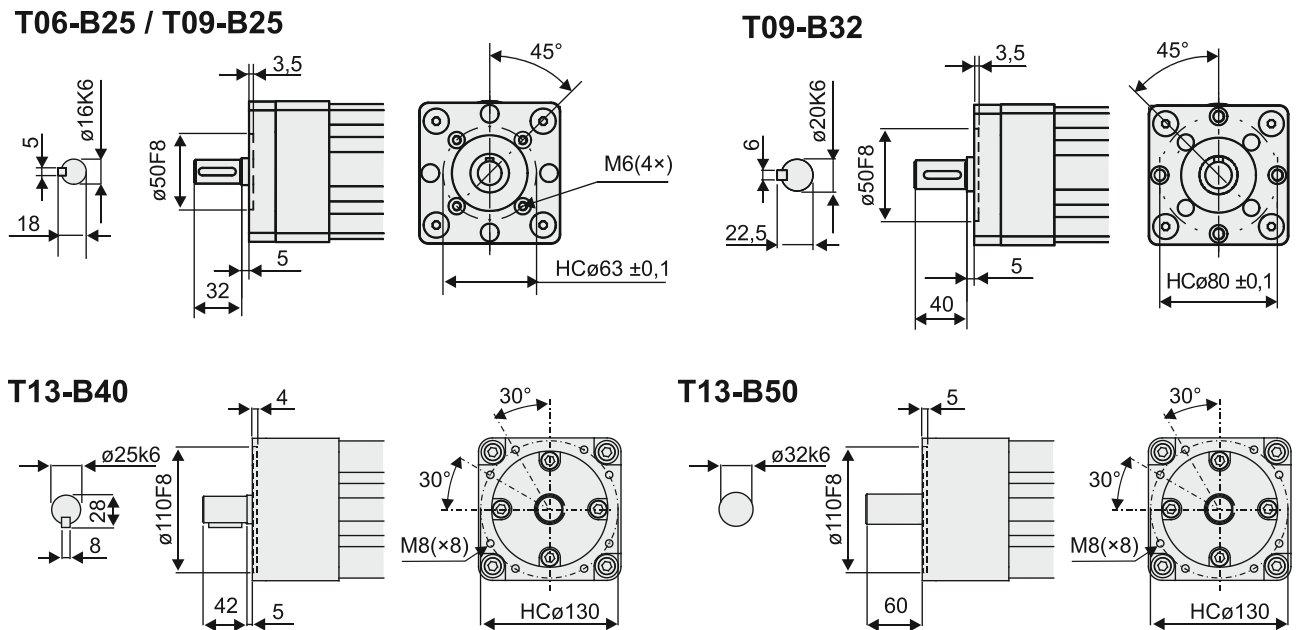
2.2 Connection of load



loadconnection\_2013.wmf

Figure 3: connection of load

2.3 Motor flange



motorflange\_2010.wmf

Figure 4: motor flanges

2.4 Feet mounting kit

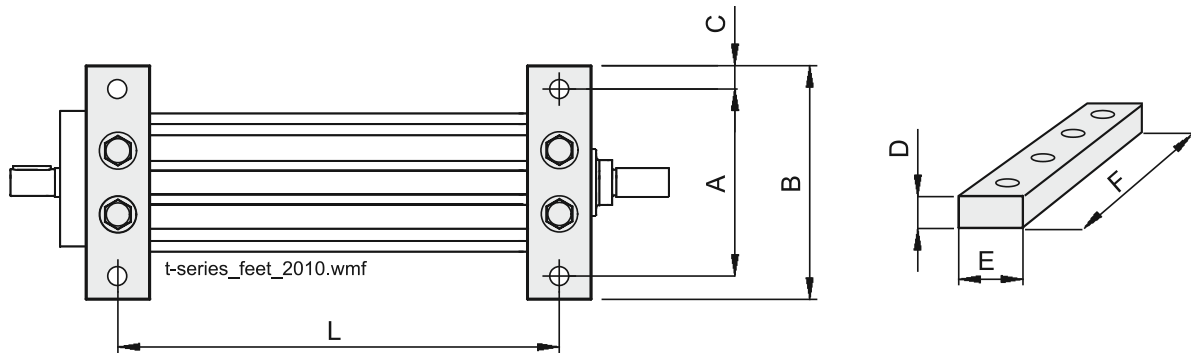


Figure 5: mounting feet

	A	B	C	D	E	F	L	Tightening torque [Nm]
<b>T06-B25</b>	- on request -							
<b>T09-B25</b>	125	155	15	20	40	155	Smax + 141	78
<b>T09-B32</b>	125	155	15	20	40	155	Smax + 162	78
<b>T13-B40</b>	176	220	22	30	60	220	Smax + 216	220
<b>T13-B50</b>	176	220	22	30	60	220	Smax + 292	220

Table 2: mounting feet dimensions

2.5 Trunnion mounting kits

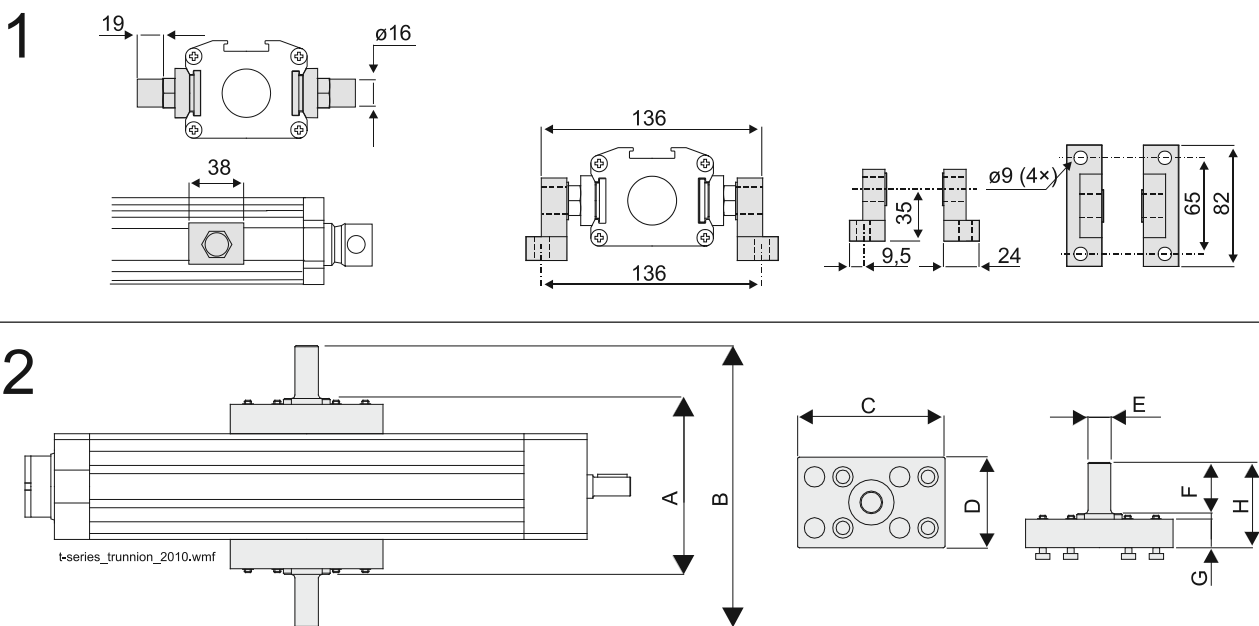


Figure 6: trunnion

	A	B	C	D	E	F	G	H	Tightening torque [Nm]
<b>T09-B</b>	150	240	130	80	∅20 f8	45	25	75	11
<b>T13-B</b>	316	210	180	110	∅35 f8	63	30	93	45

Table 3: trunnion dimensions

1. Trunnion shafts and trunnion brackets for T60.
2. Trunnion kit for T90 and T130.

Make sure to mount the bearings on the trunnion shafts as close to the unit as possible!

2.6 Mounting of worm gear type BS40 / BS50

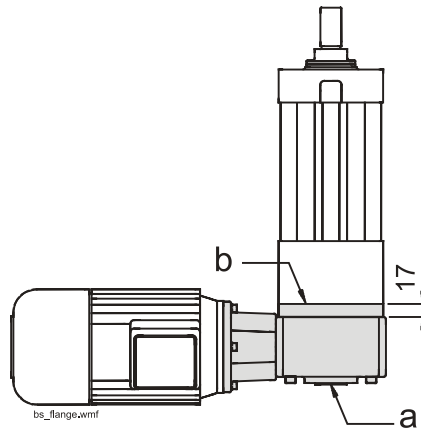


Figure 7: flange for worm gear type BS40 / BS50

To be able to mount a worm gear (a) of type BS40 (for T90 only) or BS50 (for T130 only) an intermediate flange (b) must be used. There is no flange available for T60.

2.7 Installation of magnetic sensors

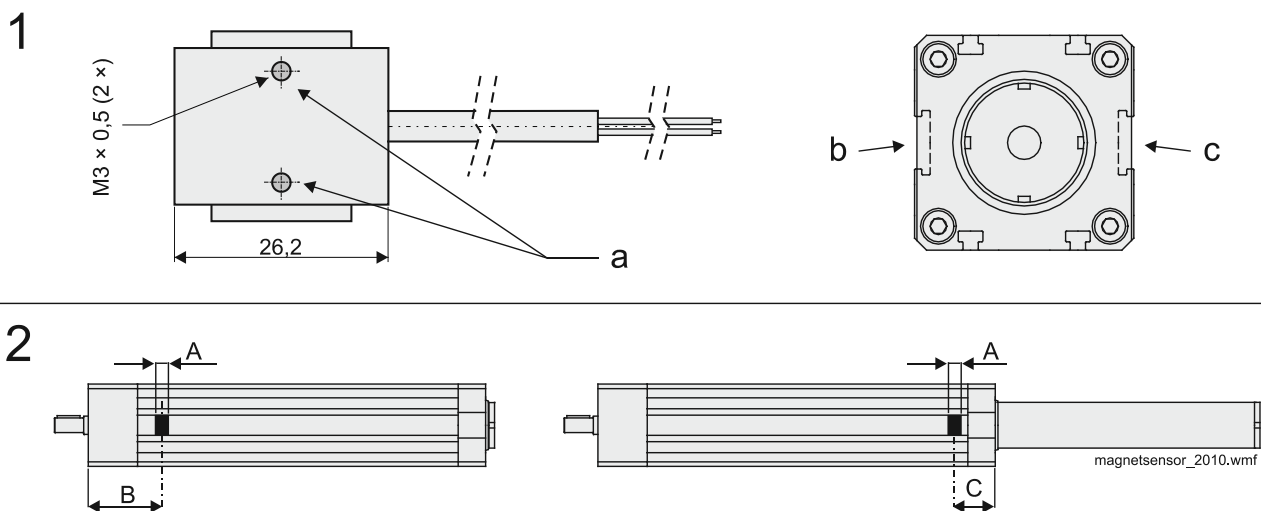


Figure 8: magnetic sensor

1. The sensors are fixed in the desired position with set screws (a) in the T-slot. On T60 units there is only one T-slot for sensors (b) while T90 and T130 has two (b and c).

2. Magnet width (A) and magnet position (B) for the actuator at fully retracted (left panel) and fully extended (right panel) positions, respectively. The positioning of the sensor highly depends on the application since traversing speed, load, deceleration and the motor/drive combination will all influence how quickly the unit will stop after the sensor sent the signal. Thus, the sensor must be positioned accordingly. For safety, we recommend that minimum 25 mm is added for the "B" and "C" values in the table below to prevent the unit hitting the mechanical ends, (e.g. 55 + 25 and 118 + 25).

	A	B	C
T06-B2505, T06-B2525 (T06-B2510, T06-B2550)	5	55	118 (140)
T09-B25	8	141	68
T09-B32	8	82	162
T13-B40	24	194	84
T13-B50	24	324	100

Table 4: magnet positions

### 3. Service and maintenance

#### 3.1 General maintenance instructions

- The customer can perform the service and maintenance described in this manual. Other service ought to be performed by authorised personnel / service workshop.
  - Follow the recommended service intervals. Replace defective parts immediately. Only use parts of the same make and type as original. Ordering data can be found in the spare part lists supplied with the unit. Also state the manufacturing number of the unit (embossed in the drive end).
  - T90 and T130 is not self-braking. This means that the load and the extension tube can move if the driving force is disconnected, or if the motor, gears or brakes are detached during service. This is even more important for vertical applications. Ensure therefore that the load is secured before service is begun.
  - Check the unit in connection to lubrication. Be attentive towards the wear and function of the rod seal, the magnetic sensors, limit switches and the mounting of them. Check all connections to the support and the rod. Also, be attentive towards a changed level of noise. Replace, repair or adjust.
  - Keep the actuator clean. Wipe it off as required, particularly the rod. If cleaning fluid is required, use small amounts and see to it that none gets into the actuator. Do not use strong cleaning agents. Dry it fully.
  - **Never** mix different types of oils / lubricants!
-

### 3.2 Lubrication of the ball screw

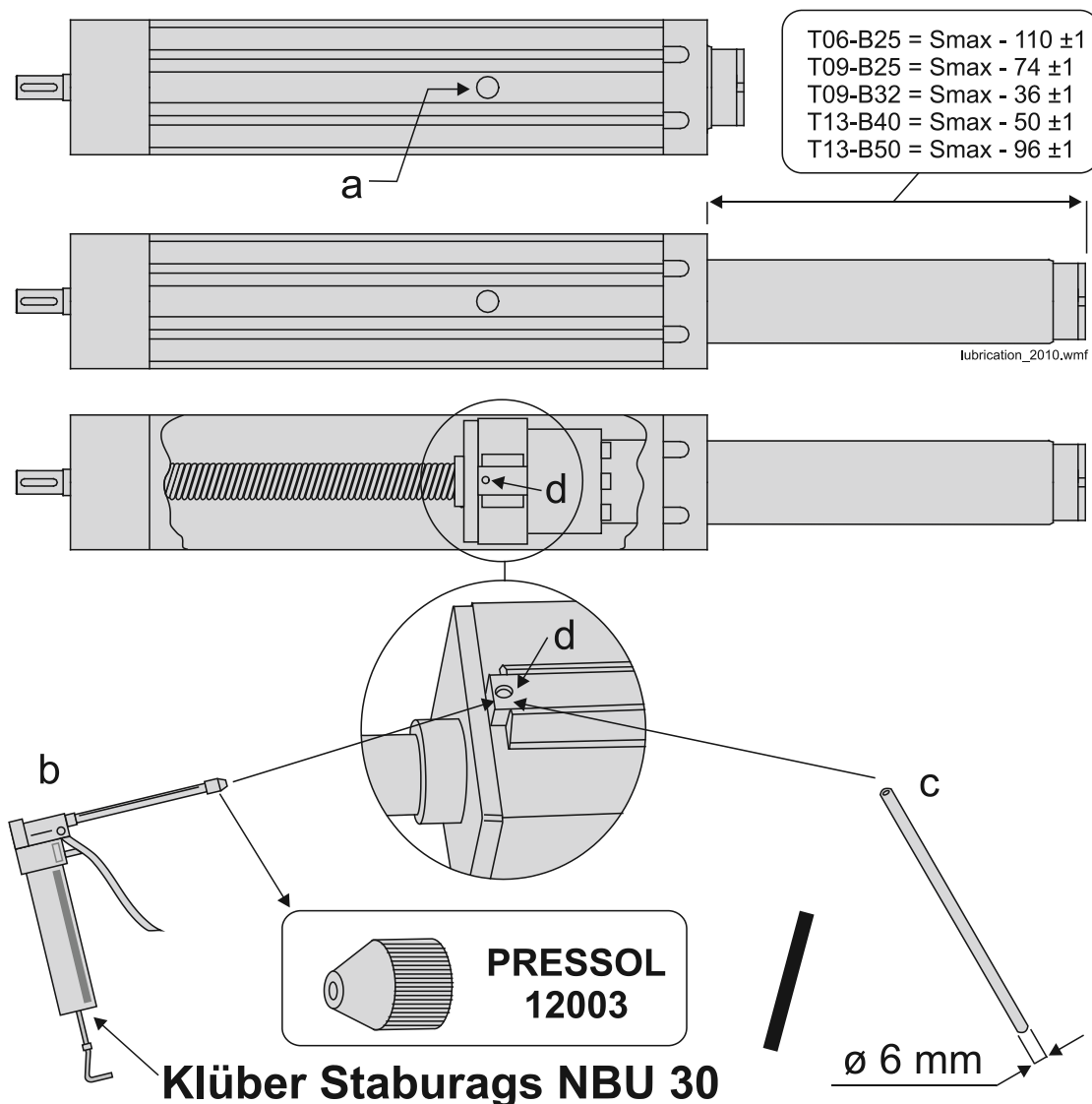


Figure 9: lubrication of the ball screw

1. The ball screw is lubricated every 600 hours of operation or every 6:th month depending on whichever comes first.
2. Recommended lubricant is Klüber Staburags NBU 30.
3. Remove the plastic plug covering the lubrication hole (a).
4. Run the extension tube to the indicated position for the actuator model in question. For T06-B25 the lubrication position is at the maximum stroke length ( $S_{max}$ ) of the unit – 110 mm, for T09-B25 it is at  $S_{max}$  – 74 mm, for T09-B32 at  $S_{max}$  – 36, for T13-B40 at  $S_{max}$  – 50 mm and for T13-B50 at  $S_{max}$  – 96 mm.
5. Apply 20 ml of lubricant to the ball nut by sticking a grease gun nipple (b) or a tube (c), through which the lubricant can be applied, straight in to the lubrication hole in the profile so that it enters the lubrication hole (d) of the ball nut assembly. Recommended type of grease gun nipple is Pressol pointed coupler M10 x 1 female article no: 12003 or equivalent. If a tube is used the recommended tube diameter is 6 mm.
6. Pull out the grease gun nipple / tube and put back the plastic plug.

## 4. Technical data

### 4.1 Technical data

		T06-B2505M ••••	T06-B2510M ••••	T06-B2525M ••••
Max. speed	[m/s]	0,25	0,66	1,66
Max. radial load	Fr [N]	100	100	100
Max. axial load	Fx [N]			
static		15 000	15 000	15 000
dynamic		10 000	10 000	10 000
Repeatability	[mm]	± 0,05	± 0,05	± 0,05
Max. input speed	[rpm]	3000	4000	4000
Weight	[kg]	5 + (L <sup>A</sup> × 9,5)	5 + (L <sup>A</sup> × 9,5)	5 + (L <sup>A</sup> × 9,5)
Ambient temperature	[°C]	-20 – +70	-20 – +70	-20 – +70
Linear move / shaft turn	[mm]	5	10	25

		T06-B2550M ••••	T09-B2510M ••••	T09-B2525M ••••
Max. speed	[m/s]	2,5	0,8	1,5
Max. radial load	Fr [N]	100	300	300
Max. axial load	Fx [N]			
static		15 000	15 000	15 000
dynamic		10 000	10 000	10 000
Repeatability	[mm]	± 0,05	± 0,05	± 0,05
Max. input speed	[rpm]	3000	4800	4800
Weight	[kg]	5 + (L <sup>A</sup> × 9,5)	5 + (L <sup>A</sup> × 16,2)	5 + (L <sup>A</sup> × 16,2)
Ambient temperature	[°C]	-20 – +70	-20 – +70	-20 – +70
Linear move / shaft turn	[mm]	50	10	25

		T09-B3220M ••••	T09-B3232M ••••	T13-B4010M ••••
Max. speed	[m/s]	1,25	2	0,4
Max. radial load	Fr [N]	500	500	800
Max. axial load	Fx [N]			
static		25 000	25 000	45 000
dynamic		20 000	20 000	40 000
Repeatability	[mm]	± 0,05	± 0,05	± 0,05
Max. input speed	[rpm]	3750	3750	2500
Weight	[kg]	6,5 + (L <sup>A</sup> × 18)	6,5 + (L <sup>A</sup> × 18)	18,5 + (30 × (L <sup>A</sup> – 0,239))
Ambient temperature	[°C]	-20 – +70	-20 – +70	-20 – +70
Linear move / shaft turn	[mm]	20	32	10

		T13-B4020M ••••	T13-B4040M ••••	T13-B5010M ••••
Max. speed	[m/s]	1	2	0,33
Max. radial load	Fr [N]	800	800	800
Max. axial load	Fx [N]			
static		45 000	45 000	80 000
dynamic		35 000	15 000	60 000
Repeatability	[mm]	± 0,05	± 0,05	± 0,05
Max. input speed	[rpm]	3000	3000	2000
Weight	[kg]	18,5 + (30 × (L <sup>A</sup> – 0,239))	18,5 + (30 × (L <sup>A</sup> – 0,239))	31,8 + (L <sup>A</sup> × 35)
Ambient temperature	[°C]	-20 – +70	-20 – +70	-20 – +70
Linear move / shaft turn	[mm]	20	40	50

<sup>A</sup> L in metres, see figure 1 for definition of L

Table 5: technical data

**EUROPE****United Kingdom**

Thomson  
Office 9, The Barns  
Caddsdow Business Park  
Bideford, Devon, EX39 3BT  
Phone: +44 (0) 1271 334 500  
E-mail: sales.uk@thomsonlinear.com

**Germany**

Thomson  
Nürtinger Straße 70  
72649 Wolfschlügen  
Phone: +49 (0) 7022 504 403  
Fax: +49 (0) 7022 504 405  
E-mail: sales.germany@thomsonlinear.com

**France**

Thomson  
Phone: +33 (0) 243 50 03 30  
Fax: +33 (0) 243 50 03 39  
E-mail: sales.france@thomsonlinear.com

**Italy**

Thomson  
Largo Brughetti  
20030 Bovisio Masciago  
Phone: +39 0362 594260  
Fax: +39 0362 594263  
E-mail: info@thomsonlinear.it

**Spain**

Thomson  
Rbla Badal, 29-31 7th, 1st  
08014 Barcelona  
Phone: +34 (0) 9329 80278  
Fax: + 34 (0) 9329 80278  
E-mail: sales.esm@thomsonlinear.com

**Sweden**

Thomson  
Estridsväg 10  
29109 Kristianstad  
Phone: +46 (0) 44 24 67 00  
Fax: +46 (0) 44 24 40 85  
E-mail: sales.scandinavia@thomsonlinear.com

**SOUTH AMERICA****Brazil**

Thomson  
Av. Tamboré, 1077  
Barueri, SP – 06460-000  
Phone: +55 (11) 3616-0191  
Fax: +55 (11) 3611-1982  
E-mail: sales.brasil@thomsonlinear.com

**USA, CANADA and MEXICO**

Thomson  
203A West Rock Road  
Radford, VA 24141, USA  
Phone: 1-540-633-3549  
Fax: 1-540-633-0294  
E-mail: thomson@thomsonlinear.com  
Literature: literature.thomsonlinear.com

**ASIA****Asia Pacific**

E-mail: sales.apac@thomsonlinear.com

**China**

Thomson  
Rm 2205, Scitech Tower  
22 Jianguomen Wai Street  
Beijing 100004  
Phone: +86 400 6661 802  
Fax: +86 10 6515 0263  
E-mail: sales.china@thomsonlinear.com

**India**

Thomson  
c/o CNRG Energy India Pvt. Ltd.  
Unit No. FF A 07  
Art Guild House, A Wing, 1st Floor, L.B.S Marg  
Kurla – West, Mumbai – 400070 India  
Phone: +0091 22 6249 5043  
Email: sales.india@thomsonlinear.com

**Japan**

Thomson  
Minami-Kaneden 2-12-23, Suita  
Osaka 564-0044  
Phone: +81-6-6386-8001  
Fax: +81-6-6386-5022  
E-mail: csjapan@scgap.com

**South Korea**

Thomson ROA  
704 ASEM Tower (Samsung-dong),  
517 Yeongdong-daero,  
Gangnam-gu, Seoul, S. Korea (06164)  
Phone: +82 2 6917 5048/5049  
Fax: +82 2 528 1456/1457  
E-mail: sales.korea@thomsonlinear.com



**Vi, Tollo Linear AB**

Försäkrar att denna produkt överensstämmer med maskin direktivet 98/37/EEC, MD, EU-direktivet 2002/95/EC (RoHS) samt ingående komponenters direktiv enligt bifogade dokument.

**We, Tollo Linear AB**

Declare that this product corresponds with the directive 98/37/EEC, MD, EU Directive 2002/95/EC (RoHS) and included parts directive according to enclosed documents.

**Wir, Tollo Linear AB**

Bestätigen, dass dieses Produkt mit der Verordnung 98/37/EEC, MD, EU-Richtlinie 2002/95/EC (RoHS) übereinstimmt und die enthaltenen Teile sich auf die beigefügten Dokumente beziehen.

## Precision Linear Actuators – PLA - ECT

.....  
Produkt/Product/Erzeugnis - Beskrivning/Description/Bezeichnung -

**Enligt bilaga / Acc. To table / Nach tabelle. (T105858.xls)**  
.....

Kan tas i bruk när den maskin eller anläggning som den skall ingå i överensstämmer med EU:s maskindirektiv och/eller andra relevanta bestämmelser.

Can be used when the machine or the system, which it shall be, a part of is in accordance with the demands in the EEC Machinery Directive and/or other relevant regulations.

Kann in Betrieb genommen werden, wenn die Maschine oder Anlage in welcher das Teil/die Komponente eingehen soll, den Anforderungen der EU Maschinendirektiven und/oder anderen diesbezüglichen Vorschriften entspricht.

**Kristianstad**

**2008-05-05**

Datum/Date/Datum

Anders Trygg

Product Manager

.....  
Namn/Name/Namen

.....  
Titel/Title/Titel

  
.....  
Sign./Signature/Unterschrift

11028224.doc



## DESIGNATION INFORMATION

**Design. ex.:**    **ECT**   **13** — **B43**   **R**   **02PB**   **2510** — **1000**   **S**   **T**   **1**   **1**   **XX**

**Unit Type:**

EC (Electric Cylinders)

**ECT**

**Unit Size:**

09 (T90)

**09**

13 (T130)

**13**

**Motor:**

B43 (AKM43 - for ECT09)  
 B53 (AKM53 - for ECT09,ECT13)  
 B63 (AKM63 - for ECT13)  
 I09 (IEC90-B14 - for ECT09)  
 I10 (IEC100-B14 - for ECT13)

**B43**  
**B53**  
**B63**  
**I09**  
**I10**

**Motor Option:**

E (Encoder)  
 B (Brake) - (always on I09 & I10)  
 P (Encoder + Brake)  
 R (Resolver)  
 S (Resolver + Brake)  
 X (Without any motor options)

**E**  
**B**  
**P**  
**R**  
**S**  
**X**

**Drive Ratio and Drive Type:**

01LD (i=1:1, inline, motor)  
 05LP (i=5:1, inline, planetary)  
 10LP (i=10:1, inline, planetary)  
 01PB (i=1:1, parallel, belt)  
 02PB (i=2:1, parallel, belt)  
 03PB (i=3:1, parallel, belt)

**01LD**  
**05LP**  
**10LP**  
**01PB**  
**02PB**  
**03PB**

**Screw diameter and Lead:**

2505 (ECT90)  
 2510 (ECT90)  
 2525 (ECT90)  
 3220 (ECT90)  
 3232 (ECT90)  
 4010 (ECT130)  
 4020 (ECT130)  
 4040 (ECT130)

**2505**  
**2510**  
**2525**  
**3220**  
**3232**  
**4010**  
**4020**  
**4040**

**Stroke Length**

XXXX (mm.)

**1000**

**Cylinder Mounting**

S (Clevis S - available for ECT09, ECT13 ratio 01PB, 02PB, 03PB)  
 R (Clevis R - available for ECT13 ratio 01PB, 02PB, 03PB)  
 F (Feet kit)  
 T (Trunnion kit)  
 X (Without any cylinder mounting)

**S**  
**R**  
**F**  
**T**  
**X**

**Rod End**

J (Spherical Joint ø16 - available for ECT09 lead 05, 10, 25)  
 K (Spherical Joint ø20 - available for ECT09 lead 20, 32)  
 L (Spherical Joint ø30 - available for ECT13 lead 10, 20, 40)  
 M (Spherical Joint ø40 - available for ECT13 lead 10, 20, 40)  
 N (M16x1,5 outside thread - available for ECT09 lead 05, 10, 25)  
 P (M16x2 inside thread - available for ECT09 lead 05, 10, 25)  
 Q (M20x1,5 outside thread - available for ECT09 lead 20, 32)  
 R (M20x1,5 inside thread - available for ECT09 lead 20,32)  
 S (M27x2 outside thread - available for ECT13 lead 10, 20, 40)  
 T (M27x2 inside thread - available for ECT13 lead 10, 20, 40)  
 U (M33x2 outside thread - available for ECT13 lead 10, 20, 40)  
 V (M33x2 inside thread - available for ECT13 lead 10, 20, 40)  
 X (M30x2 inside thread - available for ECT13 lead 10, 20, 40)

**J**  
**K**  
**L**  
**M**  
**N**  
**P**  
**Q**  
**R**  
**S**  
**T**  
**U**  
**V**  
**X**

**Magnetic Sensor NC**

N (Number)

**1**

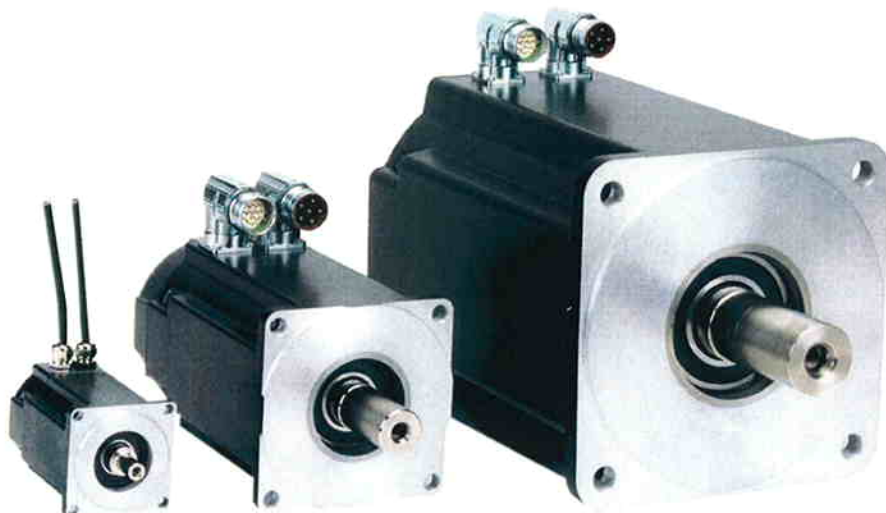
**Magnetic Sensor NO**

N (Number)

**Protection Option**

XX (Std. Unit without additional protection)  
 S1 (Wash down protection with visible outside screws and rod end in stainless class A2)  
 S2 (Chemical protection with outside screws and rod end in stainless/acid class A4)

P part no	Kntnr./Design	Ritad/Drawn	Kop./Copied	Kntnr./Check	Skala/Scale	Material	Anm. / Ref	Date: 07.08.23	
		PG		PG	(1:1)			<b>Edit: 6</b>	
  BOX 9053, S29109 KRISTIANSTAD TEL. 044-246700 FAX. 044-244085				Stycklista/Part list		-	Kntnr./Che	Ers/Ers	Datum/Date
								05.11.24	
<b>PLA (ECT09 / ECT13)</b>  <b>DESIGNATION</b>							Blad/Pa	Forts. bl./Cont'd	
							1	-	
							Ritn. nr./Dwg. No.		
							<b>T-105.858</b>		



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# AKM

## Synchronous Servomotors

**Product Manual**  
Edition 10/2007



Keep all manuals as a product component during the life span of the product.  
Pass all manuals to future users / owners of the product.

File akm\_e.\*\*\*



**Choose your Motor:**

Type	Flange	Standstill torque	Page
AKM1	40	0,18..0,41	⇒ 28
AKM2	58	0,48..1,42	⇒ 30
AKM3	70	1,15..2,88	⇒ 32
AKM4	84	1,95..6	⇒ 34
AKM5	108	4,7..14,4	⇒ 36
AKM6	138	11,9..25	⇒ 38
AKM7	188	29,4..53	⇒ 40

0    0,5    1    5    10    20    30    40    50    70 Nm

**Already published editions**

Edition	Comments
03 / 2004	First edition
12 / 2004	Performance curves corrected, polenumbers, gearhead mounts, several corrections
09 / 2005	Centering AKM7, chapter 1, several corrections, BISS interface, protection class
05 / 2006	Performance curves deleted, order numbers cables, new label
09 / 2006	New design and structure, legend for label, gearbox reference list new
10 / 2006	Winding resistance Ph-Ph corrected
01 / 2007	Encoder, ComCoder, BISS wiring diagrams updated (standardized)
05 / 2007	Several corrections
07 / 2007	EC Declaration of Conformity
09 / 2007	Cable data, label
10 / 2007	Length AKM6 with Encoder/Brake updated, vibration class, target group, use as directed

**Technical changes to improve the performance of the equipment may be made without prior notice!**

Printed in the Federal Republic of Germany

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# 1 General

## 1.1 About this manual

This manual describes the AKM series of synchronous servomotors (standard version). Among other things, you find information about:

The motors are operated in drive systems together with Danaher Motion servo amplifiers. Please observe the entire system documentation, consisting of:

- Product manual for the servo amplifier
- Installation and setup instructions for any expansion card which is connected
- Online help of the amplifier's setup software
- Accessories manual
- Technical description of the AKM series of motors

## 1.2 Target group

This manual addresses personnel with the following qualifications:

Transport : only by personnel with knowledge of handling electrostatically sensitive components.

Mech. Installation : only by mechanically qualified personnel.

Electr. Installation : only by electrically qualified personnel.

Setup : only by qualified personnel with extensive knowledge of electrical engineering and drive technology

The qualified personnel must know and observe the following standards:

IEC 60364 or DIN VDE 0100

IEC 60664 or DIN VDE 0110

national accident prevention regulations or BGV A3



**The operator must ensure that the safety instructions in this manual are followed. The operator must ensure that all personnel responsible for working with the motor have read and understood the product manual.**

## 1.3 Symbols used

	Danger to personnel from electricity and its effects		General warning general instruction mechanical hazard
⇒	see page/chapter (cross reference)	●	special emphasis

## 1.4 Abbreviations used

see chapter 10.1 "Definition of Terms".

## 2 Safety

### 2.1 Safety Notes



- Only properly qualified personnel are permitted to perform such tasks as transport, assembly, setup and maintenance. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, setup and operation of motors, and who have the appropriate qualifications for their jobs. The qualified personnel must know and observe the following standards and regulations:
  - IEC 60364 or DIN VDE 0100
  - IEC 60664 or DIN VDE 0110
  - national regulations for safety / accident prevention or BGV A3
- Read the available documentation before assembly and setup. Incorrect handling of the motors can result in injury and damage to persons and machinery. Keep strictly to the technical data and the information on the connection requirements (nameplate and documentation).



- The manufacturer of the machine must generate a hazard analysis for the machine, and take appropriate measures to ensure that unforeseen movements cannot cause injury or damage to any person or property.
- It is vital that you ensure that the motor housing is safely earthed to the PE(protective earth) busbar in the switch cabinet. Electrical safety is impossible without a low-resistance earth connection.
- Do not unplug any connectors during operation. This creates the danger of death, severe injury, or extensive material damage.
- Power connections may be live even when the motor is not rotating. Never disconnect the power connections of the motor while the equipment is energised. This can cause flashovers with resulting injuries to persons and damage to the contacts.
- After disconnecting the servo amplifier from the supply voltage, wait at least five minutes before touching any components which are normally live (e.g. contacts, screw connections) or opening any connections.

The capacitors in the servo amplifier can still carry a dangerous voltage up to five minutes after switching off the supply voltages. To be quite safe, measure the DC-link voltage and wait until the voltage has fallen below 40V.
- The surfaces of the motors can be very hot in operation, according to their protection category. The surface temperature can exceed 100°C. Measure the temperature, and wait until the motor has cooled down below 40°C before touching it.
- Remove any fitted key (if present) from the shaft before letting the motor run independently, to avoid the dangerous results of the key being thrown out by centrifugal forces.

## 2.2 Use as directed

- The AKM series of synchronous servomotors is designed especially for drives for industrial robots, machine tools, textile and packing machinery and similar with high requirements for dynamics.
- The user is **only** permitted to operate the motors under the ambient conditions which are defined in this documentation.
- The AKM series of motors is **exclusively** intended to be driven by servo amplifiers under speed and / or torque control.
- The motors are installed as components in electrical apparatus or machines and can only be commissioned and put into operation as integral components of such apparatus or machines.
- The thermal contact which is integrated in the motor windings must be observed and evaluated.
- The conformity of the servo-system to the standards mentioned in the EC Declaration of Conformity on page 8 is only guaranteed when the components (servo amplifier, motor, cables etc.) that are used have been supplied by us.

## 2.3 Prohibited use

- The use of the motors in the following environments is prohibited:
  - potentially explosive areas
  - environments with corrosive and/or electrically conductive acids, alkaline solutions, oils, vapours, dusts
  - directly on supply networks
- Commissioning the motor is prohibited if the machine in which it was installed
  - does not meet the requirements of the EC Machinery Directive
  - does not comply with the EMC Directive
  - does not comply with the Low Voltage Directive



### 3 Standards

#### 3.1 EC Declaration of Conformity

We, the company

Danaher Motion GmbH  
Wacholderstrasse 40-42  
40489 Düsseldorf

hereby in sole responsibility declare the conformity of the product series

**Motor series AKM**  
**(Types AKM1, AKM2, AKM3, AKM4, AKM5, AKM6, AKM7)**

with the following standards:

- EC Directive 2004/108/EC  
Electromagnetic compatibility  
Used standard EN61800-3
- EC Directive 2006/95/EC  
Electrical devices for use in special voltage limits  
Used standard EN61800-5-1

Issued by: Business Unit Motors Europe  
Bernhard Wühl  
Weiterstadt, 25.05.2007

Legally valid signature



This Declaration does not contain any assurance of properties in the meaning of product liability.  
The notes on safety and protection in the operating instructions must always be observed.

The above-mentioned company has the following technical documentation for examination:

- Proper operating instructions
- Diagrams (for EU authority only)
- Test certificates (for EU authority only)
- Other technical documentation (for EU authority only)

## 4 Handling

### 4.1 Transport

- Climate category 2K3 to EN 50178
- Transport temperature -25...+70°C, max. 20K/hr change
- Transport humidity rel. humidity 5% - 95% , no condensation
- Only by qualified personnel in the manufacturer's original recyclable packaging
- Avoid shocks, especially to the shaft end
- If the packaging is damaged, check the motor for visible damage. Inform the carrier and, if appropriate, the manufacturer.

### 4.2 Packaging

- Cardboard packing with Instapak<sup>®</sup> foam cushion.
- You can return the plastic portion to the supplier or a certified disposal company (see "Disposal").

Motor type	Carton	Max.stacking height	Motor type	Carton	Max.stacking height
AKM1	X	10	AKM5	X	5
AKM2	X	10	AKM6	X	1
AKM3	X	6	AKM7	X	1
AKM4	X	6			

### 4.3 Storage

- Climate category 1K4 to EN 50178
- Storage temperature - 25...+55°C, max. variation 20K/hr.
- Humidity rel. humidity 5% - 95%, no condensation
- Store only in the manufacturer's original recyclable packaging
- Max. stacking height see table under Packaging
- Storage time unlimited

### 4.4 Maintenance / Cleaning

- Maintenance and cleaning only by qualified personnel
- The ball bearings have a grease packing which is adequate for 20,000 hours of operation under normal conditions. The bearings should be replaced after 20,000 hours of operation under rated conditions (by the manufacturer).
- Check the motor for bearing noise every 2500 operating hours, respectively each year. If any noises are heard, then the operation of the motor must stop, the bearings must be replaced (by the manufacturer).
- Opening the motor invalidates the warranty.
- If the housing is dirty, clean housing with Isopropanol or similar, **do not immerse or spray**

### 4.5 Disposal

In accordance to the WEEE-2002/96/EG-Guidelines we take old devices and accessories back for professional disposal, if the transport costs are taken over by the sender. Send the devices to:

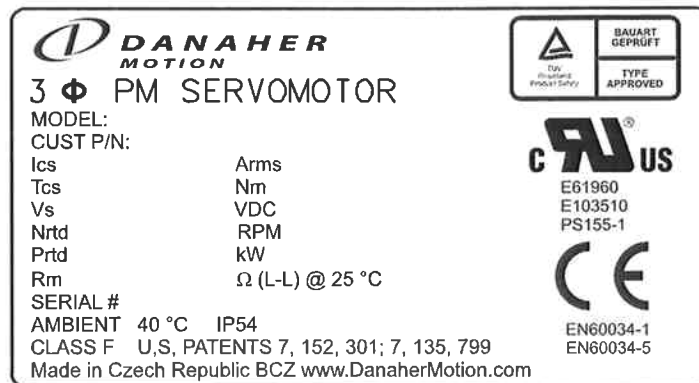
Danaher Motion GmbH  
 Robert-Bosch-Straße 10  
 D-64331 Weiterstadt  
 Germany

## 5 Package

### 5.1 Delivery package

- Motor from the AKM series
- Technical description on CDROM
- Motor package leaflet (short info)

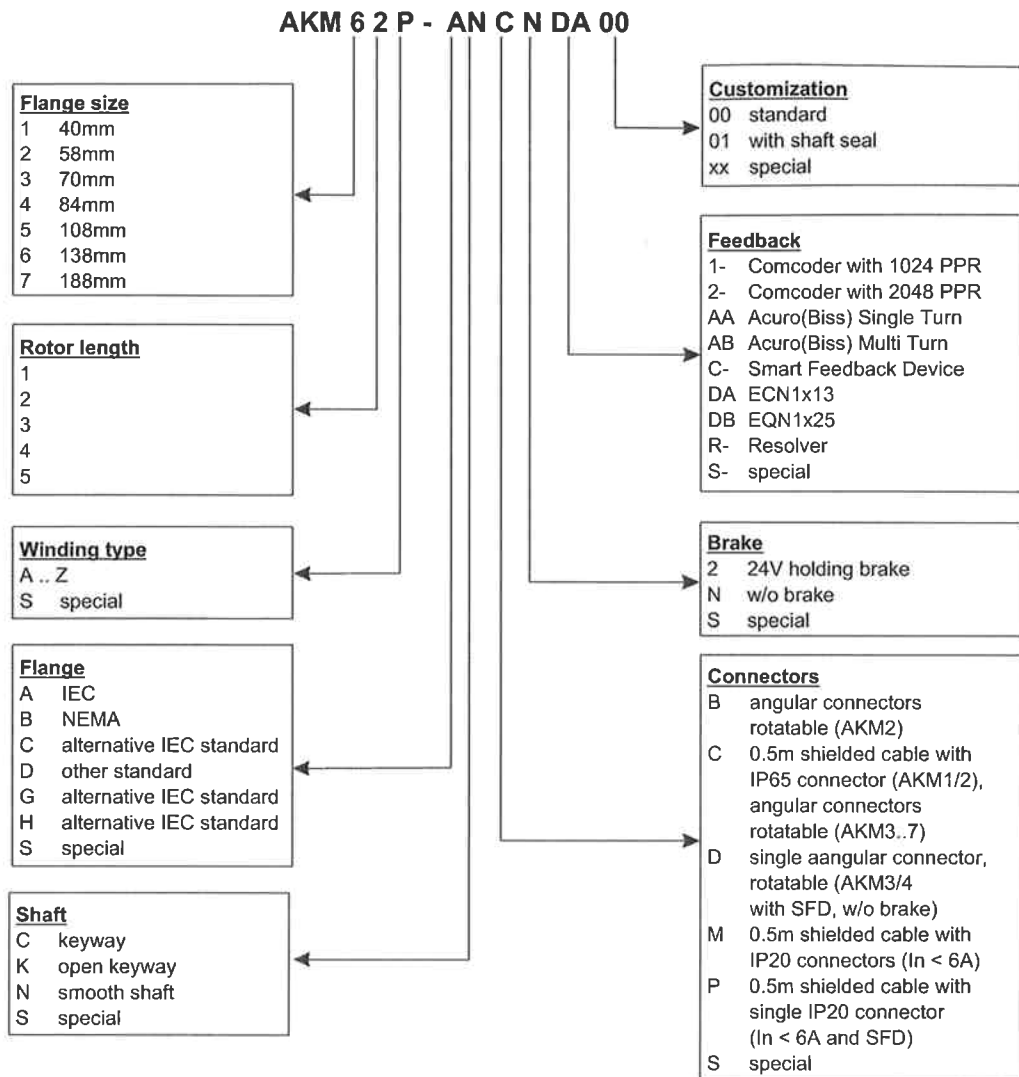
### 5.2 Nameplate



#### Legend:

MODEL	motor type
CUST P/N	customer part no.
Ics	I <sub>0ms</sub> (standstill current)
Tcs	M <sub>0</sub> (standstill torque)
Vs	U <sub>n</sub> (DC bus link voltage)
Nrtd	nn (rated speed @ U <sub>n</sub> )
Prtd	P <sub>n</sub> (rated power)
Rm	R <sub>25</sub> (winding resistance @ 25°)
SERIAL	serial no.
AMBIENT	max. ambient temp.

5.3 Model number description



## 6 Technical Description

### 6.1 Design of the motors

Synchronous servomotors in the AKM series are brushless DC motors for demanding servo applications. When combined with our digital servo amplifiers they are especially suited for positioning tasks in industrial robots, machine tools, transfer lines etc. With high requirements for dynamics and stability.

The servomotors have permanent magnets in the rotor. The rare earth neodymium -iron-boron magnetic material is an important factor in making it possible to drive these motors in a highly dynamic fashion. A three-phase winding which is driven by the servo amplifier is integrated into the stator. The motor does not have any brushes since commutation is performed electronically by the servo amplifier

The temperature of the winding is monitored by temperature sensors in the stator windings and is signalled via an electrically isolated thermistor (PTC,  $\leq 550\Omega$  /  $\geq 1330\Omega$ ).

A **resolver** is built into the motors as standard feedback element. The servo amplifiers evaluate the resolver position and supply sinusoidal currents to the motors.

The alternatively offered feedback systems partly cause a change of the motor length and cannot be retrofitted.

The motors can be delivered with or without a built-in holding brake. Retrofitting of the brake is not possible.

The motors are enamelled in matt black (RAL 9005). This finish is not resistant against solvents (e.g. trichlorethylene, nitro-thinners, or similar).

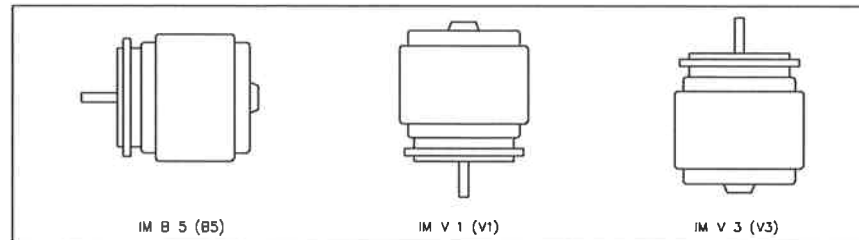
### 6.2 General technical data

<b>Climate category</b>	3K3 to EN 50178
<b>Ambient temperature (at rated values)</b>	5...+40°C for site altitude up to 1000m amsl It is vital to consult our applications department for ambient temperatures above 40°C and encapsulated mounting of the motors.
<b>Permissible humidity (at rated values)</b>	95% rel. humidity, no condensation
<b>Power derating (currents and torques)</b>	1% / K in range 40°C...50°C up to 1000m amsl for site altitude above 1000m amsl and 40°C 6%    up to 2000m amsl 17%   up to 3000m amsl 30%   up to 4000m amsl 55%   up to 5000m amsl No derating for site altitudes above 1000m amsl with temperature reduction of 10K / 1000m
<b>Ball-bearing life</b>	$\geq 20.000$ operating hours
<b>Technical data</b>	$\Rightarrow$ p.27
<b>Storage data</b>	$\Rightarrow$ p.9

## 6.3 Standard features

### 6.3.1 Style

The basic style for the AKM synchronous motors is style IM B5 according to DIN EN 60034-7. The permitted mounting positions may be read from the technical data of the motor series.



### 6.3.2 Shaft end, A-side

Power transmission is made through the cylindrical shaft end A, fit k6 (AKM1: h7) to DIN 748, with a locking thread but **without a fitted-keyway**.

Bearing life is calculated with 20.000 operating hours.

#### Radial force

If the motors drive via pinions or toothed belts, then high radial forces will occur. The permissible values at the end of the shaft may be read from the diagrams in chapter 10. The maximum values at rated speed you will find at the technical data. Power take-off from the middle of the free end of the shaft allows a 10% increase in  $F_R$ .

#### Axial force

When assembling pinions or wheels to the axis and use of e.g. angular gearheads axial forces arise. The maximum values at rated speed you will find at the technical data.

#### Coupling

Double-coned collets have proved to be ideal zero-backlash coupling devices, combined, if required, with metal bellows couplings.

### 6.3.3 Flange

Flange dimensions to IEC standard, fit j6 (AKM1: h7), accuracy according to DIN 42955.

Tolerance class: **N**

### 6.3.4 Protection class

Standard version	IP65
Standard shaft bushing	IP54
Shaft bushing with shaft-sealing ring	IP67

### 6.3.5 Protective device

The standard version of each motor is fitted with an electrically isolated PTC (rated temperature  $155^{\circ}\text{C} \pm 5\%$ ). The PTC does **not** provide any protection against short, heavy overloading. Provided that our preassembled resolver cable is used, the PTC is integrated into the monitoring system of the digital servo amplifiers.

### 6.3.6 Insulation material class

The motors come up to insulation material class F according to IEC 85.

**6.3.7 Vibration class**

The motors are made to vibration class A according to DIN EN 60034-14. For a speed range of 600-3600 rpm and a shaft centre between 56-132mm, this means that the actual value of the permitted vibration severity is 1.6mm/s.

Velocity [rpm]	max. rel. Vibration Displacement[ $\mu$ m]	max. Run-out [ $\mu$ m]
$\leq$ 1800	90	23
$>$ 1800	65	16

**6.3.8 Connection method**

The motors are equipped with angular connectors (AKM1: straight connectors at cable ends) for power supply and feedback signals .

The mating connectors are not part of the delivery package. We can supply preassembled resolver and power cables. On page 18 you will find notes on the cable materials.

**6.3.9 Feedback unit**

<b>Standard</b>	Resolver	Two-pole hollow-shaft
<b>Option</b>	EnDat Encoder, Single-Turn	AKM2-AKM4: ECN 1113, AKM5-AKM7: ECN1313
<b>Option</b>	EnDat Encoder, Multi-Turn	AKM2-AKM4: EQN 1125, AKM5-AKM7: EQN1325
<b>Option</b>	ComCoder	Incremental encoder with commutation, resolution 500-10000 lines
<b>Option</b>	SFD	fully digital resolver interface
<b>Option</b>	BiSS Encoder, Single-/Multi-Turn	AKM2-AKM4: AD36, AKM5-AKM7: AD58

The motor length depends on the mounted feedback unit. Retrofitting is not possible.

**6.3.10 Holding brake**

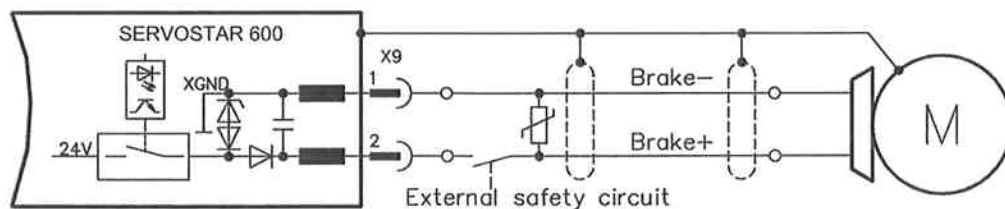
The AKM2-AKM7 motors are optionally available with a holding brake. A spring applied brake (24V DC) is integrated into the motors. When this brake is de-energized it blocks the rotor. **The holding brakes are designed as standstill brakes** and are not suited for repeated operational braking. If the brake is released then the rotor can be moved without a remanent torque. The motor length increases when a holding brake is mounted.

The holding brake can be controlled directly by the servo amplifier (no personal safety !), the winding is suppressed in the servo amplifier — additional circuitry is not required.

If the holding brake is not controlled directly by the servo amplifier, an additional wiring (e.g. varistor) is required. Consult our applications department beforehand.

A personal safe operation of the holding brake requires an additional contact (normally opened) in the braking circuit and an anti-surge-device (e.g. Varistor) for the brake.

Wiring example for SERVOSTAR 600:



**6.3.11 Pole numbers**

Motor	Poles	Motor	Poles	Motor	Poles	Motor	Poles
AKM1	6	AKM3	8	AKM5	10	AKM7	10
AKM2	6	AKM4	10	AKM6	10		

## 6.4 Options

### — Holding brake

Built-in holding brake.

Motor length increases by the holding brake.

### — Radial shaft-sealing rings

A radial shaft-sealing ring can be supplied at extra charge to seal against oil mist and oil spray. This increases the protection rating of the shaft bushing to IP67.

### — Keyway

The motors are available with keyway and key inserted according to DIN6885

The shaft is balanced with a short (half) key.

### — EnDat, BISS, ComCoder, SFD

Another feedback system is mounted instead of the resolver. The motor length can increase by the alternative feedback.

With exception of the radial shaft seal the options **cannot** be retrofitted. Options such as radial shaft seal, holding brake, EnDat or Comcoder can lead to a reduction of rated data.

## 6.5 Selection criteria

The three-phase servomotors are designed to operate with SERVOSTAR servo amplifiers. Together, both units form a closed speed or torque control loop.

The most important selection criteria are:

— Standstill torque	$M_0$	[Nm]
— Rated speed	$n_n$	[min <sup>-1</sup> ]
— Moment of inertia of motor and load	$J$	[kgcm <sup>2</sup> ]
— Effective torque (calculated)	$M_{rms}$	[Nm]

When calculating the motors and servo amplifiers which are required, take account of the static load **and** the dynamic load (acceleration/braking). Collected formulae and examples of the calculations are available from our applications department.



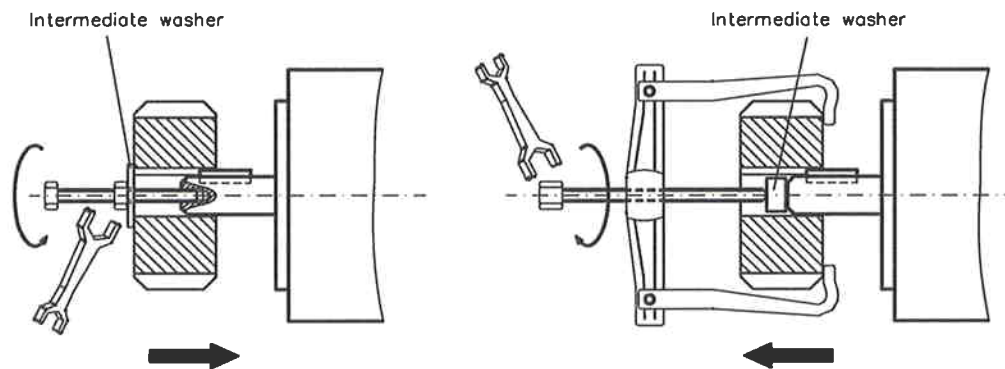
## 7 Mechanical Installation

### 7.1 Important Notes



Only qualified staff with knowledge of mechanical engineering are permitted to assemble the motor.

- Protect the motor from unacceptable stresses. Take care, especially during transport and handling, that components are not bent and that insulation clearances are not altered.
- The site must be free of conductive and aggressive material. For V3-mounting (shaft end upwards), make sure that no liquids can enter the bearings. If an encapsulated assembly is required, please consult our applications department beforehand.
- Ensure an unhindered ventilation of the motors and observe the permissible ambient and flange temperatures. For ambient temperatures above 40°C please consult our applications department beforehand.
- Servomotors are precision equipment. The flange and shaft are especially vulnerable during storage and assembly — so avoid brute force. Precision requires delicacy. It is important to use the locking thread which is provided to tighten up couplings, gear wheels or pulley wheels and warm up the drive components, where possible. Blows or the use of force will lead to damage to the bearings and the shaft.



- Wherever possible, use only backlash-free, frictionally-locking collets or couplings. Ensure correct alignment of the couplings. A displacement will cause unacceptable vibration and the destruction of the bearings and the coupling.
- For toothed belts, it is vital to observe the permissible radial forces. An excessive radial load on the shaft will significantly shorten the life of the motor.
- Avoid axial loads on the motor shaft, as far as possible. Axial loading significantly shortens the life of the motor.
- In all cases, do not create a mechanically constrained motor shaft mounting by using a rigid coupling with additional external bearings (e.g. in a gearbox).
- Take note of the no. of motor poles and the no. of resolver poles, and ensure that the correct setting is made in the servo amplifier which is used. An incorrect setting can lead to the destruction of the motor, especially with small motors.
- Check the compliance to the permitted radial and axial forces  $F_R$  and  $F_A$ . When you use a toothed belt drive, the **minimal** permitted diameter of the pinion e.g. follows from the equation:  $d_{min} \geq \frac{M_0}{F_R} \times 2$ .

## 8 Electrical Installation

### 8.1 Safety notes



Only staff qualified and trained in electrical engineering are allowed to wire up the motor.

Always make sure that the motors are de-energized during assembly and wiring, i.e. No voltage may be switched on for any piece of equipment which is to be connected. Ensure that the switch cabinet remains turned off (barrier, warning signs etc.). The individual voltages will only be turned on again during setup.

Never undo the electrical connections to the motor while it is energised. A dangerous voltage, resulting from residual charge, can be still present on the capacitors up to 5 minutes after switch-off of the mains supply.

Measure the DC-link voltage and wait until it has fallen below 40V.

Even when the motor is not rotating, control and power leads may be live.



The ground symbol  $\text{||||}$ , which you will find in the wiring diagrams, indicates that you must provide an electrical connection, with as large a surface area as possible, between the unit indicated and the mounting plate in the switch cabinet. This connection is to suppress HF interference and must not be confused with the PE (protective earth) symbol (protective measure to EN 60204).

To wire up the motor, use the wiring diagrams in the Installation and Setup Instructions of the servo amplifier which is used.

## 8.2 Guide for electrical installation

- Check that the servo amplifier and motor match each other. Compare the rated voltage and rated current of the unit. Carry out the wiring according to the wiring diagram in the product manual of the servo amplifier. The connections to the motor are shown on pages 19f. Notes on the connection methods can be found on page 18.
- Ensure that there is proper earthing of the servo amplifier and the motor. Use correct earthing and EMC-shielding according to the product manual of the servo amplifier which is used. Earth the mounting plate and motor casing. For connection methods see chapter 8.3.
- Route the power and control cables as separately as possible from one another (separation > 20 cm). This will improve the immunity of the system to electromagnetic interference. If a motor power cable is used which includes integral brake control leads, then these brake control leads must be shielded. The shielding must be connected at both ends (see product manual of the servo amplifier).
- Cabling:
  - Route power cables as separately as possible from control cables
  - Connect up the resolver or encoder.
  - Connect the motor cables, install motor chokes close to the servo amplifier
  - Connect shields to shielding terminals or EMC connectors at both ends
  - Connect the holding brake, if used
  - Connect shielding at both ends.
- Install all cables carrying a heavy current with an adequate cross-section, as per EN 60204. The recommended cross-section can be found in the Technical data.



**In case of long motor cables (>25m) and dependent on the type of the used servo amplifier a motor choke (3YL) must be switched into the motor cable (see product manual of the servo amplifier and accessory manual).**

- Connect up all shielding via a wide surface-area contact (low impedance) and metallized connector housings or EMC-cable glands.

## 8.3 Connection of the motors with preassembled cables



- Carry out the wiring in accordance with the valid standards and regulations.
- Only use our preassembled shielded cables for the resolver and power connections.
- Connect up the shielding according to the wiring diagrams in the product manual for the servo amplifier.
- Incorrectly installed shielding inevitably causes EMC interference.
- The maximum cable length is defined in the product manual of the used servo amplifier.

**Requirements to cable material:**

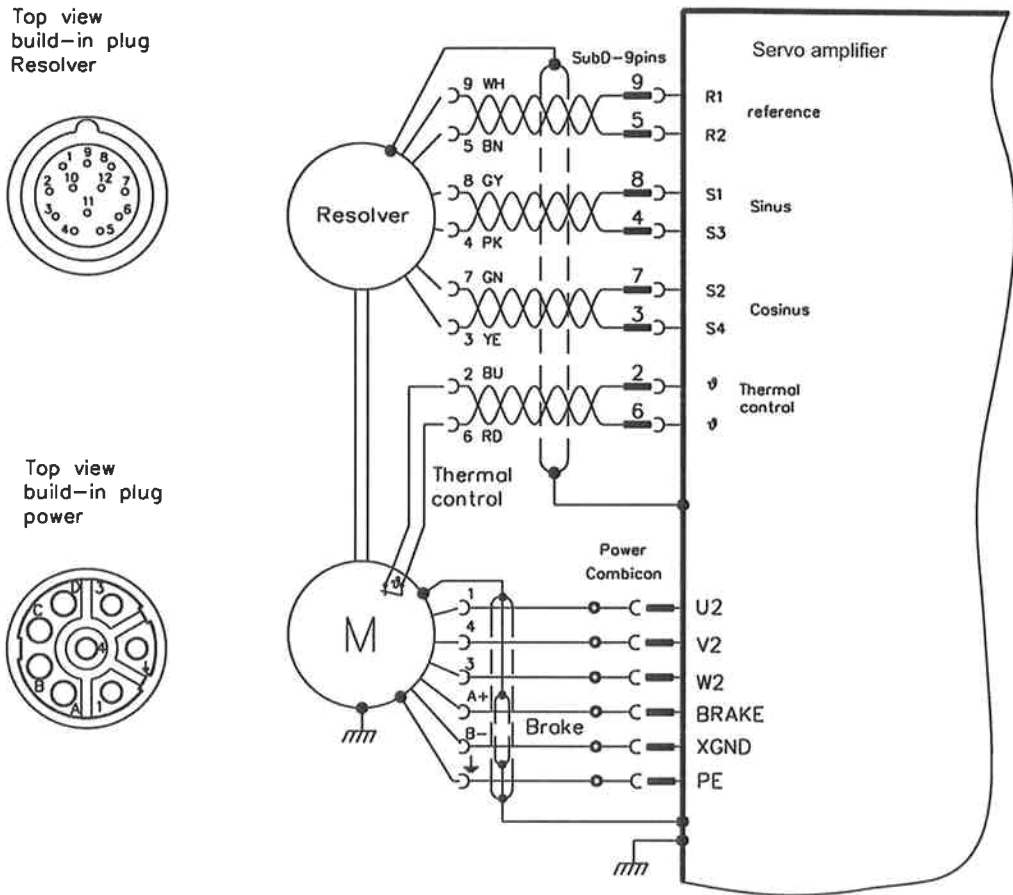
### Capacity

Motor cable	less than 150 pF/m
Resolver cable	less than 120 pF/m

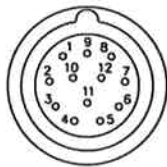
**For a detailed description of preassembled cables, please refer to the accessories manual.**

8.4 Wiring diagrams

8.4.1 Wiring diagram for motors with Resolver



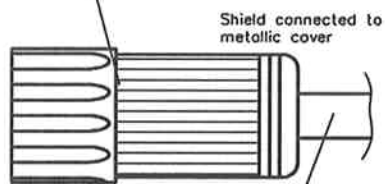
Top view build-in plug Resolver



Top view build-in plug power



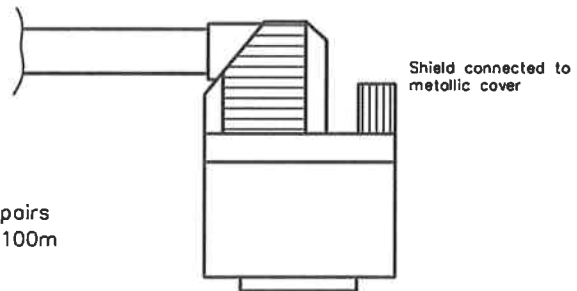
connector round, 12-poles



Shield connected to metallic cover

4 x 2 x 0,25 shielded, twisted pairs on request max. 100m

Sub-D connector 9-poles



Shield connected to metallic cover

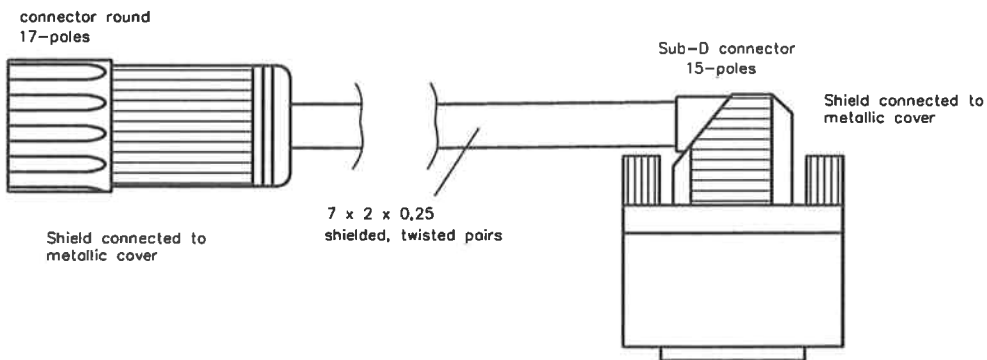
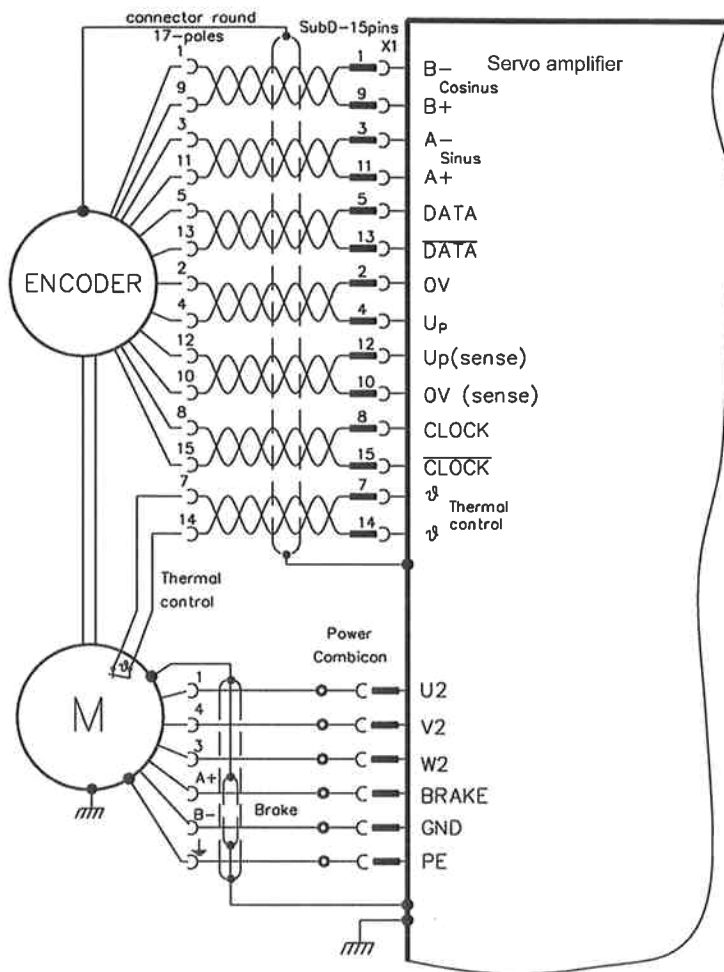
Colour coding acc. to IEC 757

8.4.2 Wiring diagram for motors with Encoder

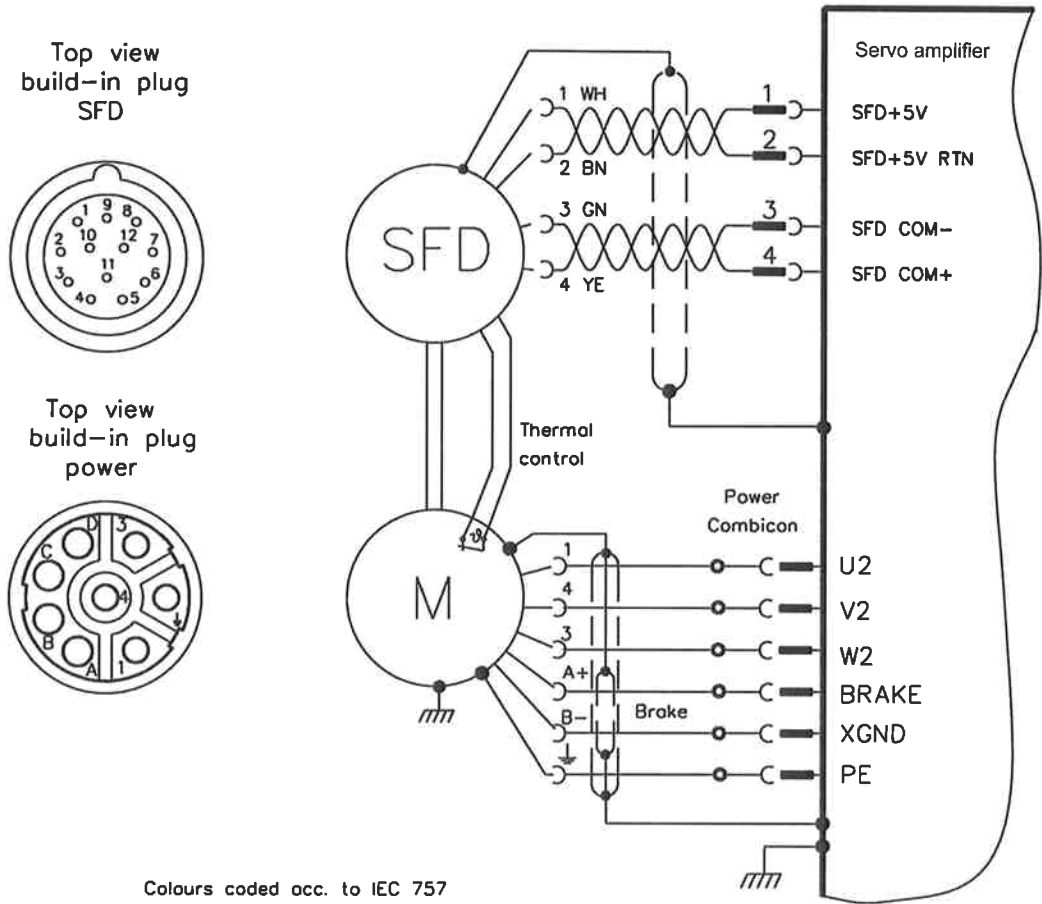
Top view build-in plug Encoder



Top view build-in plug power



8.4.3 Wiring diagram for motors with SFD



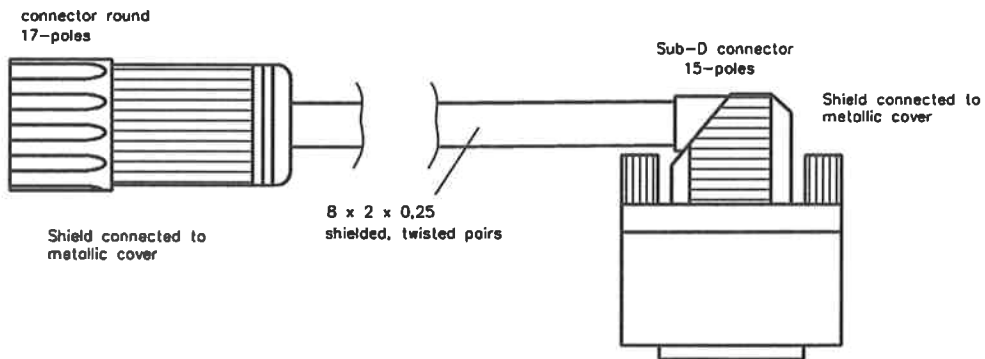
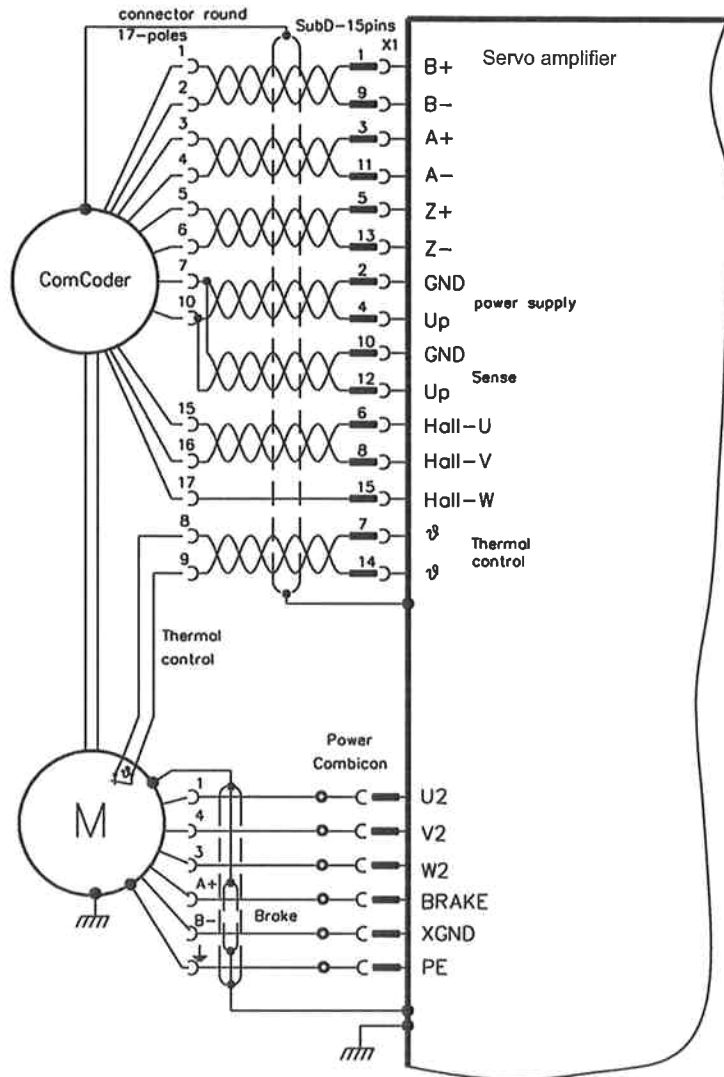
Colours coded acc. to IEC 757

8.4.4 Wiring diagram for motors with ComCoder

Top view  
build-in plug  
ComCoder



Top view  
build-in plug  
power

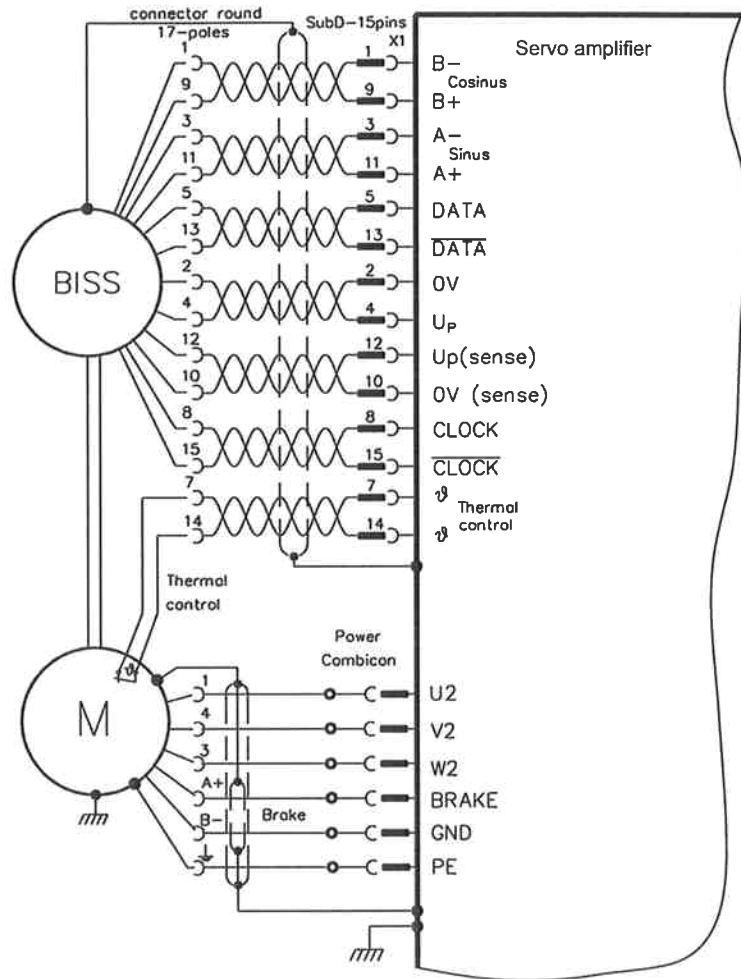


8.4.5 Wiring diagram for motors with BISS

Top view  
build-in plug  
Encoder



Top view  
build-in plug  
power



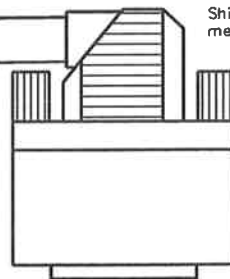
connector round  
17-poles



Shield connected to  
metallic cover

7 x 2 x 0,25  
shielded, twisted pairs

Sub-D connector  
15-poles



Shield connected to  
metallic cover



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## 9 Setup

### 9.1 Important notes



Only specialist personnel with extensive knowledge in the areas of electrical engineering / drive technology are allowed to commission the drive unit of servo amplifier and motor.

Check that all live connection points (terminal boxes) are safe against accidental contact. Deadly voltages can occur, up to 900V.

Never undo the electrical connections to the motor when it is live. The residual charge in the capacitors of the servo amplifier can produce dangerous voltages up to 5 minutes after the mains supply has been switched off.

The surface temperature of the motor can exceed 100°C in operation. Check (measure) the temperature of the motor. Wait until the motor has cooled down below 40°C before touching it.

Make sure that, even if the drive starts to move unintentionally, no danger can result for personnel or machinery.

### 9.2 Guide for setup

The procedure for setup is described as an example. A different method may be appropriate or necessary, depending on the application of the equipment.

- Check the assembly and orientation of the motor.
- Check the drive components (clutch, gear unit, belt pulley) for the correct seating and setting (observe the permissible radial and axial forces).
- Check the wiring and connections to the motor and the servo amplifier. Check that the earthing is correct.
- Test the function of the holding brake, if used. (apply 24V, the brake must be released).
- Check whether the rotor of the motor revolves freely (release the brake, if necessary). Listen out for grinding noises.
- Check that all the required measures against accidental contact with live and moving parts have been carried out.
- Carry out any further tests which are specifically required for your system.
- Now commission the drive according to the setup instructions for the servo amplifier.
- In multi-axis systems, individually commission each drive unit (servo amplifier and motor).

### 9.3 Trouble Shooting

The following table is to be seen as a "First Aid" box. There can be a large number of different reasons for a fault, depending on the particular conditions in your system. The fault causes described below are mostly those which directly influence the motor. Peculiarities which show up in the control loop behaviour can usually be traced back to an error in the parameterization of the servo amplifier. The documentation for the servo amplifier and the setup software provides information on these matters.

For multi-axis systems there may be further hidden reasons for faults.

Our applications department can give you further help with your problems.

Fault	Possible cause	Measures to remove the cause of the fault
<b>Motor doesn't rotate</b>	<ul style="list-style-type: none"> <li>— Servo-amplifier not enabled</li> <li>— Break in setpoint lead</li> <li>— Motor phases in wrong sequence</li> <li>— Brake not released</li> <li>— Drive is mechanically blocked</li> </ul>	<ul style="list-style-type: none"> <li>— Supply ENABLE signal</li> <li>— Check setpoint lead</li> <li>— Correct the phase sequence</li> <li>— Check brake controls</li> <li>— Check mechanism</li> </ul>
<b>Motor runs away</b>	<ul style="list-style-type: none"> <li>— Motor phases in wrong sequence</li> </ul>	<ul style="list-style-type: none"> <li>— Correct the phase sequence</li> </ul>
<b>Motor oscillates</b>	<ul style="list-style-type: none"> <li>— Break in the shielding of the resolver cable</li> <li>— amplifier gain to high</li> </ul>	<ul style="list-style-type: none"> <li>— Replace resolver cable</li> <li>— use motor default values</li> </ul>
<b>Error message: brake</b>	<ul style="list-style-type: none"> <li>— Short-circuit in the supply voltage lead to the motor holding brake</li> <li>— Faulty motor holding brake</li> </ul>	<ul style="list-style-type: none"> <li>— Remove the short-circuit</li> <li>— Replace motor</li> </ul>
<b>Error message: output stage fault</b>	<ul style="list-style-type: none"> <li>— Motor cable has short-circuit or earth short</li> <li>— Motor has short-circuit or earth short</li> </ul>	<ul style="list-style-type: none"> <li>— Replace cable</li> <li>— Replace motor</li> </ul>
<b>Error message: resolver</b>	<ul style="list-style-type: none"> <li>— Resolver connector is not properly plugged in</li> <li>— Break in resolver cable, cable crushed or similar</li> </ul>	<ul style="list-style-type: none"> <li>— Check connector</li> <li>— Check cables</li> </ul>
<b>Error message: motor temperature</b>	<ul style="list-style-type: none"> <li>— Motor thermostat has switched</li> <li>— Loose resolver connector or break in resolver cable</li> </ul>	<ul style="list-style-type: none"> <li>— Wait until the motor has cooled down. Then investigate why the motor becomes so hot.</li> <li>— Check connector, replace resolver cable if necessary</li> </ul>
<b>Brake does not grip</b>	<ul style="list-style-type: none"> <li>— Required holding torque too high</li> <li>— Brake faulty</li> <li>— Motor shaft axially overloaded</li> </ul>	<ul style="list-style-type: none"> <li>— Check the dimensioning</li> <li>— Replace motor</li> <li>— Check the axial load, reduce it. Replace motor, since the bearings have been damaged</li> </ul>

## 10 Technical Data

All data valid for 40°C environmental temperature and 100K overtemperature of the winding. The data can have a tolerance of +/- 10%.

### 10.1 Definition of Terms

#### Standstill torque $M_0$ [Nm]

The standstill torque can be maintained indefinitely at a speed  $n < 100 \text{ min}^{-1}$  and rated ambient conditions.

#### Rated torque $M_n$ [Nm]

The rated torque is produced when the motor is drawing the rated current at the rated speed. The rated torque can be produced indefinitely at the rated speed in continuous operation (S1).

#### Standstill current $I_{0rms}$ [A]

The standstill current is the effective sinusoidal current which the motor draws at  $n < 100 \text{ min}^{-1}$  to produce the standstill torque.

#### Peak current (pulse current) $I_{0max}$ [A]

The peak current (effective sinusoidal value) is approximately equivalent to 4-times the rated current. The actual value is determined by the peak current of the servo amplifier which is used.

#### Torque constant $K_{Trms}$ [Nm/A]

The torque constant defines how much torque in Nm is produced by the motor with 1A r.m.s. current. The relationship is  $M = I \times K_T$  (up to  $I = 2 \times I_0$ )

#### Voltage constant $K_{Emfs}$ [mV/min<sup>-1</sup>]

The voltage constant defines the induced motor EMF, as an effective sinusoidal value between two terminals, per 1000 rpm

#### Rotor moment of inertia $J$ [kgcm<sup>2</sup>]

The constant  $J$  is a measure of the acceleration capability of the motor. For instance, at  $I_0$  the acceleration time  $t_b$  from 0 to 3000 rpm is given as:

$$t_b [s] = \frac{3000 \times 2\pi}{M_0 \times 60s} \times \frac{m^2}{10^4 \times cm^2} \times J \quad \text{with } M_0 \text{ in Nm and } J \text{ in kgcm}^2$$

#### Thermal time constant $t_{th}$ [min]

The constant  $t_{th}$  defines the time for the cold motor, under a load of  $I_0$ , to heat up to an overtemperature of  $0.63 \times 105$  Kelvin. This temperature rise happens in a much shorter time when the motor is loaded with the rated current.

#### Release delay time $t_{BRH}$ [ms] / Application delay time $t_{BRL}$ [ms] of the brake

These constants define the response times of the holding brake when operated with the rated voltage from the servo amplifier.

#### $U_N$

Rated mains voltage

#### $U_n$

DC-Bus link voltage.  $U_n = \sqrt{2} * U_N$

10.2

AKM1

Technical data

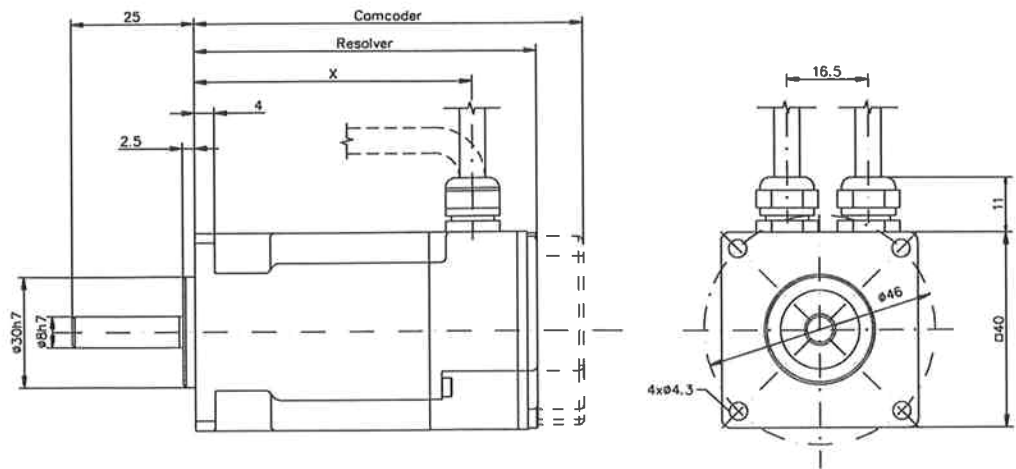
Data	Symbol [Unit]	AKM							
		11B	11C	11E	12C	12E	13C	13D	
<b>Electrical data</b>									
Standstill torque*	$M_0$ [Nm]	0.18	0.18	0.18	0.31	0.31	0.41	0.40	
Standstill current	$I_{0rms}$ [A]	1.16	1.45	2.91	1.51	2.72	1.48	2.40	
max. Mains voltage	$U_N$ [VAC]	230VAC							
$U = 75VDC$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	6000	—	3000	—	2000
	Rated torque*	$M_n$ [Nm]	—	—	0.18	—	0.31	—	0.40
	Rated power	$P_n$ [kW]	—	—	0.11	—	0.10	—	0.08
$U_N = 115V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	4000	6000	—	4000	8000	3000	7000
	Rated torque*	$M_n$ [Nm]	0.18	0.18	—	0.30	0.28	0.41	0.36
	Rated power	$P_n$ [kW]	0.08	0.11	—	0.13	0.23	0.13	0.27
$U_N = 230V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	8000	—	—	8000	—	8000	—
	Rated torque*	$M_n$ [Nm]	0.17	—	—	0.28	—	0.36	—
	Rated power	$P_n$ [kW]	0.14	—	—	0.23	—	0.30	—
$U_N = 400V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—
$U_N = 480V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—
Peak current	$I_{0max}$ [A]	4.65	5.79	11.6	6.06	10.9	5.93	9.6	
Peak torque	$M_{0max}$ [Nm]	0.61	0.61	0.61	1.08	1.08	1.46	1.44	
Torque constant	$K_{Trms}$ [Nm/A]	0.16	0.13	0.06	0.21	0.11	0.28	0.17	
Voltage constant	$K_{E rms}$ [mV/min]	10.2	8.3	4.1	13.3	7.2	17.9	10.9	
Winding resistance Ph-Ph	$R_{25}$ [Ω]	18.2	12.1	3.1	12.4	3.9	13.5	5.4	
Winding inductance Ph-Ph	$L$ [mH]	12.5	8.3	2.0	9.1	2.7	10.3	3.8	
<b>Mechanical data</b>									
Rotor moment of inertia	$J$ [kgcm <sup>2</sup> ]	0.017		0.031		0.045			
Pole number		6		6		6			
Static friction torque	$M_R$ [Nm]	0.0011		0.0021		0.0031			
Thermal time constant	$t_{TH}$ [min]	4		6		7			
Weight standard	$G$ [kg]	0.35		0.49		0.63			
Radial load permitted at shaft end @ 8000 min <sup>-1</sup>	$F_R$ [N]	30							
Axial load permitted	$F_A$ [N]	12							

\* reference flange Aluminium 254mm \* 254mm \* 6.35mm

Connections and cables

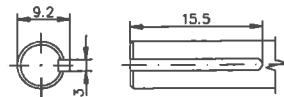
Data	AKM1
Power connection	4 + 4 poles, round, on Cable 0.5m
Motorcable, shielded	4 x 1
Motor cable with control leads, shielded	4 x 1 + 2 x 0.75
Resolver connection	12 poles, round, on Cable 0.5m
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>
Comcoder connection (option)	17 poles, round, on Cable 0.5m

Dimensions (drawing in principle)

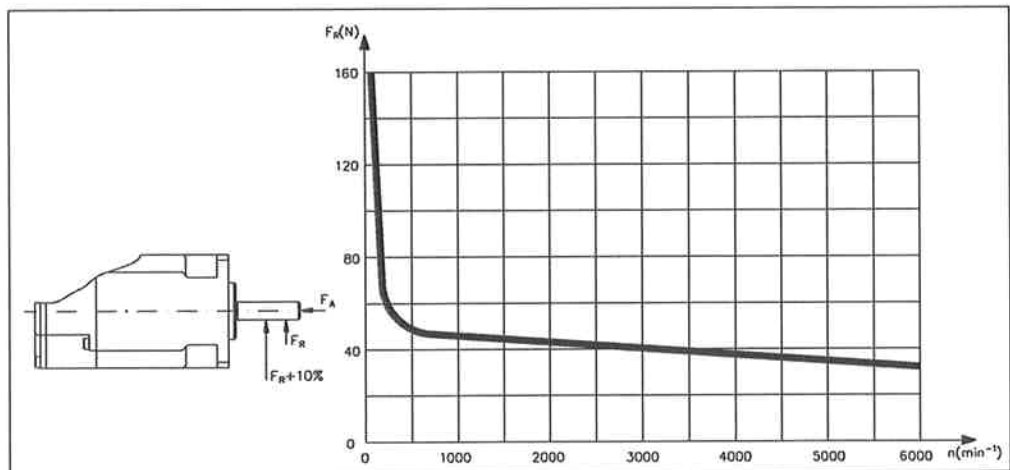


Model	X	Resolver	Comcoder
AKM11	56.1	69.6	79.0
AKM12	75.1	88.6	98.0
AKM13	94.1	107.6	117.0

Option Keyway



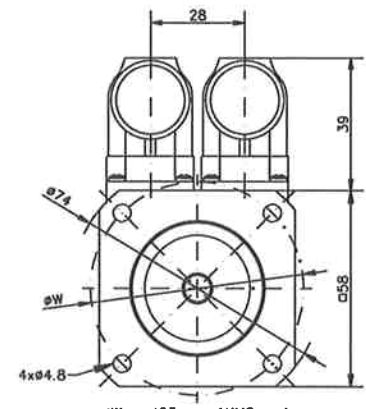
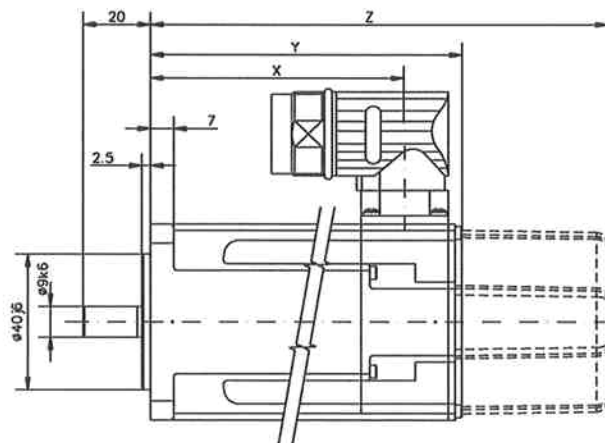
Radial forces at the shaft end



**Connections and cables**

Data	AKM2
Power connection	4 + 4 poles, round, angular
Motorcable, shielded	4 x 1
Motor cable with control leads, shielded	4 x 1 + 2 x 0.75
Resolver connection	12 poles, round, angular
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>
Encoder connection (option)	17 poles, round, angular
Encoder cable, shielded	7 x 2 x 0.25mm <sup>2</sup>

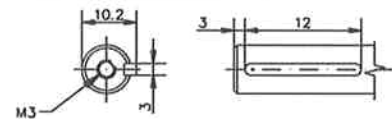
**Dimensions (drawing in principle)**



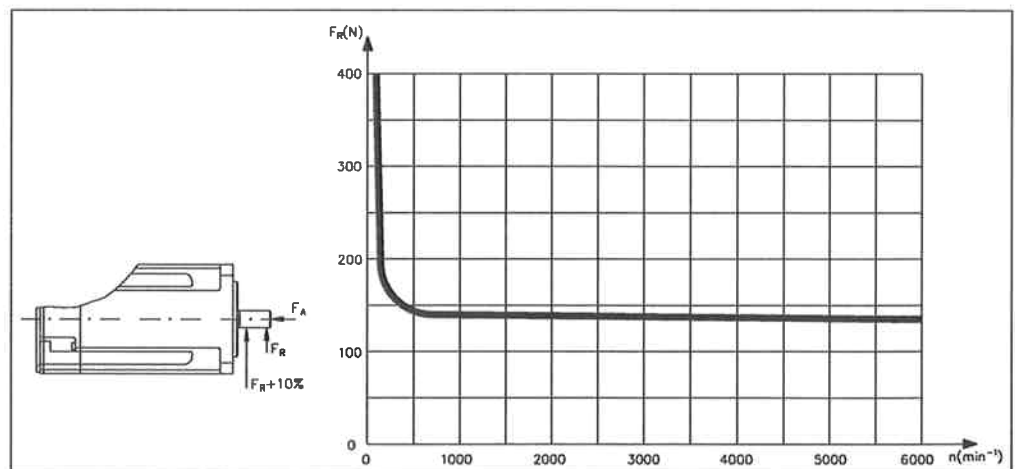
øW = ø63mm, AKM2xx-Ax  
 øW = ø65mm, AKM2xx-Dx

Model	X	Y	Z (brake)
AKM21	76.1	95.4	129.5
AKM22	95.1	114.4	148.5
AKM23	114.1	133.4	167.5
AKM24	133.1	152.4	186.5

**Option Keyway**



**Radial forces at the shaft end**



10.4

AKM3

Technical data

Data	Symbol [Unit]	AKM									
		31C	31E	31H	32C	32D	32H	33C	33E	33H	
<b>Electrical data</b>											
Standstill torque*	$M_0$ [Nm]	1.15	1.20	1.23	2.00	2.04	2.10	2.71	2.79	2.88	
Standstill current	$I_{0rms}$ [A]	1.37	2.99	5.85	1.44	2.23	5.50	1.47	2.58	5.62	
max. Mains voltage	$U_N$ [VAC]	480									
$U = 75VDC$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	750	2000	—	—	1200	—	—	800
	Rated torque*	$M_n$ [Nm]	—	1.19	1.20	—	—	2.06	—	—	2.82
	Rated power	$P_n$ [kW]	—	0.09	0.25	—	—	0.26	—	—	0.24
$U_N = 115V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	2500	6000	—	1000	3000	—	—	2500
	Rated torque*	$M_n$ [Nm]	—	1.17	0.97	—	2.00	1.96	—	—	2.66
	Rated power	$P_n$ [kW]	—	0.31	0.61	—	0.21	0.62	—	—	0.70
$U_N = 230V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	2500	6000	—	1500	2500	7000	1000	2000	5500
	Rated torque*	$M_n$ [Nm]	1.12	0.95	—	1.95	1.93	1.45	2.64	2.62	2.27
	Rated power	$P_n$ [kW]	0.29	0.60	—	0.31	0.51	1.06	0.28	0.55	1.31
$U_N = 400V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	5000	—	—	3000	5500	—	2000	4500	—
	Rated torque*	$M_n$ [Nm]	1.00	—	—	1.86	1.65	—	2.54	2.34	—
	Rated power	$P_n$ [kW]	0.52	—	—	0.58	0.95	—	0.53	1.10	—
$U_N = 480V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	6000	—	—	3500	6000	—	2500	5000	—
	Rated torque*	$M_n$ [Nm]	0.91	—	—	1.83	1.58	—	2.50	2.27	—
	Rated power	$P_n$ [kW]	0.57	—	—	0.67	0.99	—	0.65	1.19	—
Peak current	$I_{0max}$ [A]	5.5	12.0	23.4	5.7	8.9	22.0	5.9	10.3	22.5	
Peak torque	$M_{0max}$ [Nm]	3.88	4.00	4.06	6.92	7.05	7.26	9.76	9.96	10.2	
Torque constant	$K_{Trms}$ [Nm/A]	0.85	0.41	0.21	1.40	0.92	0.39	1.86	1.10	0.52	
Voltage constant	$K_{E rms}$ [mV/min]	54.5	26.1	13.7	89.8	59.0	24.8	120	70.6	33.4	
Winding resistance Ph-Ph	$R_{25}$ [ $\Omega$ ]	21.4	4.74	1.29	23.8	10.3	1.69	26.6	9.01	1.96	
Winding inductance Ph-Ph	$L$ [mH]	37.5	8.6	2.4	46.5	20.1	3.55	53.6	18.5	4.1	
<b>Mechanical data</b>											
Rotor moment of inertia	$J$ [kgcm <sup>2</sup> ]	0.33		0.59		0.85					
Pole number		8		8		8					
Static friction torque	$M_R$ [Nm]	0.014		0.02		0.026					
Thermal time constant	$t_{TH}$ [min]	14		17		20					
Weight standard	$G$ [kg]	1.55		2.23		2.9					
Radial load permitted at shaft end @ 3000 min <sup>-1</sup>	$F_R$ [N]					195					
Axial load permitted	$F_A$ [N]					65					

\* reference flange Aluminium 254mm \* 254mm \* 6.35mm

Brake data

Data	Symbol [Unit]	Value
Holding torque @ 120°C	$M_{BR}$ [Nm]	2.5
Operating voltage	$U_{BR}$ [VDC]	24 ± 10 %
electrical power	$P_{BR}$ [W]	10.1
Moment of inertia	$J_{BR}$ [kgcm <sup>2</sup> ]	0.011
Release delay time	$t_{BRH}$ [ms]	25
Application delay time	$t_{BRL}$ [ms]	10
Weight of the brake	$G_{BR}$ [kg]	0.35
Typical backlash	[ °mech.]	0.46



**TABELL 2a. Storlek 200-315, 4-, 6- & 8-poliga** **TABLE 2a. Size 200-315, 4-, 6- & 8-poles**

Motorstorlek Motor size	Lager D-sida Bearing D-end 4-6-8-poliga	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]	Lager ND-sida Bearing ND-end 4-6-8-poles	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]
200	NU312 C3	18	75	6312 C3	20	85
225	NU313 C3	19	90	6313 C3	23	105
250	NU315 C3	25	120	6315 C3	30	145
280	NU317 C3	30	150	6317 C3	37	190
315	NU318 C3	32	200	6318 C3	41	260

OBS! Flänsmotorer har samma kullager på båda sidor (Ej rullager på drivsidan).

NOTE! Flange motors have the same ball bearings on both ends (No roller bearing on the drive end)

**TABELL 2b. Storlek 200-315, 2-poliga****TABLE 2b. Size 200-315, 2-pole**

Motorstorlek Motor size	Lager D-sida Bearing D-end 2-poliga	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]	Lager ND-sida Bearing ND-end 2-poles	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]
200	6312 C3	20	85	6312 C3	20	85
225	6313 C3	23	105	6313 C3	23	105
250	6315 C3	30	145	6315 C3	30	145
280	6315 C3	30	145	6315 C3	30	145
315	6315 C3	30	145	6315 C3	30	145

**TABELL 3. Åtdragningsmoment i Nm****TABLE 3. Tightening torque in Nm**

	M5	M6	M8	M10	M12	M16	M18	M20	M22	M24
Elanslutning Electrical conn. [Nm]	2,5	4	8	12	20	40	-	-	-	-
Max åtdragn.moment för fötter. Max torque for feet. [Nm]	5	8	22	45	75	91	119	150	184	282

Rätt till ändringar förbehålles!

We reserve the right to make design changes!

**BEVI AB – ORGANISATIONSNUMMER / VAT –No. SE55607432001**

Adress  
Address  
Bevivägen 1  
384 30 Blomstermåla  
SWEDEN

Telefon  
Telephone  
+46 (0)499-27100

Telefax  
Telefax  
+46 (0)499-20008

Internet/E-post  
Internet/e-mail  
[www.bevi.com](http://www.bevi.com)  
[sales@bevi.se](mailto:sales@bevi.se)

10.5 AKM4

Technical data

Data	Symbol [Unit]	AKM													
		41C	41E	41H	42C	42E	42G	42J	43E	43G	43K	44E	44G	44J	
<b>Electrical data</b>															
U = 75VDC	Standstill torque*	M <sub>0</sub> [Nm]	1.95	2.02	2.06	3.35	3.42	3.53	3.56	4.70	4.80	4.90	5.76	5.88	6.00
	Standstill current	I <sub>0rms</sub> [A]	1.46	2.85	5.60	1.40	2.74	4.80	8.40	2.76	4.87	9.60	2.90	5.00	8.80
	max. Mains voltage	U <sub>N</sub> [VAC]	480												
U = 115V	Rated speed	n <sub>n</sub> [min <sup>-1</sup> ]	—	—	1000	—	—	—	—	—	—	—	—	—	—
	Rated torque*	M <sub>n</sub> [Nm]	—	—	1.99	—	—	—	—	—	—	—	—	—	—
	Rated power	P <sub>n</sub> [kW]	—	—	0.21	—	—	—	—	—	—	—	—	—	—
U <sub>N</sub> = 230V	Rated speed	n <sub>n</sub> [min <sup>-1</sup> ]	—	1200	3000	—	—	—	3000	—	—	2500	—	—	—
	Rated torque*	M <sub>n</sub> [Nm]	—	1.94	1.86	—	—	—	3.03	—	—	4.08	—	—	—
	Rated power	P <sub>n</sub> [kW]	—	0.24	0.58	—	—	—	0.95	—	—	1.07	—	—	—
U <sub>N</sub> = 400V	Rated speed	n <sub>n</sub> [min <sup>-1</sup> ]	1200	3000	6000	—	1800	3500	6000	1500	2500	6000	1200	2000	4000
	Rated torque*	M <sub>n</sub> [Nm]	1.88	1.82	1.62	—	3.12	2.90	2.38	4.24	4.00	2.62	5.22	4.90	3.84
	Rated power	P <sub>n</sub> [kW]	0.24	0.57	1.02	—	0.59	1.06	1.50	0.67	1.05	1.65	0.66	1.03	1.61
U <sub>N</sub> = 480V	Rated speed	n <sub>n</sub> [min <sup>-1</sup> ]	3000	6000	—	1500	3500	6000	—	2500	5000	—	2000	4000	6000
	Rated torque*	M <sub>n</sub> [Nm]	1.77	1.58	—	3.10	2.81	2.35	—	3.92	3.01	—	4.80	3.76	2.75
	Rated power	P <sub>n</sub> [kW]	0.56	0.99	—	0.49	1.03	1.48	—	1.03	1.58	—	1.01	1.57	1.73
U <sub>N</sub> = 480V	Rated speed	n <sub>n</sub> [min <sup>-1</sup> ]	3500	6000	—	2000	4000	6000	—	3000	6000	—	2500	5000	6000
	Rated torque*	M <sub>n</sub> [Nm]	1.74	1.58	—	3.02	2.72	2.35	—	3.76	2.57	—	4.56	3.19	2.75
	Rated power	P <sub>n</sub> [kW]	0.64	0.99	—	0.63	1.14	1.48	—	1.18	1.61	—	1.19	1.67	1.73
	Peak current	I <sub>0max</sub> [A]	5.8	11.4	22.4	5.61	11.0	19.2	33.7	11.0	19.5	38.3	11.4	20.0	35.2
	Peak torque	M <sub>0max</sub> [Nm]	6.12	6.28	6.36	11.1	11.3	11.5	11.6	15.9	16.1	16.3	19.9	20.2	20.4
	Torque constant	K <sub>Trms</sub> [Nm/A]	1.34	0.71	0.37	2.40	1.26	0.74	0.43	1.72	0.99	0.52	2.04	1.19	0.69
	Voltage constant	K <sub>E rms</sub> [mV/min]	86.3	45.6	23.7	154	80.9	47.5	27.5	111	63.9	33.2	132	76.6	44.2
	Winding resistance Ph-Ph	R <sub>25</sub> [Ω]	21.3	6.02	1.56	27.5	7.78	2.51	0.80	8.61	2.61	0.74	8.08	2.80	0.94
	Winding inductance Ph-Ph	L [mH]	66.1	18.4	5.0	97.4	26.8	9.2	3.1	32.6	10.8	2.9	33.9	11.5	3.8
<b>Mechanical data</b>															
Rotor moment of inertia	J [kgcm <sup>2</sup> ]	0.81		1.5				2.1				2.7			
Pole number		10		10				10				10			
Static friction torque	M <sub>R</sub> [Nm]	0.014		0.026				0.038				0.05			
Thermal time constant	t <sub>TH</sub> [min]	13		17				20				24			
Weight standard	G [kg]	2.44		3.39				4.35				5.3			
Radial load permitted at shaft end @ 3000 min <sup>-1</sup>	F <sub>R</sub> [N]	450													
Axial load permitted at shaft	F <sub>A</sub> [N]	180													

\* reference flange Aluminium 254mm \* 254mm \* 6.35mm

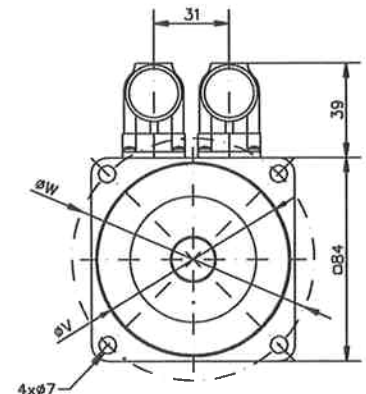
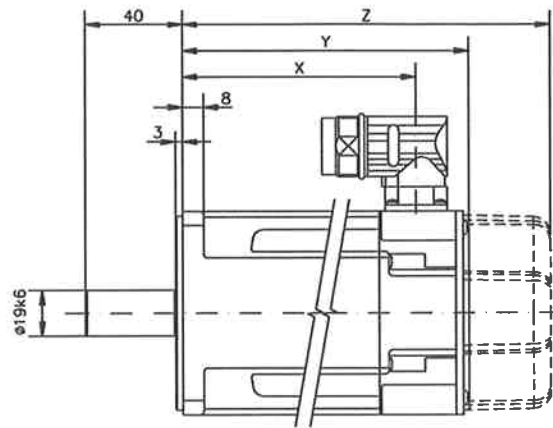
Brake data

Data	Symbol [Unit]	Value
Holding torque @ 120°C	M <sub>BR</sub> [Nm]	6
Operating voltage	U <sub>BR</sub> [VDC]	24 ± 10 %
electrical power	P <sub>BR</sub> [W]	12.8
Moment of inertia	J <sub>BR</sub> [kgcm <sup>2</sup> ]	0.068
Release delay time	t <sub>BRH</sub> [ms]	35
Application delay time	t <sub>BRL</sub> [ms]	15
Weight of the brake	G <sub>BR</sub> [kg]	0.63
Typical backlash	[ °mech.]	0.37

**Connections and cables**

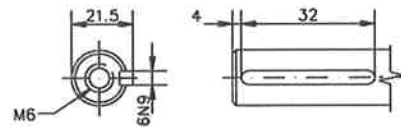
Data	AKM4
Power connection	4 + 4 poles, round, angular
Motor cable, shielded	4 x 1.5
Motor cable with control leads, shielded	4 x 1.5 + 2 x 0.75
Resolver connection	12 poles, round, angular
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>
Encoder connection (option)	17 poles, round, angular
Encoder cable, shielded	7 x 2 x 0.25mm <sup>2</sup>

**Dimensions (drawing in principle)**



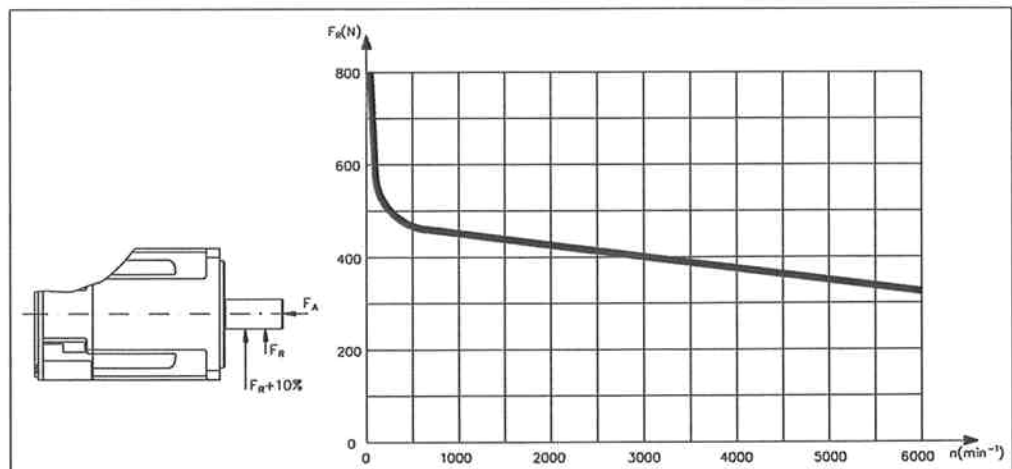
Model	X	Resolver/Encoder	
		Y	Z (brake)
AKM41	96.4	118.8	152.3
AKM42	125.5	147.8	181.3
AKM43	154.4	176.8	210.3
AKM44	183.4	205.8	239.3

**Option Keyway**



$\phi W = \phi 100, \phi V = \phi 80\text{j6}, \text{AKM4xx-Ax}$   
 $\phi W = \phi 90, \phi V = \phi 60\text{j6}, \text{AKM4xx-Cx}$

**Radial forces at the shaft end**



10.6 AKM5

Technical data

Data	Symbol [Unit]	AKM															
		51E	51G	51K	52E	52G	52K	52M	53G	53K	53M	53P	54G	54K	54L	54N	
<b>Electrical data</b>																	
Standstill torque*	$M_0$ [Nm]	4.70	4.75	4.90	8.34	8.43	8.60	8.60	11.4	11.6	11.4	11.4	14.3	14.4	14.1	14.1	
Standstill current	$I_{0rms}$ [A]	2.75	4.84	9.4	2.99	4.72	9.3	13.1	4.77	9.4	13.4	19.1	5.0	9.7	12.5	17.8	
max. Mains voltage	$U_N$ [VAC]	480															
U = 75VDC	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
U <sub>N</sub> = 115V	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	2500	—	—	—	—	—	—	—	—	—	—	—	
	Rated torque*	$M_n$ [Nm]	—	—	4.15	—	—	—	—	—	—	—	—	—	—	—	
	Rated power	$P_n$ [kW]	—	—	1.09	—	—	—	—	—	—	—	—	—	—	—	
U <sub>N</sub> = 230V	Rated speed	$n_n$ [min <sup>-1</sup> ]	1200	2500	5500	—	1500	3000	4500	1000	2000	3000	5000	—	1800	2500	3500
	Rated torque*	$M_n$ [Nm]	4.41	4.02	2.35	—	7.69	6.80	5.20	10.7	10.1	8.72	5.88	—	12.7	11.5	9.85
	Rated power	$P_n$ [kW]	0.55	1.05	1.35	—	1.21	2.14	2.45	1.12	2.12	2.74	3.08	—	2.39	3.00	3.61
U <sub>N</sub> = 400V	Rated speed	$n_n$ [min <sup>-1</sup> ]	2500	5000	—	1500	2500	5500	—	2000	4000	—	—	1500	3500	4500	—
	Rated torque*	$M_n$ [Nm]	3.98	2.62	—	7.61	7.06	3.90	—	9.85	7.65	—	—	12.9	10.0	8.13	—
	Rated power	$P_n$ [kW]	1.04	1.37	—	1.20	1.85	2.25	—	2.06	3.20	—	—	2.03	3.68	3.83	—
U <sub>N</sub> = 480V	Rated speed	$n_n$ [min <sup>-1</sup> ]	3000	6000	—	2000	3000	6000	—	2400	4500	—	—	2000	4000	—	—
	Rated torque*	$M_n$ [Nm]	3.80	1.94	—	7.28	6.66	3.25	—	9.50	6.85	—	—	12.3	9.25	—	—
	Rated power	$P_n$ [kW]	1.19	1.22	—	1.52	2.09	2.04	—	2.39	3.23	—	—	2.57	3.87	—	—
Peak current	$I_{0max}$ [A]	8.24	14.5	28.3	9.00	14.2	27.8	39.4	14.3	28.1	40.3	57.4	14.9	29.2	37.5	53.4	
Peak torque	$M_{0max}$ [Nm]	11.6	11.7	12.0	21.3	21.5	21.9	21.9	29.7	30.1	29.8	29.8	37.8	38.4	37.5	37.6	
Torque constant	$K_{T,rms}$ [Nm/A]	1.72	0.99	0.52	2.79	1.79	0.93	0.66	2.39	1.24	0.85	0.60	2.88	1.50	1.13	0.80	
Voltage constant	$K_{E,rms}$ [mV/min]	110	63.6	33.5	179	115	60.1	42.4	154	79.8	54.7	38.4	185	96.6	72.9	51.3	
Winding resistance Ph-Ph	$R_{25}$ [Ω]	8.98	2.75	0.75	8.96	3.70	0.96	0.49	3.97	1.06	0.51	0.28	4.08	1.08	0.65	0.33	
Winding inductance Ph-Ph	L [mH]	36.6	12.1	3.40	44.7	18.5	5.00	2.50	21.3	5.70	2.70	1.30	22.9	6.20	3.50	1.80	
<b>Mechanical data</b>																	
Rotor moment of inertia	J [kgcm <sup>2</sup> ]	3.4			6.2			9.1			12						
Pole number		10			10			10			10						
Static friction torque	$M_R$ [Nm]	0.022			0.04			0.058			0.077						
Thermal time constant	$t_{TH}$ [min]	20			24			28			31						
Weight standard	G [kg]	4.2			5.8			7.4			9						
Radial load permitted at shaft end @ 3000 min <sup>-1</sup>	$F_R$ [N]	450															
Axial load permitted	$F_A$ [N]	180															

\* reference flange Aluminium 305mm \* 305mm \* 12.7mm

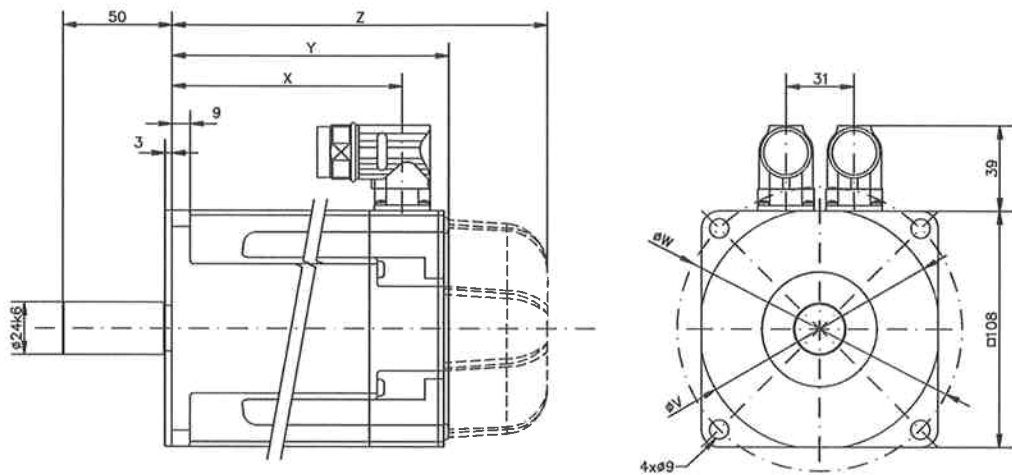
Brake data

Data	Symbol [Unit]	Value
Holding torque @ 120°C	$M_{BR}$ [Nm]	14.5
Operating voltage	$U_{BR}$ [VDC]	24 ± 10 %
electrical power	$P_{BR}$ [W]	19.5
Moment of inertia	$J_{BR}$ [kgcm <sup>2</sup> ]	0.173
Release delay time	$t_{BRH}$ [ms]	80
Application delay time	$t_{BRL}$ [ms]	15
Weight of the brake	$G_{BR}$ [kg]	1.1
Typical backlash	[ °mech.]	0.31

Connections and cables

Data	AKM5	
Power connection	4 + 4 poles, round, angular	
Motorcable, shielded	4 x 1.5	4 x 2.5
Motor cable with control leads, shielded	4 x 1.5 + 2 x 0.75	4 x 2.5 + 2 x 1
Resolver connection	12 poles, round, angular	
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>	
Encoder connection (option)	17 poles, round, angular	
Encoder cable, shielded	7 x 2 x 0.25mm <sup>2</sup>	

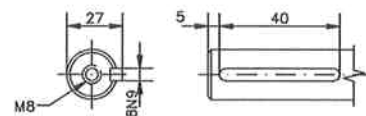
Dimensions (drawing in principle)



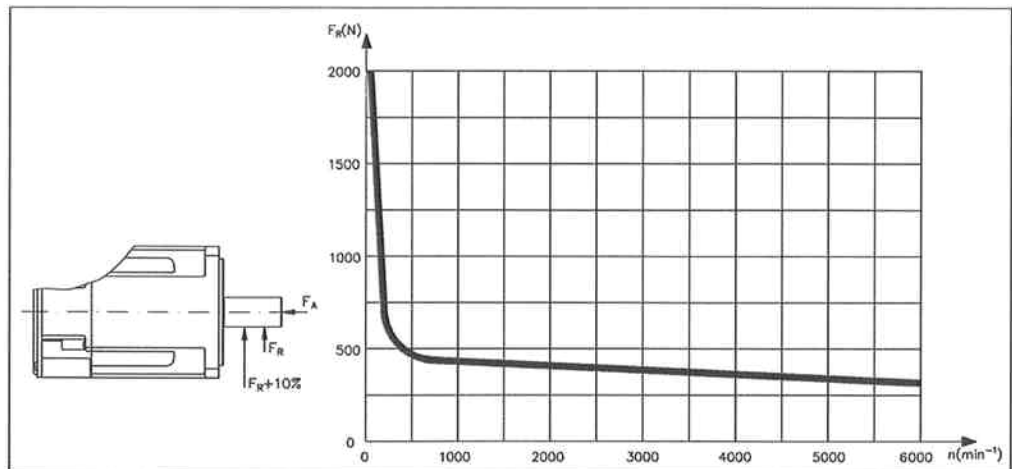
øW=ø130, øV=ø110j6, AKM5xx-Ax  
øW=ø115, øV=ø95j6, AKM5xx-Cx

Model	X	Resolver/Comcoder		Encoder	
		Y	Z (brake)	Y	Z (brake)
AKM51	105.3	127.5	172.5	146.0	189.0
AKM52	136.3	158.5	203.5	177.0	220.0
AKM53	167.3	189.5	234.5	208.0	251.0
AKM54	198.3	220.5	265.5	239.0	282.0

Option Keyway



Radial forces at the shaft end



10.7 AKM6

Technical data

Data	Symbol [Unit]	AKM														
		62G	62K	62M	62P	63G	63K	63M	63N	64K	64L	64P	65K	65M	65N	
<b>Electrical data</b>																
Standstill torque*	$M_0$ [Nm]	11.9	12.2	12.2	12.3	16.5	16.8	17.0	17.0	20.8	21.0	20.4	24.8	25.0	24.3	
Standstill current	$I_{0rms}$ [A]	4.9	9.6	13.4	18.8	4.5	9.9	13.8	17.4	9.2	12.8	18.6	9.8	13.6	17.8	
Mains voltage	$U_N$ [VAC]	230-480														
U = 75VDC	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—	—	—	—	—	—	—	
U <sub>N</sub> = 115V	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—	—	—	—	—	—	—	
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—	—	—	—	—	—	—	
U <sub>N</sub> = 230V	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	2000	3000	4500	—	1500	2000	3000	1200	1500	2500	1000	1500	2000
	Rated torque*	$M_n$ [Nm]	—	10.4	9.50	8.10	—	14.9	14.3	13.0	18.8	18.4	16.0	22.8	21.9	19.8
	Rated power	$P_n$ [kW]	—	2.18	2.98	3.82	—	2.34	2.99	4.08	2.36	2.89	4.19	2.39	3.44	4.15
U <sub>N</sub> = 400V	Rated speed	$n_n$ [min <sup>-1</sup> ]	1800	3500	6000	—	1200	3000	4000	5000	2000	3000	4500	2000	2500	3500
	Rated torque*	$M_n$ [Nm]	10.4	9.00	5.70	—	14.9	12.9	11.3	9.60	17.2	15.6	11.9	20.2	19.2	16.0
	Rated power	$P_n$ [kW]	1.96	3.30	3.58	—	1.87	4.05	4.73	5.03	3.60	4.90	5.61	4.23	5.03	5.86
U <sub>N</sub> = 480V	Rated speed	$n_n$ [min <sup>-1</sup> ]	2000	4500	6000	—	1500	3500	4500	6000	2500	3500	5500	2200	3000	4000
	Rated torque*	$M_n$ [Nm]	10.2	8.00	5.70	—	14.6	12.0	10.5	7.00	16.3	14.4	9.00	19.7	18.1	14.7
	Rated power	$P_n$ [kW]	2.14	3.77	3.58	—	2.29	4.40	4.95	4.40	4.27	5.28	5.18	4.54	5.69	6.16
Peak current	$I_{0max}$ [A]	14.6	28.7	40.3	56.5	13.4	29.7	41.4	52.2	27.5	38.4	55.9	29.4	40.9	53.3	
Peak torque	$M_{0max}$ [Nm]	29.8	30.1	30.2	30.4	41.8	42.6	43.0	43.0	53.5	54.1	52.9	64.5	65.2	63.7	
Torque constant	$K_{Trms}$ [Nm/A]	2.47	1.28	0.91	0.66	3.70	1.71	1.24	0.98	2.28	1.66	1.10	2.54	1.85	1.38	
Voltage constant	$K_{Ems}$ [mV/min]	159	82.1	58.8	42.2	238	110	79.9	63.3	147	107	71.0	164	119	88.8	
Winding resistance Ph-Ph	$R_{25}$ [Ω]	4.13	1.08	0.57	0.30	5.50	1.14	0.61	0.39	1.41	0.75	0.36	1.35	0.73	0.43	
Winding inductance Ph-Ph	L [mH]	31.7	8.5	4.4	2.2	43.5	9.3	4.9	3.1	11.8	6.2	2.8	11.4	6.1	3.4	
<b>Mechanical data</b>																
Rotor moment of inertia	J [kgcm <sup>2</sup> ]	17			24			32			40					
Pole number		10			10			10			10					
Static friction torque	$M_R$ [Nm]	0.05			0.1			0.15			0.2					
Thermal time constant	$t_{TH}$ [min]	20			25			30			35					
Weight standard	G [kg]	8.9			11.1			13.3			15.4					
Radial load permitted at shaft end @ 3000 min <sup>-1</sup>	$F_R$ [N]	770														
Axial load permitted	$F_A$ [N]	280														

\* reference flange Aluminium 457mm \* 457mm \* 12.7mm

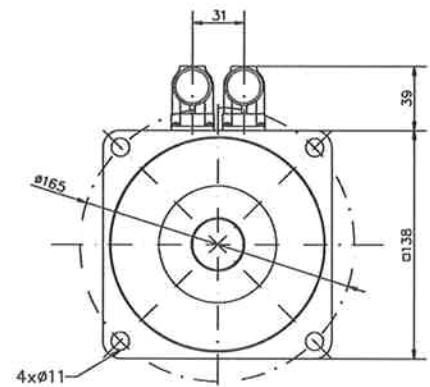
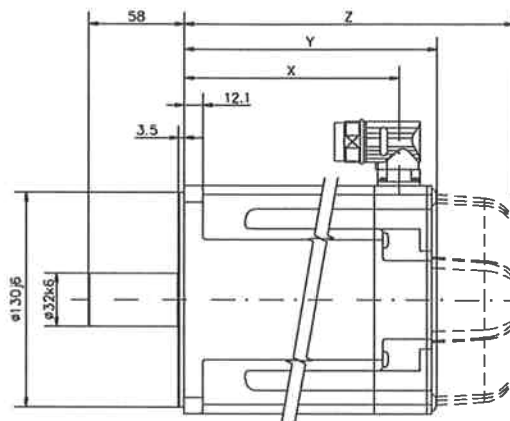
Brake data

Data	Symbol [Unit]	Value
Holding torque @ 120°C	$M_{BR}$ [Nm]	25
Operating voltage	$U_{BR}$ [VDC]	24 ± 10 %
electrical power	$P_{BR}$ [W]	25.7
Moment of inertia	$J_{BR}$ [kgcm <sup>2</sup> ]	0.61
Release delay time	$t_{BRH}$ [ms]	105
Application delay time	$t_{BRL}$ [ms]	20
Weight of the brake	$G_{BR}$ [kg]	2
Typical backlash	[ °mech.]	0.24

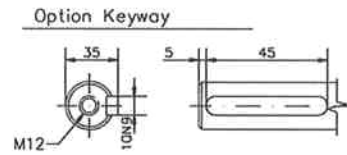
**Connections and cables**

Data	AKM6
Power connection	4 + 4 poles, round, angular
Motorcable, shielded	4 x 2.5
Motor cable with control leads, shielded	4 x 2.5 + 2 x 1
Resolver connection	12 poles, round, angular
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>
Encoder connection (option)	17 poles, round, angular
Encoder cable, shielded	7 x 2 x 0.25mm <sup>2</sup>

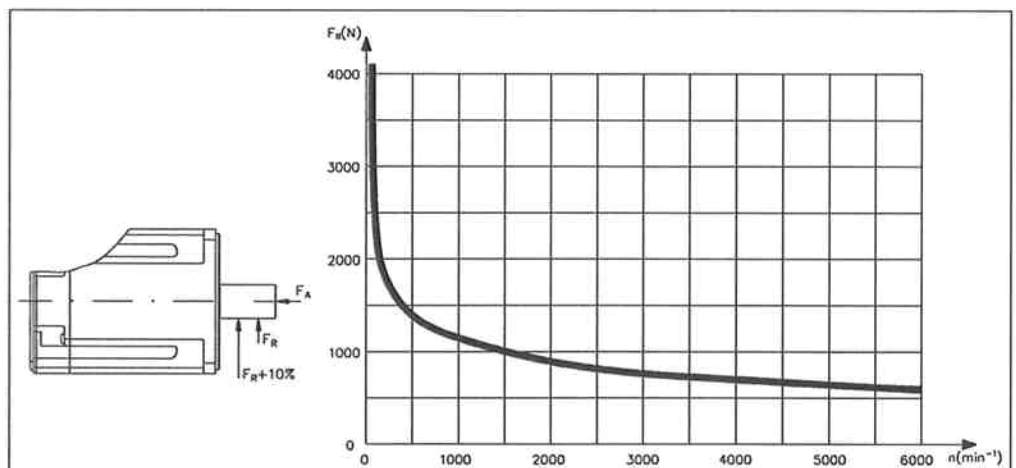
**Dimensions (drawing in principle)**



Model	X	Resolver/Comcoder		Encoder	
		Y	Z (brake)	Y	Z (brake)
AKM62	130.5	153.7	200.7	172.2	219.7
AKM63	155.5	178.7	225.7	197.2	244.7
AKM64	180.5	203.7	250.7	222.2	269.7
AKM65	205.5	228.7	275.7	247.2	294.7



**Radial forces at the shaft end**



10.8

AKM7

Technical data

Data	Symbol [Unit]	AKM							
		72K	72M	72P	73M	73P	74L	74P	
<b>Electrical data</b>									
Standstill	Standstill torque*	$M_0$ [Nm]	29.7	30.0	29.4	42.0	41.6	53.0	52.5
	Standstill current	$I_{0rms}$ [A]	9.3	13.0	18.7	13.6	19.5	12.9	18.5
	max. Mains voltage	$U_N$ [VAC]	480						
$U = 75VDC$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—
$U_N = 115V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	—	—	—	—	—
	Rated torque*	$M_n$ [Nm]	—	—	—	—	—	—	—
	Rated power	$P_n$ [kW]	—	—	—	—	—	—	—
$U_N = 230V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	—	—	1800	—	1300	—	—
	Rated torque*	$M_n$ [Nm]	—	—	23.8	—	34.7	—	—
	Rated power	$P_n$ [kW]	—	—	4.49	—	4.72	—	—
$U_N = 400V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	1500	2000	3000	1500	2400	1200	1800
	Rated torque*	$M_n$ [Nm]	25.1	23.6	20.1	33.8	28.5	43.5	39.6
	Rated power	$P_n$ [kW]	3.94	4.94	6.31	5.31	7.16	5.47	7.46
$U_N = 480V$	Rated speed	$n_n$ [min <sup>-1</sup> ]	1800	2500	3500	1800	2800	1400	2000
	Rated torque*	$M_n$ [Nm]	24.0	22.1	18.2	32.1	26.3	41.5	35.9
	Rated power	$P_n$ [kW]	4.52	5.79	6.67	6.05	7.71	6.08	7.52
Peak current	$I_{0max}$ [A]	27.8	38.9	56.1	40.8	58.6	38.7	55.5	
Peak torque	$M_{0max}$ [Nm]	79.2	79.7	78.5	113	111	143	142	
Torque constant	$K_{Trms}$ [Nm/A]	3.23	2.33	1.58	3.10	2.13	4.14	2.84	
Voltage constant	$K_{Erms}$ [mVmin]	208	150	102	200	137	266	183	
Winding resistance Ph-Ph	$R_{25}$ [ $\Omega$ ]	1.36	0.69	0.35	0.76	0.38	0.93	0.47	
Winding inductance Ph-Ph	L [mH]	20.7	10.8	5.0	12.4	5.9	16.4	7.7	
<b>Mechanical data</b>									
Rotor moment of inertia	J [kgcm <sup>2</sup> ]	65			92		120		
Pole number		10			10		10		
Static friction torque	$M_R$ [Nm]	0.16			0.24		0.33		
Thermal time constant	$t_{TH}$ [min]	46			53		60		
Weight standard	G [kg]	19.7			26.7		33.6		
Radial load permitted at shaft end @ 1000 min <sup>-1</sup>	$F_R$ [N]	1300							
Axial load permitted	$F_A$ [N]	500							

\* reference flange Aluminium 457mm \* 457mm \* 12.7mm

Brake data

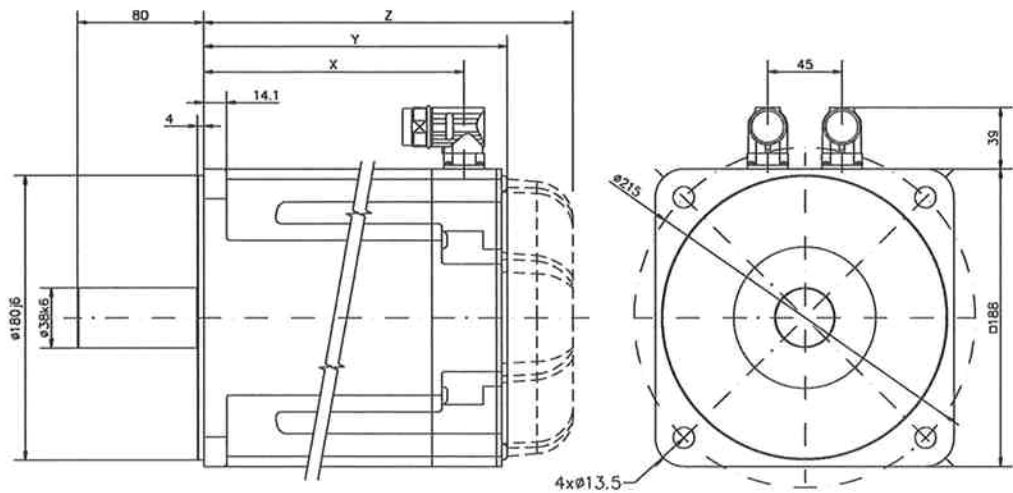
Data	Symbol [Unit]	Value
Holding torque @ 120°C	$M_{BR}$ [Nm]	53
Operating voltage	$U_{BR}$ [VDC]	24 ± 10 %
electrical power	$P_{BR}$ [W]	35.6
Moment of inertia	$J_{BR}$ [kgcm <sup>2</sup> ]	1.64
Release delay time	$t_{BRH}$ [ms]	110
Application delay time	$t_{BRL}$ [ms]	35
Weight of the brake	$G_{BR}$ [kg]	2.1
Typical backlash	[ °mech.]	0.2



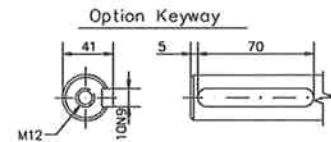
**Connections and cables**

Data	AKM7
Power connection	4 + 4 poles, round, angular
Motorcable, shielded	4 x 2.5
Motor cable with control leads, shielded	4 x 2.5 + 2 x 1
Steueradern, geschirmt	4 x 1
Resolver connection	12 poles, round, angular
Resolver cable, shielded	4 x 2 x 0.25mm <sup>2</sup>
Encoder connection (option)	17-polig, rund
Encoder cable, shielded	7 x 2 x 0.25mm <sup>2</sup>

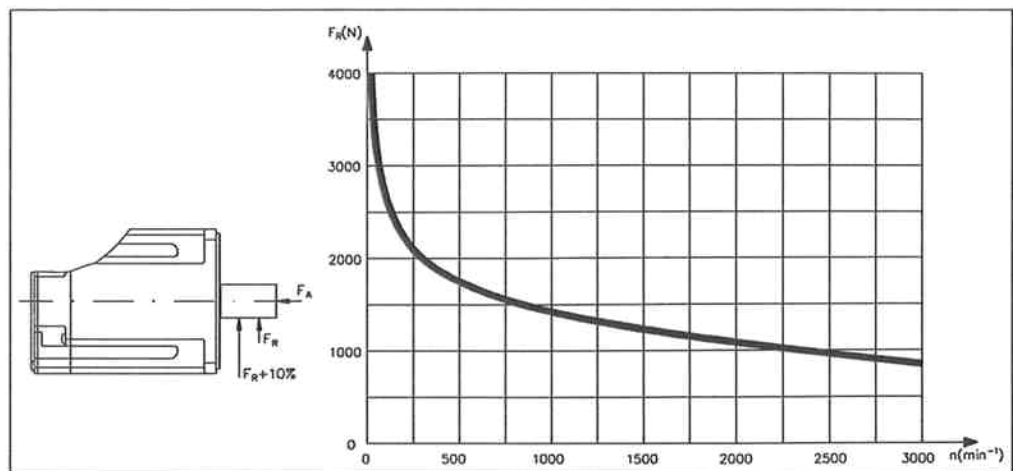
**Dimensions (drawing in principle)**



Model	X	Resolver/Camcoder		Encoder	
		Y	Z (brake)	Y	Z (brake)
AKM72	164.5	192.5	234.5	201.7	253.3
AKM73	198.5	226.5	268.5	235.7	287.3
AKM74	232.5	260.5	302.5	269.7	321.3



**Radial forces at the shaft end**



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## 11

## Appendix

## 11.1

## Assignment of RediMount gearhead mounts

AKM Motor	RediMount	Flange length] in. (mm)
AKM1xx - Ax	RM060-130	1.38 (35.1)
AKM1xx - Bx	RM060-311	1.47 (37.3)
AKM1xx - Cx	RM060-XXX	in preparation
AKM2xx - Ax	RM060-6	1.22 (31.0)
	RM075-6	in preparation
	RM090-6	2.47 (62.7)
	RM100-6	in preparation
AKM2xx - Bx	RM060-11	1.22 (31.0)
	RM075-11	in preparation
	RM090-11	2.47 (62.7)
	RM100-11	in preparation
AKM2xx - Cx	RM060-343	1.22 (31.0)
	RM075-343	1.69 (42.9)
	RM090-343	1.74 (44.1)
	RM100-343	2.47 (62.7)
	RM115-343	1.93 (48.9)
AKM2xx - Dx	RM060-XXX	in preparation
	RM075-XXX	in preparation
	RM090-XXX	in preparation
	RM100-XXX	in preparation
AKM2xx - Ex	RM060-11	1.22 (31.0)
	RM075-11	in preparation
	RM090-11	2.47 (62.7)
	RM100-11	in preparation
AKM3xx - Ax	RM060-19	1.22 (31.0)
	RM075-19	1.69 (42.9)
	RM090-19	1.74 (44.1)
	RM100-19	2.32 (58.9)
AKM3xx - Cx	RM060-XXX	in preparation
	RM075-XXX	in preparation
	RM090-XXX	in preparation
	RM100-XXX	in preparation
AKM3xx - Gx	RM060-20	1.22 (31.0)
	RM075-20	1.69 (42.9)
	RM090-20	1.74 (44.1)
AKM4xx - Ax	RM075-40	1.69 (42.9)
	RM090-40	1.74 (44.1)
	RM100-40	1.72 (43.7)
	RM115-40	1.93 (48.9)
AKM4xx - Bx	RM075-307	in preparation
	RM090-307	2.47 (62.7)
	RM100-307	in preparation
	RM115-307	1.93 (48.9)
AKM4xx - Cx	RM075-124	1.69 (42.9)
	RM090-124	1.74 (44.1)
	RM100-124	1.72 (43.7)
	RM115-124	1.93 (48.9)
AKM4xx - Ex	RM075-28	1.69 (42.9)
	RM090-28	1.74 (44.1)
	RM100-28	1.72 (43.7)
	RM115-28	1.93 (48.9)
AKM4xx - Gx	RM075-37	1.69 (42.9)
	RM090-37	1.74 (44.1)
	RM100-37	1.72 (43.7)
	RM115-37	1.93 (48.9)
AKM4xx - Hx	RM075-25	1.69 (42.9)
	RM090-25	1.74 (44.1)
	RM100-25	1.72 (43.7)
	RM115-25	1.93 (48.9)

AKM Motor	RediMount	Flange length] in. (mm)
AKM4xx - Kx	RM075-105	1.69 (42.9)
	RM090-105	1.74 (44.1)
	RM100-105	1.72 (43.7)
	RM115-105	1.93 (48.9)
AKM5xx - Ax	RM090-71	2.47 (62.7)
	RM100-71	1.72 (43.7)
	RM115-71	1.93 (48.9)
	RM142-71	2.74 (69.6)
	RM180-71	3.60 (91.4)
AKM5xx - Bx	RM090-72	2.47 (62.7)
	RM100-72	2.08 (52.8)
	RM115-72	2.36 (59.9)
	RM142-72	2.74 (69.6)
AKM5xx - Cx	RM090-53	in preparation
	RM100-53	in preparation
	RM115-53	2.36 (59.9)
	RM142-53	in preparation
AKM5xx - Dx	RM090-XXX	in preparation
	RM100-XXX	in preparation
	RM115-XXX	in preparation
	RM142-XXX	in preparation
AKM5xx - Gx	RM090-69	2.47 (62.7)
	RM100-69	1.72 (43.7)
	RM115-69	1.93 (48.9)
	RM142-69	2.74 (69.6)
AKM5xx - Hx	RM090-52A	1.74 (44.1)
	RM100-52	1.72 (43.7)
	RM115-52	2.36 (59.9)
	RM142-52	2.74 (69.6)
AKM6xx - Ax	RM115-92	in preparation
	RM142-92	3.21 (81.5)
	RM180-92	3.60 (91.4)
	RM220-92	2.74 (69.5)
AKM6xx - Gx	RM115-88	2.36 (59.9)
	RM142-88	3.21 (81.5)
	RM180-88	3.60 (91.4)
	RM220-88	in preparation
AKM6xx - Kx	RM115-83	2.36 (59.9)
	RM142-83	2.74 (69.6)
	RM180-83	in preparation
	RM220-83	in preparation
AKM6xx - Lx	RM115-XXX	in preparation
	RM142-XXX	in preparation
	RM180-XXX	in preparation
	RM220-XXX	in preparation
AKM7xx - Ax	RM142-114S	3.36 (85.3)
	RM180-114	3.60 (91.4)
	RM220-114	2.74 (69.6)
AKM7xx - Gx	RM142-107	3.36 (85.3)
	RM180-107	3.60 (91.4)
	RM220-107	2.74 (69.9)
AKM7xx - Kx	RM142-96	3.36 (85.3)
	RM180-96	3.60 (91.4)
	RM220-96	in preparation

## 11.2 Assignment of Micron Gearheads to RediMount mounts

These gearheads can be fitted to RediMount:

RediMount Mount	Micron gearhead
RM060	DT60, DTR60, DTRS60, DTRH60, NT23, NTP23, NT60, NTR23, UT006, UTR006, EQ23, EQ60
RM075	UT075, UTR075, UT090, UTR090
RM090	DT90, DTR90, DTRS90, DTRD90, DTRH90, NT34, NTP34, NT90, NTR34
RM100	UT010, UTR010, ET010, UT115, UTR115
RM115	DT115, DTR115, DTRS115, DTRD115, DTRH115, NT42, NTP42, NT115, NTR42
RM142	DT142, DTR142, DTRS142, DTRD142, DTRH142, NT142, UT014, UTR014, ET014
RM180	UT018, UTR018, ET018
RM220	UT220

You can find further information on Redimount and Micron gearheads on our website.

## 11.3

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E-Mail [support\\_dus.germany@danahermotion.com](mailto:support_dus.germany@danahermotion.com)

Internet [www.DanaherMotion.net](http://www.DanaherMotion.net)

Tel.: +49(0)203 - 99 79 - 0

Fax: +49(0)203 - 99 79 - 216

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# MOTOR MANUAL

**BEVI KORTSLUTNA,  
TREFAS  
STANDARD  
ELMOTORER**

**BEVI THREE PHASE  
SQUIRREL CAGE,  
TEFC,  
ELECTRIC MOTORS**

**IEC 56-315, IP 55(56), IC 411, IM 1001-3631**

**Sg (SKg, SLg), Sh (SKh, SLh) 56-80  
ISSh (ISSKh, ISSLh) 90  
ISSg (ISSKg, ISSLg) 100-180  
2Sg (2SKg, 2SLg) 200-315**

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## 1. TEKNISK BESKRIVNING

### Allmänt

De mantelkylda 3-fas motorerna av typerna Sg/Sh/ISSg/ISSh/2Sg är standard elmotorer med data enligt katalog och testprotokoll. Motorerna uppfyller krav enligt tillämpliga IEC- och ISO-standarder.

Om inte annat angivits, gäller de nominella effekterna för kontinuerlig drift, S1, vid angiven nätspänning och nätfrekvens, omgivningstemperaturer upp till 40°C samt för drift på höjder upp till 1000 m över havet.

### Normer

Motorernas konstruktion, märkeffekter och anslutningsmått uppfyller kraven enligt internationell och svensk standard enligt följande:  
- SS-EN 60034-1 och IEC 60072-1

### Kapslingsklass (skyddsform)

Motorerna är tillverkade i kapslingsklass IP 55 och går bra att montera i dammig och fuktig omgivning. Motorerna kan utan speciella skyddsåtgärder ställas upp utomhus och standardmålningen tål detta. Vid svåra miljö- och klimatförhållanden rekommenderas dock specialmålning. Monteras axeltappen nedåt bör motorn förses med skyddsplåt över fläktkåpan. Motorer med axeltappen uppåt måste skyddas så att vatten inte tränger in i motorn utefter axeln. Motorerna kan på begäran erhållas i IP 56.

### Kylning

Som standard finns mantelkylning med utvändigt kylfläkt på motoraxelns icke drivsida (ND-sida), normbeteckningen IC 411. Andra kylmetoder kan erbjudas, t.ex. separatdriven kylfläkt som ofta önskas vid frekvensomriktardrift.

### Isolationsklass

Samtliga motorer är i klass F om inget annat anges på märkskylten. Klass F medger högre temperaturstegring än klass B. Motorerna får därmed stor överlastmarginal. Motorer i klass F kan normalt sett även användas i fuktiga och torra tropiska klimat. Ställs speciella krav på elmotorn kan de erhållas i olika specialutföranden för fuktiga eller torra tropiska klimat.

## 1. TECHNICAL DESCRIPTION

### General

Three-phase surface-cooled induction motors with squirrel-cage rotor type Sg/Sh/ISSg/ISSh/2Sg are standard motors with technical data according to BEVI catalogues and test certificates.

The motors meet the requirements of ISO-standards and the IEC regulations and recommendations.

If not given otherwise the rated powers are valid for continuous S1 duty, at given supply voltage and frequencies, ambient temperatures up to 40°C and for motor setting up at an altitude up to 1000 m above sea level.

### Standards

Motor construction, dimensions and outputs comply with the following Swedish and International Standards:  
- SS-EN 60034-1 och IEC 60072-1

### Enclosure (Degree of protection)

Motors are produced with degree of protection IP 55 and are suitable for use in damp and dusty environments. Motors can, without special enclosure modifications, be installed outside and the standard paint finish is also suitable. However, for harsh environments and climatic conditions we recommend a special paint finish. Motors mounted with shaft vertically down should be protected by a lid fitted over the fan cowl. Motors mounted with shaft vertically up should be protected so that water cannot penetrate down the motor shaft. Alternatively motors to IP 56 can be supplied.

### Cooling

As standard, cooling is by a fan fitted to the non drive end shaft extension (standard designation IC 411). Other cooling methods can be supplied, for example a separate blower fan which is frequently required for inverter driven motors.

### Insulation

All motors conform to the insulation class F, unless the markplate is different. Class F insulation permits a higher temperature rise than Class B. These motors have an increased overload margin. Motors with Class F can normally be used in wet and dry tropical climate conditions. If the motor has to comply with specially tough demands it can be made in special executions for wet or dry tropical climate conditions.



**Spänning och frekvens**

Motorerna tillverkas för frekvenserna 50 och 60 Hz samt för alla förekommande spänningar upp till 690 V. Bredbandsspänning är standard på alla våra motorer. Detta ger ett vidgat användningsområde för motorerna samt en enklare hantering vid beställning och lagerhållning. Nätspänningen kan variera  $\pm 5\%$  utan att märkeffekten behöver ändras.

**Konstruktion**

Statorn för motorstorlekarna 56-112 tillverkas av lättmetall medan storlekarna 132-315 är av gjutjärn. Lagersköldarna för motorstorlekarna 56-90 tillverkas av lättmetall. Storlekarna 100 - 315 är av gjutjärn. Lager av kända fabrikat används. Rotorn är gjuten av aluminium samt försedd med kullager ur 62- eller 63-serien. Lagertyperna för de olika motorstorlekarna har angivits i Tabell 1 och 2. Storlek 200-315 motorer är utrustade med smörjnippel som möjliggör kompletterande smörjning av lagren, se punkt 10. De övriga motorstorlekarna kan på begäran förses med smörjnipplor.

**Ytbehandling**

Motorerna målas med industrilack i RAL 5010.

**Underhåll**

I normala driftsmiljöer begränsas underhållet till smörjning av lagren. Med de fettkvaliteter som används idag betraktas små motorer som underhållsfria genom sina slutna lagerhus och täta lager. Större motorer har smörjnipplor för smörjning av lagren. Vid onormala miljöer, exempelvis hög omgivningstemperatur, skall alla lager kontrolleras och smörjas regelbundet.

**Uttagsslåda**

Motorer i grundutförande har en plint med sex uttag i uttagsslådan. Flerhastighetsmotorer kan vara försedda med 6 eller fler uttag. Uttagsbeteckningar och kopplingschema finns på insidan av uttagsslådans lock.

Motorer med termokontakter, termistorer eller med stilleståndsvärme har två separata ledningar uppdragna i uttagsslådan. Det kan även förekomma fall med separat kopplingslist med uttag för anslutning av dessa tillbehör.

**Avtappning av kondensvatten**

På motorstorlek 200-315 är de nedersta delarna av motorernas lagersköldar försedda med pluggade hål som kan användas som utlopp för eventuellt kondensvatten.

**Voltage and frequency**

Motors are produced for frequencies of 50 and 60 Hz and all standard voltages up to 690 V. All motors are range wound. This permits a wide range of uses and simplifies ordering and stockholding. The mains supply can vary by up to  $\pm 5\%$  without affecting the rated motor efficiency.

**Construction**

Stator frames for sizes 56-112 in die cast aluminium, sizes 132-315 is made in cast iron. The endshields for sizes 56-90 is made in die cast aluminium, and sizes 100-315 in cast iron. Bearings from well known manufacturers are used. The rotor cage is cast of aluminium and fitted with series 62- or 63 roller bearings. The types of bearings for the different motor sizes are given in Table No. 1 and 2. Motors of size 200-315 are fitted with grease nipples making possible additional greasing of bearings, see paragraph 10. In the remaining sizes of motors additional greasing is provided upon request.

**Exterior**

Motors are finished in a blue enamel paint, RAL 5010.

**Maintenance**

In normal use maintenance is limited to greasing of the bearings. The quality of modern greases makes smaller motors, with sealed bearings and enclosed construction, effectively maintenance free. Larger motors are fitted with grease nipples for bearing lubrication. For abnormal conditions, for example high ambient temperatures, the condition of bearings should be monitored and greased regularly.

**Terminal box**

Motors in the basic execution have six stator winding terminals in the terminal box. Multiple speed motors are provided with 6 or more terminals. The designation of terminals and connection diagram are given on a plate arranged inside the cover of the terminal box.

Motors with thermal protection or with heaters have two separate cables inside the terminal box. There can also be cases when an additional connection strip is provided for connection of this equipment.

**Motor dewatering**

On motors size 200-315, the lowest points of motor bearing plates have holes, stopped with a plug, serving to dewater the motor interior.

## 2. TRANSPORT OCH FÖRVARING

Motorerna kan transporteras på valfria transportmedel förutsatt att transportmedlet är täckt och att motorerna skyddas mot stötar och slag.

Motorer försedda med NU-lager bör ha en transport-säkrad axel.

Lyft av motorerna skall endast ske i motorns lyftögla, (fr o m. storlek 100).

Förvaring kan ske i lokaler där:

- max. relativ fuktighet inte överstiger 80% vid 20°C,
- omgivningstemperatur bara tillåts variera från -10°C till +40°C, (icke kondenserande).
- det inte tillåts tillträde för damm, gaser samt såväl frätande som andra korrosiva kemiska ångor som kan verka nedbrytande på isolation eller inkapsling,
- inga vibrationer förekommer

De maskinbearbetade ytorna på förvarade motorer bör vidare skyddas mot atmosfärisk påverkan genom täckning med tjockt fett eller en lätt borttagbar rostskyddsfärg.

## 3. MONTERING AV MOTOR

Motorns rotor är dynamiskt balanserad. Balanseringen har utförts med halv kil, enligt IEC 60034-14. För att undvika vibrationer skall således kopplingshalvor och drivskivor balanseras med halv kil efter det att kilspåret har dragits.

Innan motorn ställs upp på den avsedda platsen skall:

- transportsäkringarna tas bort (om sådana finns),
- kontroll utföras för att fastställa eventuella transport- eller förvaringsskador,
- isolationens motstånd till jord mäts: Det lägsta isolationsmotståndet vid en lindningstemperatur på ca. 20°C bör uppgå till min. 10 MOhm (större än 100 MOhm rekommenderas innan motorn startas). Om det uppmätta motståndet är lägre skall motorn torkas. Under torkningsprocessen bör förhållandena vara sådana att fuktighet försvinner från lindningen, d.v.s. att åtminstone uttagslådans lock skall avlägsnas för att underlätta luftcirkulationen i motorns inre. Torkningstemperaturen får ej överstiga 100°C.
- för motorer med fettsmorda lager kontrolleras smörjfettets kvalitet i lagren om motorn förvarats längre än 1½ år. Vid dessa tillfällen är det bäst att byta ut fett - använd SKF LGMT3 eller motsvarande fett. Vid ändring av lagerfettets typ skall lagren tvättas med lagerrengöringsvätska och torkas ordentligt.

## 2. TRANSPORT AND STORAGE

The motors can be forwarded in any covered transport means free of violent shocks or blows.

Motors with NU bearings should have the shaft secured.

Lifting of motors should only be done through the lifting eye placed on the motor frame (from size 100 and up).

Storage of motors can take place in rooms in which:

- max. relative humidity does not exceed 80 % at 20°C,
- ambient temperature ranges from -10°C to +40°C, non condensing).
- there is no access of dusts, gases and caustic vapours as well as other corroding chemical fumes destructive to insulation or casing,
- no vibrations occur

In the stored motors the machined surfaces should be protected against atmospheric influences by coating them with thick grease or easy rinsable anticorrosive lacquer.

## 3. MOUNTING OF MOTOR

The rotor is dynamically balanced. The balancing has been done with a half-key fitted to the shaft, according to IEC 60034-14. This means that, in order to avoid vibrations, coupling halves and pulleys shall be balanced with a half-key, after the making of the key way.

Before setting-up the motor on site:

- remove bearing protections (if such are provided)
- check motor for possible mechanical transport or storage damages
- measure insulation resistance to frame: The lowest insulation resistance at a winding temperature of approx. 20°C should amount to 10 MOhm (greater than 100 MOhm is recommended before start-up of motor). If the measured insulation resistance is lower the motor has to be subjected to drying. During the drying process the conditions should be such that the humidity is removed from the windings i.e. at least the terminal box cover must be removed to facilitate the air exchange within the motor. The dryingtemperature must not exceed 100°C.
- For motors with re-greasable bearings the grease quality shall be checked when the motors have been stored for a period longer than 1½ year. In such case it is best to change the grease using the LGMT3 or equivalent grease. When changing the grease grade the bearings are to be washed with a proper bearing cleaning liquid and dried thoroughly.

Motorn bör ställas upp så att inspektion och underhåll underlättas.

En flexibel koppling eller remskiva noggrant balanserad med halv kil kan monteras på axeländen enligt följande:

- ta bort skyddslacken från axeländen,
- smörj den rengjorda änden med ett tunt lager fett,
- värm upp kopplingshalvan eller remskivan till ca. 85°C och sätt den på plats på axeländen med hjälp av en passande bricka och en bult, som sätts i det befintliga gängade hålet i axeländen, pressa på kopplingshalvan eller remskivan till dess den kommit längst in på axeländen. Använd inte hammare eftersom dess slag kan skada motorns lager.

Uppriktningsfelet för elmotorn får vara max. 0,1 mm för motoraxelns centrum i förhållande till den drivna maskinens axelcentrum. Ett spelrum på minst 1 mm måste lämnas mellan kopplingshalvorna.

För stor remspänning måste noggrant undvikas vid remtransmissioner då det leder till förkortad livslängd för lagren och överbelastning av axeln, vilket i extrema fall kan leda till lagerhaveri och/eller axelbrott.

Säkerställ motorns kylning genom att kontrollera att motorns flätkåpa står minst 11-45 mm ifrån närmaste vägg, beroende på motorstorlek.

För åtdragning av motorer med fot se tabell 3.

On the site the motor is to be set up so as to ensure an easy access in case of inspection and maintenance.

A flexible coupling or sheave thoroughly balanced with half key is to be fitted onto the shaft end's shaft neck. To this end:

- remove protective varnish from the shaft neck,
- apply a thin layer of grease or oil on then cleaned shaft neck
- warm the coupling half or sheave up to approx. 85°C and with a suitable washer and bolt, using the threaded hole in the shaft end shaft neck or an appropriate jig, fit the coupling or sheave onto the shaft end shaft neck. Do not use a hammer as its blows may damage the motor bearings.

The installed motor shaft centre line may show a misalignment of up to 0,1 mm with respect to that of the driven machine shaft. A clearance of min. 1 mm must be allowed between the coupling halves.

In belt drives excessive tensioning of belt is to be avoided as it leads to reduced lifetime of bearings and the overloading of shaft.

Secure the cooling of motor by controlling the distance between fan cowl and closest wall. It must be 11-45 mm depending on motor size.

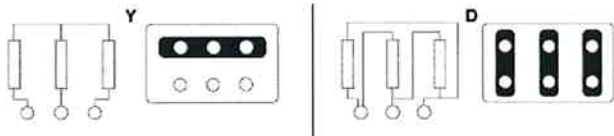
Tightening torque for motors with feet see table 3.

#### 4. INKOPPLING TILL ELNÄT

Innan man kopplar in motorn till elnätet jämför uppgifterna på motorns märkskylt med nätets spänning och frekvens. Beskrivning av lämplig kopplingsgrupp finns ingraverad på motorns märkskylt och kopplingsschema finns på insidan av uttagslådans lock. Motorn skall installeras i enlighet med allmänt gällande regler och elsäkerhetsföreskrifter, och måste installeras av en behörig elinstallatör.

##### Inkoppling av standard enhastighetsmotorer

Trefasmotorer kan normalt kopplas för två spänningar. Detta beror på att statorlindningen kan kopplas på två olika sätt: Stjärnkoppling (Y-koppling) eller triangelkoppling (D-koppling).



Enhastighetsmotorn kan startas direkt mot nätet, alternativt genom Y/D-start om man behöver en låg startström och kan acceptera ett litet startmoment (ca 20-30% av värdena vid direktstart). Vid Y/D-start borttages kopplingsblecken på motorplinten, och en Y/D-starter kopplas in. Motorer i IEC storlekarna 56-100 kan normalt sett inte Y/D-startas.

I motorer där statorlindning försetts med termistorskydd skall de "TH"-märkta uttagen kopplas till ett lämpligt termistorrelä.

##### Observera:

Vid kontroll av termistorerna får den spänning som används i "TH"-uttagen inte överstiga 4,5 V, d.v.s. 1,5 V per termistor. För hög spänning medför att termistorerna förstörs.

I motorer med termokontakter som inbyggt temperaturskydd i lindningen skall normalt sett de "TC"-märkta uttagen kopplas in som en NC-kontakt i kontrollutrustningens stoppkedja. Termokontakterna kan normalt sett max. bryta 1,6 A vid 250 VAC och  $\cos\phi$  0,8. Önskas högre brytförmåga, kontakta BEVI.

Används PT-100 givare eller liknande motståndsgivare, bör dessa anslutas enligt kopplingsschema i uttagslock. (Givarna är oftast märkta TPU, TPV, TPW, TPND osv...).

Motorer med stilleståndsvärme (antikondensationsvärme) har värmeslingor inbyggda.

Värmeslingorna skall kopplas in endast vid stilleståndstillfällen. Under drift såväl som under driftsinspektion skall värmeslingorna vara bortkopplade.

#### 4. CONNECTION TO MAINS

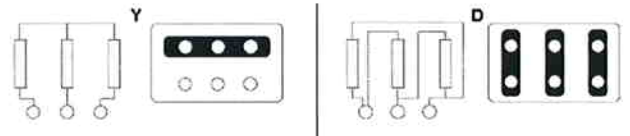
Before connecting the motor to the mains compare the data in the rating plate with the mains voltage.

The designation of terminals and winding connection is given on the plate with connection diagram provided inside the terminal box cover.

The motor must be installed in accordance with the generally in force principles and regulations, and must be installed by an qualified electrician.

##### Standard single speed motor connections

Three phase motors can normally be used on two different voltages (either Star or Delta connected).



The single speed motor may be started by direct connecting to the line voltage or by a star/delta starter, if you need a low starting current and a low starting torque can be accepted (approx. 20-30% of the direct start values). At Y/D-start you remove the connectors on the terminals, and connect a stardelta switch. Motors sizes 56-100 can normally not be started by Y/D-start.

In motors whose stator windings are provided with thermistor thermal protection the "TH" terminal leads shall be connected to a thermistor relay.

##### Attention:

When checking the thermistor sensor circuit the voltage applied to the "TH" terminals cannot exceed 4,5 V, i.e. 1,5 V per thermistor. High voltage causes the destruction of stator winding thermal protection.

In motors with thermo contact as high temperature protection, the leads marked "TC" shall be connected as a NC contact in the stop chain of the control equipment. Thermo contacts can normally disconnect max. 1,6 A at 250 VAC and  $\cos\phi$  0,8. If a higher cut out capacity is needed, please contact BEVI.

If PT-100 or similar sensors are used, these shall be connected according to the instruction in the lid of the terminal box. (The sensors are normally marked TPU, TPV, TPW, TPND ...).

Motors with winding preheaters have heating strips built-in on the stator winding phases. Heating strips are to be connected only when the motor is at a standstill. During motor operation as well as during its inspection the heating strips are to be disconnected from the mains.

I motorns uttagslåda finns en uppmärkt jordskruv för anslutning av inkommande jordledare. Motorn skall jordas enligt gällande säkerhetsföreskrifter. Efter anslutning av alla matningskablar och skyddsjord måste åtdragningen av alla uttagsplintarna kontrolleras, kabelgenomföringarnas tätningshylsor dras åt, oanvända kabelingångar täckas etc. Efter att uttagslådans gummitätningar har kontrollerats kan locket läggas på och skruvas fast.

## 5. UPPSTART AV ELMOTOR

Innan motorn tas i drift skall:

- alla onödiga föremål avlägsnas från dess omedelbara närhet,
- både motorn och den drivna maskinen rengöras,
- det kontrolleras att ett fritt intag av kylluft till fläkten har garanterats,
- den elektriska installationen, kontaktörerna eller motorskyddet, alla mätinstrumenten samt annan kontroll- och skyddsutrustning kontrolleras så att de fungerar korrekt,
- kontroll ske att alla fästbultar är säkert åtdragna såväl som alla detaljer som kan vara kritiska för motorns skyddsklass,
- motorns jordning kontrolleras ordentligt,
- kontroll ske om anläggningen är klar att startas,
- en testkörning genomförs. Under testkörningen kontrolleras:
  - nätspänningen (trefas- eller huvudspänningar),
  - motorströmmen (trefas strömmar),
  - motorns rotationsriktning,
  - motorkylningens effektivitet samt att motorn kopplats rätt till den drivna maskinen,
  - om onormala vibrationer eller andra felaktiga funktioner förekommer i motorn,
  - temperaturstegringen i olika motordelar, såsom lagersköldar, lager och statorhus,
  - att startutrustningens olika delar samt kontroll- och skyddsutrustningar fungerar korrekt,
  - motorns elektriska parametrar samt genom detta att rätt typ av motor valts.

Efter att motorn har blivit driftsvarm kan det vara lämpligt att efterdra alla elkraftsanslutningar. Vid drift då kraftiga vibrationer ej kan undvikas bör elanslutningar kontrolleras ofta, samt utföras med kabel av typ RK (extra mångtrådig).

Då de ovanstående rekommendationerna är fullföljda och korrekt drift av motorn och den drivna maskinen har fastställts kan motorn betraktas som igångkörd efter installation.

In the terminal box of each motor a suitable marked earthing terminal is provided on the frame. The motor is to be earthed in accordance with existing regulations. After connection of all supply and protective cables the reliable tightening of all terminals is to be checked, cables to be sealed with glands, the unused entries to be stopped, box packings to be checked and the terminal box cover to be fixed.

## 5. MOTOR START-UP

Before putting the motor into service:

- remove all unnecessary objects from the close surroundings of the motor,
- clean the motor and driven machine,
- check, whether a free cooling air intake to the fan is ensured,
- check the electrical installation, the circuit breaker, measuring instruments and other auxiliary and protection equipment for correct operation,
- check all the fixing screws and cable connections for safe tightening as well as all elements critical for the motor protection grade,
- check the effectiveness of earthing,
- check whether the set is ready for start-up,
- carry out a test run. During test run of the set, check:
  - line voltage,
  - current,
  - motor revolutions sense,
  - effectiveness of motor cooling and correct coupling with driven machine,
  - whether abnormal vibrations or other malfunctions of the motor are present,
  - temperature rises of respective motor elements, such as bearing shields, bearings, frame.
  - starting-up equipment elements, control and protection gears, for correct operation.
  - electrical parameters attained by the motor and evaluate the correctness of motor type selection.

After reaching operating temperature it is recommended to tighten all electrical connections once more. If the motor operates under conditions where vibrations are unavoidable, the electrical connection should be checked regularly, and be made with cables with multi stranded cores.

After the above recommended procedures are accomplished and correct operation of the drive motor and driven machine is attained, the motor may be regarded as commissioned after installation.

## 6. SERVICE UNDER DRIFT

Följande rutinkontroller bör göras under motorns drift:

- koll av att motorn fungerar oklanderligt,
- koll av att motorn kyls effektivt,
- koll av att lagren fungerar klanderfritt – inga knackande eller visslande ljud får förekomma, efter att motorn har gått ca. 10 timmar efter idrifttagning,
- koll om det förekommer onormala vibrationer,
- koll av tillståndet för kopplingen mellan motor och den drivna maskinen,
- koll att strömförbrukningen inte är större än märkströmmen.

Motorn skall stoppas omedelbart om:

- onormal temperaturstegring i motorns statorhus noteras,
- rök eller röklukt kommer från motorn eller installationen,
- motorfläkten är skadad,
- den drivna maskinen är skadad,
- det förekommer anledning att tro att start av motorn och den drivna maskinen kan vara riskfylld för omgivningen.

Återstart av motorn är tillåten först då alla konstaterade fel har åtgärdats.

## 6. SERVICE OF MOTOR DURING OPERATION

During motor operation carry out the following routine checks:

- motor for correct operation.
- motor cooling effectiveness.
- bearings for correct operation - no knocks or whistle are permitted, after approximately 10 hours of running after start-up.
- whether any abnormal vibrations are present.
- motor and driven machine coupling condition.
- whether the current consumption is within the rated value.

The motor must be immediately stopped, when:

- abnormal temperature rise of the motor frame is started.
- fume or smell of burning get out of the motor or installation.
- motor fan is damaged.
- driven machine is damaged.
- for any other reason, when starting-up of motor and driven machine is hazardous to the environment.

Starting-up the motor anew is permitted only after all stated faults are rectified.

## 7. REGELBUNDNA INSPEKTIONER

För att behålla motorns fulla tekniska prestanda skall alla nämnda felaktiga funktioner som upptäcks under motorns drift omedelbart avlägsnas och åtgärdas.

Frånsett ovannämnda regel bör varje motor i drift underkastas följande periodiska inspektionsprocedur:

1. En mindre inspektion var sjätte månad (motorer som går i dammiga lokaler - var tredje månad eller oftare).
2. Allmän översyn - en gång per år.

Den mindre motorinspektionen innehåller följande punkter:

- en utvändig översyn och rengöring,
- mätning av statorlindningens isolationsmotstånd, dvs "meggning" med 500 V megger,
- kontroll av att alla uttagsplintarna och fästbultarna är ordentligt åtdragna,
- kontroll av matningskabel och skyddsjord.

Den generella motorinspektionen skall täcka följande punkter:

- demontering av motorn,
- urtagning av rotor,
- kontroll av stator, särskilt med hänsyn till lindningarnas beskaffenhet,
- mätning av statorlindningens isolationsmotstånd,
- kontroll av rotor,
- kontroll av lager, utbyte av smörjfett i lagerkamrarna om nödvändigt (motorer i storlekarna 200-315),
- kontroll av start-, skydds- och kontrollutrustningarna.

Alla eventuella defekter som konstateras under översynen måste åtgärdas och defekta delar ersättas med nya. Det rekommenderas också att, om möjligt, förbättra motorns målning.

Man skall försäkra sig om att de tekniska kraven som återfinns på motorns märkskylt följes noga under den allmänna översynen och eventuell reparation.

Vidare rekommenderas det att motorn regelbundet underkastas vissa konditionsprov. Kontakta BEVI Blomstermåla, för närmare information samt om hjälp önskas med att utföra konditionsproven.

## 7. PERIODICAL INSPECTIONS

To maintain the full technical efficiency of the motor, all malfunctions stated during motor operation must be removed immediately.

Apart from the above rule, each motor in operation should be subjected to the following periodical inspection procedures:

1. Minor inspection every 6 month (if the motor operates in a dusty room, every 3 month or even more frequently).
2. General inspection every year.

The minor inspection of motor covers the following procedures:

- external visual inspection and motor cleaning.
- measurement of stator winding insulation resistance, that is measuring with a 500 V megger.
- check of all contact and fixing screws for safe tightening.
- inspection of supply mains cable and earthing conductors.

The general inspection of motor covers the following procedures:

- dismantling of motor.
- removal of rotor.
- inspection of stator with particular attention to the condition of windings.
- winding insulation resistance measurement.
- inspection of rotor.
- inspection of bearings, exchange of grease in the bearing chambers if necessary.
- inspection of start-up-, protection- and controlequipment.

All faults stated during the inspection must be removed and used-up parts must be replaced with new ones. It is recommended to renew the protective coatings. During general inspection and eventual repair, be sure the technical requirements quoted in the motor rating plate are met.

It is recommended to subject the motor to curtailed tests. Please contact BEVI Blomstermåla, Sweden, for further information. BEVI can also assist with the curtailed tests.

## 8. ARBETSSÄKERHETENS PRINCIPER

För att undvika olyckor vid installation samt vid service och inspektion av elmotorn skall följande arbets säkerhetsprinciper följas:

1. Motorn skall installeras i enlighet med allmänt gällande regler och elsäkerhetsföreskrifter, och måste installeras av en behörig elinstallatör.
2. Under inga som helst omständigheter får motorn arbeta utan de skydd som förutsetts i konstruktionen.
3. Kopplingen eller remtransmissionen måste vara avskärmd och ordentligt skyddad från beröring.
4. Alla metall delar måste vara jordade.
5. Kablar måste vara ordentligt skyddade mot skador.

Inspektioner, underhåll eller reparationer får endast göras på order och under tillsyn av tillbörligt kvalificerad personal som har kunskaper om gällande arbets säkerhetsbestämmelser.

Inspektioner och reparationer får endast göras då motorn säkert kopplats bort från kraftnätet, t.ex. via låst säkerhetsbrytare.

## 9. FELSÖKNING

Eventuella störningar i motordriften beror vanligtvis på felaktig inkoppling till kraftnätet, olämpligt val av motortyp i förhållande till de erforderliga arbetsförhållandena eller möjligen på grund av utnötning eller skador på de mekaniska delarna.

Vissa andra fel som kan ge störningar i motordriften har beskrivits tidigare i dessa instruktioner.

## 8. WORK SAFETY PRINCIPLES

To avoid accidents during installation, service and inspections of the motor the following work safety principles must be observed:

1. The motor must be installed in accordance with the generally in force electrical code principles and regulations, and must be installed by a qualified electrician.
2. In no case may the motor operate without guards forseen by the motor construction.
3. The coupling or belt drive must be shielded properly protected against touching.
4. All metal parts must be suitably earthed.
5. Cables and supply conductors must be properly protected against damaging.

Inspections, maintenance or repairs can be done only upon order and under supervision by appropriately qualified and trained staff in the line of work safety regulations.

Inspections and repairs must take place when the motors are safely disconnected from the mains.

## 9. TROUBLESHOOTING

Eventually present troubles in motor operation are most commonly due to incorrect connection to supply mains, inadequate motor type selection for the required operating conditions, or eventually due to the wear or damage to mechanical parts.

Some faults, wich may be a cause of troubles in motor operation, have been described earlier in this manual.



## 10. KULLAGER OCH SMÖRJINTERVALL

Motorerna är normalt sett utrustade med kullager serie 62 & 63 (undantag drivsidan på 4-8 poliga motorer i storlek 200-315 på fot och fot/flänsutförande som har rullager), se tabell 1 och 2.

Värden på tillåtna radial- och axialkrafterna för axel och axelände, kan erhållas av BEVI, har beräknats på grundval av antagandet om 20 000 - 30 000 driftstimmar för lagren, beroende på utförande.

Vid hårda arbetsförhållanden och då höga radialkrafter påverkar axeln och axeländan kan kullagret på drivsidan ersättas med rullager serie NU3 eller NU2 av samma dimension, om motorn är 4-8 polig.

Vågbrickan är normalt sett placerad på drivsidan för fot- samt fot/fläns-motorer, medan den för flänsmotorer är placerad på icke drivsidan.

Motorer i storlek 200-315 har infettade lager och fettfylld lagerkammare och kan därför tas i drift utan någon ytterligare fettsmörjning av lager. Påfyllning av fett ska ske under drift med hjälp av fettspruta genom monterad smörjnippel. Rengör nippeln grundligt före påfyllning.

I motorer med hastigheter upp till 1800 varv/min skall påfyllning av fett i lagren ske efter ca 1500 driftstimmar eller minst var sjätte månad. I motorer med hastigheter över 1800 varv/min skall smörjning ske dubbelt så ofta.

Fullständigt utbyte av smörjfett i lagren och lagerkammarna skall ske:

- i motorer med hastigheter upp till 1800 varv/min efter 10 000 driftstimmar men dock med max. 2 års smörjintervall,
- i motorer med hastigheter överstigande 1800 varv/min efter 5000 driftstimmar dock inte senare än efter 1 års drift.

Tabell 2 anger de ungefärliga mängderna smörjfett vid påfyllning alternativt utbyte för de olika motorstorlekarna.

**TABELL 1. Storlek 56-180**

**TABLE 1. Sizes 56-180**

Motorstorlek Motor size	Lagertyp Bearing type	Kommentar Comment
56	6201 2Z	Lager med skyddsplåtar. Ingen smörjning nödvändig. Bytes vid behov  Sealed bearings. No lubrication necessary. Exchange when needed.
63	6202 2Z	
71	6203 2Z	
80	6204 2Z	
90	6205 2Z C3	
100	6206 2Z C3	
112	6306 2Z C3	
132	6308 2Z C3	
160	6309 2Z C3	
180	6311 2Z C3	

## 10. BEARING AND LUBRICATION

The motors are normally fitted with ball bearings series 62 & 63 (except DE side on 4-8 pole motors size 200-315 in foot respectively foot/flange execution, which have roller bearings), see table 1 and 2.

The values of admitted radial and axial forces of shaft end shaft neck, which can be obtained from BEVI, have been calculated at the assumption of some 20 000 - 30 000 work hours for the bearings, depending on type.

In case of heavy work conditions and at high radial forces acting on the shaft end the ball bearing at the drive side can be replaced with a roller bearing series NU3 or NU2 of the same dimensions, if the motor is 4-8 poles.

The wave washer is normally placed at the DE side at foot- respectively foot/flange motors, at flange motors the wave washer is normally placed at the NDE side.

Motors in sizes 200-315 have bearings and bearing chambers filled with grease and are ready for operation. Refilling of bearings with grease should be accomplished during motor operation by means of a grease gun through the grease nipples arranged at the bearing shields. Before refilling the bearings with grease, clean the grease nipples thoroughly.

In motors of a speed up to 1800 r.p.m. refilling of grease in bearings shall be done after some 1500 work hours or, at least, once every six months. In motors of a speed above 1800 r.p.m. the greasing is to be done twice as often.

The complete change of grease in bearings and bearing chambers is to be done:

- in motors of a speed upto 1800 r.p.m. after 10 000 work hours, yet not later than after 2 years.
- in motors of a speed exceeding 1800 r.p.m. after 5000 work hours, yet not later than after 1 year.

In Table 2 the approximate quantities of grease at refilling and change for the individual motor sizes are given.

**TABELL 2a. Storlek 200-315, 4-, 6- & 8-poliga** **TABLE 2a. Size 200-315, 4-, 6- & 8-poles**

Motorstorlek Motor size	Lager D-sida Bearing D-end 4-6-8-poliga	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]	Lager ND-sida Bearing ND-end 4-6-8-poles	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]
200	NU312 C3	18	75	6312 C3	20	85
225	NU313 C3	19	90	6313 C3	23	105
250	NU315 C3	25	120	6315 C3	30	145
280	NU317 C3	30	150	6317 C3	37	190
315	NU318 C3	32	200	6318 C3	41	260

OBS! Flänsmotorer har samma kullager på båda sidor (Ej rullager på drivsidan).

NOTE! Flange motors have the same ball bearings on both ends (No roller bearing on the drive end)

**TABELL 2b. Storlek 200-315, 2-poliga****TABLE 2b. Size 200-315, 2-pole**

Motorstorlek Motor size	Lager D-sida Bearing D-end 2-poliga	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]	Lager ND-sida Bearing ND-end 2-poles	Lagerfett påfyllning Bearing grease regreasing [gram]	Lagerfett utbyte Bearing grease change [gram]
200	6312 C3	20	85	6312 C3	20	85
225	6313 C3	23	105	6313 C3	23	105
250	6315 C3	30	145	6315 C3	30	145
280	6315 C3	30	145	6315 C3	30	145
315	6315 C3	30	145	6315 C3	30	145

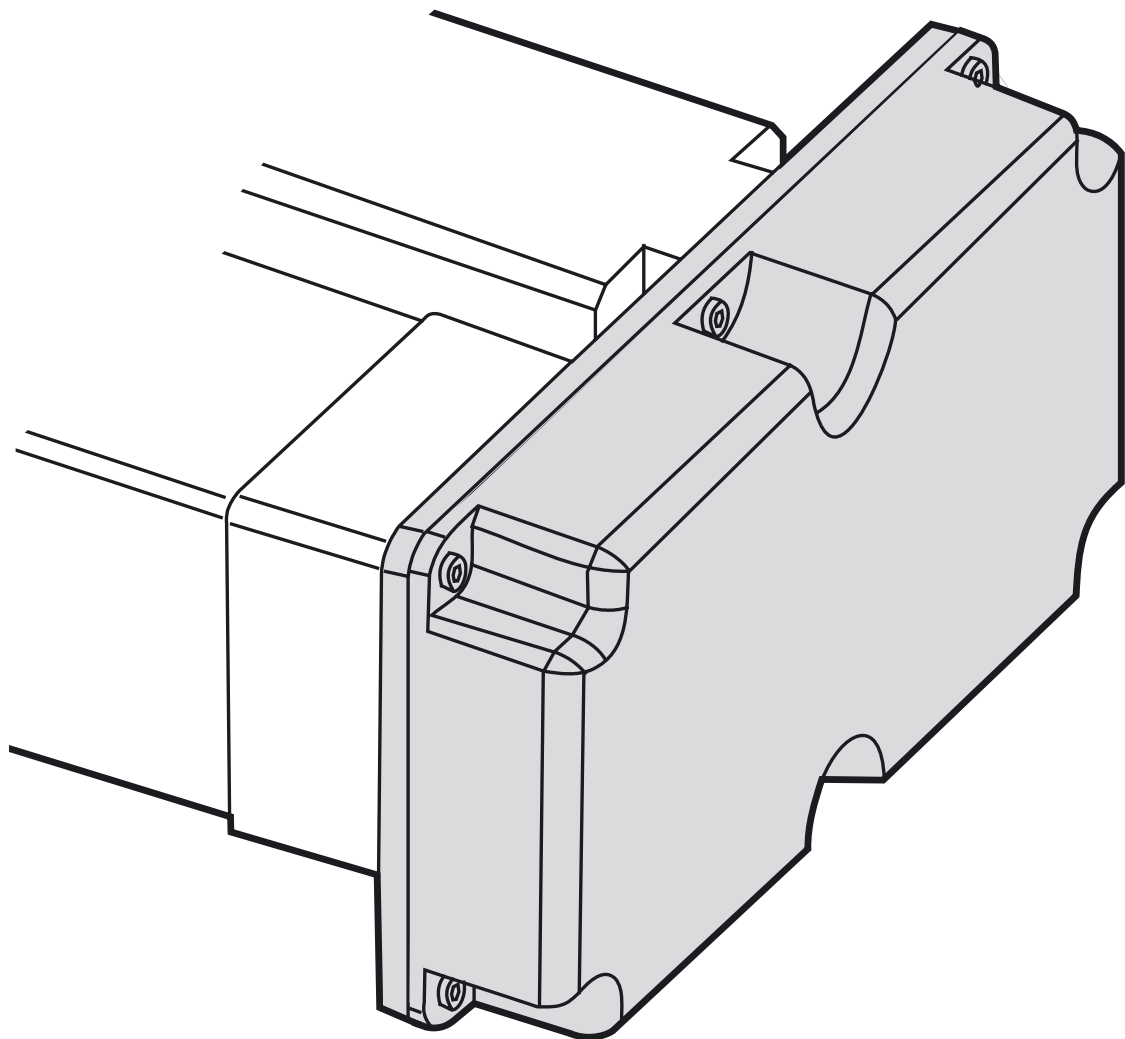
**TABELL 3. Åtdragningsmoment i Nm****TABLE 3. Tightening torque in Nm**

	M5	M6	M8	M10	M12	M16	M18	M20	M22	M24
Elanslutning Electrical conn. [Nm]	2,5	4	8	12	20	40	-	-	-	-
Max åtdragn.moment för fötter. Max torque for feet. [Nm]	5	8	22	45	75	91	119	150	184	282

Rätt till ändringar förbehålles!

We reserve the right to make design changes!

## Beltgear type BGM09, BGM41 and BGM81



Installation Manual  
Edition: 1  
DW110500gb-0450

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**o n n n on**

1.1 Position of type designation plate and mounting of the belt gear plate..... 3  
 1.2 Mounting of the motor coupling ..... 3  
 1.3 Mounting of the coupling to the unit..... 4  
 1.4 Mounting of the belt ..... 4  
 1.5 Mounting of the cover ..... 5

2.1 Tightening torque for screws ..... 6  
 2.2 Dimension L ..... 6  
 2.3 Tightening torque for motor shaft couplings ..... 6  
 2.4 Tightening torque for unit shaft couplings ..... 6

**n**

3.1 Technical data ..... 7

Version History  
 Edition Number  
 1

Edition Date  
 2004-12-08

Reason for Revision  
 Manual created

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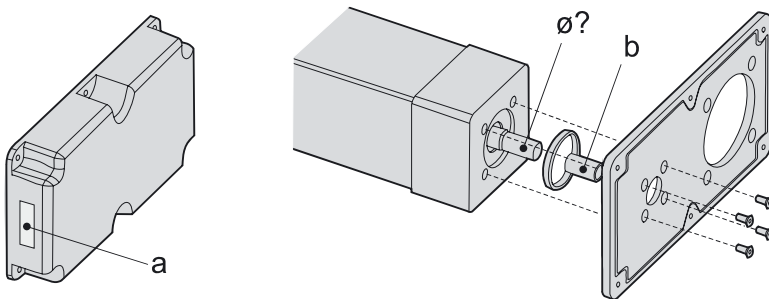


Figure 1: designation plate and belt plate

The designation of the belt gear can be found on the type designation plate (a). Measure the diameter of the unit shaft before mounting. Mount the belt gear plate and the spacer ring to the unit. Some belt gear models require a sleeve (b) to be mounted to the shaft of the unit. In such case a sleeve is included in the shipment. Tighten the screws according to table 1, page 6.

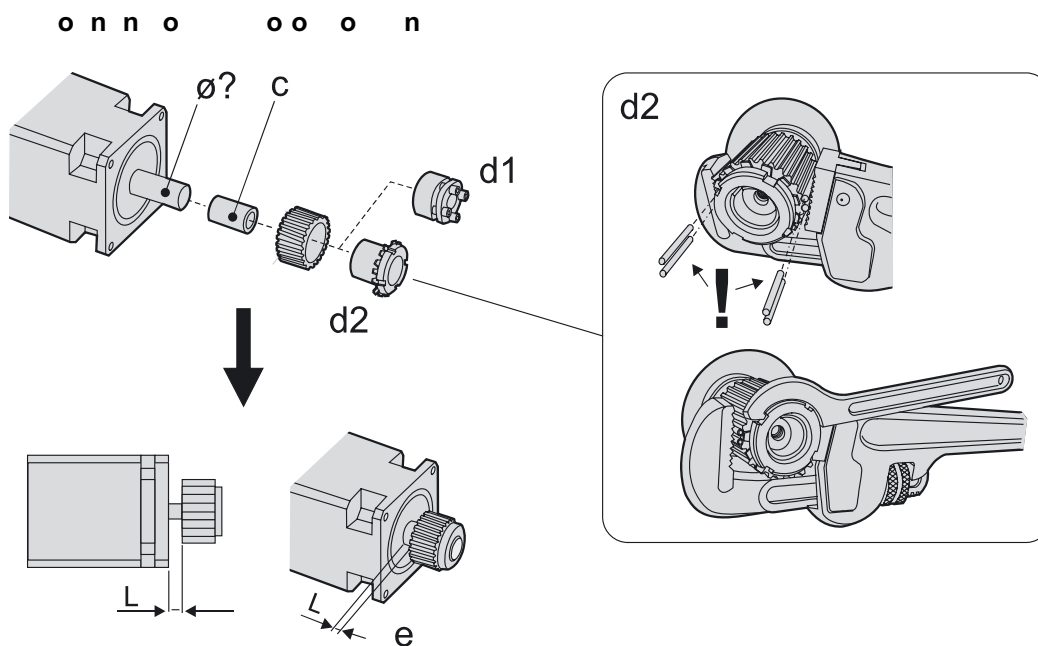


Figure 2: motor coupling mounting

Measure the diameter of the motor shaft. Some belt gear models require a sleeve (c) to be mounted to the motor shaft before mounting the motor coupling. In such case a sleeve is included in the shipment. Insert the coupling in the belt wheel and put the two on the motor shaft/sleeve. Tighten the coupling at the correct L dimension (see table 2, page 6) between the coupling and the motor flange. The supplied coupling can be one of two types (d1 or d2).

Coupling type d1:

This type of coupling use four tightening screws. The coupling tends to move out of the shaft when being tightened. To avoid this, tighten the screws in small steps and re-adjust the position of the coupling between each step until the correct tightening torque is set (see table 3, page 6).

Coupling type d2:

This type of coupling uses a tightening ring. Use four pins (supplied with the belt gear) when tightening the ring to avoid damaging the belt wheel. Tighten the ring until the correct tightening torque is set (see table 3, page 6).

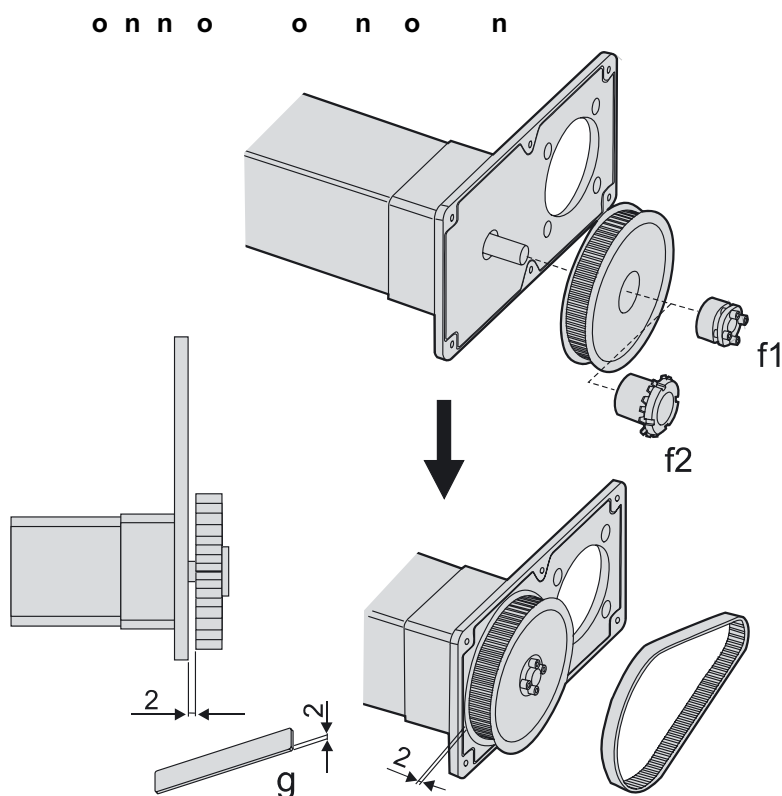


Figure 3: coupling to the unit

Insert the coupling in the belt wheel and put the two on the shaft/sleeve of the unit. The supplied coupling can be one of two types (f1 or f2). The correct distance between the belt wheel and the belt gear plate is 2 mm. Use the measuring stick (g) to ensure that the distance is 2 mm.

#### Coupling type f1:

This type of coupling use four tightening screws. The coupling tends to move out of the shaft when being tightened. To avoid this, tighten the screws in small steps and re-adjust the position of the coupling between each step until correct tightening torque is set (see table 4, page 6).

#### Coupling type f2:

This type of coupling uses a tightening ring. Tighten the ring until the correct tightening torque is set (see table 4, page 6).

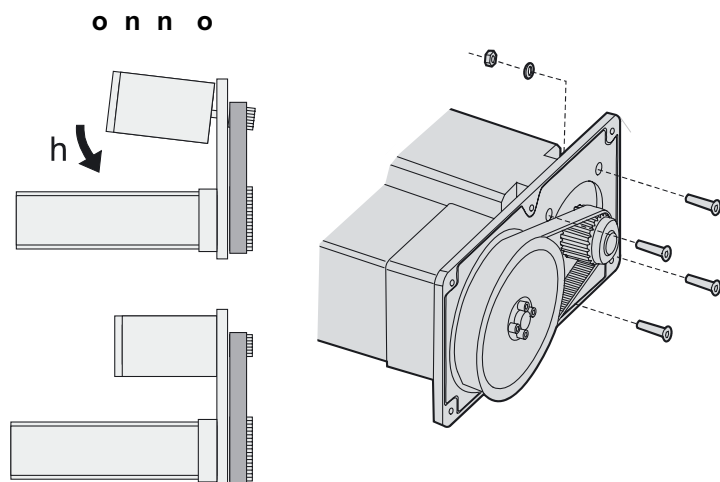


Figure 4: mounting of the belt

Put the belt around the belt wheel of the unit and then insert the motor (h). Mount the motor to the belt plate using four screws. Tighten screws according to table 1, page 6.

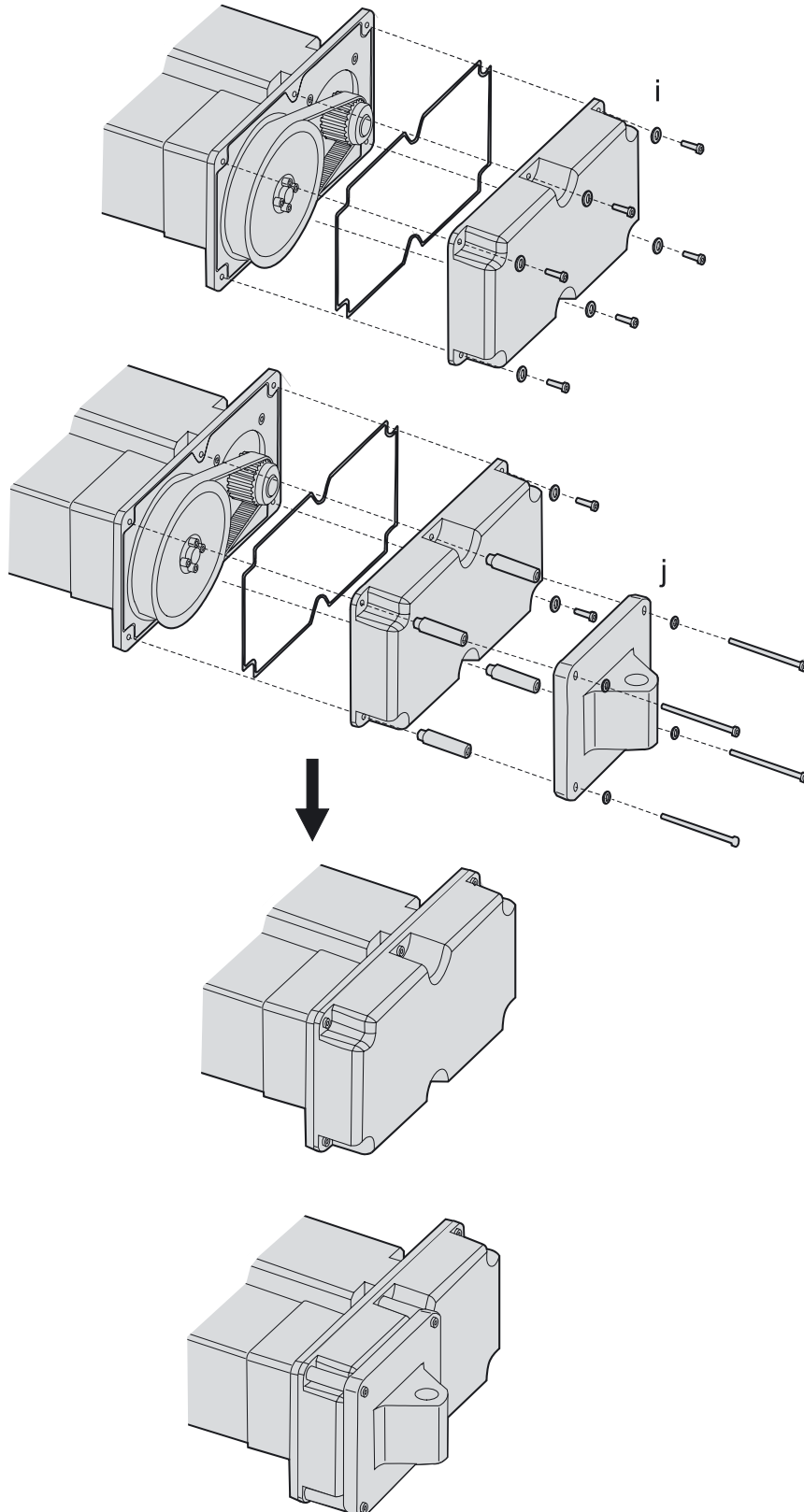


Figure 5: mounting of the cover

Mount the cover (i) and the sealing using the six screws. If the belt gear comes with a clevis (j), mount the clevis and the cover using the four distance sleeves, the four long and the two short screws. Tighten all screws according to table 1, page 6.

n n o o

	n n o
M5	6,5
M6	9,4
M8	23
M10	52
M16	150

Table 1: tightening torque for screws

n on

	o
BGM09	9,5
BGM41	13,5
BGM81	16

Table 2: dimension L

n n o o o o n

o	o n	o o	o o on	n n o
BGM09	d2	11	yes	100
BGM09	d2	14	yes	100
BGM09	d2	19	no	100
BGM41	d1	14	no	5
BGM41	d2	19	yes	140
BGM41	d2	24	no	140
BGM81	d2	24	no	140
BGM81	d2	28	no	140
BGM81	d2	32	no	140

Table 3: motor shaft couplings

n n o o n o n

o	o n	n	n on	n n o
BGM09	f1	11	no	5
BGM09	f1	16	no	5
BGM41	f1	16	no	5
BGM41	f1	20	no	14
BGM41	f2	20	no	140
BGM81	f1	25	no	14
BGM81	f2	25	no	140

Table 4: unit shaft couplings



n

n

	o		
Weight [kg]	1,9	4,6	12,1
Weight of clevis option [kg]	1,2	2,4	5,1
Max. input speed [rpm]	5000	5000	5000
Protection class	IP65	IP65	IP65

*Table 5: technical data*

**n**

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Bâtiment Paul Tiger 2  
F-72026 Le Mans Cedex 2, France  
Tel. +33 (02) 43 50 03 30  
Fax. +33 (02) 43 50 03 39  
E-mail: sales.france@danahermotion.com

**n**

Danaher Linear GMBH  
Postfach 2008  
D-72610 Nürtingen, Germany  
Tel. 0180 5 24 67 90  
Fax. 0180 5 24 40 85  
E-mail: info@danahermotion.net

Danaher Motion srl  
Via Brughetti  
200 30 Bovisio Masciago, Italy  
Tel. +39 (0) 362 594 260  
Fax. +39 (0) 362 594 263  
E-mail: info@danahermotion.it

**n**

Danaher Motion  
Tollo Linear  
Badal, 29–31 7th, 1st  
08014 Barcelona, Spain  
Tel./Fax. +34 (0) 9329 80278  
E-mail: helpdesk@tollo.com

**n n**

Danaher Motion  
Tollo Linear AB  
Box 9053  
SE-291 09 Kristianstad, Sweden  
Tel. +46 (0)44 24 67 00  
Fax. +46 (0)44 24 40 85  
E-mail: helpdesk@tollo.com

**n n o**

Danaher Motion  
Fishleigh Road  
Roundswell Business Park  
Barnstaple, Devon  
EX31 3UD, UK  
Tel. +44 (0) 1271 334500  
Fax +44 (0) 1271 334502  
E-mail: LMSEurope@danahermotion.com



**Planetary Gearhead Installation Information for the  
Thomson Micron RediMount\* Products:**

**DuraTRUE\*, DuraTRUE90\*, NemaTRUE90\*, UltraTRUE\*, UltraTRUE90\*, PowerTRUE90\***

**INTRODUCTION**

The Thomson Micron product lines combine ease of installation with precision speed reduction, torque multiplication and inertia matching. The product lines are available in many standard ratios designed to meet the most demanding motion control applications. The sealed, permanently lubricated units provide long maintenance free life.

**RECOMMENDED TOOLS**

- (1) Torque wrench with hex drive per the table below, or equivalent torquing device.

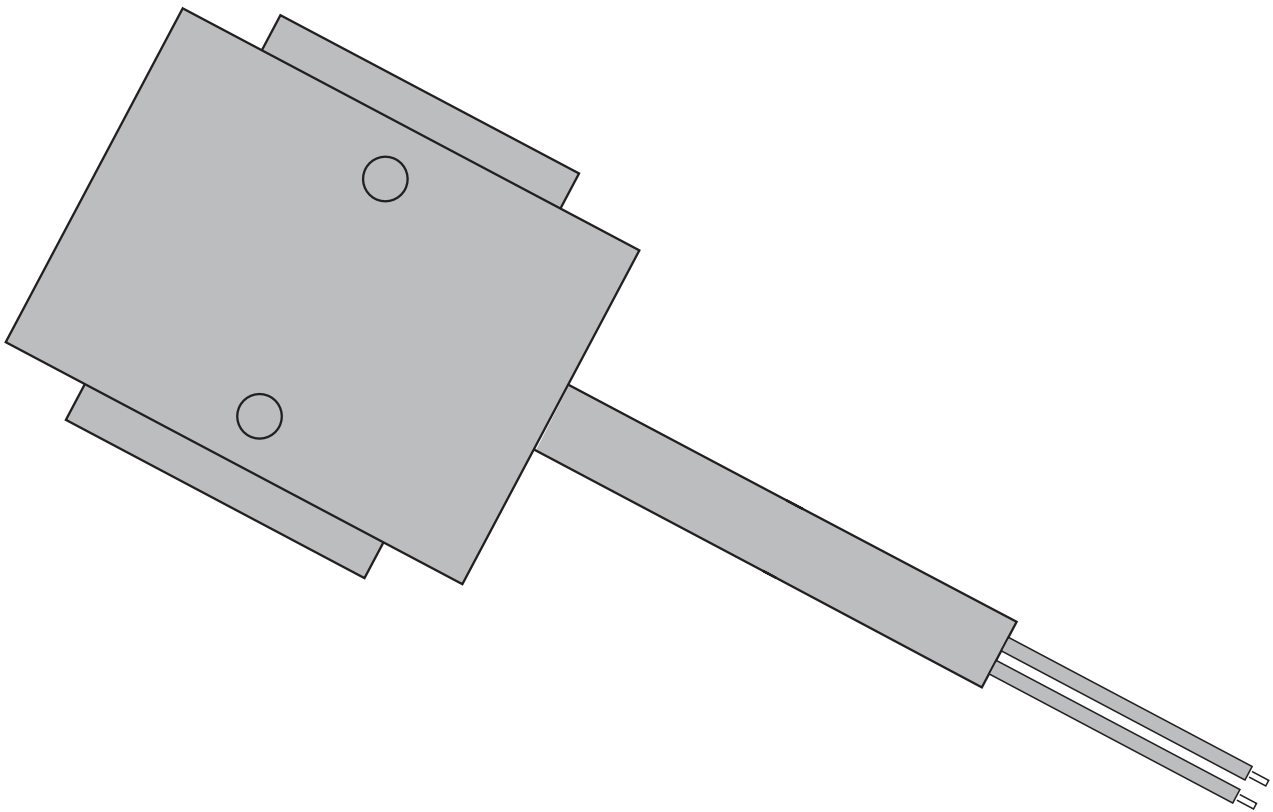
**INSTALLATION PROCEDURE**

1. Degrease motor shaft, pinion bore and mounting surfaces.
2. Slide the provided bushing into the hub, and align the slot in the bushing with the slot in the hub (A bushing may not be required, or it may already be installed as received).
3. Rotate the hub to align housing access holes with the hub clamping bolts.
4. Set the motor on a work surface or holding fixture with the output shaft facing straight up. Slide the gearhead down onto the motor shaft. If there is a keyway on the motor, remove and discard the keys, align the keyway with the slot in the hub.
5. Tighten the hub bolts to the pre torque value indicated in the table.
6. Bolt the motor to the gearhead with the bolts provided.
7. Gradually tighten the hub bolts in three steps, increasing the torque each time. Final tightening torque should be to the final torque value listed in the table.

Gearhead Type	Size	Recommended Torque Wrench and Adaptor	Tightening Sequence, Torque Values			
			Pre Torque	Final Torque	Pre Torque	Final Torque
DuraTRUE DuraTRUE90 EQ	60	TW-060	2 in-lb	39 in-lb	22 N-cm	441 N-cm
	90	TW-090	4 in-lb	76 in-lb	43 N-cm	859 N-cm
	115	TW-115	1 ft-lb	26 ft-lb	2 N-m	36 N-m
	142	TW-142	3 ft-lb	53 ft-lb	4 N-m	72 N-m
NemaTRUE NemaTRUE90 EQ	23	TW-23R	2 in-lb	39 in-lb	22 N-cm	441 N-cm
	34	TW-34R	4 in-lb	76 in-lb	43 N-cm	859 N-cm
	42	TW-42R	1 ft-lb	26 ft-lb	2 N-m	36 N-m
UltraTRUE UltraTRUE90 PowerTRUE90	60	TW-006	2 in-lb	39 in-lb	22 N-cm	441 N-cm
	7.5	TW-075	4 in-lb	76 in-lb	43 N-cm	859 N-cm
	10	TW-010	1 ft-lb	26 ft-lb	2 N-m	36 N-m
	14	TW-014	3 ft-lb	53 ft-lb	4 N-m	72 N-m
	18	TW-018	5 ft-lb	92 ft-lb	6 N-m	125 N-m
	22	TW-022	10 ft-lb	92 ft-lb	12 N-m	125 N-m

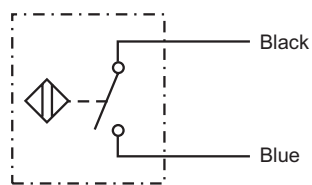
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# *Installation manual for magnetic sensors*



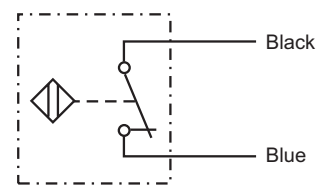
**Magnetic Sensor  
N.O. (normally open)  
P/n. D535 070**

Connection diagram  
D535 070

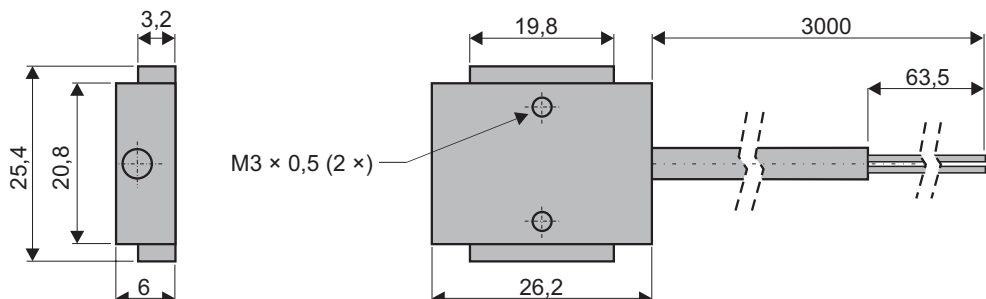


**Magnetic Sensor  
N.C. (normally closed)  
P/n. D535 071**

Connection diagram  
D535 071



Mechanical dimensions  
D535 070 and D535 071

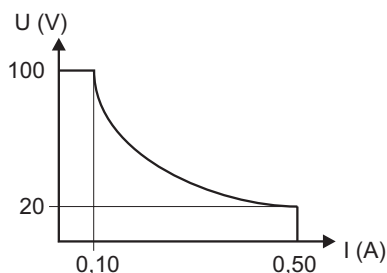


Mechanical data  
D53 5070 and D535 071

Housing material	PA 6.6	Operating temperature	-25°C – +65°C
Cable	3 m PUR 2 × 0,14 mm <sup>2</sup>	Protection class	IP 67
Mechanical life	3 × 10 <sup>8</sup> operations at resistive load		

Electrical data  
D535 070 and D535 071

Max. power	10 VA
Max. voltage	100 Vdc
Max. current	0,5 A
Max. contact resistance	20 ohm

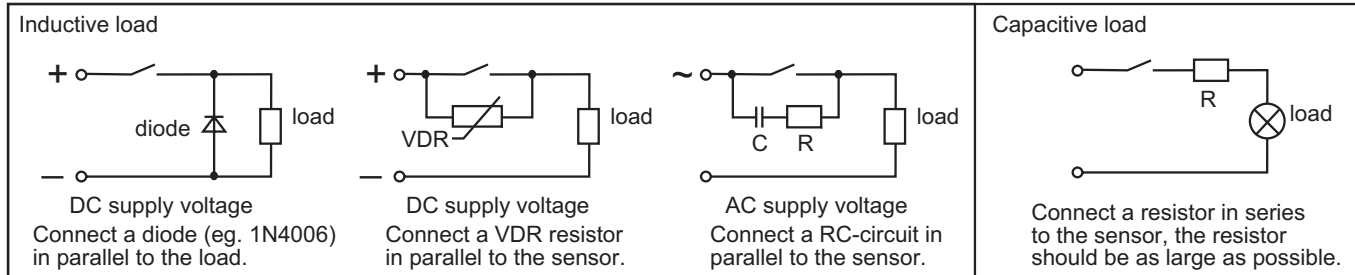


U (V)	I (A)
20	0,50
24	0,417
48	0,208
100	0,10

Graph only for resistive load

Contact protection  
D535 070 and D535 071

Very often the load has an inductive or capacitive character. In these cases it is important to protect the contact against spikes and high power. There is no general solution for all the different applications, but the following information gives some important guide lines.



General application information

The duration of the signal from the sensor when the magnet passes depends mainly upon two factors. The first is the length of the magnet and the second is the speed of the magnet. The length of the magnet can be found in the manuals for each product while the speed must be calculated by the customer. If the duration of the signal becomes too short the input device for the signal (relay, PLC input, etc.) may not be able to detect it. Note that the response time for different input devices differ very much. The duration of the signal from the sensor will also shorten by increasing temperature, current, supply voltage or/and vibrations. The type of contact protection will also affect the duration of the signal.

If there is a problem to detect a signal or if the function becomes erratic, try the following operations.

1. Select a input device with better (shorter) response time.
2. Lower the speed (if possible).
3. Lower the current or the supply voltage.

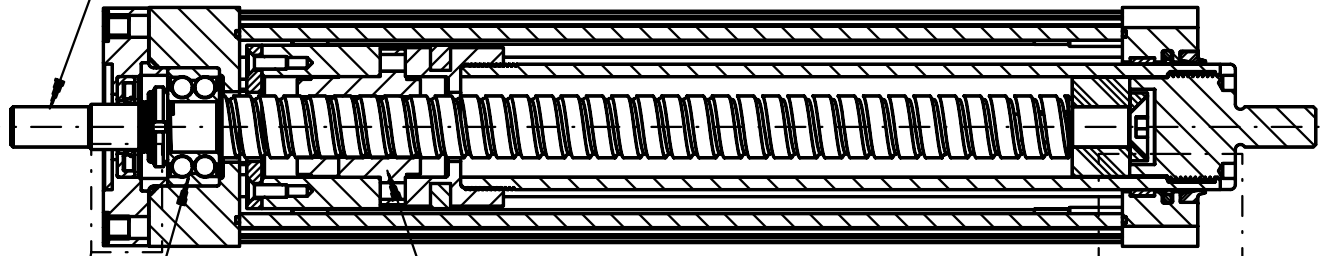
# Reservdelar (Spare parts)

## Industrial Actuator T90

Ballscrew

E - E

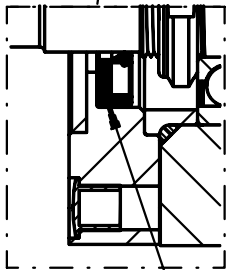
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- D606092 RM2510/T7, L= \_\_\_\_\_
- D606093 RM2525/T7, L= \_\_\_\_\_
- D606097 RM3220/T7, L= \_\_\_\_\_
- D606221 RM3232/T7, L= \_\_\_\_\_



Ball bearing

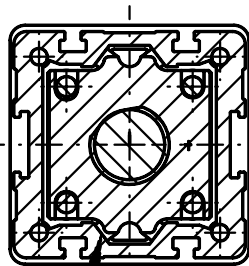
Ball nut

- |                    |                 |
|--------------------|-----------------|
| D277139 (1x) (ø25) | D310932 2505 FK |
| D277145 (2x) (ø32) | D310939 2510 FH |
|                    | D310946 2525 FH |
|                    | D606068 3220 FH |
|                    | D606220 3232 FH |



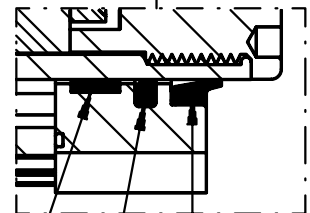
Sealing

- D276865 (ø25)
- D800406 (ø32)



Slide bushing

- D606201 (4x) (ø25)
- D606202 (4x) (ø32)

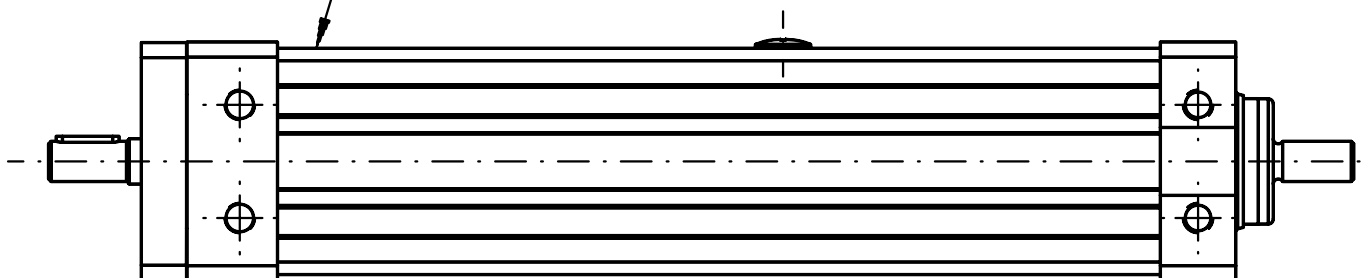


Guide  
D606216

Wiper  
D276852

Rod seal  
D606217

Tillverkningsnummer (Production number)



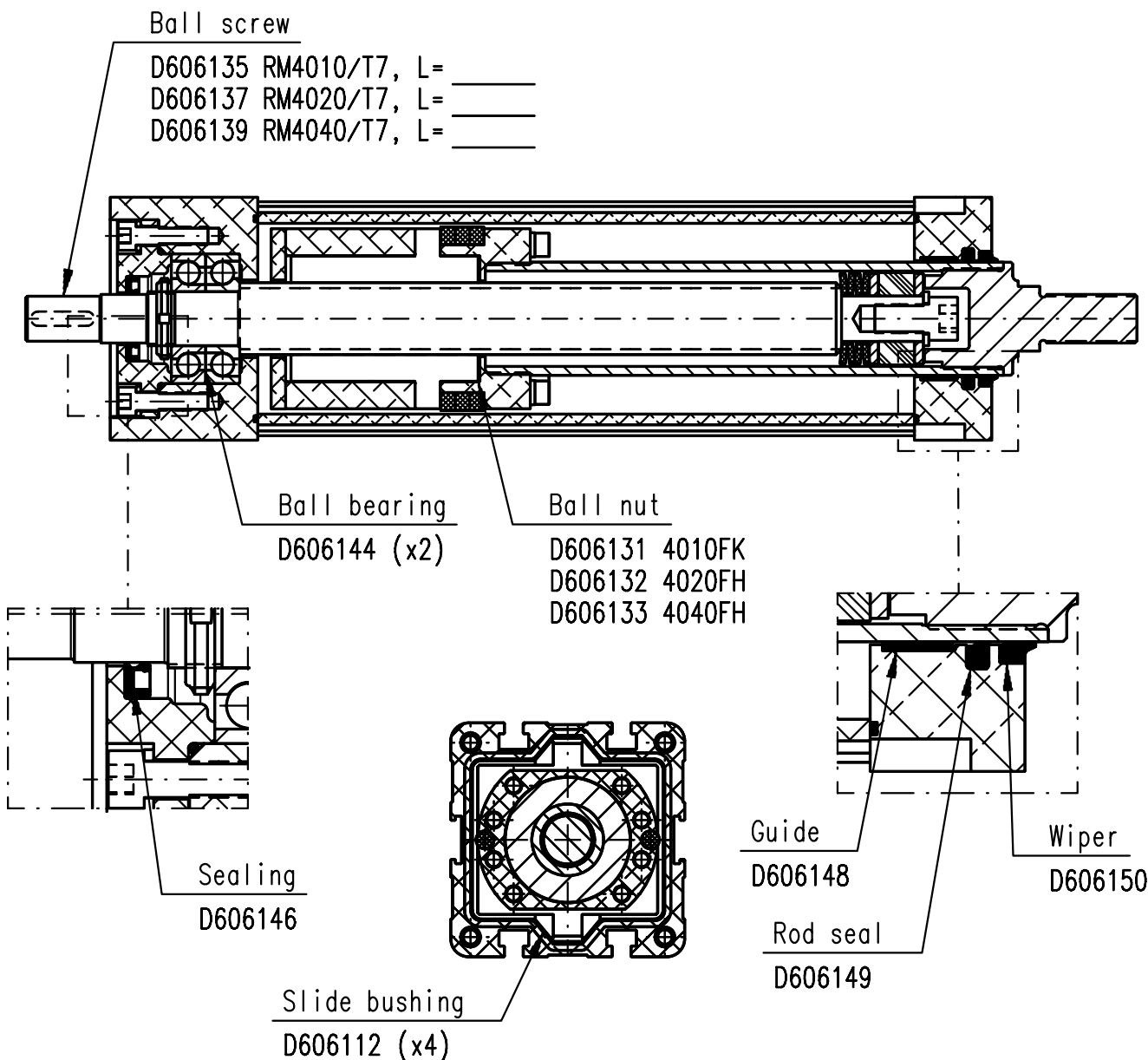
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Ange tillverkningsnummer!

(When ordering:  
Specify production number!)

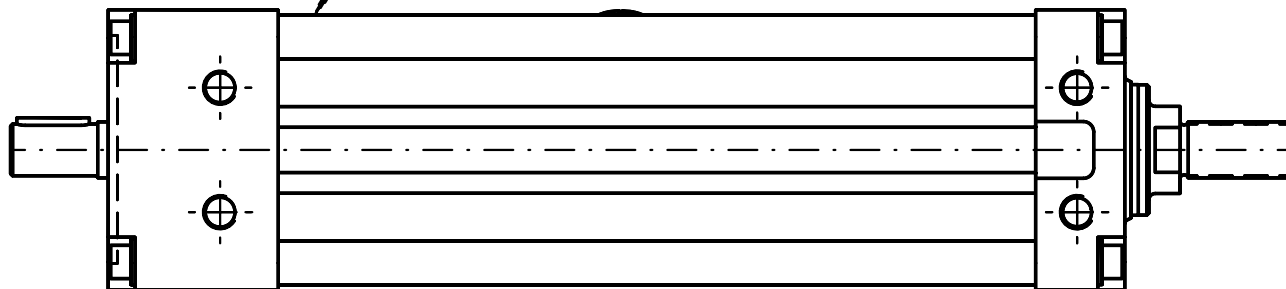
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T-105.893	0

Rev. Numb. Change. No	Ändring. Alteration	Date Datum	Executed Inf.
Nr. Ant. Ändr. Nr			

# Reservdelar (Spare parts) Industrial Actuator T130.



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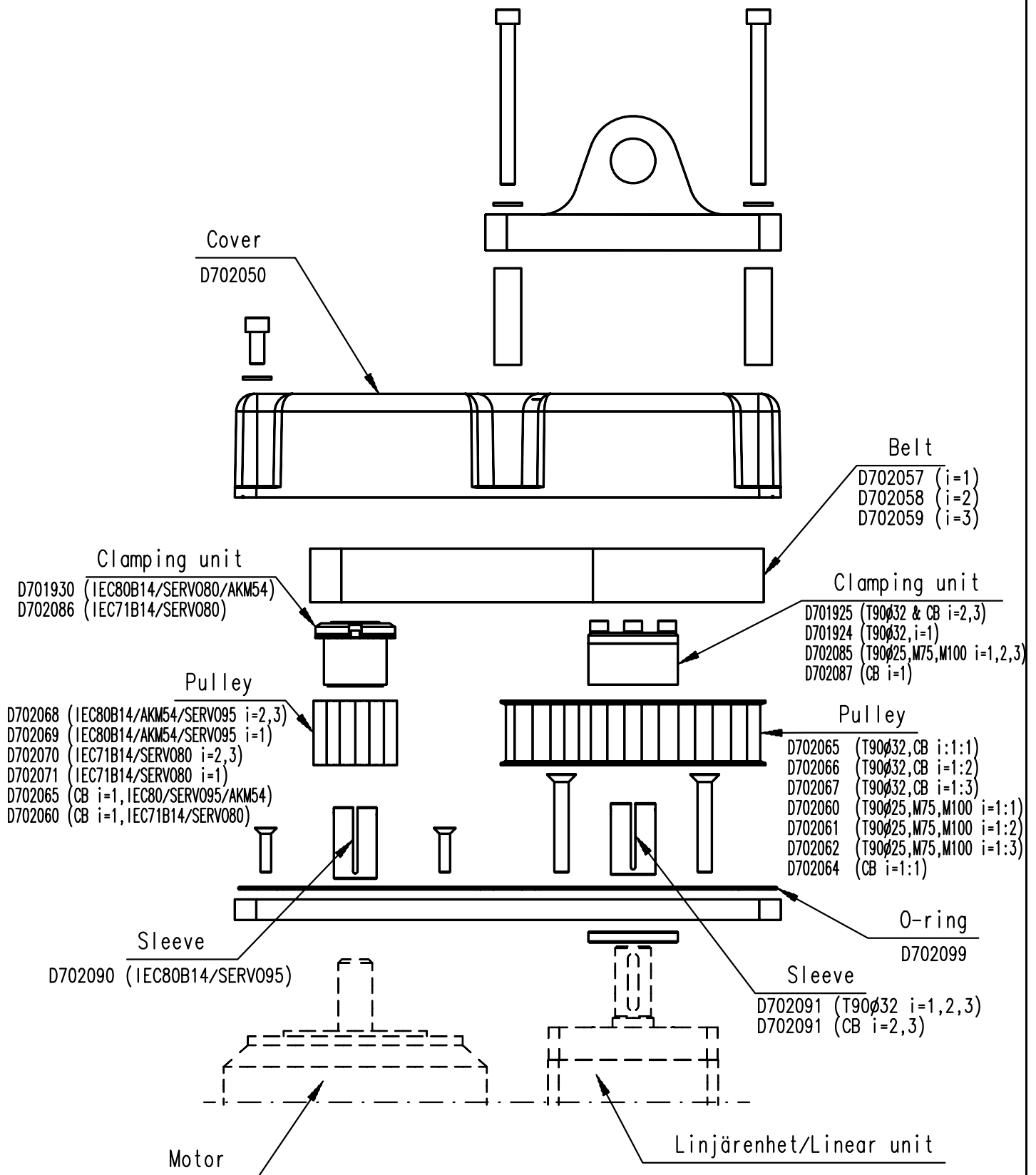


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# Reservdelar (Spare parts)

## Belt gear BGM 41.



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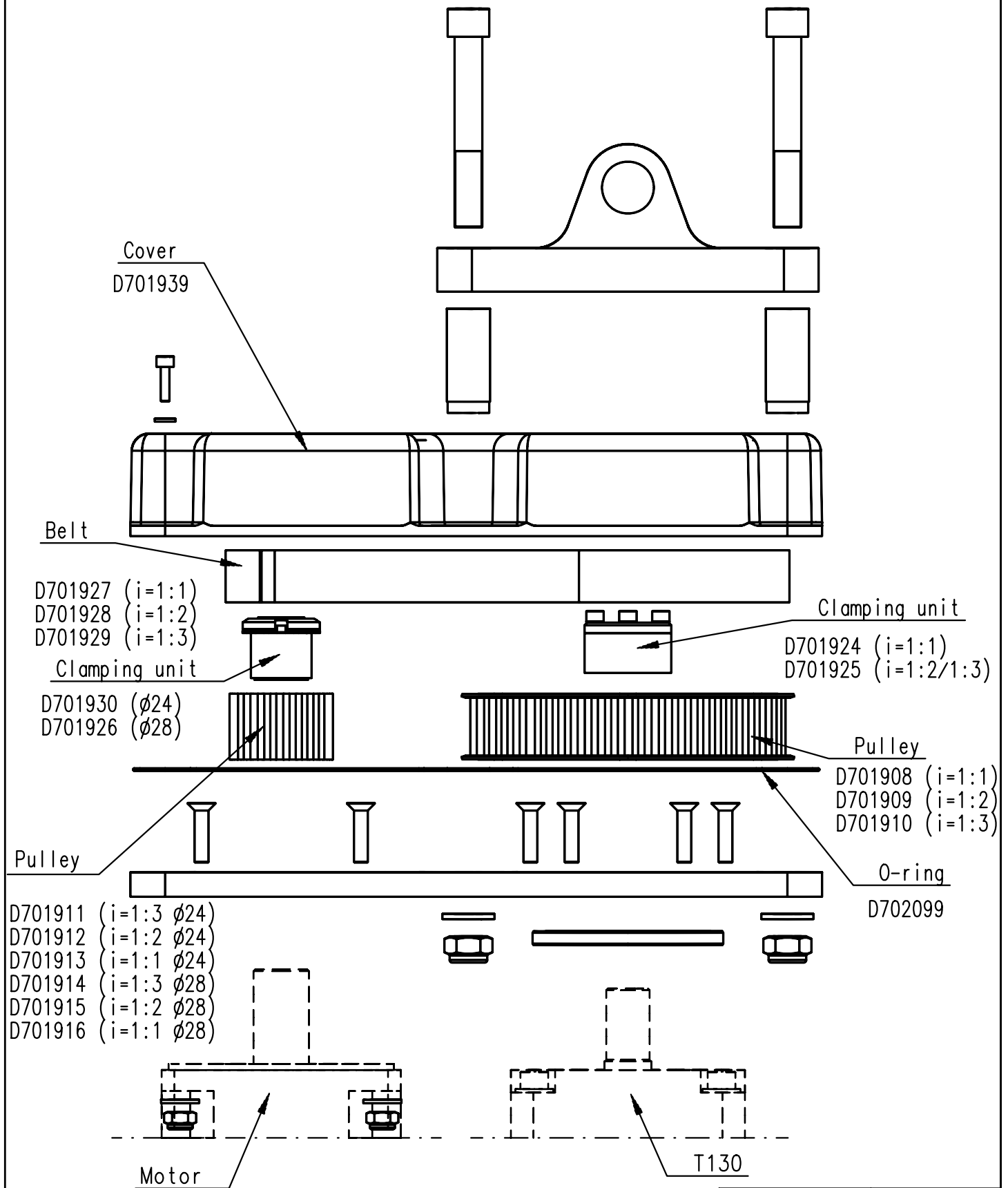
# Reservdelar (Spare parts)

## Belt gear BGM81.



Tollo Linear

Box 9053, SE-291 09 Kristianstad, Sweden  
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- D701912 (i=1:2  $\phi 24$ )
- D701913 (i=1:1  $\phi 24$ )
- D701914 (i=1:3  $\phi 28$ )
- D701915 (i=1:2  $\phi 28$ )
- D701916 (i=1:1  $\phi 28$ )

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## EUROPE

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Thomson  
Office 9, The Barns  
Caddsdow Business Park  
Bideford, Devon, EX39 3BT  
Phone: +44 (0) 1271 334 500  
E-mail: sales.uk@thomsonlinear.com

### Germany

Thomson  
Nürtinger Straße 70  
72649 Wolfschlugen  
Phone: +49 (0) 7022 504 403  
Fax: +49 (0) 7022 504 405  
E-mail: sales.germany@thomsonlinear.com

### France

Thomson  
Phone: +33 (0) 243 50 03 30  
Fax: +33 (0) 243 50 03 39  
E-mail: sales.france@thomsonlinear.com

### Italy

Thomson  
Largo Brughetti  
20030 Bovisio Masciago  
Phone: +39 0362 594260  
Fax: +39 0362 594263  
E-mail: info@thomsonlinear.it

### Spain

Thomson  
Rbla Badal, 29-31 7th, 1st  
08014 Barcelona  
Phone: +34 (0) 9329 80278  
Fax: + 34 (0) 9329 80278  
E-mail: sales.esm@thomsonlinear.com

### Sweden

Thomson  
Estridsväg 10  
29109 Kristianstad  
Phone: +46 (0) 44 24 67 00  
Fax: +46 (0) 44 24 40 85  
E-mail: sales.scandinavia@thomsonlinear.com

## SOUTH AMERICA

### Brazil

Thomson  
Av. Tamboré, 1077  
Barueri, SP – 06460-000  
Phone: +55 (11) 3616-0191  
Fax: +55 (11) 3611-1982  
E-mail: sales.brasil@thomsonlinear.com

## USA, CANADA and MEXICO

Thomson  
203A West Rock Road  
Radford, VA 24141, USA  
Phone: 1-540-633-3549  
Fax: 1-540-633-0294  
E-mail: thomson@thomsonlinear.com  
Literature: literature.thomsonlinear.com

## ASIA

### Asia Pacific

E-mail: sales.apac@thomsonlinear.com

### China

Thomson  
Rm 2205, Scitech Tower  
22 Jianguomen Wai Street  
Beijing 100004  
Phone: +86 400 6661 802  
Fax: +86 10 6515 0263  
E-mail: sales.china@thomsonlinear.com

### India

Thomson  
c/o CNRG Energy India Pvt. Ltd.  
Unit No. FF A 07  
Art Guild House, A Wing, 1st Floor, L.B.S Marg  
Kurla – West, Mumbai – 400070 India  
Phone: +0091 22 6249 5043  
Email: sales.india@thomsonlinear.com

### Japan

Thomson  
Minami-Kaneden 2-12-23, Suita  
Osaka 564-0044  
Phone: +81-6-6386-8001  
Fax: +81-6-6386-5022  
E-mail: csjapan@scgap.com

### South Korea

Thomson ROA  
704 ASEM Tower (Samsung-dong),  
517 Yeongdong-daero,  
Gangnam-gu, Seoul, S. Korea (06164)  
Phone: +82 2 6917 5048/5049  
Fax: +82 2 528 1456/1457  
E-mail: sales.korea@thomsonlinear.com