Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Rexroth IndraDyn S
MSK Synchronous Motors

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Edition 01

Operating Instructions

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Rexroth IndraDyn S
MSK Synchronous Motors

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Purpose of Documentation
This documentation…

- briefs mounting, operating and maintenance personnel,
- contains basic instructions on the assembly, operation and maintenance of the motors.

Record of Revision

Edition	Release Date	Notes
DOK-MOTOR*-MSK********-IT01-EN-P	06/2011	First edition

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Note
This document has been printed on chlorine-free bleached paper.

D Deutsch	USA English	F Français
⚠WARNUNG Lebensgefahr bei Nichtbeachtung der nachstehenden Sicherheitshinweise! Nehmen Sie die Produkte erst dann in Betrieb, nachdem Sie die mit dem Produkt gelieferten Unterlagen und Sicherheitshinweise vollständig durchgelesen, verstanden und beachtet haben. Sollten Ihnen keine Unterlagen in Ihrer Landessprache vorliegen, wenden Sie sich an Ihren zuständigen Rexroth-Vertriebspartner. Nur qualifiziertes Personal darf an Antriebskomponenten arbeiten. Nähere Erläuterungen zu den Sicherheitshinweisen entnehmen Sie Kapitel 1 dieser Dokumentation.	**⚠WARNING Danger to life in case of non-compliance with the below-mentioned safety instructions!** Do not attempt to install or put these products into operation until you have completely read, understood and observed the documents supplied with the product. If no documents in your language were supplied, please consult your Rexroth sales partner. Only qualified persons may work with drive components. For detailed explanations on the safety instructions, see chapter 1 of this documentation.	**⚠AVERTISSEMENT Danger de mort en cas de non-respect des consignes de sécurité figurant ci-après!** Ne mettez les produits en service qu'après avoir lu complètement et après avoir compris et respecté les documents et les consignes de sécurité fournis avec le produit. Si vous ne disposez pas de la documentation dans votre langue, merci de consulter votre partenaire Rexroth. Uniquement du personnel qualifié est autorisé de travailler sur les composants d'entraînement. Vous trouverez des explications plus détaillées relatives aux consignes de sécurité au chapitre 1 de la présente documentation.
⚠WARNUNG Hohe elektrische Spannung! Lebensgefahr durch elektrischen Schlag! Betreiben Sie Antriebskomponenten nur mit fest installiertem Schutzleiter. Schalten Sie vor Zugriff auf Antriebskomponenten die Spannungsversorgung frei. Beachten Sie die Entladezeiten von Kondensatoren.	**⚠WARNING High electrical voltage! Danger to life by electric shock!** Only operate drive components with a permanently installed equipment grounding conductor. Disconnect the power supply before accessing drive components. Observe the discharge times of the capacitors.	**⚠AVERTISSEMENT Tensions électriques élevées! Danger de mort par électrocution!** N'exploitez les composants d'entraînement que si un conducteur de protection est installé de manière permanente. Avant d'intervenir sur les composants d'entraînement, coupez toujours la tension d'alimentation. Tenez compte des délais de décharge de condensateurs.
⚠WARNUNG Gefahrbringende Bewegungen! Lebensgefahr! Halten Sie sich nicht im Bewegungsbereich von Maschinen und Maschinenteilen auf. Verhindern Sie den unbeabsichtigten Zutritt für Personen. Bringen Sie vor dem Zugriff oder Zutritt in den Gefahrenbereich die Antriebe sicher zum Stillstand.	**⚠WARNING Dangerous movements! Danger to life!** Keep free and clear of the ranges of motion of machines and moving machine parts. Prevent personnel from accidentally entering the range of motion of machines. Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.	**⚠AVERTISSEMENT Mouvements entraînant une situation dangereuse! Danger de mort!** Ne séjournez pas dans la zone de mouvement de machines et de composants de machines. Évitez tout accès accidentel de personnes. Avant toute intervention ou accès dans la zone de danger, assurez-vous de l'arrêt préalable de tous les entraînements.
⚠WARNUNG Elektromagnetische / magnetische Felder! Gesundheitsgefahr für Personen mit Herzschrittmachern, metallischen Implantaten oder Hörgeräten! Zutritt zu Bereichen, in denen Antriebskomponenten montiert und betrieben werden, ist für o.g Personen untersagt bzw. nur nach Rücksprache mit einem Arzt erlaubt.	**⚠WARNING Electromagnetic / magnetic fields! Health hazard for persons with heart pacemakers, metal implants or hearing aids!** The above-mentioned persons are not allowed to enter areas in which drive components are mounted and operated, or rather are only allowed to do this after they consulted a doctor.	**⚠AVERTISSEMENT Champs électromagnétiques / magnétiques! Risque de santé pour les porteurs de stimulateurs cardiaques, d'implants métalliques et d'appareils auditifs!** L'accès aux zones où sont montés et exploités les composants d'entraînement est interdit aux personnes susmentionnées ou bien ne leur est autorisé qu'après consultation d'un médecin.
⚠VORSICHT Heiße Oberflächen (> 60 °C)! Verbrennungsgefahr! Vermeiden Sie das Berühren von metallischen Oberflächen (z. B. Kühlkörpern). Abkühlzeit der Antriebskomponenten einhalten (mind. 15 Minuten).	**⚠CAUTION Hot surfaces (> 60 °C)! Risk of burns!** Do not touch metallic surfaces (e.g. heat sinks). Comply with the time required for the drive components to cool down (at least 15 minutes).	**⚠ATTENTION Surfaces chaudes (> 60 °C)! Risque de brûlure!** Évitez de toucher des surfaces métalliques (p. ex. dissipateurs thermiques). Respectez le délai de refroidissement des composants d'entraînement (au moins 15 minutes).

D Deutsch	USA English	F Français
⚠VORSICHT Unsachgemäße Handhabung bei Transport und Montage! Verletzungsgefahr! Verwenden Sie geeignete Montage- und Transporteinrichtungen. Benutzen Sie geeignetes Werkzeug und persönliche Schutzausrüstung.	**⚠CAUTION Improper handling during transport and mounting! Risk of injury!** Use suitable equipment for mounting and transport. Use suitable tools and personal protective equipment.	**⚠ATTENTION Manipulation incorrecte lors du transport et du montage! Risque de blessure!** Utilisez des dispositifs de montage et de transport adéquats. Utilisez des outils appropriés et votre équipement de protection personnel.
⚠VORSICHT Unsachgemäße Handhabung von Batterien! Verletzungsgefahr! Versuchen Sie nicht, leere Batterien zu reaktivieren oder aufzuladen (Explosions- und Ätzungsgefahr). Zerlegen oder beschädigen Sie keine Batterien. Werfen Sie Batterien nicht ins Feuer.	**⚠CAUTION Improper handling of batteries! Risk of injury!** Do not attempt to reactivate or recharge low batteries (risk of explosion and cauterization). Do not dismantle or damage batteries. Do not throw batteries into open flames.	**⚠ATTENTION Manipulation incorrecte de piles! Risque de blessure!** N'essayez pas de réactiver des piles vides ou de les charger (risque d'explosion et de brûlure par acide). Ne désassemblez ni endommagez des piles. Ne jetez pas des piles dans le feu.

E Español	I Italiano
⚠ADVERTENCIA ¡Peligro de muerte en caso de no observar las siguientes indicaciones de seguridad! Los productos no se pueden poner en servicio hasta después de haber leído por completo, comprendido y tenido en cuenta la documentación y las advertencias de seguridad que se incluyen en la entrega. Si no dispusiera de documentación en el idioma de su país, diríjase a su distribuidor competente de Rexroth. Solo el personal debidamente cualificado puede trabajar en componentes de accionamiento. Encontrará más detalles sobre las indicaciones de seguridad en el capítulo 1 de esta documentación.	**⚠AVVERTENZA Pericolo di morte in caso di inosservanza delle seguenti indicazioni di sicurezza!** Mettere in funzione i prodotti solo dopo aver letto, compreso e osservato per intero la documentazione e le indicazioni di sicurezza fornite con il prodotto. Se non dovesse essere presente la documentazione nella vostra lingua, siete pregati di rivolgervi al rivenditore Rexroth competente. Solo personale qualificato può eseguire lavori sui componenti di azionamento. Per ulteriori spiegazioni riguardanti le indicazioni di sicurezza consultare il capitolo 1 di questa documentazione.
⚠ADVERTENCIA ¡Alta tensión eléctrica! ¡Peligro de muerte por descarga eléctrica! Active sólo los componentes de accionamiento con el conductor protector firmemente instalado. Desconecte la alimentación eléctrica antes de manipular los componentes de accionamiento. Tenga en cuenta los tiempos de descarga de los condensadores.	**⚠AVVERTENZA Alta tensione elettrica! Pericolo di morte in seguito a scosse elettriche!** Mettere in esercizio i componenti di azionamento solo con conduttore di messa a terra ben installato. Staccare l'alimentazione prima di intervenire sui componenti di azionamento. Osservare i tempi di scarica del condensatore.
⚠ADVERTENCIA ¡Movimientos peligrosos! ¡Peligro de muerte! No permanezca en la zona de movimiento de las máquinas ni de sus piezas. Impida el acceso accidental de personas. Antes de acceder o introducir las manos en la zona de peligro, los accionamientos se tienen que haber parado con seguridad.	**⚠AVVERTENZA Movimenti pericolosi! Pericolo di morte!** Non sostare nelle zone di manovra delle macchine e delle loro parti. Impedire un accesso non autorizzato per le persone. Prima di accedere alla zona di pericolo, arrestare e bloccare gli azionamenti.

E Español	I Italiano
⚠ADVERTENCIA ¡Campos electromagnéticos/magnéticos! ¡Peligro para la salud de las personas con marcapasos, implantes metálicos o audífonos! El acceso de las personas arriba mencionadas a las zonas de montaje o funcionamiento de los componentes de accionamiento está prohibido, salvo que lo autorice previamente un médico.	**⚠AVVERTENZA Campi elettromagnetici / magnetici! Pericolo per la salute delle persone portatrici di pacemaker, protesi metalliche o apparecchi acustici!** L'accesso alle zone in cui sono installati o in funzione componenti di azionamento è vietato per le persone sopra citate o consentito solo dopo un colloquio con il medico.
⚠ATENCIÓN ¡Superficies calientes (> 60 °C)! ¡Peligro de quemaduras! Evite el contacto con las superficies calientes (p. ej., disipadores de calor). Observe el tiempo de enfriamiento de los componentes de accionamiento (mín. 15 minutos).	**⚠ATTENZIONE Superfici bollenti (> 60 °C)! Pericolo di ustioni!** Evitare il contatto con superfici metalliche (ad es. dissipatori di calore). Rispettare i tempi di raffreddamento dei componenti di azionamento (almeno 15 minuti).
⚠ATENCIÓN ¡Manipulación inadecuada en el transporte y montaje! ¡Peligro de lesiones! Utilice dispositivos de montaje y de transporte adecuados. Utilice herramientas adecuadas y equipo de protección personal.	**⚠ATTENZIONE Manipolazione inappropriata durante il trasporto e il montaggio! Pericolo di lesioni!** Utilizzare dispositivi di montaggio e trasporto adatti. Utilizzare attrezzi adatti ed equipaggiamento di protezione personale.
⚠ATENCIÓN ¡Manejo inadecuado de las pilas! ¡Peligro de lesiones! No trate de reactivar o cargar pilas descargadas (peligro de explosión y cauterización). No desarme ni dañe las pilas. No tire las pilas al fuego.	**⚠ATTENZIONE Utilizzo inappropriato delle batterie! Pericolo di lesioni!** Non tentare di riattivare o ricaricare batterie scariche (pericolo di esplosione e corrosione). Non scomporre o danneggiare le batterie. Non gettare le batterie nel fuoco.

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1 About this Documentation

1.1 Validity of this Documentation

This documentation is valid for Rexroth housing motors of the MSK series and must be observed by assemblers, operators, service engineers and facility operators.

1.2 Additional Documentation

Operate this product only, if you have the following documentation available. You must understand and observe this documentation.

	Title	Document type	Document number
🕮	Rexroth IndraDyn S - Synchronous Motors MSK	Project Planning Manual	DOK-MOTOR*-MSK*********-PR-❑❑-❑❑-P
🕮	Rexroth Indra Dyn S Synronous Motors MSK for Hazardous Areas	Project Planning Manual	DOK-MOTOR*-MSK*EXGIIK3-PR❑❑-❑❑-P
🕮	Rexroth Connection Cables IndraDrive and IndraDyn	Selection data	DOK-CONNEC-CABLE*INDRV-AU❑❑-❑❑-P

Fig.1-1: Additional documentation

1.3 Presentation of Information

Safety-related guidelines

The safety-related guidelines in these operating instructions include signal words (danger, warning, caution, note) and a signal symbol (acc. to ANSI Z535.6-2006).

The signal word is intended to draw your attention to the safety-related guidelines and describes the seriousness of the danger. The warning triangle with exclamation mark indicates the danger for persons.

⚠ DANGER

Non-compliance with this safety-related guideline **will** result in death or severe personal injury.

⚠ WARNING

Non-compliance with this safety-related guideline **can** result in death or severe personal injury.

⚠ CAUTION

Non-compliance with this safety-related guideline can result in moderate or minor personal injury.

NOTICE

Non-compliance with this safety-related guideline can result in material damage.

About this Documentation

Symbols

Symbol	Meaning
	Reference to supplementary documentation
	This note gives important information, which must be observed.
▶	Single, independent action step
1. 2. 3.	Numbered action instructions: The numbers show that the action steps must be taken one after the other.
	Warning against dangerous electric voltage
	Warning against hot surfaces
	Warning against rotating machine parts
	Warning against overhead load
	Electrostatic sensitive devices
	Prohibition for persons with cardiac pacemaker
	Do not carry along metal parts or clocks
	Hammer scales are forbidden
	ATEX sign; explosion protection designation
c UL® US	The UL Recognized Compontent Mark shows recognized component parts which are components of a bigger product or system.
CE	The letters C and E stand for "Conformité Européenne“. The CE mark only shows that a product conforms with the respective EC guidelines. Conformity with the Low Voltage Directive 2006/95EC, EN 60034-1, EN 60034-5 is confirmed for MSK motors.
SI	Component prepared for use in systems for "integrated safety technology".

Fig. 1-2: Meaning of symbols

2 Safety-related Guidelines

2.1 About this Chapter

Please observe the general safety-related guidelines in this chapter and the safety-related guidelines and handling instructions in this manual. This will prevent personal hazards, material damage and errors.

☞ This manual must be stored by the user during the whole product lifetime and passed on when selling.

2.2 Appropriate Use

Prerequisites for appropriate and safe use of the motors are proper transport and storage, correct assembly and connection and careful maintenance and operation.

The motors have been designed for installation in industrial machinery. The motors comply with the following standards and directives.

Standards

EN 60034-1	Rating and performance
EN 60034-5	Degree of protection

Directives

2006/95/EC	Low Voltage Directive

The machine manufacturer must evaluate the electric and mechanic safety as well as environmental influences in the assembled state of the machine according to the Machine Directive 2006/42/EC and DIN EN 60204-1 (safety of machines).

The electric installation must comply with the protection requirements of the EMC Directive 2004/108/EC. The plant manufacturer is responsible for correct installation (for example: physical separation of signal and power cables, using shielded cables, ...). The converter manufacturer's EMC instructions must be observed.

The machine may not be commissioned before conformity with these directives has been determined.

2.3 Inappropriate Use

Any use of the MSK motors outside of the specified fields of application or under operating conditions and technical data other than those specified in this documentation is considered to be "inappropriate use".

Unless explicitly provided for this purpose, the motors may not be used in explosion-hazardous areas (ATEX) (see housing design **-NSNN**).

Direct operation on the three-phase network is forbidden.

2.4 Personnel Qualification

For the purpose of this manual, qualified personnel means persons who are familiar with transporting, installing, mounting, commissioning and operating the components of the electrical drive and control system and the associated hazards and have an appropriate qualification for their job.

All persons working on, with or in the vicinity of an electrical system must be informed of the relevant safety requirements, safety guidelines and internal instructions (EN 50110-1).

2.5 General Safety-related Guidelines

Do not install or operate motors or components of the electric drive and control system before you have not carefully read all delivered documents.

Please observe the particular applicable national, local and system-specific regulations, the safety-related guidelines in the documentation and the warning and informative labels on the motors.

Improper use of the motors and failure to follow the safety-related guidelines in this document may result in material damage, personal injury, electric shock or, in extreme cases, to death!

For damage due to non-compliance with the safety-related guidelines, Bosch Rexroth does not assume any liability.

Applications for functional safety are only allowed if the motors have the SI sign on the rating plate.

2.6 Product and Technology-dependent Safety-related Guidelines

2.6.1 Protection against Electrical Voltage

Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.

Prior to commencing the work:

1. Isolate.
2. Protect the system or plant against restart.
3. Ensure de-energization.
4. Ground and short-circuit.
5. Cover or shield any adjacent live parts.

After completion of the work, unmake the measures in reverse order.

During operation, dangerous voltages occur! Danger! Risk of injury due to electric shock!

- Before switching on, establish the fixed connection of the protective conductor to all electric components according to the connection diagram.
- Operation, even for short-term measuring and testing purposes, is only permitted with the protective conductor securely connected to the component points provided.

2.6.2 Protection against Mechanical Hazards

Dangerous movements! Danger to life, risk of injury, severe personal injury or material damage!

- Do not stay within the area of motion of the machine. Prevent persons from accidently entering the danger zone.
- Make vertical axes safe against falling or declining after switching off the motor, e.g., by
  - locking the vertical axis mechanically,
  - providing an external braking / catching / clamping device, or

– ensuring sufficient equilibration of the vertical axis.

Only using the serially delivered **motor holding brake** or an external holding brake activated by the drive controller **is not suitable for personal protection!**

Rotating parts! Danger to life, risk of injury, severe personal injury or material damage!

- Secure key and/or transmission elements against ejection.
- Install covers on dangerous rotating machine parts before start-up.

2.6.3 Protection against Magnetic and Electromagnetic Fields

Magnetic and electromagnetic fields are created in the direct environment of live conductors or permanent magnets of electric motors and can be a great danger for persons.

Strong magnetic and electromagnetic fields pose a health hazard for persons with heart pacemakers, metallic implants and hearing aids in the direct environment of motor components!

- Persons with heart pacemakers and metallic implants are not allowed to approach or handle these motor components.

Crushing hazard of fingers and hands due to strong attractive forces of the magnets!

- Handle only with protective gloves.

Risk of destruction of sensitive parts!

- Keep watches, credit cards, check cards and identity cards with magnetic strips as well as all ferromagnetic metallic parts such as iron, nickel and cobalt away from the permanant magnets.

2.6.4 Protection against Burns

Risk of burns by hot surfaces!

- Avoid contact with hot motor surfaces. **Temperatures may rise to over 70 °C**.
- Allow the motors to cool down long enough before touching them.
- Temperature-sensitive components may not come into contact with the motor surface. Ensure appropriate mounting distance of connection cables and other components.

3 Scope of Delivery

The scope of delivery of an IndraDyn housing motor contains:

- Motor in original package
- Additional rating plate
- Operating instructions with safety-related guidelines
- Optional connecting accessories for motors with terminal box
- Protective covers for output shaft, plug connections and coolant connections of water-cooled motors.
- Accompanying papers

On delivery, immediately verify whether the delivered goods are those specified on the delivery note. The forwarder must be promptly informed of any damage on the packaging and goods, which is detected on delivery. It is forbidden to use damaged products.

4 About this Product

4.1 Product Description

4.1.1 Technical Features

The motors of the MSK series ared three-phase synchronous motors which are energized by a permanent magnet and are suitable for operation on converters or inverters of Bosch Rexroth.

Product	Three-phase synchronous motor
Manufacturer	Bosch Rexroth Electric Drives and Controls GmbH Bürgermeister-Dr.-Nebel-Strasse 2 97816 Lohr am Main / Germany
Type	MSK030, -040, -043, -050, -060, -061, -070, -071, -075, -076, -100, -101, -103, -131
Listing acc. to UL standard (UL)	UL 1004, Fifth Edition
Listing acc. to CSA standard (UL)	Canadian National Standard(s) C22.2 No. 100-04
UL files (UL)	E 335445
Ambient temperature during operation	0 … 40 °C
Motor design	B5 (EN 60034-7)
Degree of protection	IP65 (EN 60034-5)
Vibration severity grade	Level A (EN 60034-14)
Concentricity, run-out and alignment	Tolerance N (IEC 60072-1) for encoders S1, M1, S3, M3 Tolerance R (IEC 60072-1) for encoders S2, M2
Flange	acc. to DIN 42948
Shaft end	Cylindric (DIN 748 part 3), keyway optional, centering hole (DIN 332 part 2)
Installation altitude	0 ... 1,000 m
Sound pressure level	< 75 dB(A)
Insulation class	155 (EN 60034-1)
Balancing	Full-key balancing
Electrical connection	Plug connector for power and encoder
Encoder system	S1 (optical, Singleturn Hiperface, 128 signal periods) S2 (optical, Singleturn EnDat 2.1, 2048 signal periods) S3 (optical, Singleturn Hiperface, 16 signal periods) M1 (optical, Multiturn Hiperface, 128 signal periods) M2 (optical, Multiturn EnDat 2.1, 2048 signal periods) M3 (optical, Multiturn Hiperface, 16 signal periods)
Motor holding brake (optional)	Principle: electrically released U_N 24V DC (±10%)

☞ Special versions may deviate from the details specified in these operating instructions. In this case, the related supplementary documentation must be requested.

About this Product

4.1.2 Type of Construction

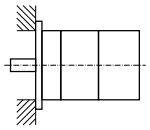
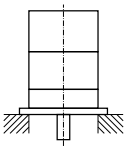
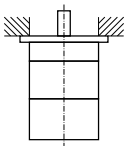
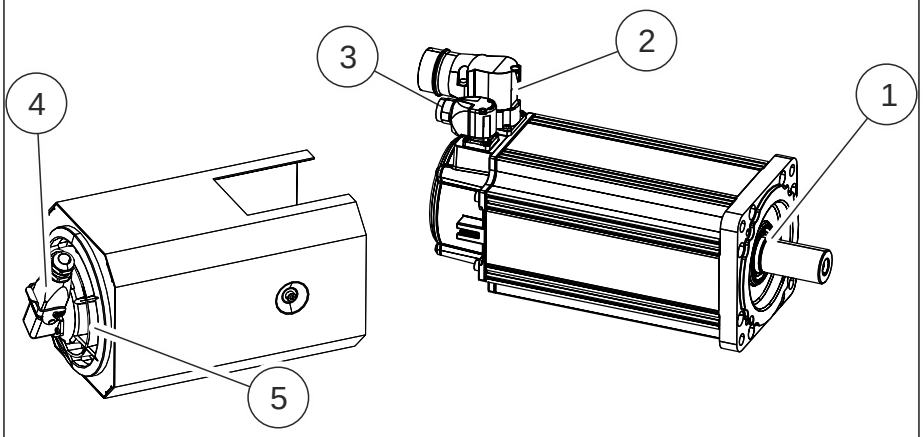
Motor design B05		
IM B5	**IM V1**	**IM V3**
		
Flange mounted on the drive side of the flange	Flange mounted on the drive side of the flange; drive side facing down	Flange mounted on the drive side of the flange; drive side facing up

Fig.4-1: Permissible types of installation according to EN 60034-7

4.1.3 Degree of Protection

Motor area	Degree of protection	Comment
		
Motor housing, output shaft, motor connector with professional assembly in connected state	IP65	Standard design
Motor housing, output shaft, motor connector with professional assembly in connected state **and** use of sealing air	IP67	Sealing air accessories
Fan motor and plug connector in connected state	IP65	Fan unit accessories
Fan grille	IP24	Fan unit accessories

① Output shaft with shaft sealing ring
② ③ Plug connector for power and encoder (can be optionally retrofitted for sealing air)
④ Fan motor with plug connector
⑤ Fan grille

Fig.4-2: IP protection areas of MSK motors

4.1.4 Output Shaft

Centering hole, according to DIN 332 Part 2, Edition 05.83	MSK													
	030	040	043	050	060	061	070	071	075	076	100	101	103	131
DS M3	■													
DS M5		■	■											
DS M6				■		■								
DS M8					■					■				
DS M10							■	■	■		■			
DS M12												■	■	
DS M16														■

Fig.4-3: Centering hole

Corresponding key according to DIN 6885-A (is not included in scope of delivery)	MSK													
	030	040	043	050	060	061	070	071	075	076	100	101	103	131
3×3×16	■													
5×5×20		■	■											
6×6×32				■		■								
8×7×40					■					■				
10×8×45							■	■	■		■			
10×8×70												■		
14×9×80														■

Fig.4-4: Keys

4.1.5 Bearings

The motors are equipped with permanently greased deep-groove ball bearings. The fixed bearing is on the B-side. The nominal bearing service life L_{10h} is 30,000 h, considering the shaft and bearing loads specified in the project planning manual.

4.1.6 Cooling

Natural Convection

Nominal data is reached at ambient temperatures of up to 40 °C. The installation situation must be selected such that sufficient heat dissipation is ensured. Unhindered vertical convection must be ensured by a sufficient distance of 100 mm to neighboring components on the lateral surfaces. Soiling of the motor surface reduces heat dissipation, see chapter 12 "Troubleshooting " on page 55.

Surface Ventilation

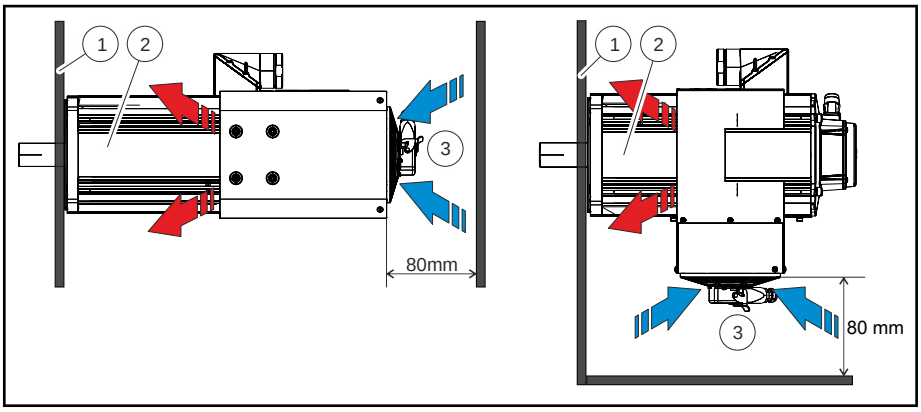
Cooling is realized by external radial (LEM-RB) or axial (LEM-AB) fan units. The different voltage ranges and the additional instructions in the project planning manual must be observed.

📖 DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK".

Soiling can reduce the performance of the fans and lead to thermal overload of the motors. Only use clean ambient air for cooling. Heated air may not be sucked in again.

The fan is explicitly not suitable for use under the following conditions:

- Delivery of air containing abrasive (eroding) particles.
- Delivery of air with a highly corrosive effect, e.g., salt mist.
- Delivery of air containing a high dust load, e.g., suction of saw dust.
- Delivery of flammable gases/particles
- Using fan units as safety related part or for assumption of safety related functions



① Machine
② Air flow-off space
③ Air suck-in space

Fig.4-5: Fan units Installation space, minimum distance

When designing the machine, take the minimum distance of the air supply ③ into account.

Liquid Cooling

Liquid cooled motors are operated in a closed coolant system with heat exchanger. The coolant flow direction can be selected as desired.

Anti-corrosion agents must be added to the coolant system. Please observe the information provided in the Project Planning Manual.

DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK".

4.2 Product Identification

4.2.1 Type Code

Size

M S K □□□ - - - - - -

= see project planning manual (e.g. "0 5 0")

Length

M S K □ - - - - - -

= see project planning manual (e.g. "C")

Winding

M S K - □□□□ - - - - -

0 = see project planning manual (e.g. "0 3 0 0")
2 = with parameter for field weakening operation (e.g. "0 3 0 2" see special product description) 1)

Cooling Mode

M S K - - □□ - - - -

N N = natural convection (fan mounting possible from size 060)
F N = liquid cooling

Encoder

M S K - - - □□ - - -

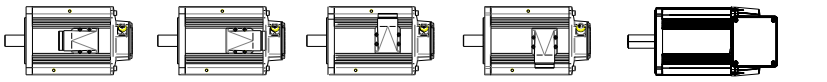
M 1 = optical, Multiturn Hiperface, 128 signal periods
M 2 = optical, Multiturn EnDat 2.1, 2,048 signal periods
M 3 = optical, Multiturn Hiperface, 16 signal periods
S 1 = optical, Singleturn Hiperface, 128 signal periods
S 2 = optical, Singleturn EnDat 2.1, 2,048 signal periods
S 3 = optical, Singleturn Hiperface, 16 signal periods

Electrical Connection

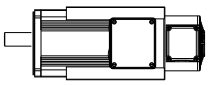
M S K - - - - □ - -

U = turnable connector 240° A
A = connector A-side
B = connector B-side
L = connector left
R = connector right
E , F = terminal box (A-side) 1)

B L R E , F



E , F - P



Shaft

M S K - - - - - □ -

G = smooth shaft with shaft sealing ring
P = shaft with keyway acc. to DIN 6885-1 with shaft sealing ring
K = conical shaft with shaft sealing ring 1)

Holding Brake

M S K - - - - - - □ -

0 = without holding brake

MSK	030	040	043	050	060	061	070	071	075	076	100	101	103	131	
1 = holding brake	1	4	4	6	10	10	23	23	23	11	32	-	33	100	Nm
2 = holding brake	-	-	-	-	-	-	-	30	30	-	70	70	60	240	Nm
3 = holding brake	-	-	-	-	-	-	-	-	22 1)	-	-	120	-	-	Nm

Housing Design

M S K - - - - - - - □□□□

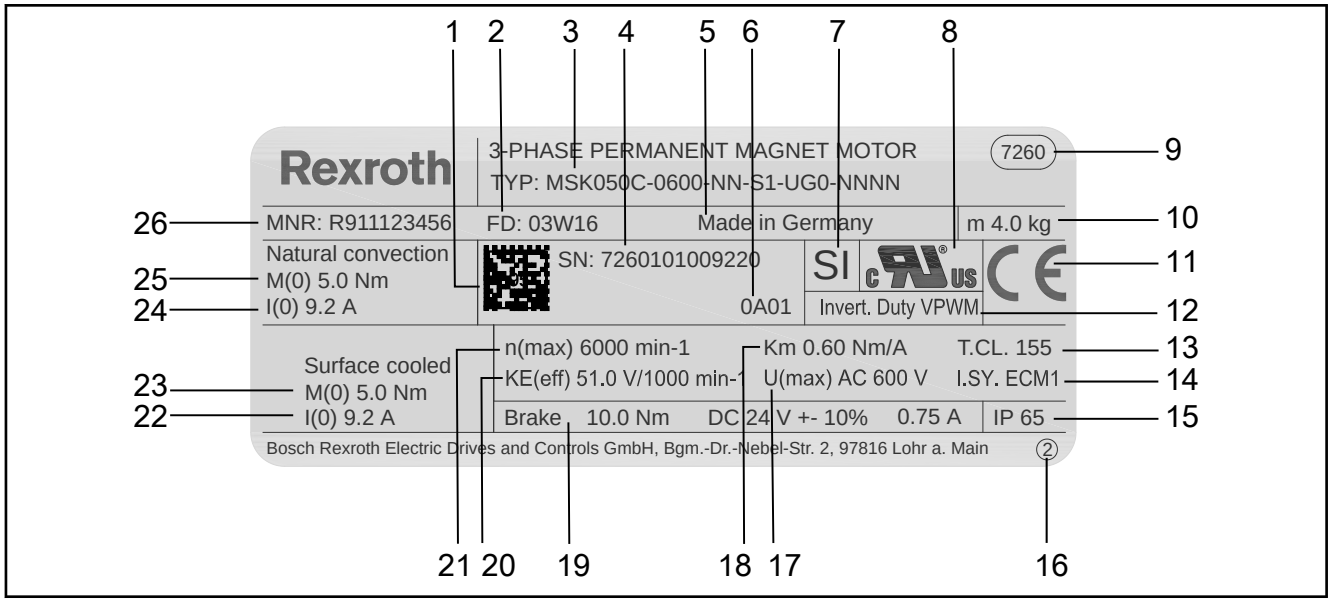
N N N N = standard
S = Ex design acc. to group II, category 3G and 3D acc. to EN 60079 ff 2)
N = concentricity, alignment and run-out tolerance DIN 42955-N
R = concentricity, alignment and run-out tolerance DIN 42955-R
P = pump drive 1) 3)
0 1 = shortened shaft design 1) 4)
0 2 = conical shaft (JIS 0614, JIS B 0904) 1) 4)
A = increased vibration severity 1) 4)
B = fixed bearing A-side 1) 4)
P = sealing air connection 1) 3)
V = reinforced bearing 1) 4)
K = 17-pole encoder connection 1)

1) Special product, partially only available in combination with other special features (see product type code)
2) Description see operating instruction "DOK-MOTOR*-MSK*EXGIIK3-IBxx-xx-P"
3) Observe product insert.
4) Product information on demand.

Fig.4-6: Type code overview

About this Product

4.2.2 Rating Plate



1	Barcode
2	Production date
3	Motor type (ordering designation according to the type code)
4	Serial number
5	Country of origin
6	Revision state
7	Designation motor prepared for safety technique
8	Designation cURus (UL)
9	Factory number
10	Netto weight
11	CE conformity
12	UL Inverter Duty VPWM
13	Thermal temperature class
14	Designation insulation system (UL)
15	Degree of protection housing
16	Type plate designation
17	Voltage class (UL)
18	Torque constant at 20°C
19	Data about holding brakes, optional (holding brake, rated voltage, rated current)
20	Voltage constant
21	Maximum speed
22	Standstill current surface (surface or liquid)
23	Continuous torque at standstill (surface or liquid)
24	Continuous current at standstill 60K
25	Continuous torque at standstill 60K
26	Material number

Fig.4-7: Type plate MSK

5 Transport and Storage

5.1 Transport (Shipping) Instructions

The motors must be transported in their original package taking classes 2K2, 2B1, 2C2, 2S2, 2M1 specified acc. to DIN EN 60721-3-2 into account.

Please observe the following classification limitations:

- Transport temperature range -20 ... +80 °C
- Relative air humidity max. 75% (at +30 °C)
- No occurence of salt mist

Before transport, discharge the liquid coolant from liquid-cooled motors to avoid frost damage.

5.2 Instructions on Machine Transport

NOTICE

Never touch the connection points of electrostatic sensitive devices!

Installed components (e.g., KTY84, encoder) may contain electrostatic sensitive devices (ESD).

▸ Observe ESD safety measures.

⚠ WARNING

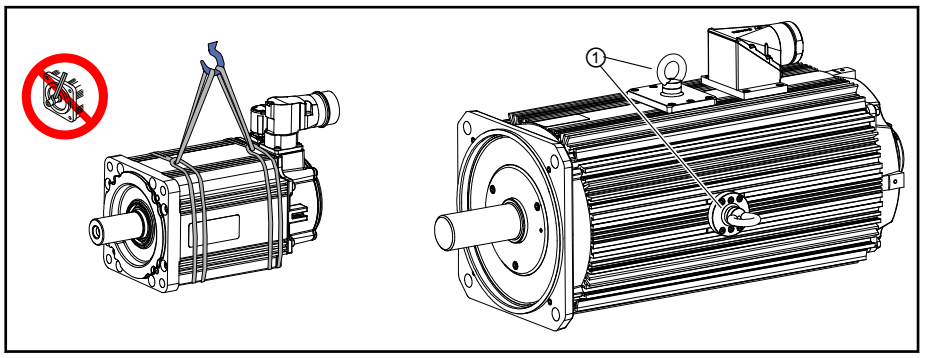
Risk of injury and material damage due to improper handling during transport!

▸ Only use hoisting gear suited for the weight of the motors. Use lifting sling belts or lifting eye bolts. Secure the lifting eye bolts before use.

▸ Never walk under hanging loads.

▸ Do not lift the motor on the shaft or on the optional fan housing.

▸ Use suitable protective equipment and protective clothing during transport, and wear safety shoes.



① Eye bolts (check firm seating before use)

Fig.5-1: Lifting and transporting motors

▸ Before transporting the motor, determine the weight of the motor. For more details about motor weight, please refer to the rating plate or the Project Planning Manual (Technical Data).

Transport and Storage

- Adjust the carrying capacity of the lifting device to the motor weight.
- If provided by the manufacturer, all lifting eye bolts must be used and tightened before use.
- Avoid increased transport vibrations.
- Remove any existing transport locks prior to commissioning and keep them

5.3 Product Storage

Store the motors in their original package at a dry, dust free, vibration free and light protected place without direct solar radiation. Please observe classes 1K2, 1B1, 1C1,1S1,1M2 specified for storage acc. to DIN EN 60721-3-2.

Please observe the following classification limitations:

- Storage temperature -20 ... +60 °C
- Relative air humidity 5 … 95 %
- Absolute air humidity 1 … 29 g/m³
- No condensation
- No ice formation/freezing
- No occurence of salt mist

NOTICE **Damage due to moisture and humidity!**

- Use coverings to protect the products from moisture.
- Store them only in rainproof and dry rooms.

☞ Before storage, discharge the liquid coolant from liquid-cooled motors to avoid frost damage.

5.4 Storage Times

Additional measures must be taken on commissioning to preserve proper functioning – irrespective of the storage time which may be longer than the warranty period of our products. However, this does not result in any additional warranty claims.

Motors

Storage time	Measures on commissioning
< 1 year	Resurface the holding brake
1 ... 5 years	1. Check the electric contacts to verify that they are free from corrosion 2. Allow the motor to run in without load at 800 ... 1,000 rpm for one hour 3. Resurface the holding brake
> 5 years	1. Change the bearings 2. Change the encoder 3. Resurface the holding brake 4. Check the electric contacts to verify that they are free from corrosion

Fig.5-2: Measures before commissioning motors stored for a prolonged period of time

Cables and connectors

Storage time	Measures prior to commissioning
< 1 year	None
1 ... 5 years	▶ Check the electric contacts to verify that they are free from corrosion
> 5 years	▶ Check the electric contacts to verify that they are free from corrosion ▶ Visually inspect the cable jacket. Do not use the cable if you detect any abnormalities (squeezed or kinked spots, color deviations, ...).

Fig.5-3: Measures before commissioning cables and connectors stored for a prolonged period of time

6 Assembly

6.1 Motor Assembly

6.1.1 Flange Assembly

NOTICE **Motor damage due to ingress of liquids!**

Liquid which exists over a longer period on the shaft sealing ring of the output shaft can ingress into the motor and cause damage.

- Ensure that liquid cannot be present at the output shaft.
- Do not mount any open gearboxes (gearboxes that are not hermetically sealed).

For details on mounting holes, please refer to the Project Planning Manual.

📖 DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK". Use all motor mounting holes to mount the motor safely to the machine.

- If coupling is direct, ensure that the support is plane and the orientation is precise.
- Avoid pinching or jamming the centering collar on the motor side.
- Avoid damage to the insertion fitting on the system side.
- Use the following screws and washers for flange assembly.

Mounting screws for IndraDyn motors

Hole ⌀ [mm]	Screw 8.8 DIN EN ISO 4762 DIN EN ISO 4014	Tightening torque M_A[Nm] at μ_K= 0.12	Washer DIN EN ISO 28738
4.5	M4 × 20	3	-
6.6	M6 × 20	10.1	-
9	M8 × 20	24.6	Yes
11	M10 × 30	48	Yes
14	M12 × 40	84	Yes
18	M16 × 35	206	Yes

Fig.6-1: Tightening torque of mounting screws

6.1.2 Attaching Transmission Elements

Fit and pull off the transmission elements such as pulleys and couplings only with suitable equipment; heat them, if necessary.

- Avoid unallowed belt tensions. Please consider the allowed radial and axial forces in the project planning manuals.
- The balancing state of transmission elements must comply with the full-key balancing of the motors.

Assembly

NOTICE

Motor damage due to strikes onto the motor shaft

▸ Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor.

Fitting

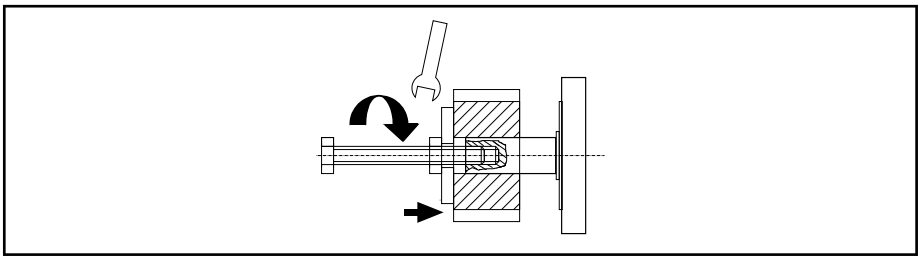


Fig.6-2: Fitting the transmission element

▸ Use the centering hole for fitting transmission elements. For details on centering holes, please refer to the Project Planning Manual.

📖 DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK". Heat the output element, if necessary.

6.2 Connecting the Electric Supply

6.2.1 Safety

⚠ WARNING

Danger! Electric voltage! Operations in the vicinity of live parts are extremely dangerous.

Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.

Prior to commencing work:

1. Isolate (even auxiliary circuits).
2. Protect the system or plant against restart.
3. Ensure de-energization.
4. Ground and short-circuit.
5. Cover or shield any adjacent live parts.

⚠ WARNING

High electrical voltage! Danger to life, risk of injury due to electric shock.

While the rotor is rotating, motors with permanent magnet excitation create a voltage > 60 V at the motor connections.

▸ Any work may only be carried out while the motor is at standstill.

▸ Never connect or disconnect plug connectors under load!

NOTICE

Never touch the connection points of electrostatic sensitive devices!

Installed components (e.g., KTY84, encoder) may contain electrostatic sensitive devices (ESD).

- Observe ESD safety measures.

6.2.2 Plug Connectors

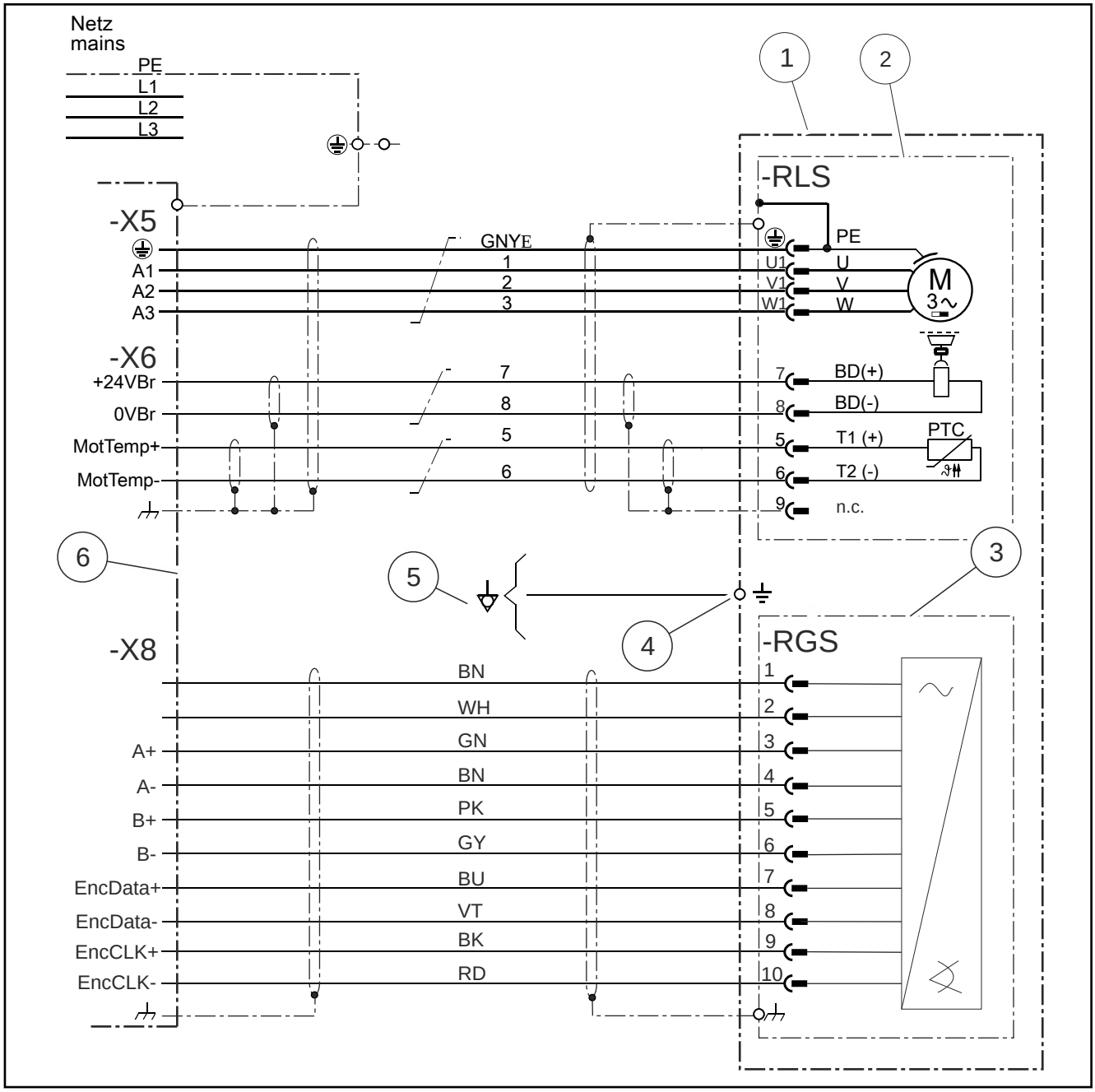
When using the connector socket, please ensure the following:

- Use ready-made cables of Rexroth, see documentation DOK-CONNEC-CABLE*INDRV-AU❒❒-❒❒-P, "Rexroth Connection Cables IndraDrive and IndraDyn" .
- Observe the circuit diagrams specified in the Project Planning Manual, see DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK" .
- The connections must be established such that a permanent safe electrical connection is ensured.
- Establish a safe protective conductor connection.
- Only use flange sockets which are free from dirt, foreign bodies and humidity.
- Completely tighten the flange sockets in screw design. The vibration O-ring may no longer be visible.
- Connect or disconnect plug connections only in de-energized, dry and clean state.
- Protect the flange sockets from external force effect.

Connection diagram

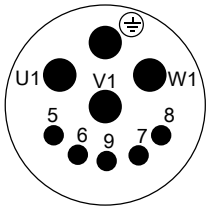
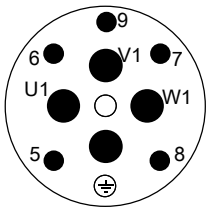
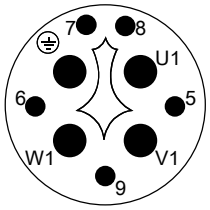
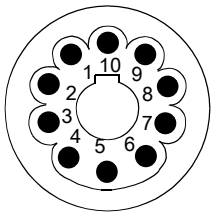
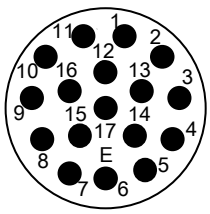
The following connection diagram shows a possible connection. The installation regulations applicable at the place of machine installation must be complied with.

Assembly



①	Motor housing
②	Power connector socket
③	Encoder connector socket
④	Equipotential bonding connection at the motor (only present on ATEX motors)
⑤	Equipotential bonding connection at the machine (only present on ATEX motors)
⑥	Rexroth drive controller

Fig.6-3: Connector socket connection diagram

Connector size	Pole pattern	Flange socket	Comment
M23	 U1 A1 W1 A2 V1 A3 ⏚ PE 5 MotTemp+ 6 MotTemp- 7 +24VBr 8 0VBr 9 n.c.	RLS1100[1)] RLS1103	Power
M40	 U1 A1 W1 A2 V1 A3 ⏚ PE 5 MotTemp+ 6 MotTemp- 7 +24VBr 8 0VBr 9 n.c.	RLS1200[1)] RLS1203	Power
M58	 U1 A1 W1 A2 V1 A3 ⏚ PE 5 MotTemp+ 6 MotTemp- 7 +24VBr 8 0VBr 9 n.c.	RLS1300	Power
M23	 1 VCC_Encoder 2 GND_Encoder 3 A+ 4 A- 5 B+ 6 B- 7 Enc_Data+ 8 Enc_Data- 9 Enc_CLK+ 10 Enc_CKL-	RGS1000[1)] RGS1003	Encoder
M23	 1 A+ 2 A- 3 n.c. 4 n.c. 5 VCC_Encoder 6 n.c. 7 GND_Encoder 8 Enc_CLK+ 9 Enc_CLK- 10 VCC_Encoder 11 B+ 12 B- 13 n.c. 14 ENńcData+ 15 n.c. 16 n.c. 17 EncData-	RGS1010	Encoder

1) Rotary flange socket

Fig.6-4: Flange socket pole patterns

The orientation of the flange sockets is adjustable. To change the orientation, screw a coupling completely to the flange socket. Then move the flange socket to the desired position, using the coupling. The possible adjustments are shown in the following figure.

Assembly

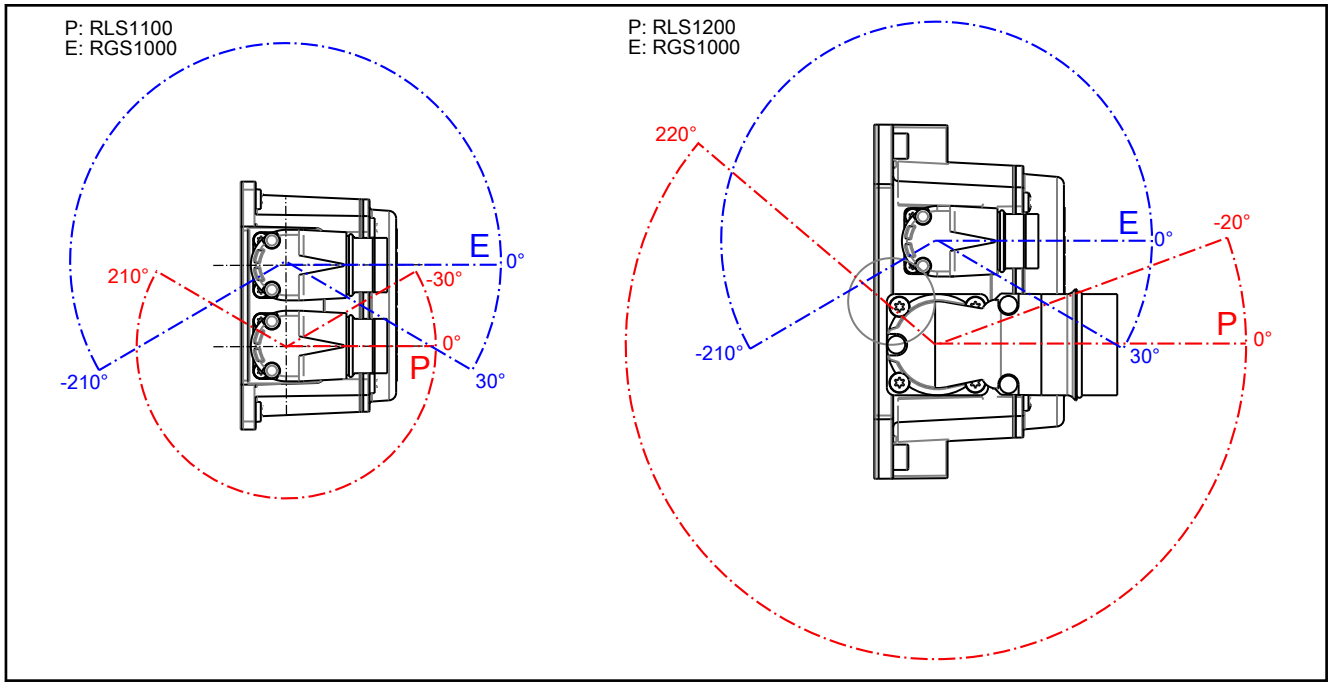


Fig.6-5: Rotary flange socket adjustment ranges

Flange socket	Maximum turning torque [1] [Nm]
RGS1000 RGS1010 RLS1100	12
RLS1200	18

1) Maximum torque for changing the orientation of the flange sockets

Fig.6-6: Flange socket turning torques

- Never exceed the specified turning torques.
- Do not change the connector output direction more than 10 times.

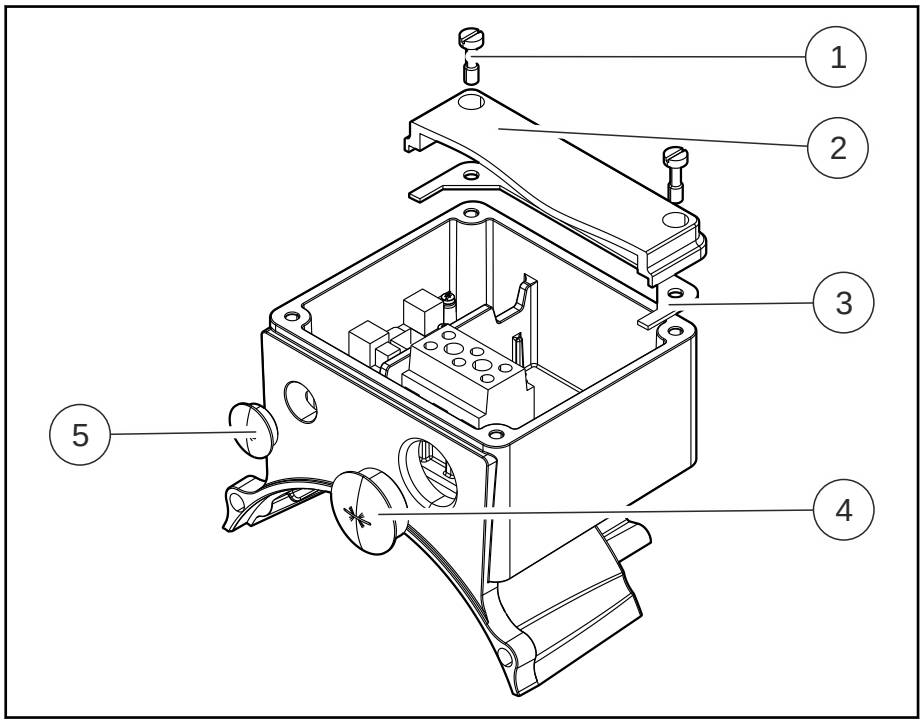
6.2.3 Terminal Box

General

When using terminal boxes, observe the following:

- Use ready-made cables of Rexroth, see documentation 🕮 DOK-CONNEC-CABLE*INDRV-AU❒❒-❒❒-P, "Rexroth Connection Cables IndraDrive and IndraDyn" .
- Observe the circuit diagrams specified in the Project Planning Manual, see 🕮 DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK".
- The connections must be established such that a permanent safe electrical connection is ensured.
- Establish a safe protective conductor connection.
- Use the related cable ends for terminal boxes (no protruding wire ends).
- Only use terminal boxes which are free from dirt, foreign bodies and humidity.
- Close cable entry openings that are not required and the box itself such that they are tight to dust and water.

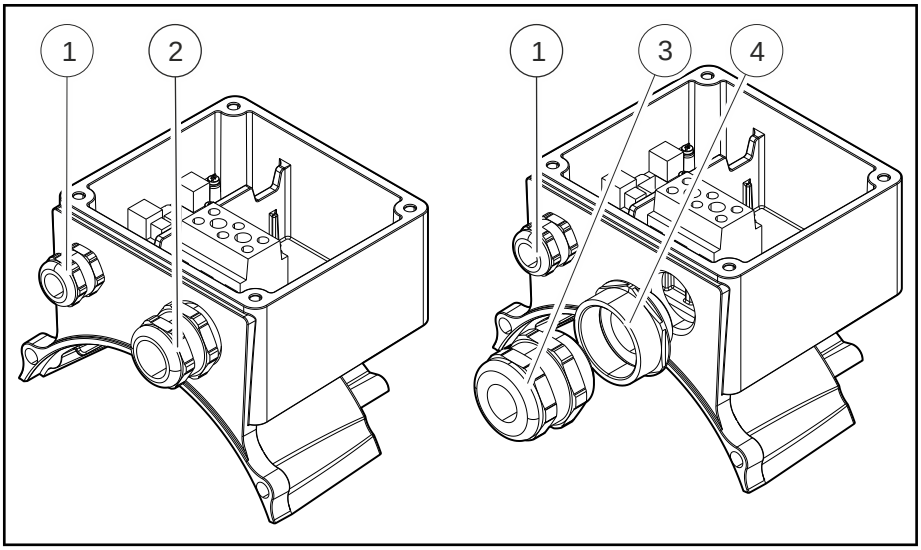
Terminal box type MSK101X-❒❒❒❒-❒❒-❒❒-F❒❒-NPNN; X=C,D,E,F



① 4 screws; M_A 5.9…7.1 Nm
② Cover
③ Seal
④ Closure M32 (power)
⑤ Closure M20 (encoder)

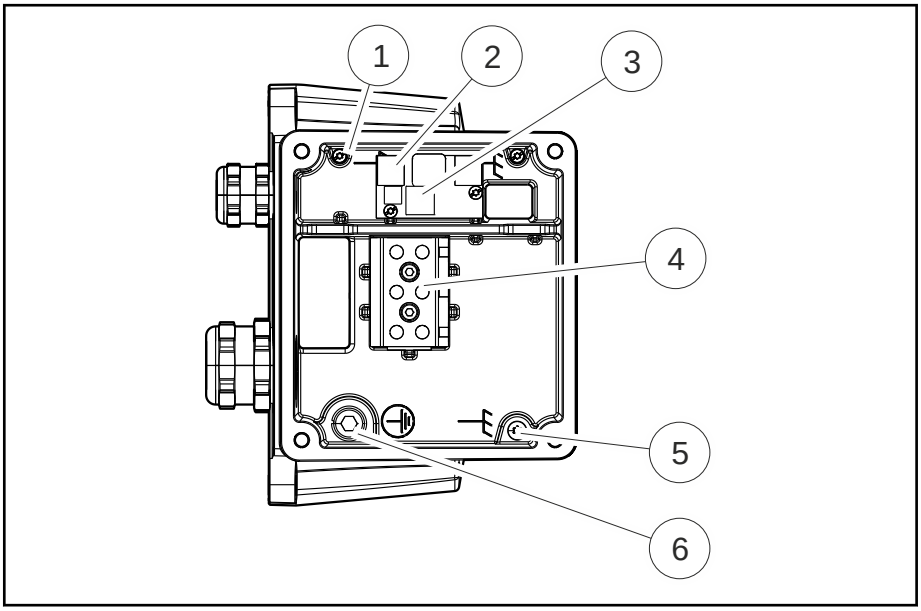
Fig.6-7: Terminal box RZK3100 (MSK101X-❒❒❒❒-❒❒-❒❒-F❒❒-NPNN)

Assembly



① Screwed connection M20 x 1.5, plastic (encoder)
② Screwed connection M32 x 1.5, plastic (power cable 2.5 … 10.0 mm²)
③ Screwed connection M40 x 1.5, plastic (power cable 16.0 mm²)
④ M32 / M40 extension, plastic (power cable 16.0 mm²)

Fig.6-8: Selecting screw unions

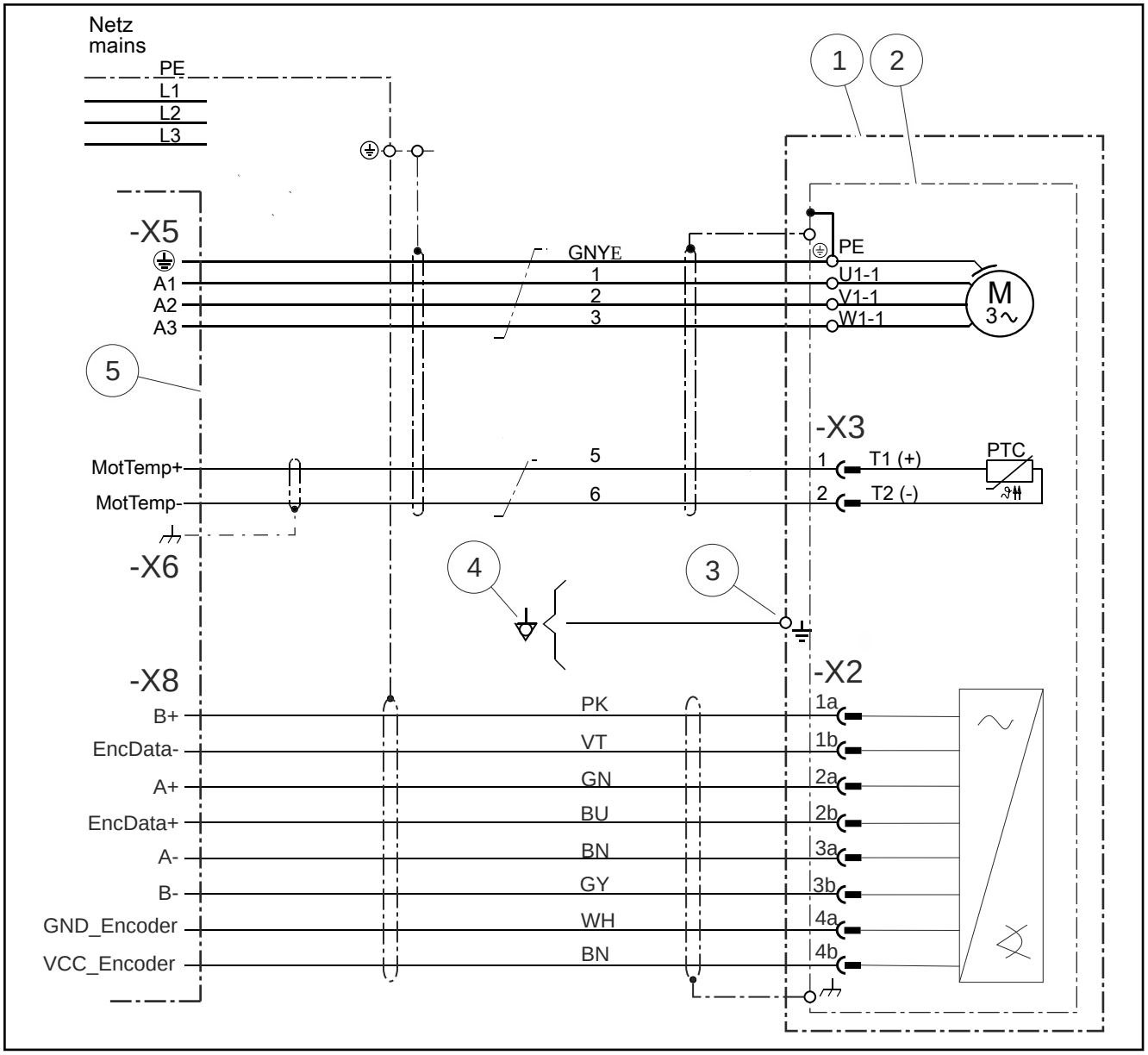


① Encoder cable shield connection
② 8-pin clamp terminal, encoder
③ 2-pin clamp terminal, brake/temperature
④ Power connection U,V,W (max. 16.0 mm²)
⑤ M4x10 power cable shield connection
⑥ M8x12 power cable protective conductor connection

Fig.6-9: Connection points of power and encoder cables

Connection diagram

The following connection diagram shows a possible connection. The installation regulations applicable at the place of machine installation must be complied with.

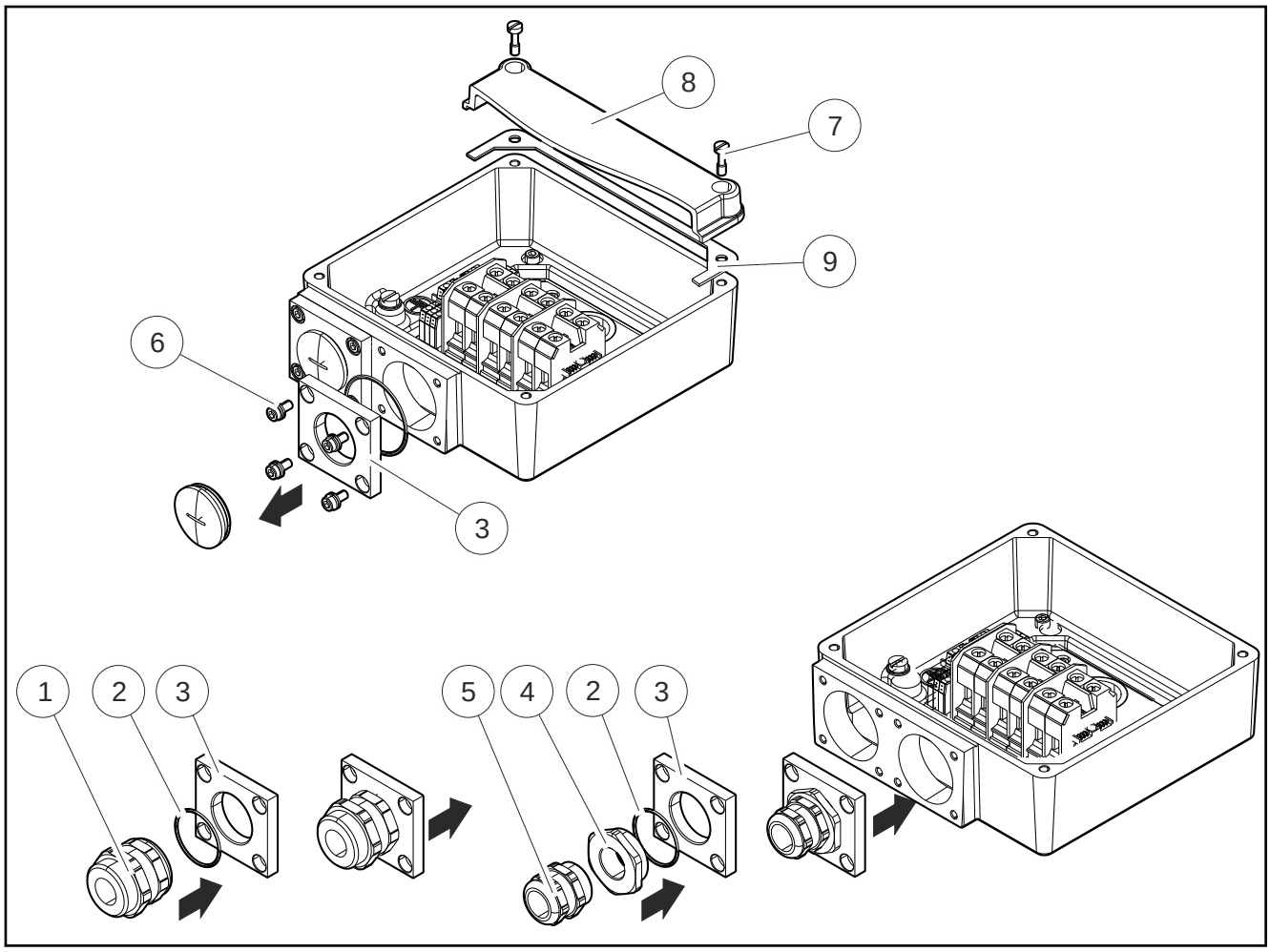


①	Motor housing
②	Terminal box
③	Equipotential bonding connection at the motor (only present on ATEX motors)
④	Equipotential bonding connection at the machine (only present on ATEX motors)
⑤	Rexroth drive controller

Fig.6-10: Terminal box connection diagram MSK101X-□□□□-□□-□□-F□□-NPNN

Assembly

Terminal box type MSK131X-□□□□-□□-□□-E□□-NPNN; X=F



①⑤	Screwed connection
②	O-ring
③	Adapter plate for receiving the screwed connection
④	Reduction (optional for cable cross-sections of 1.5, 2.5 mm²)
⑥	Adapter plate fastening screws
⑦	Cover screws
⑧	Cover
⑧	Seal of terminal box cover

Fig.6-11: Assembly RKL1300 (MSK131X-□□□□-□□-□□-E□□-NPNN)

Power connection is implemented with a single cable or two cables. The ready-made power cables are introduced into the terminal box via adapter plates (2 × M40×1.5) and cable glands.

Power cable connection to the terminal box

Proceed as follows when connecting the power cable to the terminal box:

1. Open terminal box cover.

   Unscrew and remove the mounting screws (4 screws).
2. Remove the protection cover of cable gland.
3. Detach the adapter plate ③ from the terminal box.
4. Tightly screw the adapter plate to the metric cable gland at the power cable. Use a reduction piece for power wire cross-sections of 1.5 mm² and 2.5 mm².

Before attaching the power cable to the adapter plate, check the O-ring for proper condition and correct position.

5. Place the power cable through the opening into the terminal box up to the adapter plate. Attach the adapter plate to the terminal box.

   Screw tightening torque ⑥: 9 Nm (±10%)

   Before attaching the adapter plate ⑥ to the terminal box, check the O-ring ⑤ inserted in the adapter plate for proper condition and correct position.

6. Connect the wires in accordance to the connection diagram for standard or double cabling.

   Observe the following tightening torques:

Designation	Type	Connection: mm²	Size / type	Tightening torque M_A Nm
U-V-W	WEF	1.5 … 35	M6	2.5
1 … 6 (Temp / brake)	WEF	0.2 … 2.5	Tension spring clamp	-
PE	RTE		M8	3.8

WEF = wire end ferrule

RTE = ring terminal end

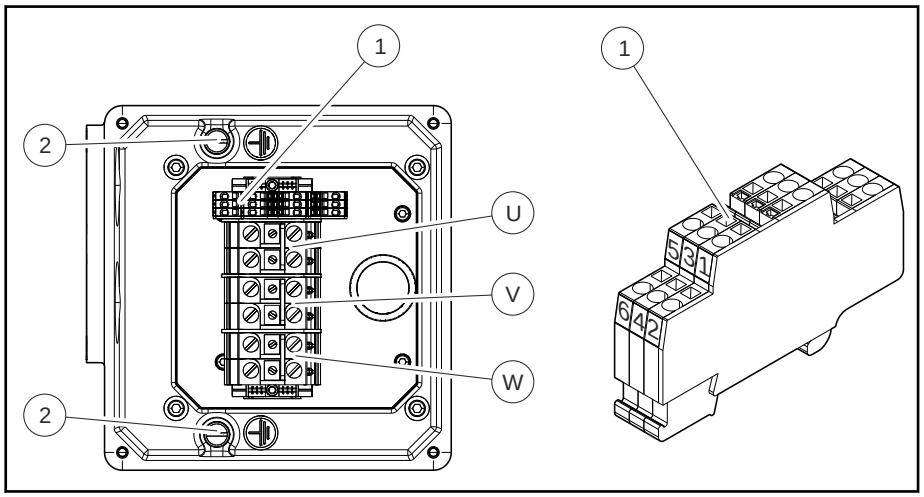
Fig.6-12: Tightening torque for screws in Nm in the terminal box

7. Close and attach the cover of the terminal box.

   Moisten the thread of the mounting screws for the cover ① with liquid screwlock Loctite 243 and fasten the cover with all the mounting screws.

   Screw tightening torque: 6.5 Nm (±10%)

   Before attaching the cover to the terminal box, check the glued-in seal ② on the terminal box cover for proper condition and correct position.

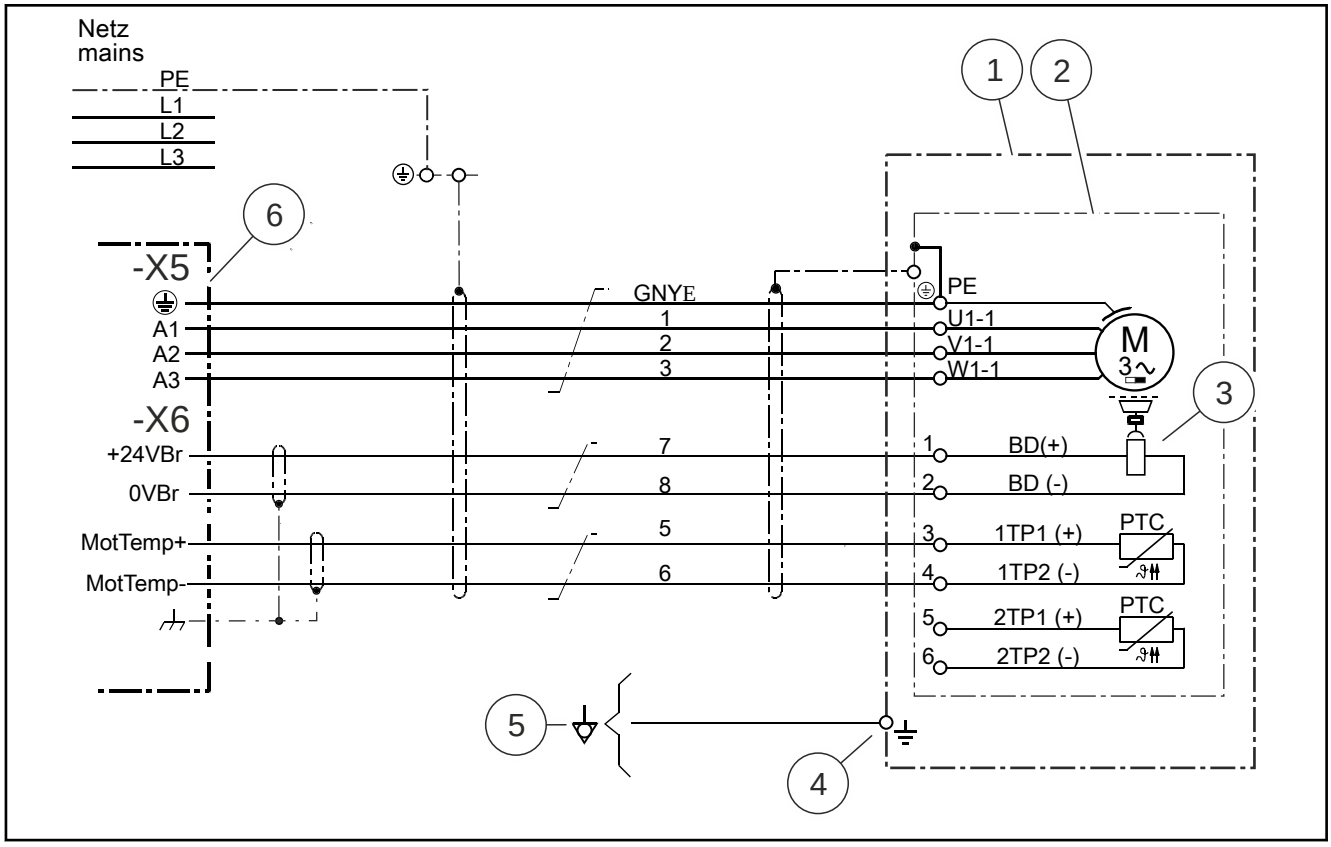


① Terminal strip (brake, temperature sensor)
② Ground terminal connection
ⓊⓋⓌ Power connection
Fig.6-13: Connection points

Single cable connection diagram

☞ The following connection diagram shows a possible connection. The installation regulations applicable at the place of machine installation must be complied with.

Assembly



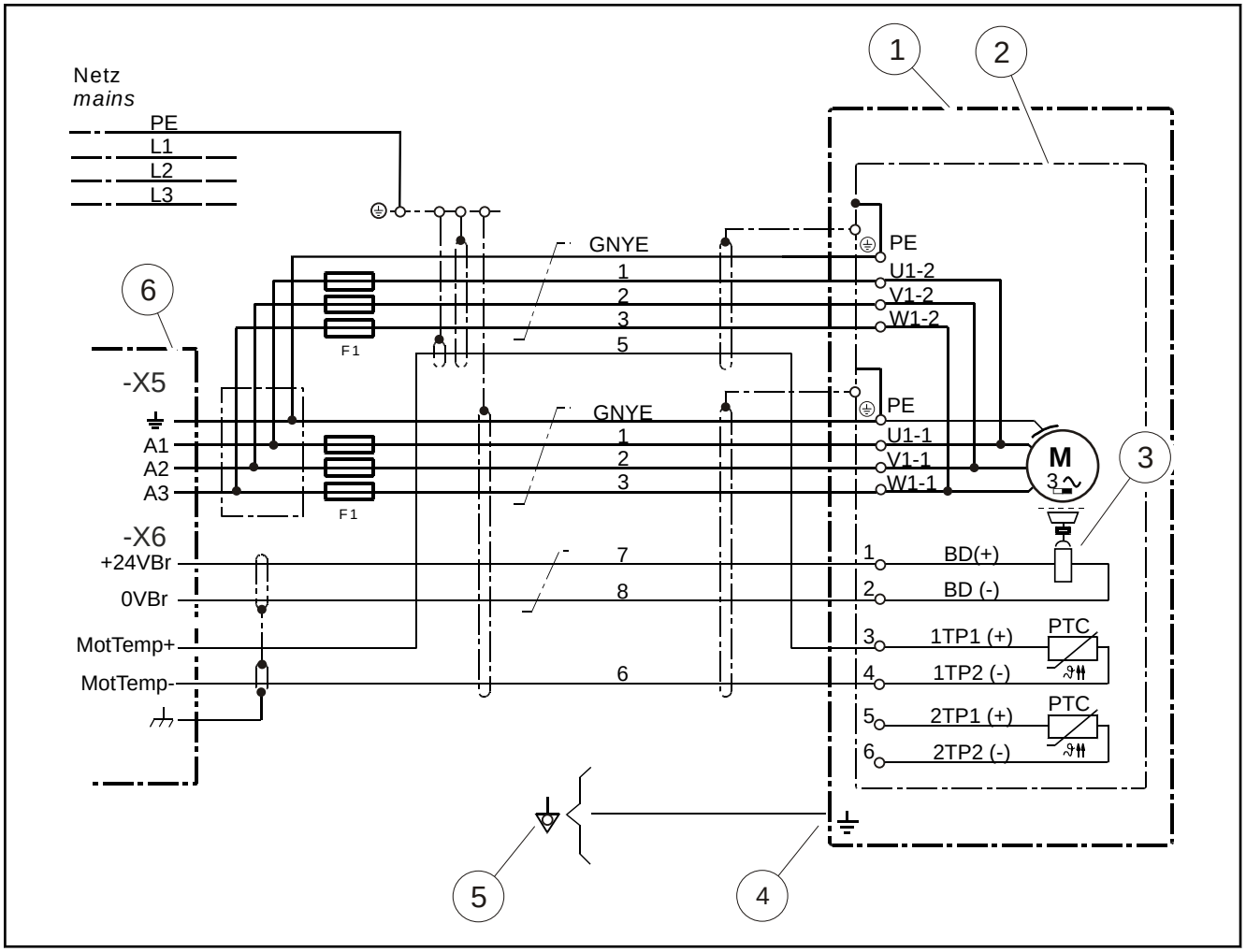
① Motor housing
② Terminal box
③ Holding brake (optional)
④ Equipotential bonding connection at the motor (only present on ATEX motors)
⑤ Equipotential bonding connection at the machine (only present on ATEX motors)
⑥ Rexroth drive controller

Fig.6-14: Terminal box connection diagram with a single cable, MSK131X-□□□□-□□-□□-E□□-NPNN

Double cabling connection diagram

Motor connection with two power cables is required if a corresponding single cable cannot be used due to the bending radius or due to its dimensions.

☞ The following connection diagram shows a possible connection. The installation regulations applicable at the place of machine installation must be complied with.



①	Motor housing
②	Terminal box
③	Holding brake (optional)
④	Equipotential bonding connection at the motor (only present on ATEX motors)
⑤	Equipotential bonding connection at the machine (only present on ATEX motors)
⑥	Rexroth drive controller

Fig.6-15: Terminal box connection diagram with a double cable, MSK131X-□□□□-□□-□□-E□□-NPNN

- Fuses F1 (NH…) which protect the wires from overload in case of cable break must be dimensioned in accordance with the current carrying capacity of the respective line cross-section.
- The fuses should be installed in the control cabinet such that they are as close as possible to the power output of the controller.
- On the motor side of the fuses, the shield of the motor power cable must be connected to the control cabinet such that it is conducting over a large area.
- Power cables are not available for placing the double cabling. Standard Rexroth power cables must be opened and customized as required.

Assembly

6.2.4 Fan Units

General

MSK motors can be optionally operated with fan units. Please observe the following connection instructions:

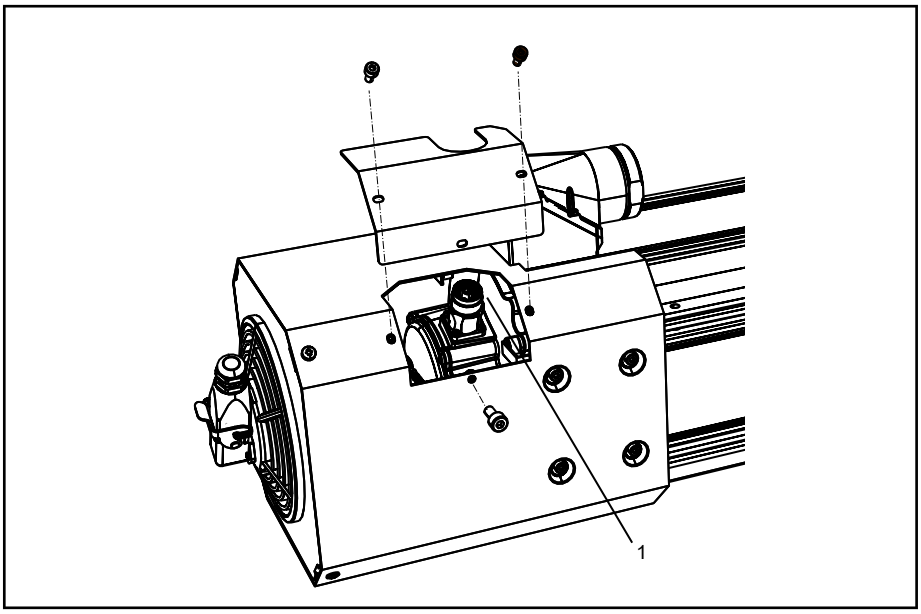
- Connect the fan unit according to the connection voltage on the rating plate.
- Establish a safe protective conductor connection.
- Only use suitable installation material.

For technical data, please refer to DOK-MOTOR*-MSK********-PR❑❑-❑❑-P, "Rexroth IndraDyn S Synchronous Motors MSK".

Motors with axial fan unit

When motors are provided with an axial fan unit, the connector socket for encoder connection is covered by the fan hood.

- Unscrew the cover plate from the fan housing to be able to connect the encoder plug connector.
- Re-attache the cover plate after completed connection (shock protection).



1 Connection for encoder flange socket

Fig.6-16: Encoder connector cover plate

Plug Connector RLS0780 for 1-phase Fan Connection

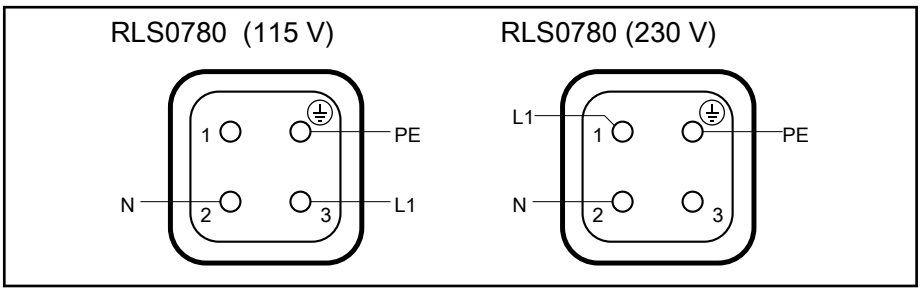


Fig.6-17: Pin assignment, cable connector, LEM

LEM fan units in design "T" with integrated thermal protection. The fan units "T" do **not** need any circuit with external motor protection.

- The delivered cable fitting can be used for cable diameters 7 ... 10 mm.

Plug Connector RLS0782 for 3-phase Fan Connection

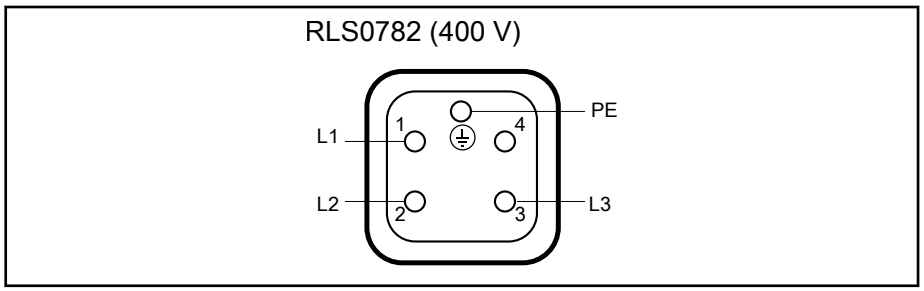


Fig.6-18: Pin assignment, cable connector, LEM

Provide LEM fan units in design "N" with external motor protection (not included in scope of delivery).

▸ The delivered cable fitting can be used for cable diameters 7 ... 10 mm.

Terminal Box LEM-AB-XXXT-21-NPNN; XXX=140,192 for 1-phase Fan Connection

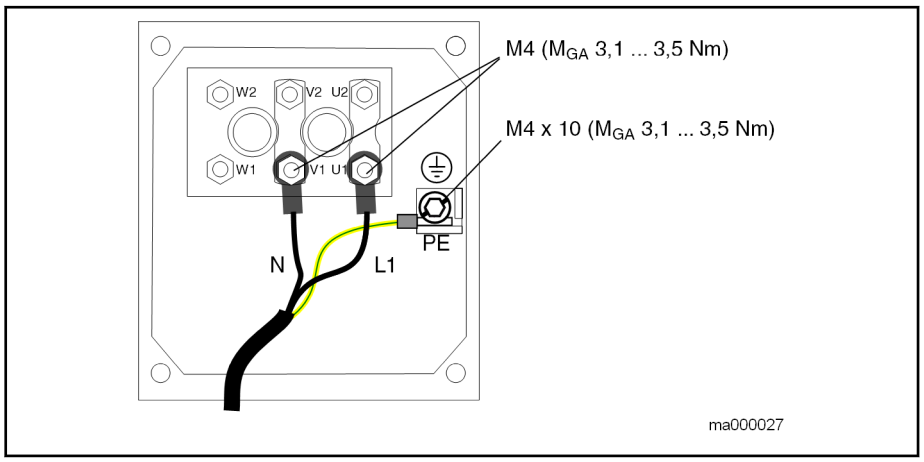


Fig.6-19: Fan cable connection

LEM fan units in design "T" with integrated thermal protection. The fan units "T" do **not** need any circuit with external motor protection switch.

▸ Use a cable gland M16 x 1.5 according to the cable diameter. The cable gland is not included in the scope of delivery.

6.3 Connecting the Cooling Water Supply

⚠ WARNING **Danger of injury due to improper handling of conductors which are under pressure!**

▸ Observe the manufacturers' operating instructions and specifications referring to the cooling system.

▸ Wear suitable protective equipment (e.g. safety goggles, protective gloves, safety shoes).

▸ Remove spilled liquid from the floor immediately to prevent the risk of falling!

▸ Release pressure and discharge medium before dismounting the lines.

▸ Do not try to strip, open or cut lines that are under load.

Assembly

MSK motors (designation within the type code ...-**FN**-...) have the following connection possibilities for the cooling water supply:

- G 1/8" pipe thread for connections that are not sealing in the thread DIN EN ISO 228-1 (cylindric)
- G 1/8" pipe thread for connections sealing in the thread DIN EN ISO 10226-1 (conic)

The maximum input pressure of the motors is **6 bar** (3 bar for motors produced prior to 2010-01-01, 10W01).

▶ Screw in the connection pieces into the 1/8" internal threads. Tightening torque 14 ... 15 Nm.

▶ Ensure that the cooling water meets the requirements; cf. Project Planning Manual 🕮 DOK-MOTOR*-MSK********-PR❒❒-❒❒-P, "Rexroth IndraDyn S Synchronous Motors MSK".

7 Commissioning and Operation

7.1 Safety

⚠ WARNING **High electrical voltage! Danger to life, risk of injury due to electric shock.**

Live parts are dangerous.

- Do not open any covers or flange sockets during operation.
- Never connect or disconnect plug connectors under load!

⚠ WARNING **Risk of injury due to rotating motor shaft!**

- Do not remove any covers, machine parts or protection devices during operation.
- Do not enter the range of movement of the machine. Prevent persons from entering this area, e.g., by means of
  - Safety fence, safety guards, protective covers
  - Optical sensors

⚠ CAUTION **Thermal danger due to hot surfaces with temperatures over 70 °C during operation**

- Do not touch hot motor surfaces.
- Install protection against contact, if necessary.
- Make sure that no temperature-sensitive components (cables, electronic components, ...) touch hot surfaces.

7.2 Commissioning

MSK motors can only be commissioned with other components (drive controller, control unit).

Prior to commissioning

Prior to commissioning, ensure that the following requirements are met.

- Storage time of the motor. Depending on the storage time, take measures to ensure safe operation. Run in bearings, resurface the holding brake, ... See table chapter 5.4 "Storage Times" on page 24.
- Ensure that all flange sockets are correctly connected and protected against coming loose.
- Ensure that a holding brake voltage of 24 V ±10% is applied to the motor. If necessary, adjust the voltage.
- Check the proper function of the holding brake.
- Ensure that the motor and all participating components of the drive are undamaged.
- Ensure that keys are protected against ejection.

Commissioning

For details on the commissioning order, please refer to the respective documentation of the drive controller or firmware description.

Please observe the general safety instructions on the protection against hazardous movements chapter 2.6.2 "Protection against Mechanical Hazards" on page 12.

7.3 Operation

During operation, keep the ambient and operation conditions and technical data specified in the project planning manual.

Checks during operation:

- Pay attention to exceptional noise.
- Pay attention to increased vibrations.
- Check the motor and fan units for cleanliness.
- Check the cooling water connections for tightness.
- Check the monitoring devices and diagnostic / error messages of the controllers.

Decommission the drive when deviations from normal operation exist. For further procedure refer to chapter 12 "Troubleshooting " on page 55.

8 Maintenance and Repair

8.1 Cleaning and Servicing

⚠ WARNING **Danger! Electric voltage! Operations in the vicinity of live parts are extremely dangerous.**

Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.

Prior to commencing work:

1. Isolate (even auxiliary circuits).
2. Protect the system or plant against restart.
3. Ensure de-energization.
4. Ground and short-circuit.
5. Cover or shield any adjacent live parts.

⚠ WARNING **Maintenance work during ongoing operation may result in personal injury and material damage!**

- ▸ Do not carry out any maintenance measures while the machine is running.
- ▸ During maintenance work, protect the system against restarting and unauthorized use.

⚠ CAUTION **Hot surfaces with temperatures over 70 °C may cause burns!**

- ▸ Allow the motors to cool down prior to commencing work.
- ▸ Wear safety gloves.
- ▸ Do not work on hot surfaces.

Motors

Excessive dirt, dust or chips may adversely affect the functionality of the motors and, in extreme cases, even cause a failure of the motors. Clean the cooling fins of the motors at regular intervals (after one year at the latest) to reach a sufficiently high heat emission surface. If the cooling fins are partially covered with dirt, sufficient heat dissipation via the ambient air is no longer ensured.

Connection cables

⚠ WARNING **Contact with live parts may cause death by electrocution!**

- ▸ Change damaged connection cables and decommission the plant immediately.
- ▸ Do not repair any connection lines provisionally.

- Check connection cables for damage at regular intervals and replace them, if necessary.
- Check any optional drag chains for defects.

- Check the protective conductor connection for proper condition and firm seating at regular intervals and replace it, if necessary.

8.2 Service Repair, Maintenance and Spare Parts

Wearing parts are reliably and professionally repaired and replaced by the Bosch Rexroth Service in shopfloor-oriented quality.

The service lives of motor components, such as seals and bearings, may vary depending on the operating conditions, such as operation mode, speed, vibration and shock load, and frequent reverse mode.

We recommend to change the bearing after 30,000 operating hours. Shorter replacement intervals may be necessary; cf. checks during operation chapter 7.3 "Operation" on page 44.

We recommend regular visual inspections on shaft sealing rings. Depending on operating conditions, signs of wear may appear after 5,000 operating hours. If necessary, replace the shaft sealing rings.

☞ We recommend to have these repairs made by Bosch Rexroth Service.

The Bosch Rexroth service helpdesk at our headquarters in Lohr, Germany and our worldwide service provide **24/7 support and assistance**.

Phone:	**+49 9352 40 5060**
Fax	**+49 9352 18 4941**
Email:	service.svc@boschrexroth.de
Internet:	http://www.boschrexroth.com

Preparing information

For quick and efficient help, please have the following information ready:

- Detailed description of the fault and the circumstances
- Information on the rating plate of the products in question, particularly type codes and serial numbers
- Your contact data (phone number, fax number, e-mail address)

9 Disassembly and Exchange

9.1 Tools Required

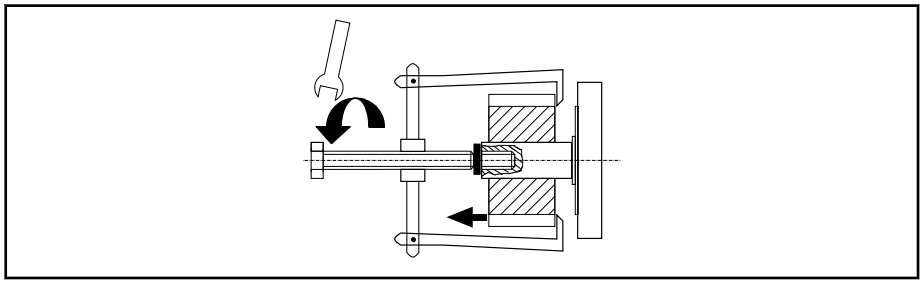
NOTICE

Motor damage due to strikes onto the motor shaft

▶ Do not strike the shaft end and do not exceed the allowed axial and radial forces of the motor.

Use suitable tools when disassembling transmission elements.

Pulling off



① Shim

Fig.9-1: Pulling off the transmission element

Use tools suitable for pulling off. Use a shim to protect the shaft end when using pulling-off tools. Heat the output element, if necessary.

9.2 Exchanging the Motor

⚠ WARNING

Lethal electric shock by live parts with more than 50 V!

The supply unit may only be replaced by qualified personnel which have been trained to perform the work on or with electrical devices.

The motor should be replaced by a motor of identical type. This is the only way to ensure that all parameterizations can remain unchanged. Moreover, repeated acceptance within the scope of the "Integrated switching technology" function is not required.

1. If necessary, note down the previous absolute value
2. Open the main switch
3. Ensure that the main switch cannot be accidentally switched on again
4. Disconnect plug connections

When exchanging the motor, close open plug sides of power connections with protection caps if moistening with coolant/lubricant or soiling must be expected (allowed soiling degree according to EN 50178: 2).

5. Exchange the motor

Observe the machine manufacturer's instructions when exchanging the motor mechanically.

6. Re-establish the plug connections
7. Re-establish the dimensional reference

⚠ WARNING **Risk of accidents due to unintentional axis movements!**

If servo axes are provided with an indirect position measuring system via the motor encoder, the dimensional reference is lost after motor replacement!

For this reason, the reference to the machine coordinate system must be re-established.

9.3 Preparing Storage

Before motors are stored, the protection covers on flange sockets, shaft and input openings for cooling water in case of liquid-cooled motors which were attached on delivery must be re-attached.

When motors are liquid-cooled, completely discharge the coolant from the cooling tubes (e.g., via purging the coolant holes with pressure air). This will prevent frost damage at storage temperatures lower than 0 °C.

10 Environmental Protection and Disposal

Production processes

The products are made in energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.

No release of hazardous substances

Our products do not contain any hazardous substances which may be released in case of appropriate use. Normally, our products will not have any negative influences on the environment.

Significant components

Basically, our motors consist of the following components: steel, aluminum, copper, brass, permanent magnets (rare earth metal), electronic components.

Return of products

Our products can be returned to us for disposal free of charge. However, this requires that the products be free from oil, grease or other dirt.

Furthermore, the products returned for disposal may not contain any undue foreign material or foreign components.

Send the products ”free domicile” to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Buergermeister-Dr.-Nebel-Strasse 2
97816 Lohr am Main, Germany

Permanent magnets

Permanent magnets present a serious danger during disposal.

⚠ WARNING **Danger due to permanent magnets!**

- Health hazard for persons with heart pacemakers, metallic implants and hearing aids in direct environment of permanent magnets.

- Crushing hazard of fingers and hand due to heavy attractive forces of the magnets.

- Risk of destruction of sensitive parts such as watches, credit cards, ...

Before disposal, permanent magnets must be demagnetized. This can be reached by thermal conditioning. The transport of magnetized rotors is forbidden.

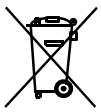
Packaging

Packaging materials consist of cardboard, wood and polystyrene and can be recycled anywhere without any problem.

For ecological reasons, please refrain from returning the empty packages to us.

Batteries and accumulators

Batteries and accumulators can be labeled with this symbol.



The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.

End users in the EU are legally bound to return used batteries. Outside the validity of the EU Directive 2006/66/EC, the particularly applicable regulations must be followed.

Used batteries can contain hazardous substances which can harm the environment or people's health when improperly stored or disposed of.

Environmental Protection and Disposal

After use, the batteries or accumulators contained in Rexroth products must be properly disposed of according to the country-specific collection systems.

Recycling

Most of the products can be recycled due to their high content of metal. In order to recycle the metal in the best possible way, the products must be disassembled into individual assemblies.

Metals contained in electric and electronic assemblies can also be recycled by means of special separation processes.

Plastic parts of the products may contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the applicable legal provisions.

11 Extension and Modification

11.1 Optional Accessories

11.1.1 Ready-made Connection Cables

	Title	Document type	Document number
🕮	Rexroth Connection Cables IndraDrive and IndraDyn	Selection data	DOK-CONNEC-CABLE*INDRV-AU❐❐-❐❐--P

Fig.11-1: Additional documentation

11.1.2 Fan Units

	Title	Document type	Document number
🕮	Rexroth IndraDyn S Synchronous Motors MSK	Project Planning Manual	DOK-MOTOR*-MSK********-PR❐❐-❐❐-P
🕮	Rexroth LEM-AB-116T, LEM-AB-140T	Package insert	DOK-MOTORx-LEMAB1XXTxx-IS01-D0-P
🕮	Rexroth LEM-AB-192T	Package insert	DOK-MOTORx-LEMAB192Txx-IS01-D0-P
🕮	Rexroth LEM-RB-116T, LEM-AB-140T	Package insert	DOK-MOTORx-LEMRB1XXTxx-IS01-D0-P
🕮	Rexroth LEM-RB-192T	Package insert	DOK-MOTORx-LEMRAB192Txx-IS01-D0-P

Fig.11-2: Additional documentation

Extension and Modification

11.1.3 Sealing Air Connection

In order to use sealing air in IndraDyn S motors, the system must have a compressed air connection. The required compressed air preparation system and the hoses for the compressed air must be provided by the customer.

Designation	Symbol	Unit	Value
Working pressure	p	bar	0,1 ± 0,05
Max. relative air humidity	φ	%	20…30
Air			Dust-free
			Oil-free
Required compressed air hose			4 × 0.75 (not included in scope of delivery)

Fig.11-3: Technical data for IndraDyn S sealing air connection

Use the SUP-M01-MSK accessory kit for motors with encoder connection RGS1000 and the SUP-M02-MSK accessory kit for motors with power connection RLS1300.

Proper functioning of the sealing air application requires a proper sealing function of the radial shaft sealing ring. Please observe the information about maintenance intervals (Fig.: 8.2).

Assembly

⚠ WARNING **Danger! Electric voltage! Operations in the vicinity of live parts are extremely dangerous.**

Work required on the electric system may only be carried out by skilled electricians. Tools for electricians (VDE tools) are absolutely necessary.

Prior to commencing work:

1. Isolate.
2. Protect the system or plant against restart.
3. Ensure de-energization.
4. Ground and short-circuit.
5. Cover or shield any adjacent live parts.

⚠ WARNING **Electrocution by live parts above 50 V!**

▸ Open machine sockets of the motor only when the system has been de-energized!

▸ Mount SUP-M01-MSK to encoder flange socket RGS1000 (Fig.: 11-4 and SUP-M02-MSK to power flange socket RLS1300 (Fig.: 11-5).

▸ Loosen the screws of the encoder plug cover and remove the cover.

▸ Mount the sealing air connection

▸ Screw the encoder plug cover with the air-pressure connector kit to the motor. Tightening torque of the screws RGS1000 1.3 Nm, RLS1300 3.1 Nm. Use screwlock (e.g., Loctite 243®)

▸ Connect the quick-action pneumatic coupling of the accessory kit to the regulated compressed air source.

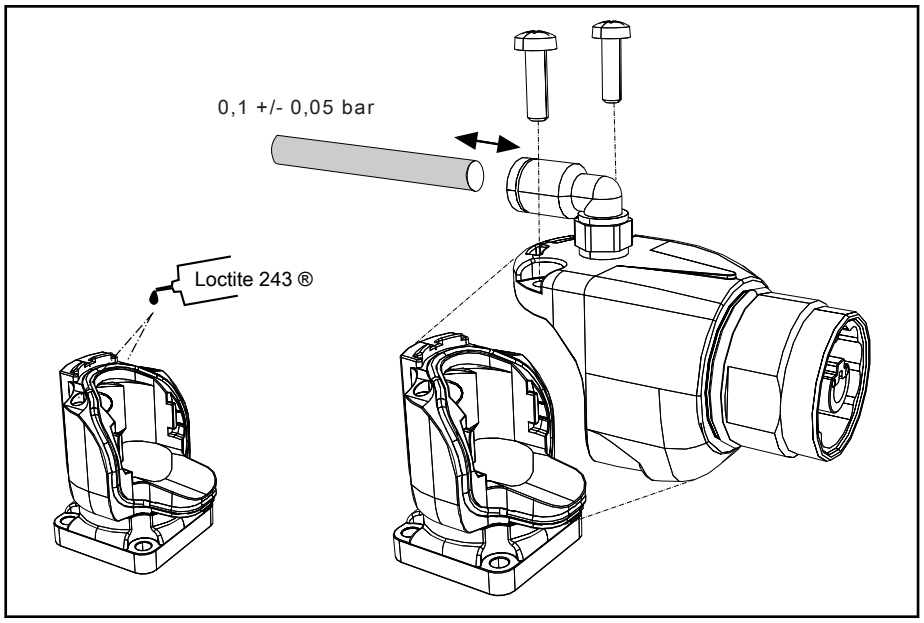


Fig.11-4: Mounting SUP-M01-MSK to RGS1000

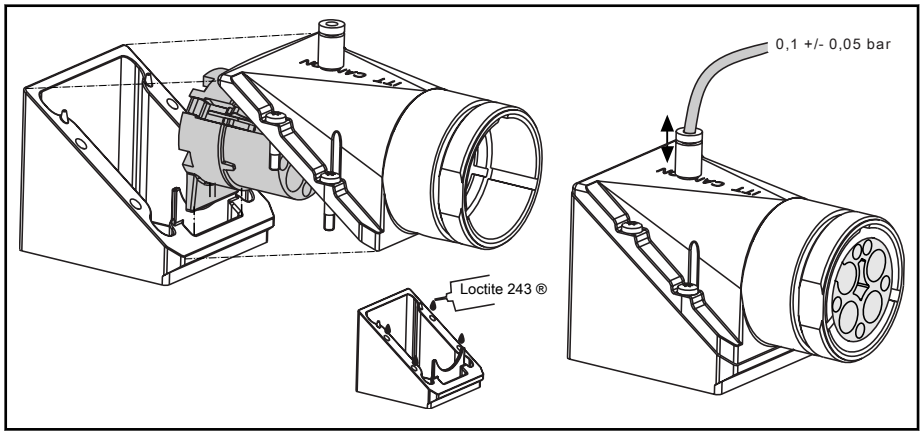


Fig.11-5: Mounting SUP-M02-MSK to RLS1300

12 Troubleshooting

12.1 Troubleshooting Procedure

As a matter of principle, the instructions in the project planning and commissioning manuals must be followed in case of failures and errors. If necessary, the manufacturer must be contacted.

Malfunction	Failure cause	Measures
The motor does not run	Drive enable is missing	Activate the drive enable
	Controller fault	Troubleshooting according to the documentation of the controller
	Supply voltage is missing	Check the supply voltage
	Brake is not released	Check the brake activation
Vibrations	Coupling elements or attachments are poorly balanced	Re-balance
	Adjustment of shaft end attachments (coupling, gearbox, ...) is insufficient	Re-align the attachments
	Mounting screws are loose	Lock the screw connections as specified
Running noise	Foreign bodies within the motor	Stop operation of the motor -> repair by manufacturer
	Bearing is damaged	Stop operation of the motor -> repair by manufacturer
High motor temperature Motor temperature monitoring unit responds	Operation outside of characteristic data	Reduce the load, check the sizing if necessary
	Heat dissipation is impaired	Clean the motor Clean the grille of the fan unit and check the function of the fan Check the coolant circuit of liquid cooling systems
Wrong or incorrect temperature displayed	Temperature sensor not connected	Connect the temperature sensor
	Temperature sensor is defective	Stop operation of the motor -> repair by manufacturer Connect the backup temperature sensor, if any is available.

Fig. 12-1: Measures to be taken in case of MSK motor failures

13 Technical Data

Technical data with operating characteristic curves are described in the project planning manual for all motor types. Please, refer to the following documentation for relevant information.

	Title	Document type	Document number
🕮	Rexroth IndraDyn S Synchronous Motors MSK	Project Planning Manual	DOK-MOTOR*-MSK********-PR❑❑-❑❑-P
🕮	Rexroth Indra Dyn S Synchronous Motors MSK for Hazardous Areas	Project Planning Manual	DOK-MOTOR*-MSK*EXGIIK3-PR❑❑-❑❑-P

Fig.13-1: Additional documentation

14 Appendix

14.1 Declarations of Conformity

Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Konformitätserklärung

Dok.-Nr.: **TC30318-1**
Datum: **2010-12-13**

- ☐ nach Maschinenrichtlinie 2006/42/EG
- ☒ nach Niederspannungsrichtlinie 2006/95/EG
- ☐ nach EMV-Richtlinie 2004/108/EG
- ☐ nach Druckgeräte-Richtlinie 97/23/EG
- ☐ nach ATEX-Richtlinie 94/9/EG

Hiermit erklärt der Hersteller,

Bosch Rexroth Electric Drives and Controls GmbH
Bürgermeister-Dr.-Nebel-Straße 2
97816 Lohr a. Main / Germany

dass das nachstehende Produkt

Bezeichnung:	AC-Motor
Typ:	MSK030, MSK040, MSK043, MSK050, MSK060, MSK061, MSK070, MSK071, MSK075, MSK076, MSK100, MSK101, MSK103, MSK131
Ab Herstelldatum:	2009-01-08

in Übereinstimmung mit der oben genannten EU-Richtlinie entwickelt, konstruiert und gefertigt wurde.

Angewandte harmonisierte Normen:

Norm	Titel	Ausgabe
EN 60034-1	Drehende elektrische Maschinen – Teil 1: Bemessung und Betriebsverhalten	2004
EN 60034-5	Drehende elektrische Maschinen – Teil 5: Schutzarten aufgrund der Gesamtkonstruktion von drehenden elektrischen Maschinen (IP-Code) – Einteilung	2001 + A1:2007

Weitere Erläuterungen:

Dieses Produkt ist eine Einbaukomponente, die aufgrund ihrer Einbaueigenschaften nicht vorneherein den Vorschriften für Endgeräte, Maschinen oder Anlagen entsprechen kann. Es darf daher nur zu Einbauzwecken verwendet werden.
Die Bewertung der elektrischen und mechanischen Sicherheit, der Umwelteinflüsse (Fremdkörper, Feuchtigkeit) muss im eingebauten Zustand am Endprodukt erfolgen.
Im eingebauten Zustand können sich die EMV-Eigenschaften dieses Produktes ändern.
Deshalb ist für das Endprodukt (Endgerät, Maschine, Anlagen) eine Überprüfung der EMV-Eigenschaften durch den Endproduktthersteller zweckmäßig.

Lohr a. Main (Ort), den 2010-12-13 (Datum) ppa. Joachim Hennig, Werkleitung LoP2 i.V. Eberhard Schemm, Entwicklungsbereichsleiter Antriebe

Änderungen im Inhalt der Konformitätserklärung sind vorbehalten. Derzeit gültige Ausgabe auf Anfrage.

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Fig. 14-1: CE conformity MSK

Appendix

Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Declaration of Conformity

(Translation of the original Declaration of Conformity)

Doc. No.: **TC30318-1**

Date: **2010-12-13**

- ☐ in accordance with Machinery Directive 2006/42/EC
- ☒ in accordance with Low Voltage Directive 2006/95/EC
- ☐ in accordance with EMC Directive 2004/108/EC
- ☐ in accordance with Pressure Equipment Directive 97/23/EC
- ☐ in accordance with ATEX Directive 94/9/EC

The manufacturer

Bosch Rexroth Electric Drives and Controls GmbH
Bürgermeister-Dr.-Nebel-Straße 2
97816 Lohr a. Main / Germany

hereby declares that the product below

Name: AC motor
Type: MSK030, MSK040, MSK043, MSK050, MSK060, MSK061, MSK070, MSK071, MSK075, MSK076, MSK100, MSK101, MSK103, MSK131

From date of manufacture: 2009-01-08

was developed, designed and manufactured in compliance with the above-mentioned EU directive.

Harmonized Standards applied:

Standard	Title	Edition
EN 60034-1	Rotating electrical machines – Part 1: Rating and performance	2004
EN 60034-5	Rotating electrical machines – Part 5: Degrees of protection provided by integral design of rotating electrical machines (IP code) - Classification	2001 + A1:2007

Further explanations:

This product is a built-in unit which, owing to its installation characteristics, is not able to comply with the regulations for complete apparatus, machines or installations from the outset. For this reason, it may only be used for built-in purposes. The product may only be assessed with regard to its electrical and mechanical safety as well as to environmental effects (foreign bodies, moisture) after it has been installed in the product intended for the final user.
After the product has been installed, its EMC properties may change. Hence the product intended for the final user (complete apparatus, machines or installations) should be inspected with regard to its EMC properties by the manufacturer of the product intended for the final user.

Place/date/signature as indicated in the original declaration.

We reserve the right to make changes to the content of the Declaration of Conformity. Current issue on request.

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Fig. 14-2: CE conformity MSK

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Notes

Rexroth
Bosch Group

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