

Rexroth IndraDyn S Synchronous Motors QSK061, -075

R911330321
Edition 02

Project Planning Manual



Title Rexroth IndraDyn S
Synchronous Motors
QSK061, -075

Type of Documentation Project Planning Manual

Document Typecode DOK-MOTOR*-QSK*****-PR02-EN-P

Internal File Reference RS-ba06b1c1239a6f210a6846a0013ec750-2-en-US-9

Record of Revision

| Edition | Release Date | Notes |
|-------------------------------|--------------|---------------|
| DOK-MOTOR*-QSK*****-PR01-EN-P | 10.2009 | First edition |
| DOK-MOTOR*-QSK*****-PR02-EN-P | 05.2011 | Amendment |

Copyright © Bosch Rexroth AG 2011

Copying this document, giving it to others and the use or communication of the contents thereof without express authority, are forbidden. Offenders are liable for the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design (DIN 34-1).

Validity The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract. All rights are reserved with respect to the content of this documentation and the availability of the product.

Published by Bosch Rexroth AG
Bgm.-Dr.-Nebel-Str. 2 ■ 97816 Lohr a. Main, Germany
Phone +49 (0)93 52 / 40-0 ■ Fax +49 (0)93 52 / 40-48 85
<http://www.boschrexroth.com/>
Dept.DC-IA/EDM3 (JW, MB)

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

Table of Contents

| | Page |
|---|-----------|
| 1 Important Instructions on Use..... | 5 |
| 1.1 Intended Use | 5 |
| 1.1.1 Introduction..... | 5 |
| 1.1.2 Areas of Use and Application..... | 5 |
| 1.2 Inappropriate Use..... | 6 |
| 2 Safety Instructions for Electric Drives and Controls..... | 7 |
| 2.1 Definitions of Terms..... | 7 |
| 2.2 General Information..... | 8 |
| 2.2.1 Using the Safety Instructions and Passing Them on to Others..... | 8 |
| 2.2.2 Requirements for Safe Use..... | 8 |
| 2.2.3 Hazards by Improper Use..... | 9 |
| 2.3 Instructions with Regard to Specific Dangers..... | 11 |
| 2.3.1 Protection Against Contact With Electrical Parts and Housings..... | 11 |
| 2.3.2 Protective Extra-Low Voltage as Protection Against Electric Shock | 12 |
| 2.3.3 Protection Against Dangerous Movements..... | 12 |
| 2.3.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting..... | 14 |
| 2.3.5 Protection Against Contact With Hot Parts..... | 14 |
| 2.3.6 Protection During Handling and Mounting..... | 15 |
| 2.3.7 Battery Safety..... | 15 |
| 2.3.8 Protection Against Pressurized Systems..... | 16 |
| 2.4 Explanation of Signal Words and the Safety Alert Symbol..... | 16 |
| 3 Type Codes..... | 19 |
| 3.1 Type Code QSK061 | 19 |
| 3.2 Type Code QSK075..... | 20 |
| 4 Technical Data..... | 21 |
| 4.1 Parameters on the Data Sheet..... | 21 |
| 4.2 Data Sheet QSK061B-0300..... | 24 |
| 4.3 Data Sheet QSK061C-0300..... | 26 |
| 4.4 Data Sheet QSK075C-0300..... | 28 |
| 4.5 Data Sheet QSK075D-0200..... | 30 |
| 4.6 Data Sheet QSK075D-0300..... | 32 |
| 4.7 Data Sheet QSK075E-0200..... | 34 |
| 5 Dimensions..... | 37 |
| 6 Connection Technique..... | 39 |
| 6.1 Electric Connection Technique Overview..... | 39 |

Table of Contents

| | Page |
|--|-----------|
| 7 Operating Conditions and Application Notes..... | 41 |
| 7.1 Ambient Conditions | 41 |
| 7.1.1 Setup Elevation and Ambient Temperature..... | 41 |
| 7.1.2 Humidity / Temperature | 42 |
| 7.1.3 Vibration..... | 42 |
| 7.1.4 Shock..... | 43 |
| 7.2 Degree of Protection..... | 44 |
| 7.3 Design and Installation Positions..... | 44 |
| 7.4 Compatibility with Foreign Materials..... | 45 |
| 7.5 Priming and Housing Varnish..... | 45 |
| 7.6 Output Shaft..... | 45 |
| 7.6.1 Plain Shaft..... | 45 |
| 7.6.2 Output Shaft with Shaft Sealing Ring..... | 46 |
| 7.7 Bearing and Shaft Load..... | 47 |
| 7.7.1 Radial Load, Axial Load..... | 47 |
| 7.7.2 Shaft Load QSK Motors | 49 |
| 7.8 Attachment of Drive Elements..... | 49 |
| 7.9 Holding Brakes | 51 |
| 7.9.1 Holding Brake Electrically-Released..... | 51 |
| 7.9.2 Holding Brakes - Notes Regarding Safety..... | 52 |
| 7.9.3 Layout of Holding Brakes..... | 53 |
| 7.9.4 Holding Brake-Commissioning and Maintenance Instructions | 53 |
| 7.10 Motor Cooling System..... | 54 |
| 7.11 Motor Temperature Monitoring..... | 54 |
| 7.11.1 General Information..... | 54 |
| 7.11.2 Temperature Sensor..... | 54 |
| 7.12 Acceptances and Authorizations..... | 56 |
| 7.12.1 CE Symbol..... | 56 |
| 8 Transport and Storage..... | 57 |
| 8.1 Notes about Transport..... | 57 |
| 8.2 Notes about Storage..... | 59 |
| 8.2.1 Storage Conditions..... | 59 |
| 8.2.2 Storage Periods..... | 60 |
| 9 Delivery Status, Identification, Handling..... | 61 |
| 9.1 State of Delivery..... | 61 |
| 9.1.1 General Information..... | 61 |
| 9.1.2 Inspection at the Factory..... | 61 |
| 9.1.3 Test Realized by the Customer..... | 61 |
| 9.2 Identification | 62 |
| 9.2.1 Scope of Delivery..... | 62 |
| 9.2.2 Type Plate..... | 62 |
| 9.3 Handling..... | 63 |

Table of Contents

| | Page |
|--|-----------|
| 10 Installation..... | 65 |
| 10.1 Safety..... | 65 |
| 10.2 Skilled Personnel..... | 65 |
| 10.3 Mechanical Attachment..... | 65 |
| 10.3.1 Flange Assembly..... | 65 |
| 10.3.2 Assembly Preparation..... | 66 |
| 10.3.3 Motor Assembly | 66 |
| 10.4 Electrical Connection – Connecting the Motor..... | 67 |
| 10.4.1 General Information..... | 67 |
| 10.4.2 Attaching the Connectors..... | 67 |
| 10.4.3 Adjusting the Output Direction | 68 |
| 11 Commissioning, Operation and Maintenance | 69 |
| 11.1 Commissioning..... | 69 |
| 11.2 Operation..... | 69 |
| 11.3 Deactivation..... | 69 |
| 11.4 Maintenance..... | 70 |
| 11.4.1 General Information..... | 70 |
| 11.4.2 Cleaning..... | 70 |
| 11.4.3 Bearings..... | 70 |
| 11.4.4 Connecting Cables..... | 71 |
| 11.5 Notice of Malfunctions | 72 |
| 11.6 Dismantling..... | 73 |
| 12 Environmental Protection and Disposal | 75 |
| 12.1 Environmental Protection..... | 75 |
| 12.2 Disposal..... | 75 |
| 13 Service and Support..... | 77 |
| Index..... | 79 |

1 Important Instructions on Use

1.1 Intended Use

1.1.1 Introduction

Rexroth products are developed and manufactured according to the state of the art. Before they are delivered, they are inspected to ensure that they operate safely.

WARNING

Personal injury and material damage due to improper use of the products

The products must only be used as intended. If they are not used as intended, situations may arise that result in personal injuries or damage to property.



Rexroth, as the manufacturer, does not provide any warranty, assume any liability, or pay any damages for damage caused by products not being used as intended. Any risks resulting from the products not being used as intended are the sole responsibility of the user.

Before using Rexroth products, the following condition precedent must be fulfilled so as to ensure that they are used as intended:

- Everyone who in any way whatsoever handles one of our products must read and understand the corresponding notes regarding safety and regarding the intended use.
- If the products are hardware, they must be kept in their original state, i.e. no constructional modifications must be made. Software products must not be decompiled; their source codes must not be modified.
- Damaged or improperly working products must not be installed or put into operation.
- It must be ensured that the products are installed according to the regulations specified in the documentation.

1.1.2 Areas of Use and Application

Rexroth IndraDyn S series synchronous motors QSK are designed to be used as rotary main and servo drive motors. The following are typical fields of application:

- Machine tools
- Printing and paper-processing machines,
- Packaging and Food-processing machines,
- Metal-forming machines
- Robotics

Device types with different driving powers and different interfaces are available for an application-specific use of the motors.

Controlling and monitoring of the motors may require connection of additional sensors and actuators.

Important Instructions on Use



QSK motors must only be used with the accessories specified in this documentation. Components that are not explicitly mentioned must neither be attached nor connected. The same is true for cables and lines.

The operation must only be carried out in the explicitly mentioned configurations and combinations of the component and with the software and firmware specified in the corresponding functional description.

Any connected drive control device must be programmed before startup in order to ensure that the motor executes the functions specifically to the particular application.

The QSK motors may only be operated under the assembly, mounting and installation conditions, in the normal position, and under the environmental conditions (temperature, degree of protection, humidity, EMC etc.) specified in this documentation.

1.2 Inappropriate Use

Any use of QSKmotors outside of the fields of application mentioned above or under operating conditions and technical data other than those specified in this documentation is considered as "non-intended use".

QSK motors may not be used if . . .

- They are subject to operating conditions which do not comply with the ambient conditions described above. For example, they must not be operated under water, under extreme temperature fluctuations or extreme maximum temperatures.
- The intended application is not explicitly released by Bosch Rexroth. Please make absolutely sure that the instructions given in the general safety notes are also complied with!

2 Safety Instructions for Electric Drives and Controls

2.1 Definitions of Terms

| | |
|----------------------------------|---|
| Application Documentation | Application documentation comprises the entire documentation used to inform the user of the product about the use and safety-relevant features for configuring, integrating, installing, mounting, commissioning, operating, maintaining, repairing and decommissioning the product. The following terms are also used for this kind of documentation: User Guide, Operation Manual, Commissioning Manual, Instruction Manual, Project Planning Manual, Application Manual, etc. |
| Component | A component is a combination of elements with a specified function, which are part of a piece of equipment, device or system. Components of the electric drive and control system are, for example, supply units, drive controllers, mains choke, mains filter, motors, cables, etc. |
| Control System | A control system comprises several interconnected control components placed on the market as a single functional unit. |
| Device | A device is a finished product with a defined function, intended for users and placed on the market as an individual piece of merchandise. |
| Electrical Equipment | Electrical equipment encompasses all devices used to generate, convert, transmit, distribute or apply electrical energy, such as electric motors, transformers, switching devices, cables, lines, power-consuming devices, circuit board assemblies, plug-in units, control cabinets, etc. |
| Electric Drive System | An electric drive system comprises all components from mains supply to motor shaft; this includes, for example, electric motor(s), motor encoder(s), supply units and drive controllers, as well as auxiliary and additional components, such as mains filter, mains choke and the corresponding lines and cables. |
| Installation | An installation consists of several devices or systems interconnected for a defined purpose and on a defined site which, however, are not intended to be placed on the market as a single functional unit. |
| Machine | A machine is the entirety of interconnected parts or units at least one of which is movable. Thus, a machine consists of the appropriate machine drive elements, as well as control and power circuits, which have been assembled for a specific application. A machine is, for example, intended for processing, treatment, movement or packaging of a material. The term "machine" also covers a combination of machines which are arranged and controlled in such a way that they function as a unified whole. |
| Manufacturer | The manufacturer is an individual or legal entity bearing responsibility for the design and manufacture of a product which is placed on the market in the individual's or legal entity's name. The manufacturer can use finished products, finished parts or finished elements, or contract out work to subcontractors. However, the manufacturer must always have overall control and possess the required authority to take responsibility for the product. |
| Product | Examples of a product: Device, component, part, system, software, firmware, among other things. |
| Project Planning Manual | A project planning manual is part of the application documentation used to support the sizing and planning of systems, machines or installations. |
| Qualified Persons | In terms of this application documentation, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their work requires. To comply with these qualifications, it is necessary, among other things, |

Safety Instructions for Electric Drives and Controls

- 1) to be trained, instructed or authorized to switch electric circuits and devices safely on and off, to ground them and to mark them
- 2) to be trained or instructed to maintain and use adequate safety equipment
- 3) to attend a course of instruction in first aid

User A user is a person installing, commissioning or using a product which has been placed on the market.

2.2 General Information

2.2.1 Using the Safety Instructions and Passing Them on to Others

Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.

If the component is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the component in the official language of the user's country.

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

2.2.2 Requirements for Safe Use

Read the following instructions before initial commissioning of the components of the electric drive and control system in order to eliminate the risk of injury and/or property damage. You must follow these safety instructions.

- Rexroth is not liable for damages resulting from failure to observe the safety instructions.
- Read the operating, maintenance and safety instructions in your language before commissioning. If you find that you cannot completely understand the application documentation in the available language, please ask your supplier to clarify.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.
- Only use accessories and spare parts approved by Rexroth.
- Follow the safety regulations and requirements of the country in which the components of the electric drive and control system are operated.
- Only use the components of the electric drive and control system in the manner that is defined as appropriate. See chapter "Appropriate Use".
- The ambient and operating conditions given in the available application documentation must be observed.
- Applications for functional safety are only allowed if clearly and explicitly specified in the application documentation "Integrated Safety Technology". If this is not the case, they are excluded. Functional safety is a safety

Safety Instructions for Electric Drives and Controls

concept in which measures of risk reduction for personal safety depend on electrical, electronic or programmable control systems.

- The information given in the application documentation with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturers must

- make sure that the delivered components are suited for their individual application and check the information given in this application documentation with regard to the use of the components,
- make sure that their individual application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only allowed once it is sure that the machine or installation in which the components are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only allowed if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective application documentation.

The machine or installation manufacturer is responsible for compliance with the limit values as prescribed in the national regulations.

- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.

National regulations which the user must take into account

- European countries: In accordance with European EN standards
- United States of America (USA):
 - National Electrical Code (NEC)
 - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
 - Regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
 - International Organization for Standardization (ISO)
 - International Electrotechnical Commission (IEC)

2.2.3 Hazards by Improper Use

- High electrical voltage and high working current! Danger to life or serious injury by electric shock!
- High electrical voltage by incorrect connection! Danger to life or injury by electric shock!
- Dangerous movements! Danger to life, serious injury or property damage by unintended motor movements!
- Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric drive systems!
- Risk of burns by hot housing surfaces!

Safety Instructions for Electric Drives and Controls

- Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!
- Risk of injury by improper handling of batteries!
- Risk of injury by improper handling of pressurized lines!

2.3 Instructions with Regard to Specific Dangers

2.3.1 Protection Against Contact With Electrical Parts and Housings



This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:
Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- Install the covers and guards provided for this purpose before switching on.
- Never touch electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.

Safety Instructions for Electric Drives and Controls

- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm² (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

| Cross section outer conductor | Minimum cross section equipment grounding conductor Leakage current ≥ 3.5 mA | |
|-------------------------------|--|----------------------------------|
| | 1 equipment grounding conductor | 2 equipment grounding conductors |
| 1.5 mm ² (16 AWG) | 10 mm ² (8 AWG) | 2 × 1.5 mm ² (16 AWG) |
| 2.5 mm ² (14 AWG) | | 2 × 2.5 mm ² (14 AWG) |
| 4 mm ² (12 AWG) | | 2 × 4 mm ² (12 AWG) |
| 6 mm ² (10 AWG) | | 2 × 6 mm ² (10 AWG) |
| 10 mm ² (8 AWG) | | - |
| 16 mm ² (6 AWG) | 16 mm ² (6 AWG) | - |
| 25 mm ² (4 AWG) | | - |
| 35 mm ² (2 AWG) | | - |
| 50 mm ² (1/0 AWG) | 25 mm ² (4 AWG) | - |
| 70 mm ² (2/0 AWG) | 35 mm ² (2 AWG) | - |
| ... | ... | ... |

Fig.2-1: Minimum Cross Section of the Equipment Grounding Connection

2.3.2 Protective Extra-Low Voltage as Protection Against Electric Shock

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

On components of an electric drive and control system provided by Rexroth, all connections and terminals with voltages between 5 and 50 volts are PELV ("Protective Extra-Low Voltage") systems. It is allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections.

Danger to life, risk of injury by electric shock! High electrical voltage by incorrect connection!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g., the mains connection) are connected to Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV ("Protective Extra-Low Voltage").

2.3.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

Safety Instructions for Electric Drives and Controls

- Improper or wrong wiring or cable connection
- Operator errors
- Wrong input of parameters before commissioning
- Malfunction of sensors and encoders
- Defective components
- Software or firmware errors

These errors can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

Dangerous movements! Danger to life, risk of injury, serious injury or property damage!

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, injury and/or property damage:

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
 - Safety fences
 - Safety guards
 - Protective coverings
 - Light barriers
- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.
- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equipment works. Do not operate the machine if the emergency stopping switch is not working.
- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.
- Make sure that the drives are brought to safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example,
 - mechanically securing the vertical axes,
 - adding an external braking/arrester/clamping mechanism or
 - ensuring sufficient counterbalancing of the vertical axes.

Safety Instructions for Electric Drives and Controls

- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") for:
 - Maintenance and repair work
 - Cleaning of equipment
 - Long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

2.3.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors or permanent magnets of electric motors represent a serious danger to persons with heart pacemakers, metal implants and hearing aids.

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric components!

- Persons with heart pacemakers and metal implants are not allowed to enter the following areas:
 - Areas in which components of the electric drive and control systems are mounted, commissioned and operated.
 - Areas in which parts of motors with permanent magnets are stored, repaired or mounted.
- If it is necessary for somebody with a heart pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of implanted heart pacemakers differs so greatly that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above.

2.3.5 Protection Against Contact With Hot Parts

Hot surfaces of components of the electric drive and control system. Risk of burns!

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!
- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C (140 °F)** during or after operation.
- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes!** The time required for cooling down is approximately five times the thermal time constant specified in the technical data.

Safety Instructions for Electric Drives and Controls

- After switching chokes, supply units and drive controllers off, wait **15 minutes** to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shieldings or barriers) or safety instructions in the application documentation.

2.3.6 Protection During Handling and Mounting

Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!

- Observe the relevant statutory regulations of accident prevention.
- Use suitable equipment for mounting and transport.
- Avoid jamming and crushing by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of falling!

2.3.7 Battery Safety

Batteries consist of active chemicals in a solid housing. Therefore, improper handling can cause injury or property damage.

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not attempt to recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries, do not damage the electrical parts installed in the devices.
- Only use the battery types specified for the product.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separately from other waste. Observe the national regulations of your country.

Safety Instructions for Electric Drives and Controls

2.3.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors and components cooled with liquids and compressed air can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricants. Improper handling of the connected supply systems, supply lines or connections can cause injuries or property damage.

Risk of injury by improper handling of pressurized lines!

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
- Observe the respective manufacturer's operating instructions.
- Before dismantling lines, relieve pressure and empty medium.
- Use suitable protective equipment (safety goggles, safety shoes, safety gloves, for example).
- Immediately clean up any spilled liquids from the floor due to the risk of falling!



Environmental protection and disposal! The agents (e.g., fluids) used to operate the product might not be environmentally friendly. Dispose of agents harmful to the environment separately from other waste. Observe the national regulations of your country.

2.4 Explanation of Signal Words and the Safety Alert Symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with ANSI Z535.6-2006).

The signal word is meant to draw the reader's attention to the safety instruction and identifies the hazard severity.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.

DANGER

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

WARNING

In case of non-compliance with this safety instruction, death or serious injury **could** occur.

CAUTION

In case of non-compliance with this safety instruction, minor or moderate injury **could** occur.

Safety Instructions for Electric Drives and Controls

NOTICE

In case of non-compliance with this safety instruction, property damage could occur.

3 Type Codes

3.1 Type Code QSK061

ZN-40024-061_NOR_N_EN_2008-03-27.fh11

| Abbrev. | Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |
|----------|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| Example: | | Q | S | K | 0 | 6 | 1 | C | - | 0 | 3 | 0 | 0 | - | N | N | - | M | 5 | - | U | G | 0 | - | N | N | N | N | | | | | | | | | | | | | | |

Product
QSK = QSK

Size
61 = 061

Length
Lengths = B, C

Winding
QSK061B = 0300
QSK061C = 0300

Cooling mode
Natural convection = NN

Encoder
Optical encoder, singleturn Hiperface, with 128 increments. = S5
Optical encoder, multiturn-absolute Hiperface, with 128 increments. = M5

Electrical connection
Plug, rotatable 240° = U

Shaft
Plain shaft with shaft sealing ring (standard). = G

Holding brake
Without holding brake = 0
Holding brake, electrically-released, 10 Nm = 1

Other design
None = NNNN

Fig.3-1: Type code QSK061

Type Codes

3.2 Type Code QSK075

ZN-40024-075_NOR_N_EN_2011-04-05.fh11

| Abbrev. | Column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 4 | | |
|----------|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|
| Example: | | Q | S | K | 0 | 7 | 5 | E | - | 0 | 3 | 0 | 0 | - | N | N | - | M | 5 | - | U | G | 0 | - | N | N | N | N | | | | | | | | | | | | | | | | | | |

Product
QSK = QSK

Size
75..... = 075

Length
Length = C, D, E

Winding
QSK075C = 0300
QSK075D = 0200, 0300
QSK075E = 0200, 0300

Cooling mode
Natural convection = NN

Encoder
Optical encoder, singleturn Hiperface,
with 128 increments = S5
Optical encoder, multiturn-absolute Hiperface,
with 128 increments = M5

Electrical connection
Plug, rotatable 240° = U

Shaft
Plain shaft with shaft sealing ring (standard) = G

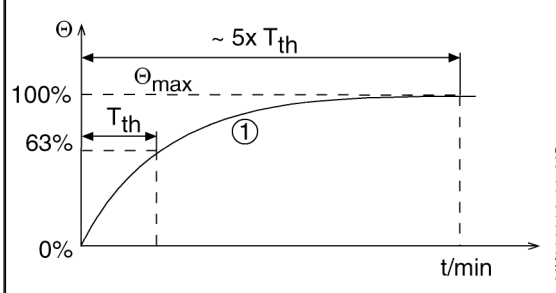
Holding brake
Without holding brake = 0
Holding brake, electrically-released, 23 Nm = 1

Other design
None = NNNN

Fig.3-2: Type code QSK075

4 Technical Data

4.1 Parameters on the Data Sheet

| Designation | Symbol | Unit | Description |
|---|-------------------|---------------------|---|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | Continuous torque that can be applied to the motor output shaft at a speed of $n \geq 0.1$ Hz. |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | Phase current (crest value) of the motor M_{dN} required for the continuous torque at standstill at a speed of $n \geq 0.1$ Hz. |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | Continuous torque that can be applied to the motor output shaft at a speed of $n \geq 0.1$ Hz. |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | Phase current (crest value) of the motor M_{0_100} required for the continuous torque at standstill at a speed of $n \geq 0.1$ Hz. |
| Maximum torque | M_{max} | Nm | The maximum torque that can be output for approx. 400 ms at maximum current I_{max} . The maximum torque that can be attained, depends on the controller used. Only the specified maximum torque in the selection lists is binding. |
| Maximum current | $I_{max(rms)}$ | A | Maximum, briefly permissible phase current of the motor winding without adverse affect on the permanent magnet circuit of the motor. |
| Torque constant at 20 °C ¹⁾ | K_{M_N} | Nm/A | Ratio of the created torque to the motor phase current at a motor temperature of 20 °C. Unit: (Nm/A). Applicable up to approx. $i = 2 \times I_{dN}$. |
| Voltage constant at 20 °C ²⁾ | K_{EMK_1000} | V/min ⁻¹ | Root-mean-square value of the induced motor voltage at a motor temperature of 20 °C and 1,000 revolutions per minute. |
| Winding resistance at 20 °C | R_{12} | ohms | Winding resistance measured between two winding ends in ohms (Ω). |
| Winding inductivity | L_{12} | mH | Inductivity measured between two phases in (mH). |
| Discharge capacity of the component | C_{dis} | nF | Discharge capacity |
| Number of pole pairs | p | - | Number of pole pairs |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | Moment of inertia of the rotor without the optional holding brake. Unit = kgm ² . |
| Thermal time constant | T_{th} | min | <p>Time of the temperature increase to 63 % of the maximum temperature of the motor housing with the motor loaded with the permissible S1 continuous torque. (T_{th} Thermal time constant) .</p>  <p>① : Chronological course of the motor housing temperature Θ_{max} : Highest temperature (motor housing)</p> |
| Maximum speed | n_{max} | min ⁻¹ | Maximum permissible speed of the motor. Limiting factors can have mechanical (centrifugal forces, bearing stress) or electrical (DC link voltage) causes. |
| Sound pressure level | L_P | dB(A) | Value of sound emission |
| Weight ³⁾ | m | kg | Motor mass |

Technical Data

| Designation | Symbol | Unit | Description |
|--|-----------------|------------------|--|
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 |
| Degree of protection according to IEC 60529 | | - | IP65 |
| Insulation class according to DIN EN 60034-1 | | - | Insulation class |
| Encoder | | | |
| Current consumption max. | $I_{Encoder}$ | mA | Maximum current consumption of encoder |
| Power supply voltage | $VCC_{Encoder}$ | V | Power supply voltage of encoder |
| Number of lines | - | - | Number of lines |
| Incremental signals | - | - | Incremental signals |
| Distinguishable revolutions | - | - | Distinguishable revolutions |
| Electric interface | - | - | Electric interface |
| Holding brake (optional) | | | |
| Holding torque | M_4 | Nm | Transferable holding torque |
| Rated voltage (+/-10 %) | U_N | V | Input voltage of the holding brake |
| Rated current | I_N | A | Current consumption of the holding brake |
| Connection time | t_1 | ms | Response delay during connection |
| Disconnection time | t_2 | ms | Disconnection time |
| Moment of inertia of the brake | J_{Br} | kgm ² | Moment of inertia of the holding brake. Has to be added to the moment of inertia of the rotor. |

1) 2)

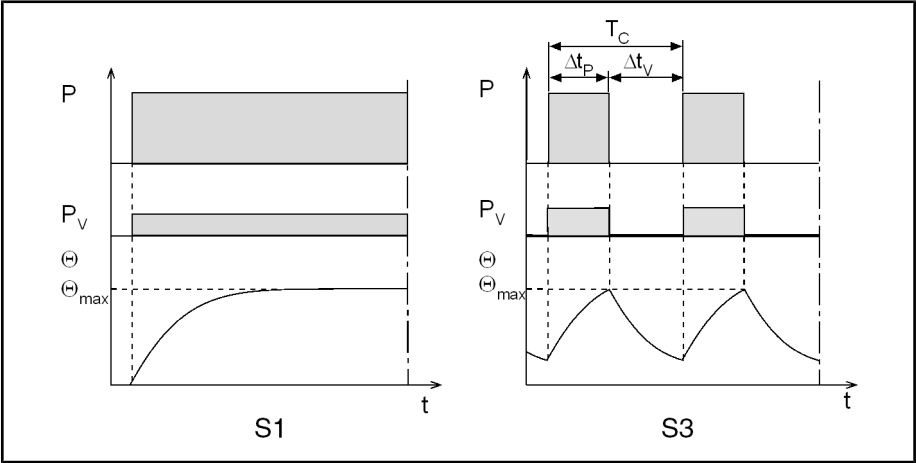
3)

Manufacturing tolerance ±5 %
Mass motor without holding brake

Fig.4-1: QSK - Definition of Parameters

Operating Modes

IndraDyn S motors are documented according to the inspection criteria and measurement procedures of EN 60034-1. The specified characteristic curves correspond to operating mode S1 or S3.



P

PV

Θ

Θmax

t

TC

ΔtP

ΔtV

Load

Electric losses

Temperature

Highest temperature (motor housing)

Time

Cycle time

Operating time with constant load

Idling time

Fig.4-2: Operating modes according to EN 60034-1:1998

Technical Data

Duty Cycle Operating mode S3 is supplemented by the specification of the duty cycle (ED) in %. The duty cycle is calculated as follows:

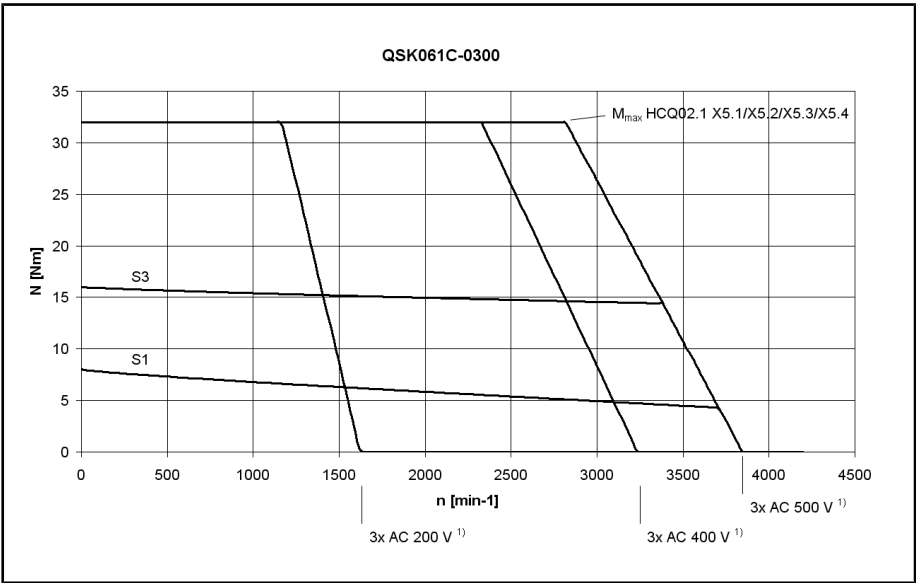
$$ED = \frac{\Delta t_p}{T_c} \cdot 100\%$$

ED Relative duty cycle in %
 Δt_p Operating time with constant load
Fig.4-3: *Relative duty cycle*

The values specified in the documentation have been determined on the basis of the following parameters:

Cycle time: 10 min
Duty cycle (DC): 25 %

Example of a motor characteristic curve



S1 Continuous operation curve S1 (60K) of the motor (according to EN 60034-1; 1998), natural convection
S3 Intermittent operation curve
1) Characteristic voltage limit curve. When a speed at the safe commutation limit is reached, the voltage limit curve limits the available maximum torque M_{max} . Input terminal voltage on HCQ controller (tolerance -5 %) see details in characteristic curves.

Fig.4-4: Example of a characteristic curve of a motor

Technical Data

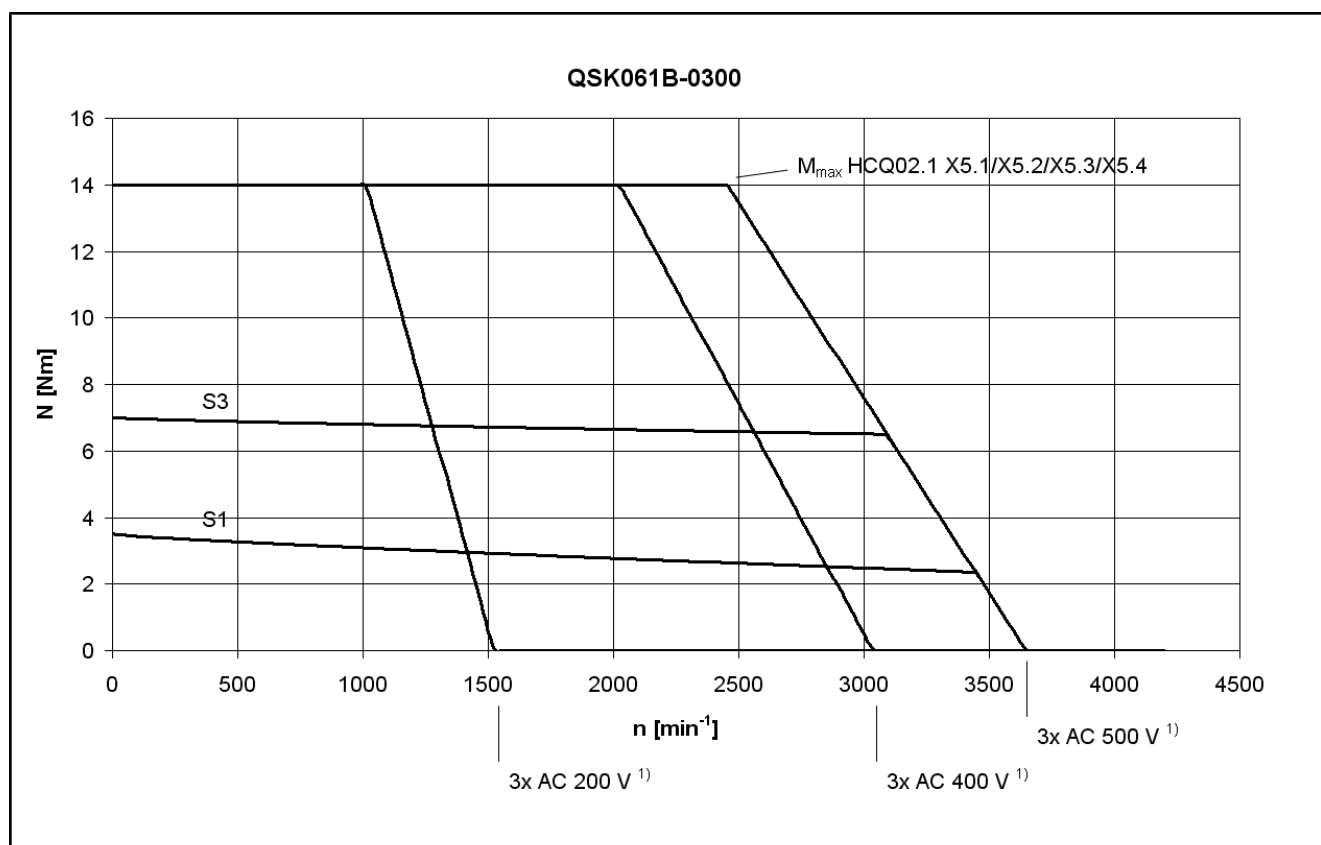
4.2 Data Sheet QSK061B-0300

| Designation | Symbol | Unit | QSK061B-0300-NN-□□-UG□-NNNN | |
|---|-------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 3.5 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 1.9 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 3.9 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 2.1 | |
| Maximum torque | M_{max} | Nm | 14.0 | |
| Maximum current | $I_{max(rms)}$ | A | 8.6 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 2.05 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 126.4 | |
| Winding resistance at 20 °C | R_{12} | ohms | 13.50 | |
| Winding inductivity | L_{12} | mH | 44.000 | |
| Discharge capacity of the component | C_{dis} | nF | 1.8 | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00044 | |
| Thermal time constant | T_{th} | min | 15.0 | |
| Maximum speed | n_{max} | min ⁻¹ | 4200 | |
| Sound pressure level | L_P | | 60.9 (±3) | |
| Weight ²⁾ | m_{mot} | kg | 5.7 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Degree of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $VCC_{Encoder}$ | V | 7...12 | |
| Encoder signal periods | \sim/I | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 10.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.75 |
| Connection time | t_1 | ms | - | 25 |
| Disconnection time | t_2 | ms | - | 40 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0000590 |

Latest amendment: 2009-04-02

- 1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-5: QSK - technical data

Technical Data



S1 Characteristic continuous operation curve

S3 Characteristic curve intermittent operation

1) Power supply voltage -5 %

Fig.4-6: Characteristic curve QSK061B-0300 on HCQ02.1

Technical Data

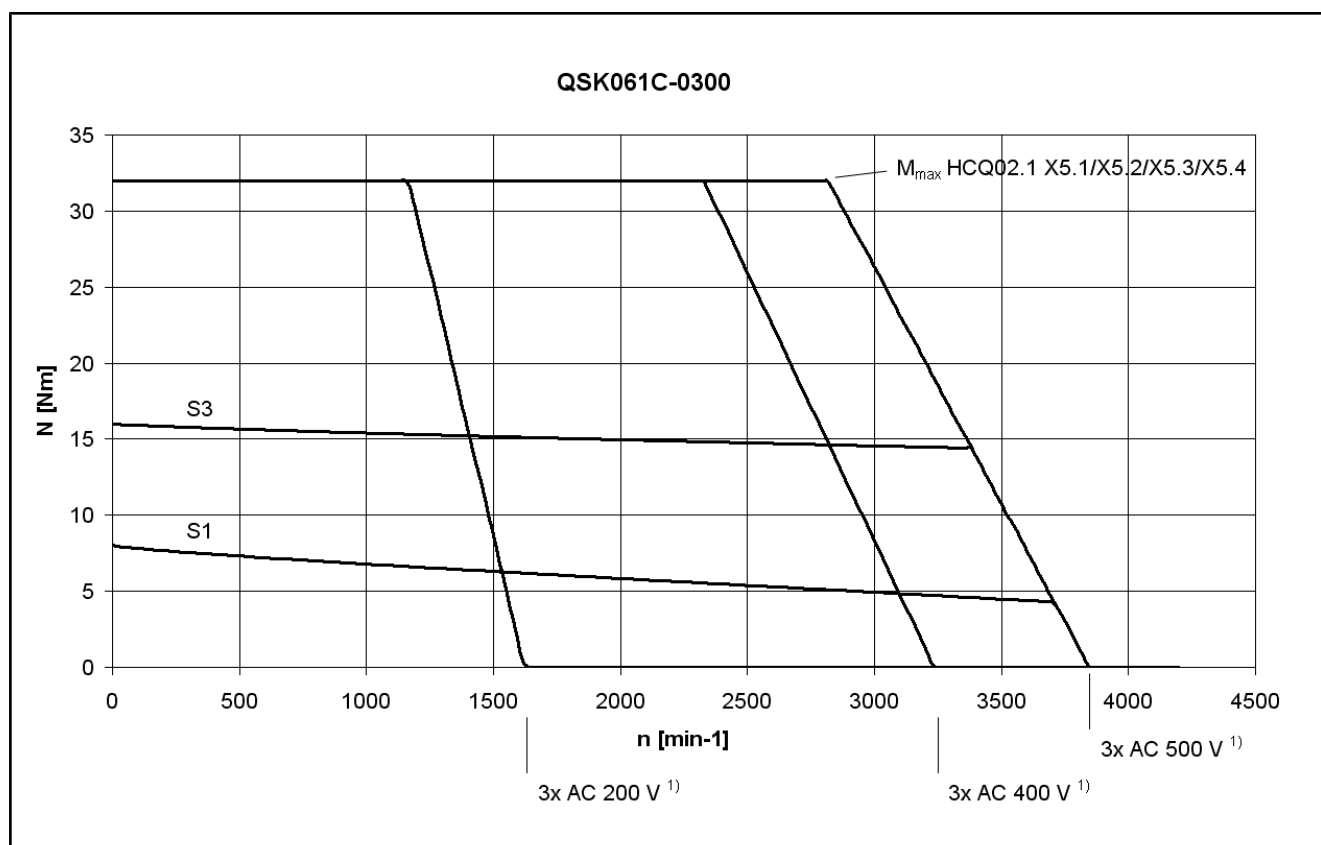
4.3 Data Sheet QSK061C-0300

| Designation | Symbol | Unit | QSK061C-0300-NN-□□-UG□-NNNN | |
|---|---------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 8.0 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 4.3 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 9.0 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 4.8 | |
| Maximum torque | M_{max} | Nm | 32.0 | |
| Maximum current | $I_{max(rms)}$ | A | 19.4 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 2.04 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 125.7 | |
| Winding resistance at 20 °C | R_{12} | ohms | 4.50 | |
| Winding inductivity | L_{12} | mH | 21.400 | |
| Discharge capacity of the component | C_{dis} | nF | 2.4 | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00075 | |
| Thermal time constant | T_{th} | min | 18.0 | |
| Maximum speed | n_{max} | min ⁻¹ | 4200 | |
| Sound pressure level | L_P | dB[A] | 60.9 (±3) | |
| Mass | m_{mot} | kg | 8.8 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Degree of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $V_{CC_{En-coder}}$ | V | 7...12 | |
| Encoder signal periods | \sim/I | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 10.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.75 |
| Connection time | t_1 | ms | - | 25 |
| Disconnection time | t_2 | ms | - | 40 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0000590 |

Latest amendment: 2008-05-30

1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-7: QSK - technical data

Technical Data



S1 Characteristic continuous operation curve

S3 Characteristic curve intermitted operation

1) Power supply voltage -5 %

Fig.4-8: Characteristic curve QSK061C-0300 on HCQ02.1

Technical Data

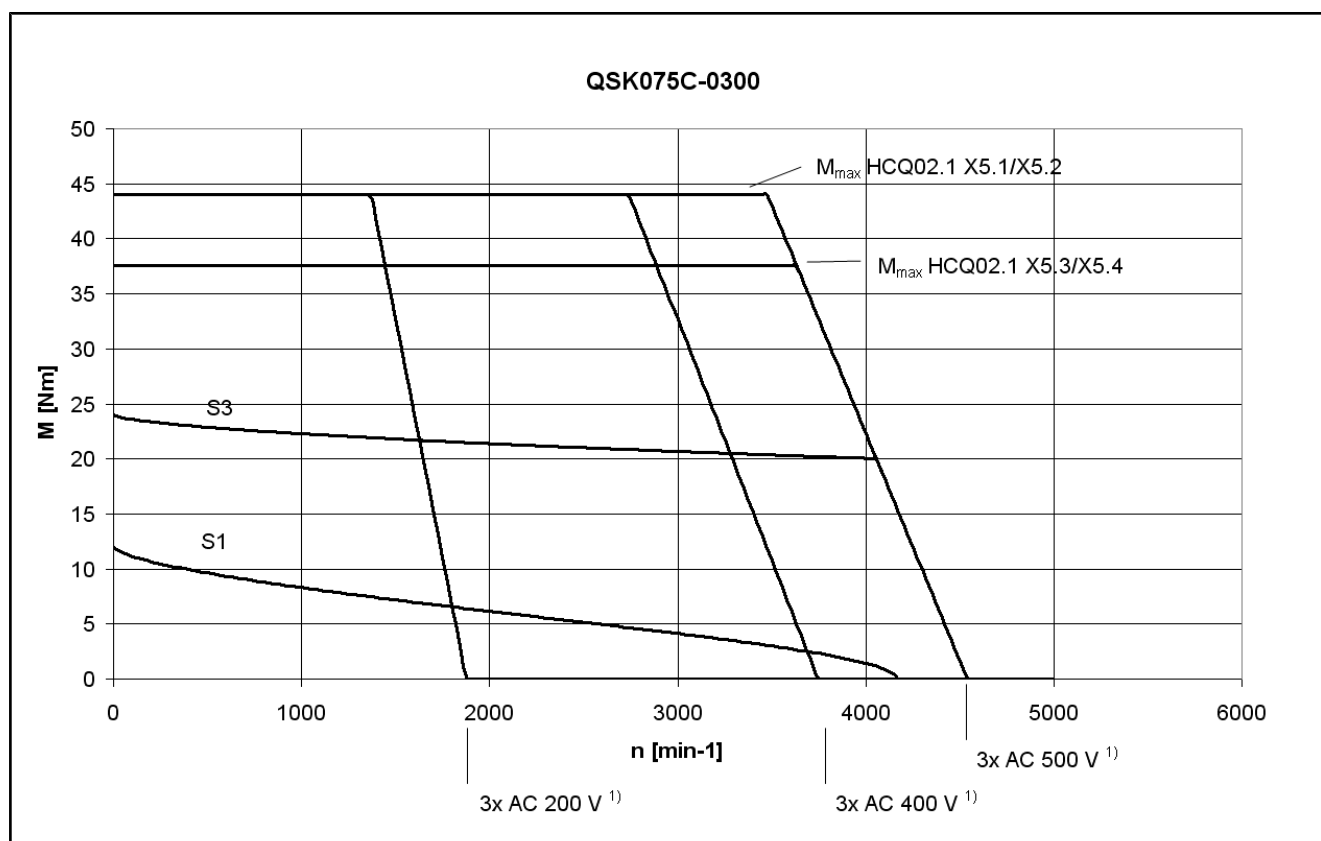
4.4 Data Sheet QSK075C-0300

| Designation | Symbol | Unit | QSK075C-0300-NN-□□-UG□-NNNN | |
|---|-------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 12.0 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 8.4 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 12.5 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 8.8 | |
| Maximum torque | M_{max} | Nm | 44.0 | |
| Maximum current | $I_{max(rms)}$ | A | 37.8 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 1.58 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 97.0 | |
| Winding resistance at 20 °C | R_{12} | ohms | 1.60 | |
| Winding inductivity | L_{12} | mH | 8.800 | |
| Discharge capacity of the component | C_{dis} | nF | 3.2 | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00352 | |
| Thermal time constant | T_{th} | min | 17.5 | |
| Maximum speed | n_{max} | min ⁻¹ | 5000 | |
| Sound pressure level | L_P | dB[A] | 61.1 (±3) | |
| Weight ²⁾ | m_{mot} | kg | 16.4 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Type of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $VCC_{Encoder}$ | V | 7...12 | |
| Encoder signal periods | \sim/\square | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 23.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.79 |
| Connection time | t_1 | ms | - | 130 |
| Disconnection time | t_2 | ms | - | 180 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0003000 |

Latest amendment: 2011-05-09

- 1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-9: QSK - technical data

Technical Data



S1 Characteristic continuous operation curve

S3 Characteristic curve intermitted operation

1) Power supply voltage -5 %

Fig. 4-10: Characteristic curve QSK075C-0300 on HCQ02.1

Technical Data

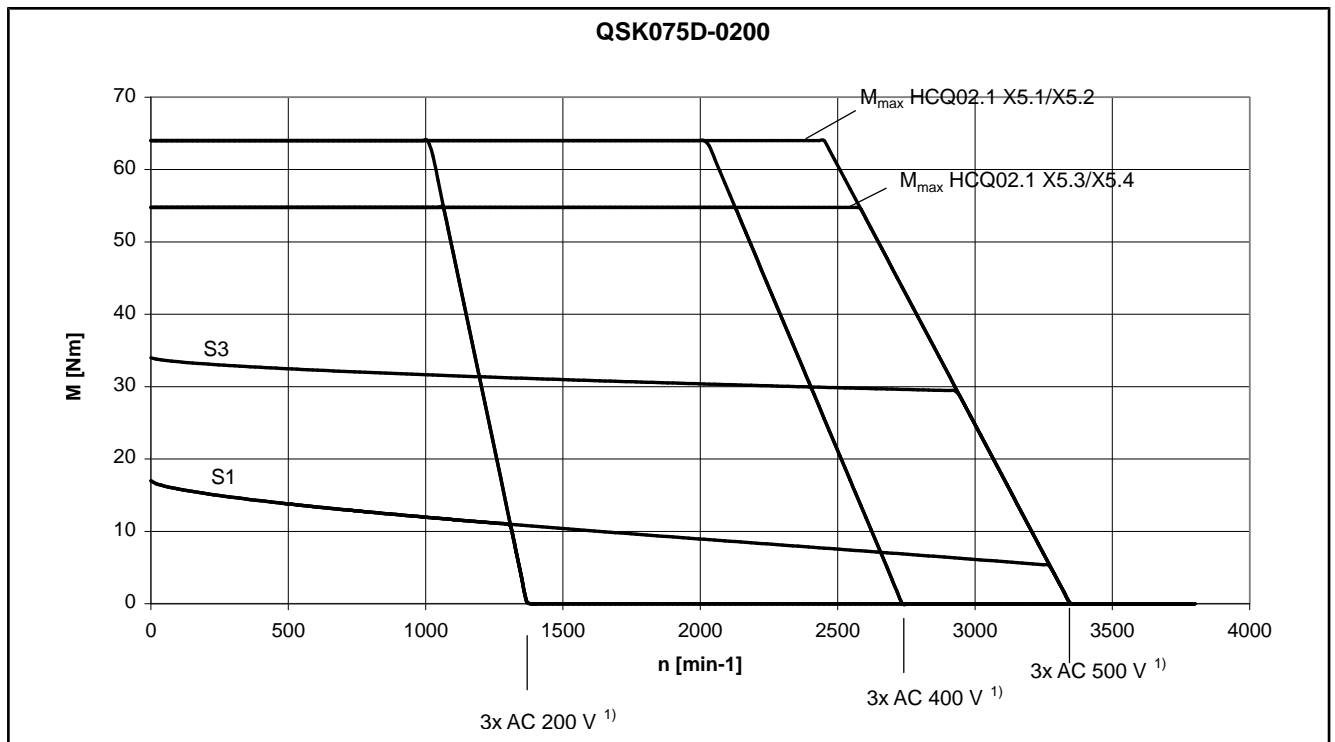
4.5 Data Sheet QSK075D-0200

| Designation | Symbol | Unit | QSK075D-0200-NN-□□-UG□-NNNN | |
|---|---------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 17.0 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 8.3 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 18.5 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 9.0 | |
| Maximum torque | M_{max} | Nm | 64.0 | |
| Maximum current | $I_{max(rms)}$ | A | 37.4 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 2.24 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 138.0 | |
| Winding resistance at 20 °C | R_{12} | ohms | 1.80 | |
| Winding inductivity | L_{12} | mH | 11.700 | |
| Discharge capacity of the component | C_{dis} | nF | 4.6 | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00490 | |
| Thermal time constant | T_{th} | min | 22.0 | |
| Maximum speed | n_{max} | min ⁻¹ | 3800 | |
| Sound pressure level | L_P | dB[A] | 61.1 (±3) | |
| Mass | m_{mot} | kg | 20.1 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Degree of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $V_{CC_{En-coder}}$ | V | 7...12 | |
| Encoder signal periods | \sim/I | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 23.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.79 |
| Connection time | t_1 | ms | - | 130 |
| Disconnection time | t_2 | ms | - | 180 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0003000 |

Latest amendment: 2011-05-09

- 1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-11: QSK - technical data

Technical Data



S1 Characteristic continuous operation curve
 S3 Characteristic curve intermittent operation; only in connection with HCQ02.1 X5.1/X5.2

1) Power supply voltage -5 %

Fig.4-12: Characteristic curve QSK075D-0200 on HCQ02.1

Technical Data

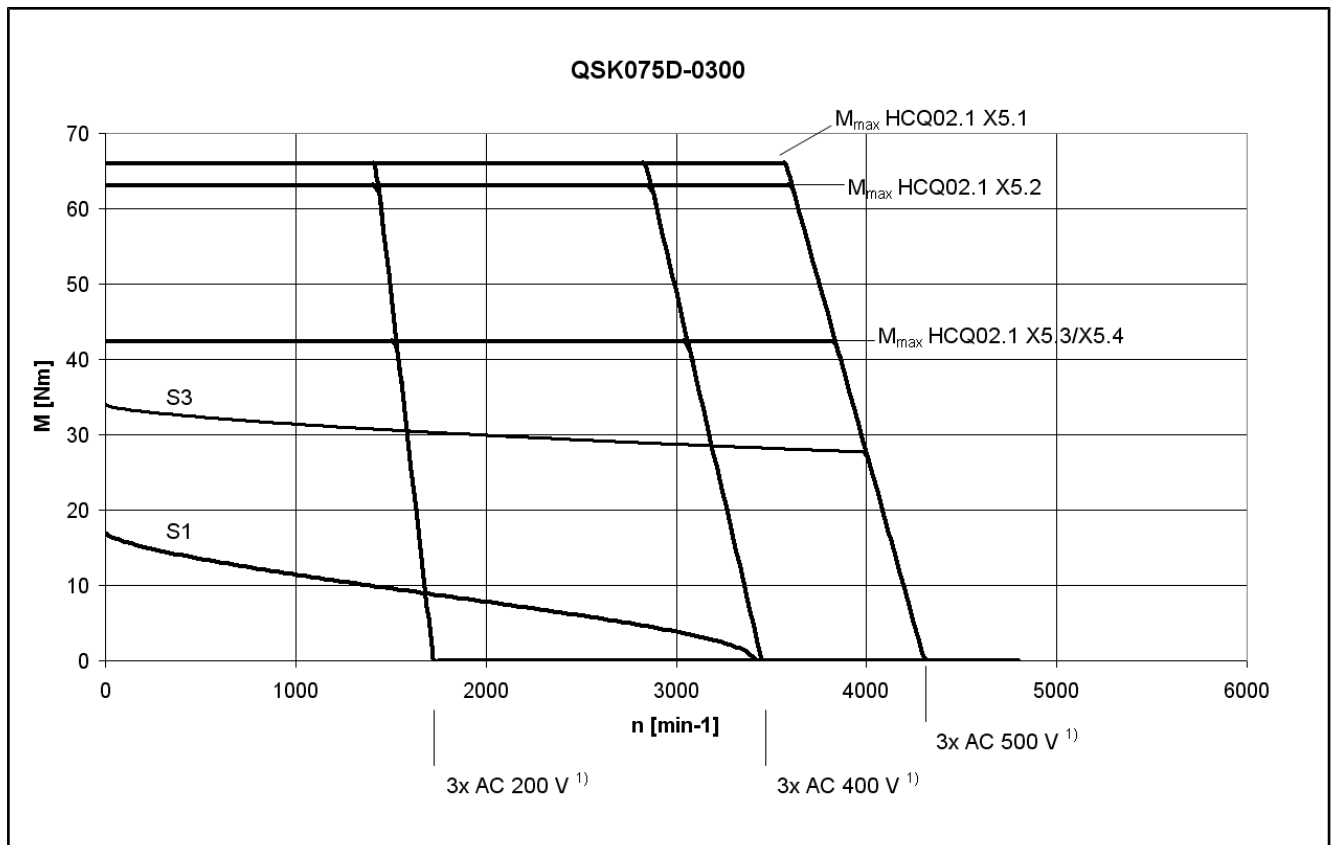
4.6 Data Sheet QSK075D-0300

| Designation | Symbol | Unit | QSK075D-0300-NN-□□-UG□-NNNN | |
|---|---------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 17.0 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 11.7 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 18.5 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 12.7 | |
| Maximum torque | M_{max} | Nm | 66.0 | |
| Maximum current | $I_{max(rms)}$ | A | 52.7 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 1.60 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 98.2 | |
| Winding resistance at 20 °C | R_{12} | ohms | 0.91 | |
| Winding inductivity | L_{12} | mH | 5.700 | |
| Discharge capacity of the component | C_{dis} | | | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00490 | |
| Thermal time constant | T_{th} | min | 22.0 | |
| Maximum speed | n_{max} | min ⁻¹ | 4800 | |
| Sound pressure level | L_P | dB[A] | 61.1 (±3) | |
| Weight ²⁾ | m_{mot} | kg | 20.1 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Degree of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $V_{CC_{En-coder}}$ | V | 7...12 | |
| Encoder signal periods | \sim/I | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 23.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.79 |
| Connection time | t_1 | ms | - | 130 |
| Disconnection time | t_2 | ms | - | 180 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0003000 |

Latest amendment: 2011-05-11

- 1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-13: QSK - technical data

Technical Data



- S1 Characteristic continuous operation curve
S3 Characteristic curve intermitted operation; only in connection with HCQ02.1 X5.1/X5.2
1) Power supply voltage -5 %
Fig. 4-14: *Characteristic curve QSK075D-0300 on HCQ02.1*

Technical Data

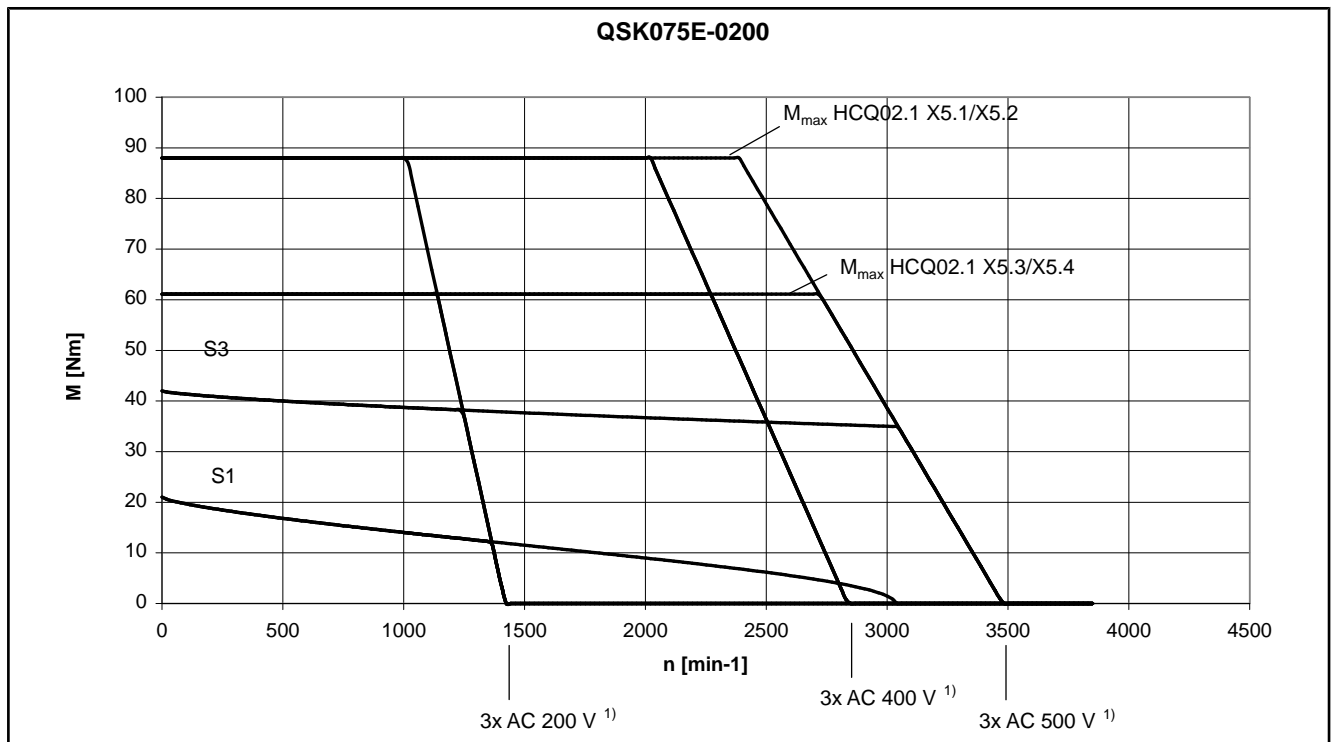
4.7 Data Sheet QSK075E-0200

| Designation | Symbol | Unit | QSK075E-0200-NN-□□-UG□-NNNN | |
|---|---------------------|---------------------|-----------------------------|-----------|
| Continuous torque at standstill 60 K | M_{0_60} | Nm | 21.0 | |
| Continuous current at standstill 60 K | $I_{0_60(rms)}$ | A | 10.2 | |
| Continuous torque at standstill 100 K | M_{0_100} | Nm | 23.0 | |
| Continuous current at standstill 100 K | $I_{0_100(rms)}$ | A | 11.2 | |
| Maximum torque | M_{max} | Nm | 88.0 | |
| Maximum current | $I_{max(rms)}$ | A | 45.9 | |
| Torque constant at 20 °C | K_{M_N} | Nm/A | 2.26 | |
| Voltage constant at 20 °C ¹⁾ | K_{EMK_1000} | V/min ⁻¹ | 139.0 | |
| Winding resistance at 20 °C | R_{12} | ohms | 1.24 | |
| Winding inductivity | L_{12} | mH | 8.400 | |
| Discharge capacity of the component | C_{dis} | nF | 5.8 | |
| Number of pole pairs | p | - | 4 | |
| Moment of inertia of the rotor | J_{rot} | kg*m ² | 0.00613 | |
| Thermal time constant | T_{th} | min | 29.0 | |
| Maximum speed | n_{max} | min ⁻¹ | 3850 | |
| Sound pressure level | L_P | dB[A] | 61.1 (±3) | |
| Weight ²⁾ | m_{mot} | kg | 23.6 | |
| Ambient temperature in operation | T_{amb} | °C | 0 ... 40 | |
| Degree of protection according to IEC 60529 | IP | - | IP65 | |
| Temperature class according to DIN EN 60034-1 | I.CL. | - | 155 | |
| Data encoder | | | M5 | S5 |
| Max. current consumption encoder | $I_{Encoder}$ | mA | 60 | |
| Encoder supply voltage | $V_{CC_{En-coder}}$ | V | 7...12 | |
| Encoder signal periods | \sim/I | - | 128 | |
| Encoder output signal | V_{out} | | 1V _{ss} | |
| Distinguishable revolutions | U_{turn} | - | 4096 | 1 |
| Encoder interface | - | - | Hiperface | |
| Holding brake data | | | 0 | 1 |
| Holding torque | M_4 | Nm | - | 23.00 |
| Input voltage (±10%) | U_N | V | - | 24 |
| Rated current | I_N | A | - | 0.79 |
| Connection time | t_1 | ms | - | 130 |
| Disconnection time | t_2 | ms | - | 180 |
| Moment of inertia of the holding brake | J_{br} | kg*m ² | - | 0.0003000 |

Latest amendment: 2011-05-11

- 1) Manufacturing tolerance ±5 %
 2) Mass motor without holding brake
 Fig.4-15: QSK - technical data

Technical Data



- S1 Characteristic continuous operation curve
 S3 Characteristic curve intermittent operation; only in connection with HCQ02.1 X5.1/X5.2
 1) Power supply voltage -5 %

Fig.4-16: Characteristic curve QSK075E-0200 on HCQ02.1

5 Dimensions

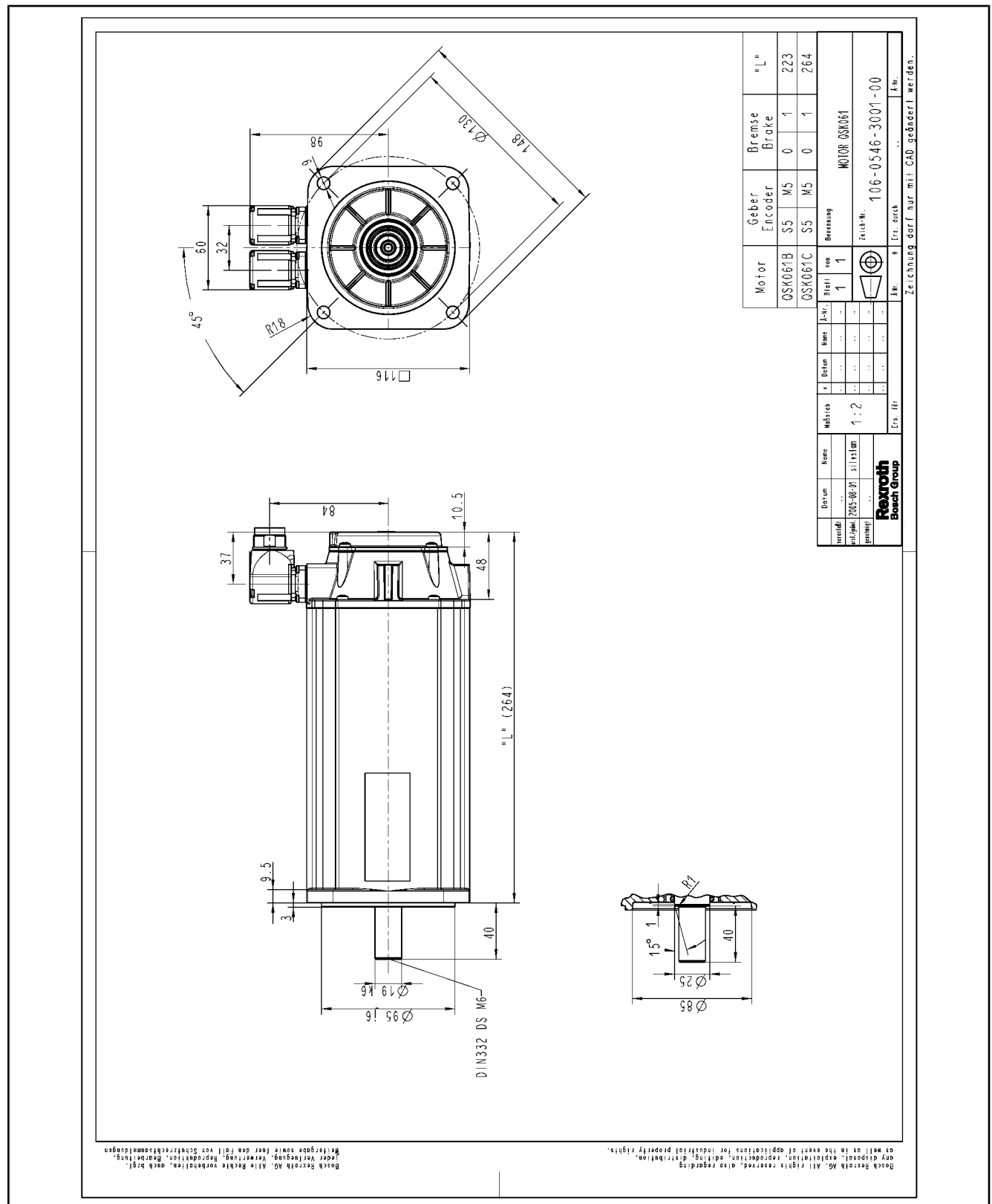


Fig.5-1: Dimensions QSK061

Dimensions

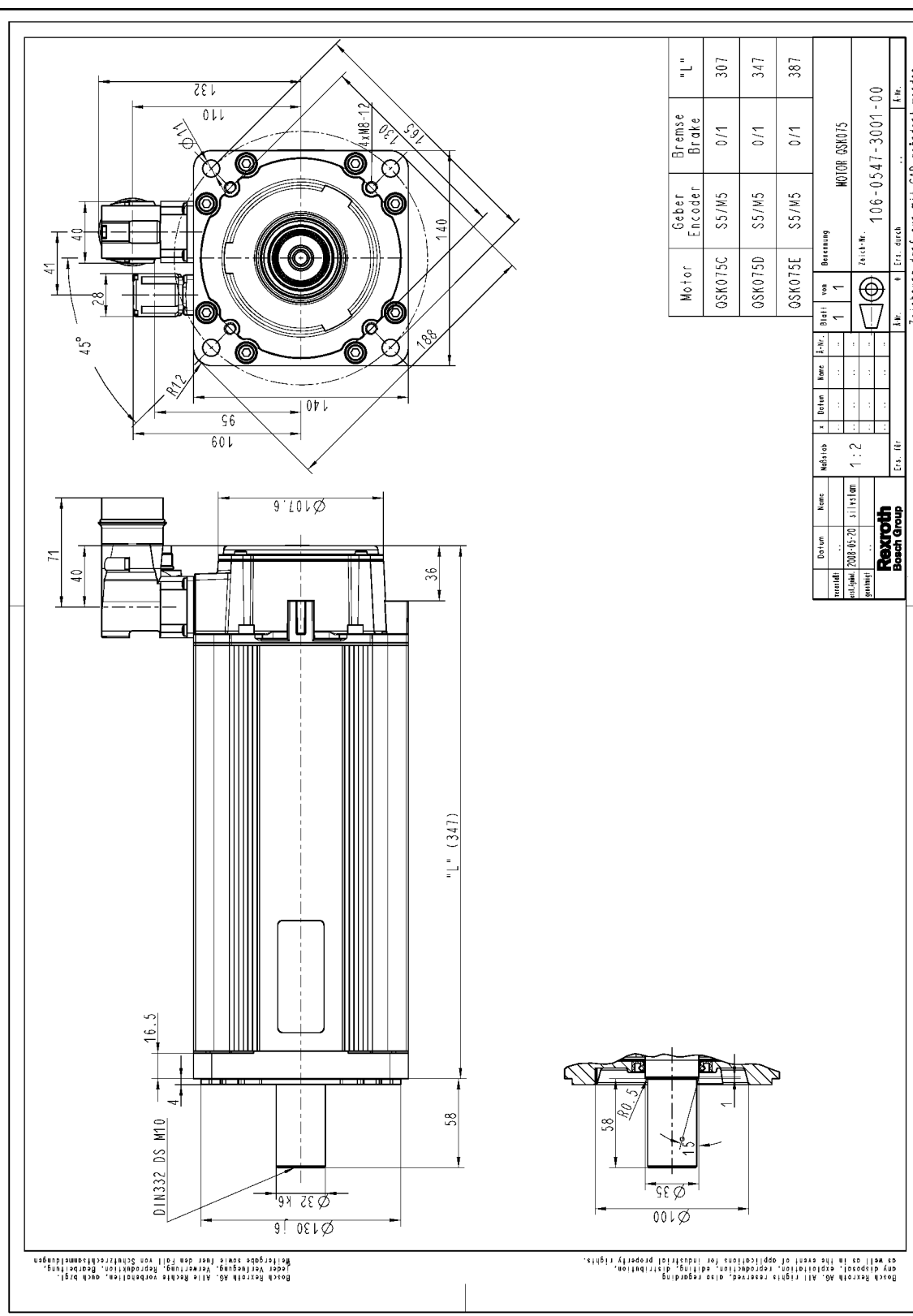


Fig.5-2: Dimensions QSK075

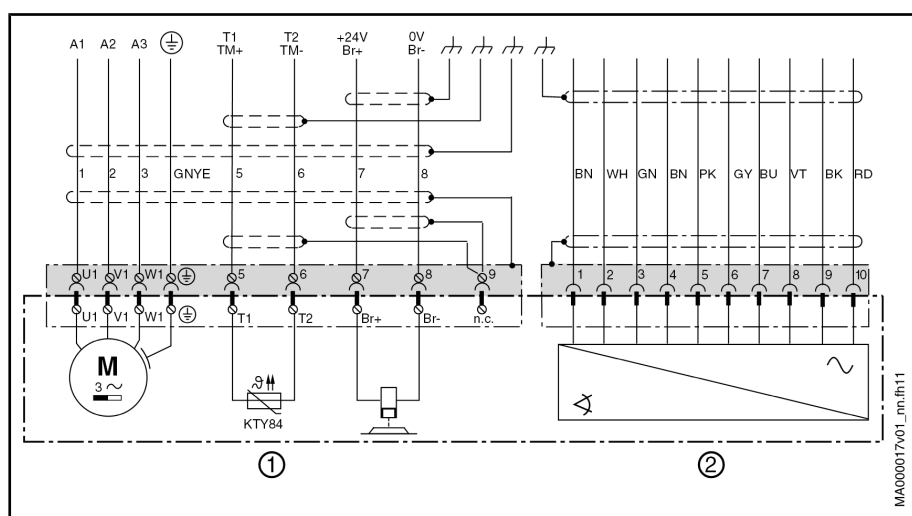
6 Connection Technique

6.1 Electric Connection Technique Overview

The electrical connections of IndraDyn S motors are standardized over all frame sizes. IndraDyn S motors are provided with

- a power connector, incl. connection for temperature sensor and holding brake,
- an encoder connection.

Both connectors are designed as plug-in connectors. When ready-made cables of Rexroth are used, a simple, fast and error-free assembly and commissioning is ensured.



- ① Power connection with temperature sensor and holding brake
② Encoder connection

Fig. 6-1: Overview of IndraDyn S connections I

QSK connector

| Motor | Power connector | Encoder connector |
|--------|-----------------|-------------------|
| QSK061 | RLS1100 | RGS1000 |
| QSK075 | RLS1200 | RGS1000 |

Fig. 6-2: Connector on QSK motors

The maximum cable length for power and encoder cables between HCQ02.1 or HCT02.1 controllers and QSK motors is **40 m**.

Connection cables (power, ready-made)

| Motor | Order designation cable | Cross section [mm²] | Converter |
|--------------|-------------------------|---------------------|------------------|
| QSK061B-0300 | RKL0020 | 1.0 | HCT02.1, HCQ02.1 |
| QSK061C-0300 | RKL0020 | 1.0 | HCT02.1, HCQ02.1 |
| QSK075C-0300 | RKL0022 | 1.5 | HCT02.1, HCQ02.1 |

Connection Technique

| Motor | Order designation cable | Cross section [mm ²] | Converter |
|------------------------------|----------------------------|-------------------------------------|---------------------|
| QSK075D-0200 QSK075D-0300 | RKL0022 | 1.5 | HCT02.1, HCQ02.1 |
| QSK075E-0200 | RKL0022 | 1.5 | HCT02.1, HCQ02.1 |

Fig. 6-3: Power cables

Connection cables (encoder, ready-made)

| Motor | Order designation cable | Converter |
|--------|----------------------------|------------------|
| QSK061 | RKG4200 | HCT02.1, HCQ02.1 |
| QSK075 | RKG4200 | HCT02.1, HCQ02.1 |

Fig. 6-4: Encoder Cables

7 Operating Conditions and Application Notes

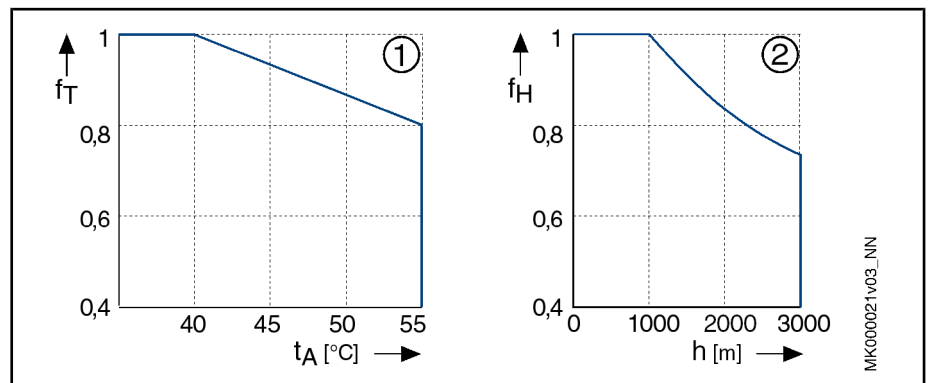
7.1 Ambient Conditions

7.1.1 Setup Elevation and Ambient Temperature

According to DIN EN 60034-1, the motor performance data specified below are valid for:

- Ambient temperatures 0 ... 40 °C
- Setup elevation 0 ... 1,000 m above sea level

When exceeding the given limits, the performance data of the motors must be reduced.



① Utilization depending on the ambient temperature

② Utilization depending on the installation altitude

f_T Temperature utilization factor

t_A Ambient temperature in degrees Celsius

f_H Height utilization factor

h Installation altitude in meters

Fig. 7-1: Derating of ambient temperature, installation altitude (in operation)

Calculation of performance data in case the limits specified are exceeded:

Ambient temperature > 40 °C

$$M_{0_red} = M_0 \times f_T$$

Installation altitude > 1,000 m

$$M_{0_red} = M_0 \times f_H$$

Ambient temperature > 40 °C and setup elevation > 1,000 m

$$M_{0_red} = M_0 \times f_T \times f_H$$

Operating Conditions and Application Notes

7.1.2 Humidity / Temperature

Ambient climatic conditions are defined in different classes according to DIN EN 60721-3-3, Table 1. They are based on observations made over long periods of time throughout the world and take into account all influencing quantities that could have an effect, such as the air temperature and humidity.

Based on this table, Rexroth recommends class 3K4 for continuous use of the motors.

This class is excerpted in the following table.

| Environmental factor | Unit | Class 3K4 |
|-----------------------------|------------------|------------------|
| Low air temperature | °C | +5 ¹⁾ |
| High air temperature | °C | +40 |
| Low rel. air humidity | % | 5 |
| High rel. air humidity | % | 95 |
| Low absolute air humidity | g/m ³ | 1 |
| High absolute air humidity | g/m ³ | 29 |
| Speed of temperature change | °C/min | 0.5 |

1) Rexroth permits 0 °C as the lowest air temperature.

Fig. 7-2: *Classification of ambient climatic conditions according to DIN EN 60721-3-3, Table 1*

7.1.3 Vibration

Sinusoidal Vibrations

Sinusoidal vibrations occur in stationary use; depending on their intensity, they have different effects on the robustness of the motors.

The robustness of the overall system is determined by the weakest component.

Based on DIN EN 60721-3-3 and DIN EN 60068-2-6, the following values result for Rexroth motors:

Maximum permissible vibration load (10-2,000 Hz)

| Direction | Encoder S5, M5 |
|------------------------------|---------------------|
| axial | 10 m/s ² |
| radial | 30 m/s ² |
| Latest amendment: 2009-03-20 | |

Fig. 7-3: *Permissible vibration load for QSK motors*

7.1.4 Shock

The shock load of the motors is indicated by providing the maximum permitted acceleration in non-stationary use, such as during transport.

Damage to functions is prevented by maintaining the limit values specified.

Based on DIN EN 60721-3-3 and DIN EN 60068-2-6, the following values result for Rexroth motors:

Maximum permitted shock load (6 ms)

| Direction | QSK061 | QSK075 |
|------------------------------|----------------------|----------------------|
| axial | 10 m/s ² | |
| radial | 500 m/s ² | 300 m/s ² |
| Latest amendment: 2009-03-20 | | |

Fig. 7-4: Permitted shock load for QSK motors

7.2 Degree of Protection

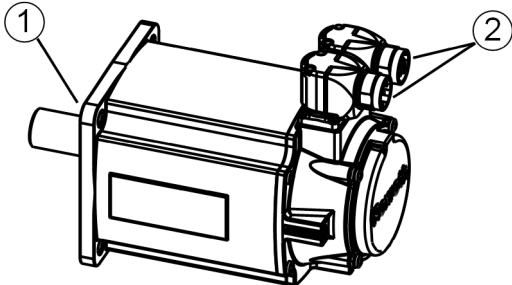
The motors are subdivided into corresponding types of protection (IP) regarding their applicability for different ambient conditions. These types of protection (IP) are described in DIN EN 60529. The protection of the device is characterized by a two-digit number. The **first digit** defines the degree of protection against contact and penetration of foreign particles. The **second digit** defines the degree of protection against water.

Degree of protection IP

| 1st digit | Degree of protection | 2nd digit | Degree of protection |
|-----------|--|-----------|---|
| 6 | Protection against penetration of dust (dust-proof); complete contact protection | 5 | Protection against a water jet from a nozzle directed against the housing from all directions (jet water) |

Fig.7-5: Definition degree of protection (IP)

The IndraDyn S motor construction corresponds to the following degrees of protection according to DIN VDE 0470, part 1, ed. 11/1992 (EN 60529):

|  | | |
|--|----------------------|-----------------|
| Motor area | Degree of Protection | Comment |
| Motor housing, output shaft, motor connector at professional assembly in connected state | IP 65 | Standard design |

- ① Output shaft with shaft sealing ring
- ② Connector for power and encoder connection

Fig.7-6: IP degree of protection with QSK motors

7.3 Design and Installation Positions

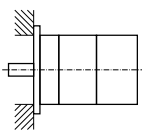
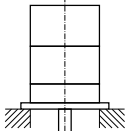
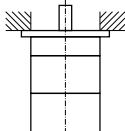
| Motor design B05 | | |
|---|--|---|
| IM B5 | IM V1 | IM V3 |
|  |  |  |
| Flange mounting on the drive side of the flange | Flange mounting on the drive side of the flange; drive side pointing down | Flange mounting on the drive side of the flange; drive side pointing up |

Fig.7-7: Permissible conditions of installation according to EN 60034-7:1993

NOTICE

Motor damage due to penetration of liquids!

If motors are attached according to IM V3, fluid present at the output shaft over a prolonged time may penetrate and cause damage to the motors.

Ensure that fluid cannot be present at the output shaft.

7.4 Compatibility with Foreign Materials

All Rexroth controls and drives are developed and tested according to the state of the art.

However, since it is impossible to follow the continuing further development of every material with which our controls and drives could come into contact (e.g. lubricants on tool machines), reactions with the materials that we use cannot be ruled out in every case.

For this reason, you must execute a compatibility test between new lubricants, cleansers, etc. and our housings and device materials before using these products.

7.5 Priming and Housing Varnish

Specification Housing Varnish

| | |
|--------------------|--|
| Color | Black (RAL9005) |
| Resistance | Resistant against <ul style="list-style-type: none"> diluted acids/alkaline solutions water, sea-water, sewage current mineral oils |
| | Limited resistance against <ul style="list-style-type: none"> organic solvents hydraulic oil |
| | No resistance against <ul style="list-style-type: none"> concentrated acids and alkaline solutions |
| Additional varnish | <ul style="list-style-type: none"> It is permitted to provide the housing with additional varnish (coat thickness no more than 40 µm). Check the adhesion and resistance of the new varnish before applying it. |

Fig. 7-8: Characteristics of the housing varnish



Protect all safety notes, type plates and open connectors with a painting protection when painting additionally.

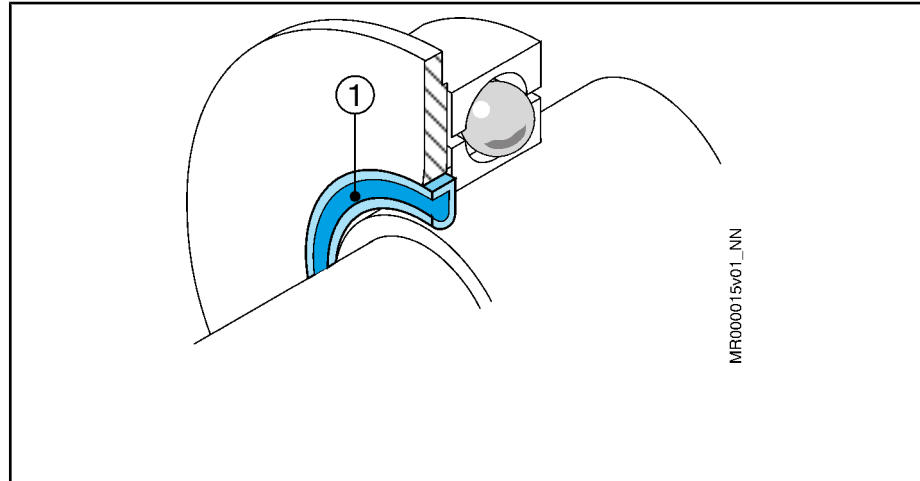
7.6 Output Shaft

7.6.1 Plain Shaft

The recommended standard model for IndraDyn S motors provides a non-positive, zero-backlash shaft-hub connection with a high degree of quiet running. Use clamping sets, clamping sleeves or clamping elements to couple the machine elements to be driven.

7.6.2 Output Shaft with Shaft Sealing Ring

IndraDyn S motors are designed with radial shaft sealing rings according to DIN 3760 – design A.



① Radial shaft sealing ring
Fig. 7-9: IndraDyn S radial shaft sealing ring

Wear Radial shaft sealing rings are friction seals. Hence, they are subject to wear and generate frictional heat.

Wear of the friction seal can be reduced only if lubrication is adequate and the sealing point is clean. Here, the lubricant also acts as a coolant, supporting the discharge of frictional heat from the sealing point.

- Prevent the sealing point from becoming dry and dirty. Make sure everything is clean.



Under normal environmental conditions, the shaft seal is greased for its lifetime. Under unfavorable environmental conditions (e.g. grinding dust, metal shavings), however, maintenance intervals could be necessary.

Resistance The materials used for the radial shaft sealing rings are highly resistant to oils and chemicals. The performance test for the particular operating conditions lies, however, within the machine manufacturer's responsibility.



The complex interactions between the sealing ring, the shaft and the sealing fluid, as well as the particular operating conditions (frictional heat, soiling, etc.), do not allow calculation of the lifetime of the shaft sealing ring.

Vertical installation positions
IM V3

The degree of protection on the flange side of motors with a shaft sealing ring is IP 65. Hence, tightness is ensured only in case of splashing fluids. Fluid levels present on the A-side require a higher degree of protection. For vertical installation position (shaft at the top) of the motor, please observe the additional notes in [chapter 7.3 "Design and Installation Positions" on page 44](#).



Rexroth recommends that any direct contact of the drive shaft and the radial shaft sealing ring with the processing medium (coolant, material corrosion) caused by the machine or system construction be avoided.

7.7 Bearing and Shaft Load

7.7.1 Radial Load, Axial Load

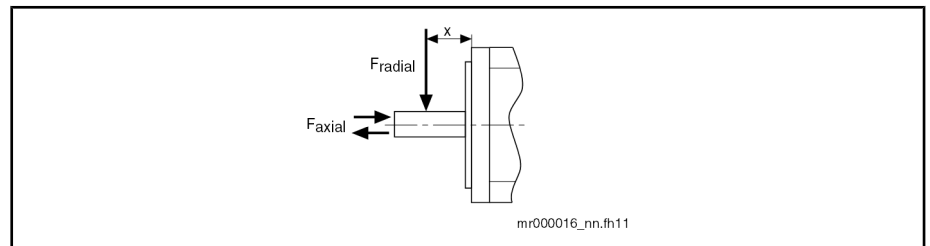
During operation, both radial and axial forces act upon the motor shaft and the motor bearings. The construction of the machine, the selected motor type and the attachment of driving elements on the shaft side must be adapted to each other to ensure that the load limits specified are not exceeded.

Bearing lifetime

If motors are operated within the limits specified for radial and axial loads, the bearing lifetime is as follows:

$L_{10h} = 20,000$ operating hours

(calculated according to ISO 281, ed. 12/1990)



X Force point of application of radial force F_{radial} , distance to the motor flange

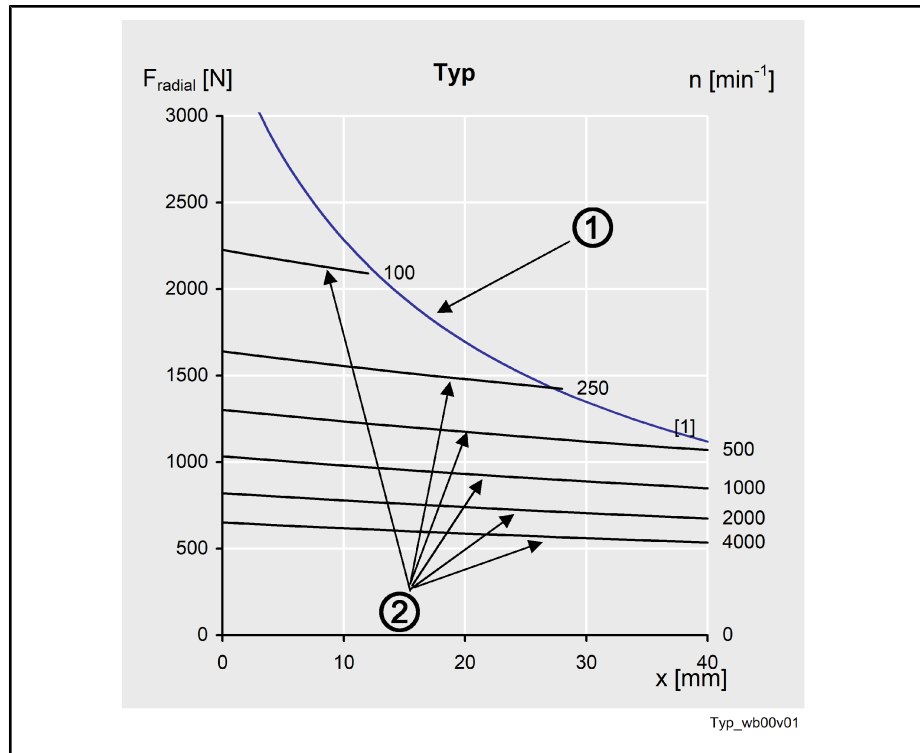
F_{radial} Effective direction of radial force

F_{axial} Effective directions of axial force

Fig. 7-10: Axial and radial force

Shaft load diagrams show the load limit for output shaft and motor bearing.

Operating Conditions and Application Notes



- ① Maximum radial force F_{radial} characteristic curves "shaft breakage"
 ② Maximum radial force F_{radial} characteristic curves "bearing load with specified mean speed n "
 n Arithmetic average speed
 X Force point of application of radial force F_{radial} , distance to the motor flange

Fig.7-11: Example of a shaft load diagram

Permitted radial force The permitted radial force $F_{\text{radial_max}}$ depends on the following factors:

- Shaft-breaking load
- Force point of application X
- Arithmetic mean speed (n_{mean})
- Bearing lifetime (specified characteristic curves for $L_{10h}=20,000h$)

Permitted axial force The maximum permitted axial force F_{axial} is proportional to the radial force. The maximum permissible axial force F_{axial} is indicated in the section on the radial force.

Mean Speed In the exact calculation of the mean speed according to the following example, the run-up and braking times are taken into account.

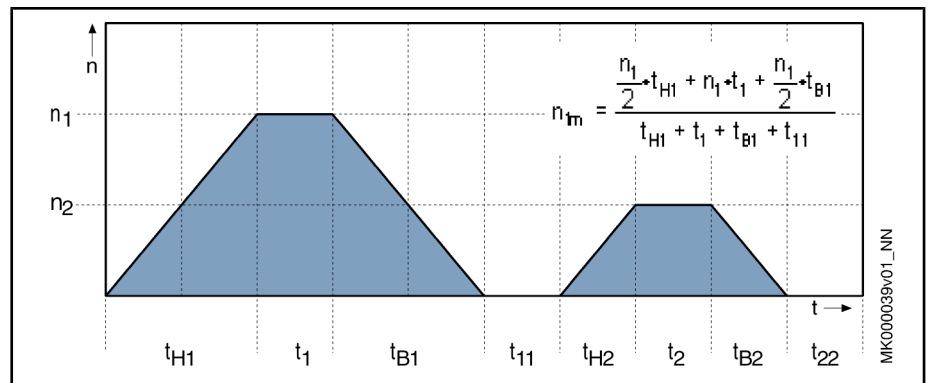


The initialization and braking times can be ignored in the calculation if the time in which the drive is operated at a constant speed is significantly greater than the acceleration and deceleration times.



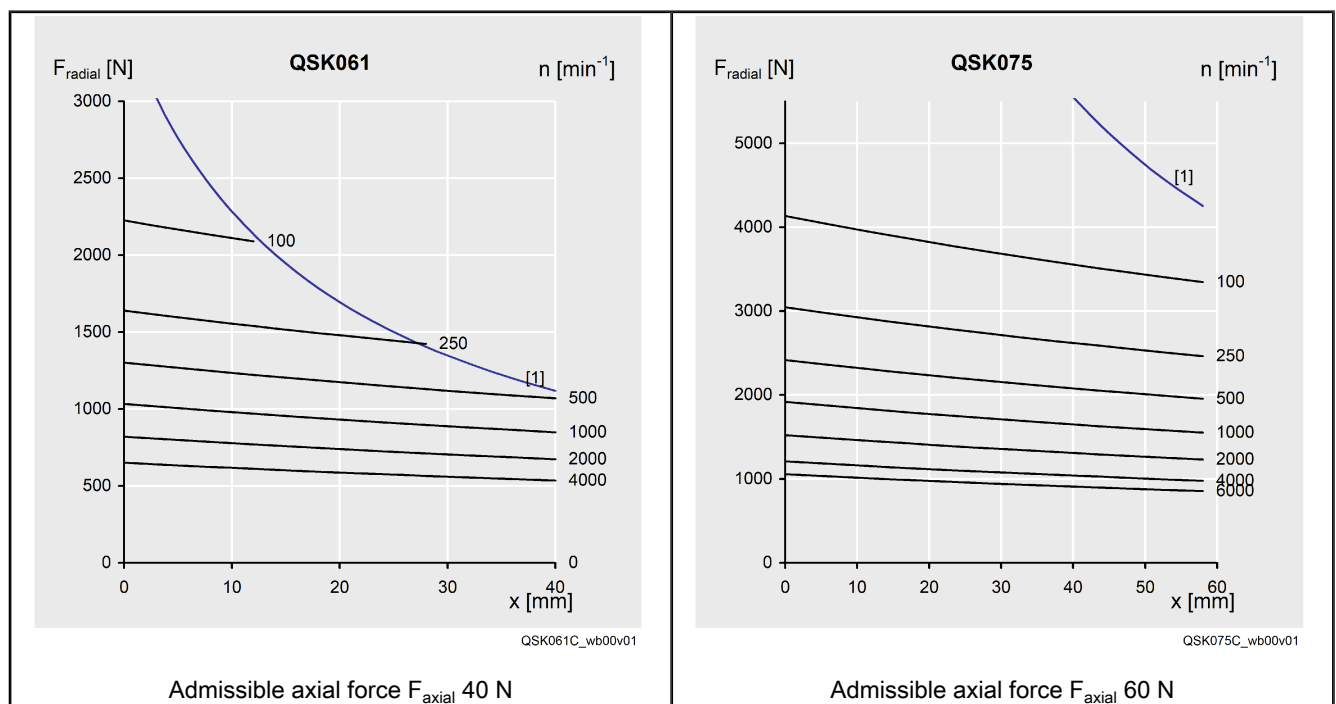
A complete processing cycle can consist of several sections with different speeds. In this case, the average is to be calculated from all the sections.

Operating Conditions and Application Notes



$n_{1m}; n_{2m}$ Mean speed
 $n_1; n_2$ Processing speed
 $t_{H1}; t_{H1}$ Run-up time
 $t_1; t_2$ Processing time
 $t_{B1}; t_{B2}$ Braking time
 $t_{11}; t_{22}$ Standstill time
 Fig. 7-12: Mean speed

7.7.2 Shaft Load QSK Motors



[1] Maximum radial force F_{radial} characteristic curves "shaft breakage"
 n [min⁻¹] Mean speed
 Fig. 7-13: Shaft load QSK

7.8 Attachment of Drive Elements

⚠ CAUTION

Motor damage caused by penetration of fluids!

If motors are attached according to IM V3, fluid present at the output shaft over a prolonged time may enter into and cause damage to the motors.

⇒ Ensure that fluid cannot be present at the output shaft.

Operating Conditions and Application Notes

Whenever attaching drive elements to the output shaft, such as

- Gearboxes
- Couplings
- Gear pinion

please be sure to observe the following notes.

Gearbox mounting on motors

Are gearboxes mounted on motors, the thermal coupling of the motors on machines or constructions changes.

Depending on the gearbox type, the heat development on the gearbox is different. The heat dissipation of the motor via the flange is reduced in every case when a gearbox is mounted. This must be heeded at the project planning.

A reduction of the given performance data is necessary, to do not overload motors when using gearboxes.

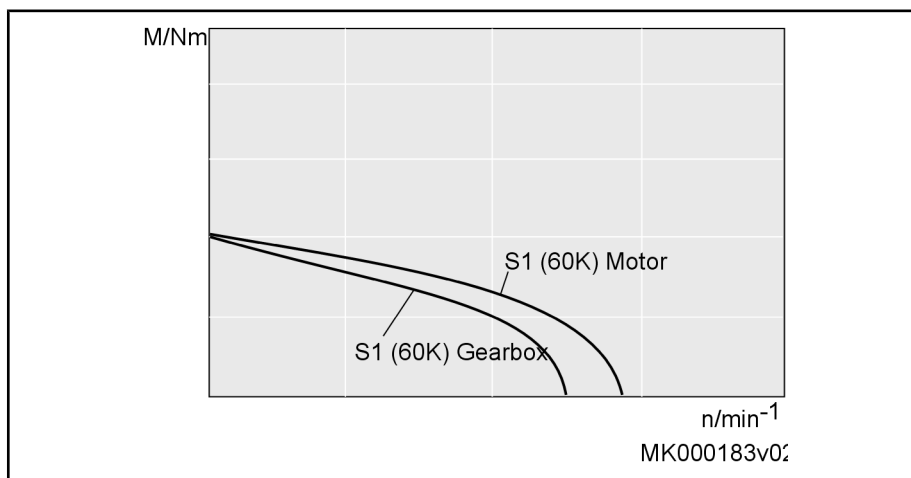


Fig. 7-14: S1 characteristic curve of gearboxes



The indicated torques in the characteristic curves of the motor have to be reduced by **10-20%** when mounting gearboxes.

Please, heed all further notes and specifications within this documentation for the used gearboxes.

Overdetermined bearing

Generally, overtermined bearings are to be avoided by all means when connecting drive elements. The tolerances inevitably present in such cases will lead to additional forces acting on the bearing of the motor shaft and, as the case may be, to a distinctly reduced service life of the bearing.



If a redundant attachment cannot be avoided, it is absolutely necessary to consult with Rexroth.

Couplings

The machine construction and the drive elements used must be carefully adapted to the motor type so as to make sure that the load limits of the shaft and the bearing are not exceeded.

**CAUTION****Motor damage due to mechanical overload**

When extremely stiff couplings are attached, the radial force which constantly changes the angular position may cause an impermissibly high load on the shaft and bearing.

Operating Conditions and Application Notes

Ball bearing pinion or helical drive pinion

Owing to thermal effects, the flange-sided end of the output shaft may shift by 0.6 mm in relation to the motor housing. If helical drive pinions or bevel gear pinions directly attached to the output shaft are used, this change in position will lead to

- a shift in the position of the axis, if the driving pinions are not defined axially on the machine side,
- a thermally dependent component of the axial force, if the driving pinions are defined axially on the machine side. This causes the risk of exceeding the maximum permissible axial force or of the play within the gears increasing to an impermissible degree.
- Damage of the motor bearing on the B-side due to exceeding of the maximum permissible axial force.



In such cases, drive elements should preferably be used with their own bearings which are connected to the motor drive shaft via axially compensating couplings.

7.9 Holding Brakes

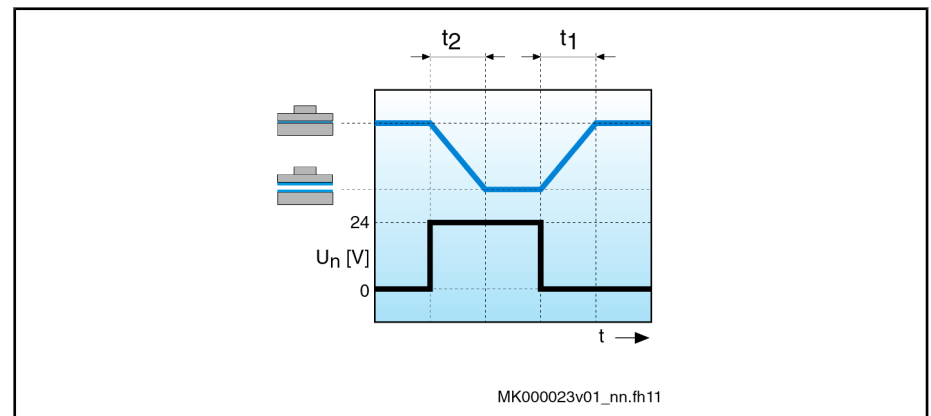
7.9.1 Holding Brake Electrically-Released

The holding brake of the IndraDyn S motors works according to the principle "electrically-released". Non-operative closed holding brakes open when applying the voltage.

The voltage supply of the holding brake must be designed so as a voltage of 24 V \pm 10% on the motor exists for safe operation (opening and closing) of the holding brake.



The voltage arriving on the motor is influenced by the cable length and the cable features, e.g. the conductor resistance.



t_1 Connection time

t_2 Disconnection time

Fig. 7-15: Holding brake diagram

The electrically releasing holding brake is used to hold the axes at a standstill and when the "controller enable" signal is off. When the supply voltage fails and the controller is enabled, the electrically-releasing holding brake will close automatically.



Do not use the holding brake as an operational brake for moving axes.

Operating Conditions and Application Notes

If the holding brake is engaged repeatedly on a drive in motion or the rated brake torque is exceeded, premature brake wear can occur.

7.9.2 Holding Brakes - Notes Regarding Safety

Observe the safety requirements for the system planning and development.

DANGER

Personal injury through hazardous movements caused by falling or descending axes!

Secure vertical axes against falling or descending after disconnection:

- lock the vertical axes mechanically,
- provide an external braking / collecting / clamping device, or
- Ensure sufficient weight compensation of the axes.

The serially delivered holding brakes which are driven by the control device are **not** suited for personal safety!

Personal protection must be realized by superordinate fail-safe measures, such as e.g. the locking off of the danger zone by means of a protective fence or grill.



Beside the specified details and notes about holding brakes, heed the additional standards and directives when planning the system.

For European countries:

- **EN 954 and ISO 13849-1 and ISO 13849-2 Safety-related components of controls**
- **Information sheet no. 005 "Gravity-loaded axes (vertical axes)" published by: Fachausschuss Maschinenbau, Fertigungssysteme, Stahlbau**

For the USA:

- See National Electric Code (NEC), National Electrical Manufacturers Association (NEMA) as well as local building regulations.

The following is generally valid: Comply with all applicable national regulations!

The permanent magnetic brake is no safety brake. This means, a torque reduction by non-influenceable disturbance factors can occur (see EN 954 and ISO 13849-1 and ISO 13849-2 or the information leaflet No. 005 about "Gravity-loaded axes (vertical axes)").

Please pay particular attention to the following:

- Corrosion on friction surfaces, as well as dust, perspiration and sediments reduce the braking effect.
- Grease must not hit the friction surface.
- Overvoltage and too high temperatures can durably weaken the permanent magnets and thus the brake.

Functioning of the holding brake is no longer ensured, if the air gap between armature and pole is improperly increased due to deterioration. In this case, no braking occurs.

7.9.3 Layout of Holding Brakes

Holding brakes on motors are basically not designed for service braking. The effective braking torques are physically conditionally different in static and dynamic operation.

| Normal operation and EMERGENCY STOP | event of faults |
|--|---|
| <p>In normal operation, using the holding brake for clamping of a standstill axes, the "static holding torque" (M_4), applies as indicated in the data sheets.</p> <p>For EMERGENCY STOP to deactivate an axis ($n < 10 \text{ min}^{-1}$), a "dynamic braking moment" acts (M_{dyn}) - sliding friction.</p> | <p>For fault conditions to deactivate a moving axis ($n \geq 10 \text{ min}^{-1}$), a "dynamic braking moment" acts (M_{dyn}) - sliding friction.</p> |
| <p style="text-align: center;">$M_4 > M_{\text{dyn}}$</p> <p style="text-align: center;">Therefore, note the following description of dynamic sizing.</p> | |

Fig. 7-16: Dynamic Sizing

Dynamic Sizing

The load torque must be smaller than the minimum dynamic moment M_{dyn} which the holding brake can provide. Otherwise the dynamic holding brake torque is not sufficient to stop the axes.

If a mass is to be decelerated in a defined time or in a defined route, the additional mass moment of inertia of the whole system must be taken into account.

Project planning recommendation

To ensure construction safety, reduce the required holding torque to 60% of the static holding torque (M_4) of the holding brake.

7.9.4 Holding Brake—Commissioning and Maintenance Instructions

In order to ensure proper functioning of the holding brake, it must be checked before the motors are commissioned. The test as well as the resurfacing may be carried out "mechanically by hand" or "automatically by means of the software function".

Checking and resurfacing of holding brakes by hand

Measure the holding torque (M_4) of the holding brake. If necessary, resurface the holding brake.

Measuring the Holding Torque (M_4) of the Holding Brake

1. De-energize the motor and secure it against re-energization.
2. Measure the transferable holding torque of the holding brake with a torque wrench. For holding torque (M_4) refer to the technical data.

If the holding torque (M_4) is achieved, the motor is ready for assembly.
If the holding torque (M_4) is **not achieved**, the subsequent resurfacing-process can be used to reconstitute the holding torque.

Resurfacing the Holding Brake

1. At closed holding brake, turn the output shaft by hand, e.g. with the help of a torque wrench, by about 5 revolutions.
2. Measure the holding torque (M_4).

If the holding torque (M_4) is achieved, the motor is ready for assembly.
If the specified holding torque (M_4) is not attained after several grinding-in processes, the holding brake is not operable. Please, contact the Rexroth Service.

Operating Conditions and Application Notes

Checking and resurfacing of holding brakes by means of the software function**Checking the Holding Torque (M4) via P-0-0541, C2100 Command Holding system check**

1. The efficiency of the holding brake and the opened state are checked by the control device by starting the routine "P-0-0541, C2100 Command Holding system check".

If the holding brake is operational, the drive is in an operational state after the routine was run through. If the braking torque is too low, the control device outputs a corresponding message.



The brake test can also be carried out cyclically in the framework of a preventive maintenance.

Restoring the Holding Torque (M4) by means of the Software Function

The following possibilities are available:

1. Realization of the resurfacing routine IndraDrive "Restoring the holding torque "(see"P-0-0544, C3900 Command Resurfacing of motor holding brake)". A repeated realization of the resurfacing routine is possible.

Upon the execution of the command C3900 it is not checked whether the resurfacing of the holding brake was successful. It is recommended to execute the command C2100 (Command Holding system check) once again.

2. Resurfacing routine by superior control. Here, special control programs adapted to the machine and system concepts are required. If necessary, please contact your Bosch Rexroth distribution partner and discuss the resurfacing routine parameters for your application.



For more detailed information about software functions refer to the functional description "Rexroth IndraDrive Firmware for Drive Control Devices MPxx, DOK-INDRV*-MP*-xxVRS**-FKxx-EN-P."

7.10 Motor Cooling System

Rexroth motors of the standard design are self-cooling motors.



Pollution of the motors reduces the heat dissipation. Ensure tidiness!

7.11 Motor Temperature Monitoring

7.11.1 General Information

The motor temperature is monitored by two systems that are operated independently of each other

- Temperature sensor
- Temperature model

and ensures thus the best protection of motors against irreversible damage by thermal overload.

7.11.2 Temperature Sensor

The monitoring of the motor temperature is ensured via the temperature sensor of the KTY84 type, which is built into the stator. The motor temperature measured is controlled via the following threshold values:

Operating Conditions and Application Notes

- Motor - warning temperature (140 °C)
- Motor - switch-off temperature (150 °C)

The threshold values are filed within the encoder memory of the QSK motors.

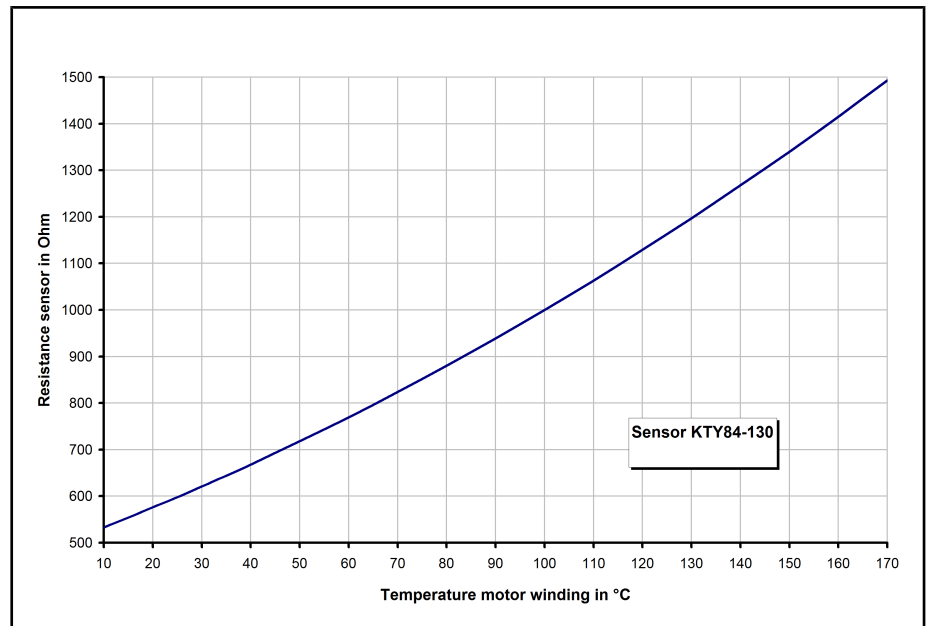


Fig. 7-17: Characteristic curve KTY84-130

The IndraDrive control devices monitor the functionality of the temperature sensors.

For further information, please refer to the functional description of IndraDrive control devices.

Operating Conditions and Application Notes

7.12 Acceptances and Authorizations

7.12.1 CE Symbol

Declaration of conformity

The certificates of conformity certifying the structure of and the compliance with the valid EN standards and EC guidelines are available for all IndraDyn S. If necessary, these certificates of conformity can be requested from the responsible sales office.

The CE mark is applied to the motor type label of the IndraDyn S.



Fig. 7-18: CE symbol

8 Transport and Storage

8.1 Notes about Transport

Transport our products only in original package. Additionally, heed specific ambient factors to protect the products from transport damage.

With regard to the DIN EN 60721-3-2, the following classifications and limit values are specified, which our products undergo during transport by road, water or sea. Please observe the described classifications in details to heed all factors, which are specified in their particular class.

Allowed classes of ambient conditions during transport acc. to DIN EN 60721-3-2

| Classification mode | Allowed class |
|---|---------------|
| Classification of climatic ambient conditions | 2K2 |
| Classification of biological ambient conditions | 2B1 |
| Classification of chemically active materials | 2C2 |
| Classification of mechanically active materials | 2S2 |
| Classification of mechanical ambient conditions | 2M1 |

Fig. 8-1: Allowed classes of ambient conditions during transport

The following significant ambient factors of the aforementioned classifications are named to receive a better overview. The specified values are the values of the particular class, if no others are given. Bosch Rexroth reserves the right, due to future experiences or changed ambient factors, to adjust these values at any time.

Permissible transport conditions

| Environmental factor | Symbol | Unit | Value |
|---|-----------|------|-----------------------------|
| Temperature | T_T | °C | -20 ... +80 ¹⁾ |
| Air humidity (relative air humidity, not combinable with quick temperature change) | φ | % | 75 (at +30 °C) |
| Occurrence of salt mist | | | Not permitted ¹⁾ |

1) Differs from DIN EN 60721-3-2

Fig. 8-2: Permissible transport conditions



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

Transport by air

If motor components with permanent magnets are shipped by air, the DGR (Dangerous Goods Regulations) of the IATA (International Air Transport Association) for hazardous materials of class 9 which also include magnetized substances and objects must be observed. For example, these regulations are applicable for

- Secondary parts of synchronous linear motors
- Rotors of synchronous kit motors

Transport and Storage

- Rotors of synchronous housing motors (if shipped as motor components, i.e., separated from the stator or motor housing in case service work is required)

For information on the maximum allowed magnetic strengths and methods of measuring such magnetic field strengths, please refer to the current IATA DGR (chapter 3.9.2.2).

8.2 Notes about Storage

8.2.1 Storage Conditions

Generally, Bosch Rexroth recommends to store all components, up to their real installation into the machine, as follows:

- in their original package
- dry and dustfree
- at room temperature
- vibration free
- protected against light or direct insolation

Factory attached protective sleeves and covers can be mounted onto our motors. They must stay on the motor for transport and storage. Remove these parts just before assembly.

With regard to the DIN EN 60721-3-1, the following classifications and limit values are specified, which our products undergo during storage. Please observe the described classifications in details to heed all factors, which are specified in their particular classification.

Allowed classes of ambient conditions during storage acc. to DIN EN 60721-3-1

| Classification mode | Class |
|---|-------|
| Classification of climatic ambient conditions | 1K2 |
| Classification of biological ambient conditions | 1B1 |
| Classification of chemically active materials | 1C2 |
| Classification of mechanically active materials | 1S1 |
| Classification of mechanical ambient conditions | 1M2 |

Fig. 8-3: Allowed classes of ambient conditions during storage

The following significant ambient factors of the aforementioned classifications are named to receive a better overview. The specified values are the values of the particular class, if no others are given. Bosch Rexroth reserves the right, due to future experiences or changed ambient factors, to adjust these values at any time.

Allowed classes of ambient conditions during storage acc. to DIN EN 60721-3-1

| Environmental factor | Symbol | Unit | Value |
|-------------------------|-----------|------------------|-----------------------------|
| Air temperature | T_L | °C | -20 ... +60 ¹⁾ |
| Relative air humidity | φ | % | 5 ... 95 |
| Absolute air humidity | p_w | g/m ³ | 1 ... 29 |
| Condensation | - - | - - | Not permitted |
| Icing | - - | - - | Not permitted |
| Direct insolation | - - | - - | Not permitted ¹⁾ |
| Occurrence of salt mist | - - | - - | Not permitted ¹⁾ |

1) Differs from DIN EN 60721-3-1

Fig. 8-4: Permitted storage conditions

Transport and Storage



Before re-storage, empty the liquid coolant from the liquid-cooled motors to avoid frost damage.

8.2.2 Storage Periods

Independent from storage duration, which can exceed the guarantee period of our products, the function remains under observance and realization of additional measures for start-up. Thereof, an additional warranty claim cannot be derived.

Motors

| Storage period | Measures for start-up |
|----------------|--|
| < 1 year | Resurfacing the holding brake |
| 1 ... 5 years | <ol style="list-style-type: none"> 1. Check the electric contact whether they are free of corrosion 2. Run in the motor without load for one hour at 800 ... 1,000 rpm 3. Resurfacing the holding brake |
| > 5 years | <ol style="list-style-type: none"> 1. Change the bearing 2. Change the encoder 3. Resurfacing the holding brake 4. Check the electric contact whether they are free of corrosion |

Fig. 8-5: Measures before start-up of long-term storage motors

Cables and Connectors

| Storage period | Measures before start-up |
|----------------|---|
| < 1 year | none |
| 1 ... 5 years | ⇒ Check the electric contact whether they are free of corrosion |
| > 5 years | ⇒ Should the cable or the cable jacket have porous parts, change them, otherwise check the electric contacts if they are free of corrosion. |

Fig. 8-6: Measure before start-up of long-term stored cables and connectors

9 Delivery Status, Identification, Handling

9.1 State of Delivery

9.1.1 General Information

On delivery, the QSK motors are packed in cardboard boxes or wooden crates. Packing units on pallets are secured by means of retaining straps.

CAUTION

Injuries due to uncontrolled movement of the retaining straps when cutting!

Maintain a sufficient distance and carefully cut the bandages.

Upon delivery from the factory, the motor drive shaft and the connectors have protective sleeves. Remove the protective sleeves just before assembly.

9.1.2 Inspection at the Factory

All QSK motors undergo the following tests, among others, at the factory:

Electrical test

- High voltage test
- Isolation resistance test
- Protective conductor connection
- Test of winding resistance

Mechanical test

- Concentricity and position tolerances of shaft end and fastening flange
- Axial eccentricity of the flange face to the shaft
- Coaxiality of the centering shoulder to the shaft
- Test of brake holding torque (option)

9.1.3 Test Realized by the Customer

Since all QSK motors undergo a standardized inspection procedure, high-voltage tests on the customer side are not required. Motors and components could be damaged if they undergo several high-voltage inspections.

NOTICE

Destruction of motor components due to improperly executed high-voltage inspection! Invalidation of warranty!

Avoid repeated inspections.

Please observe the target values of the EN 60034-1.

Delivery Status, Identification, Handling

9.2 Identification

9.2.1 Scope of Delivery

The total scope of a delivery can be seen in the delivery note or waybill. However, the contents of a delivery can be distributed over several packages. Each individual package can be identified using the shipment label attached. Please, check after receiving the delivery, if the delivered goods comply with your order and the shipping documents.

Complain any deviation at your responsible Rexroth sales partner, immediately.

Complain any visible transport damage directly at the deliverer.


9.2.2 Type Plate

Each motor has an individual type plate showing the device designation and providing technical information. Additionally, a second type plate is delivered with the motor.

If the original type plate of the motor is obscured by the machine construction, use the second type plate to an easily visible portion of the machine. This type plate is either enclosed to the motor or is removably glued onto the original type plate.

The type plate is provided for

- Identification of the motor
- Procurement of spare parts in case of a fault
- Service information.

 The type designation of the motor is also filed in the encoder data memory.

Motor name plate

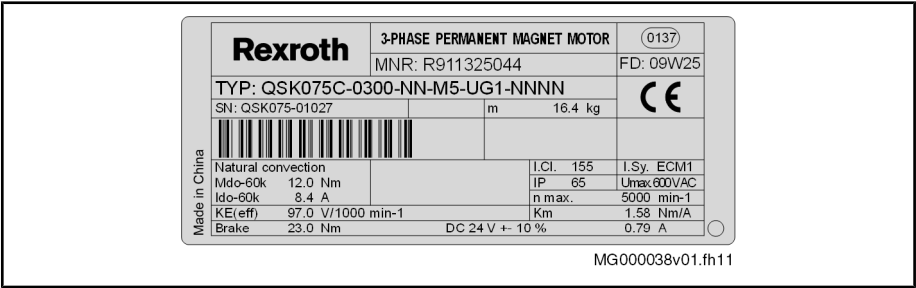


Fig. 9-1: Type label (example: IndraDyn S)

9.3 Handling

⚠ CAUTION

Injuries due to improper handling during transport of motors!

Do only use suitable lifting devices (e.g. lifting sling belts, eyebolts, chain suspension ...).

Use protective equipment and personal protective clothing (gloves, safety shoes, ...).

Never walk under hanging loads.

NOTICE

Damage of property and invalidation of the warranty due to incorrect storage!

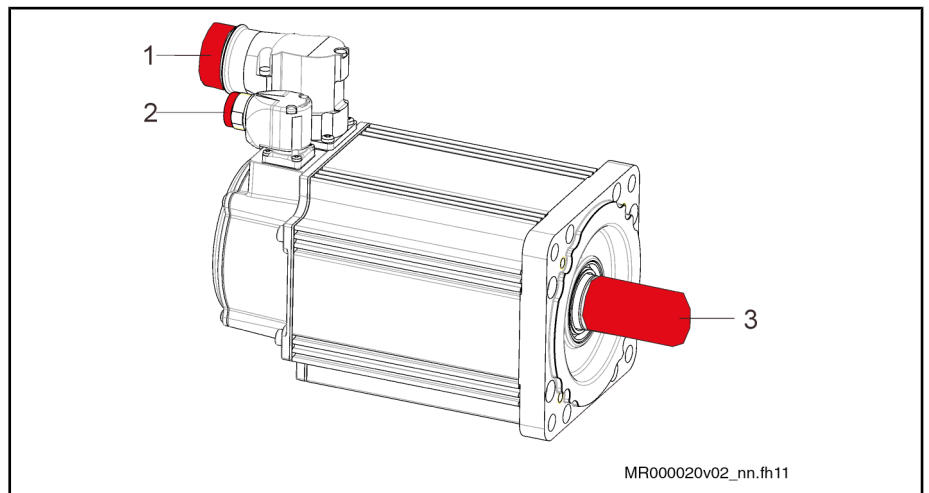
Store the motors horizontally in their original packaging in a dust-free, dry, vibration-free and sun-protected environment.

Also observe the notes regarding storage and transport on the packaging.

Handling

On delivery, the QSK motors have protective caps and covers on the output shaft and on the flange sockets. During transport and storage, the protective sleeves must remain on the motor.

- Remove the protective sleeves just before assembly.
- Also use the protective sleeves if you return the goods.
- Avoid any damage to the motor flange and drive shaft.



- ① Power connector protective sleeve
 - ② Encoder connector protective sleeve
 - ③ Shaft protective sleeve
- Fig. 9-2: IndraDyn S protective sleeves

NOTICE

Motor damage due to beats onto the motor shaft

Do never beat onto the shaft end and do not exceed the allowed axial and radial forces of the motor.

Transport

Please, observe the following points during transport:

Delivery Status, Identification, Handling

- Use suitable means of transport and consider the weight of the components (you can find the weight information on the data sheets or on the type plate of the motor).
- Provide appropriate shock absorbers, if strong vibrations may occur during transport.
- Transport the motors only in the horizontal position.
- Use cranes with lifting sling belts to lift the motors.

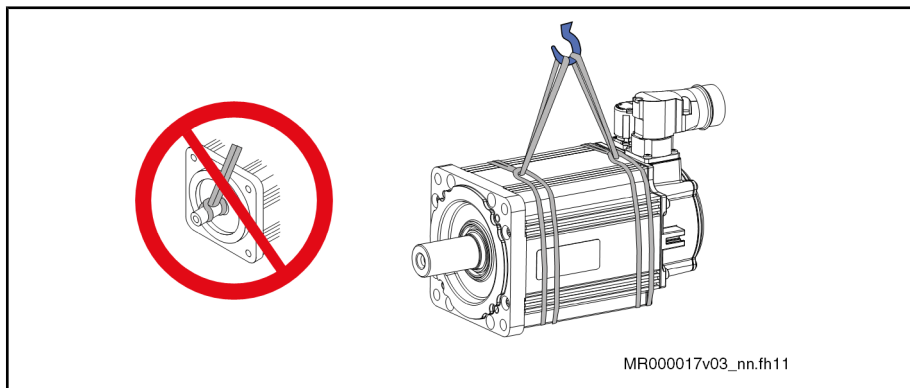


Fig.9-3: Lifting and transporting motors by means of lifting sling belts

10 Installation

10.1 Safety

WARNING

Injuries due to live parts! Lifting of heavy loads!

- Install the motors only when they are de-energized and not connected electrically.
- Use suitable tackles, protective equipment and protective clothing during transport.

Observe the notes regarding safety given in previous chapters.

Carry out all working steps very carefully. In this way, you minimize the risk of accidents and damage.

10.2 Skilled Personnel

Any works on the system and on the drives or in their vicinity must only be carried out by appropriately trained technical personnel.

Please make sure that all persons carrying out

- installation works
- maintenance, or
- operating activities

on the system are adequately familiar with the contents of this documentation as well as with all warnings and precautionary measures contained therein.



Qualified technical personnel are those persons who have been trained, instructed or are authorized to activate and deactivate, ground and mark electric circuits and equipment according to the technical safety regulations. Qualified technical personnel must possess appropriate safety equipment and have been trained in first aid.

10.3 Mechanical Attachment

10.3.1 Flange Assembly

In order to attach the motors correctly and safely to the machine, Bosch Rexroth recommends the following screws and washers for motor mounting.



The screwed connections must be able to take up both the force due to the weight of the motor and the forces acting during operation.

Usually, use cylinder head screws DIN 912 M... x ...- 8.8 and related washers according to DIN EN 28738. In case of several motors, the integration of washers is not required, see table.

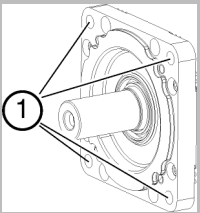


If the screws and washers used do not comply with this recommendation, the property class of the screws and the hardness class must be equivalent in order to transmit the required tightening torques.

Installation

IndraDyn S motors are designed for flange assembly (B05). Details on the mounting holes are given in the corresponding dimension sheet. For the fastening, the following general assignment applies:

Recommended screws for flange fastening of the QSK motors

|  | B05 (flange assembly) | | | |
|---|-----------------------|--------------------|----------------------|---------------------|
| | Hole | Screw (8.8) | | Washer DIN EN 28738 |
| | Ø [mm] | Type ¹⁾ | M _{GA} [Nm] | Ø [mm] |
| QSK061 | 9.0 | M8×20 | 25 | 10 |
| QSK075 | 11.0 | M10×30 | 51 | 12 |

- ① Mounting hole
M_{GA} Tightening torque in Newton meters
1) Minimum screw length for screwing into steel.
Fig. 10-1: QSK mounting accessories (flange assembly)

10.3.2 Assembly Preparation

- Log all measures taken in the commissioning log.

Prepare motor assembly as follows:

- Check the components for visible damage. Defective components must not be mounted.
- Ensure that dimensions and tolerances on the system side are suitable for motor attachment (for details, see the dimension sheet).
- Ensure that mounting can be done in a dry, clean and dust-free environment.
- Keep tools and auxiliary material, as well as measuring and testing equipment, ready at hand.
- Check that all components, mounting surfaces and threads are clean.
- Ensure that the holder for the motor flange on the machine side has no burrs.
- Remove the protective sleeve of the motor drive shaft. Retain the sleeve for later use.
- Check the motors with holding brake, whether the holding brake reaches the holding torque indicated on the data sheet. If the holding brake does not reach the indicated holding torque, proceed as described in chapter 7.9.4 Holding Brake - Commissioning and Maintenance Instructions on page 55. .

10.3.3 Motor Assembly

- Mount the motor.

Note:

- Avoid clamping or jamming the centering bundle on the motor side.
- Avoid damage to the insertion fitting on the system side.
- Connect the motor with the machine (observe the tightening torques!).
- Check the fit and accuracy of the connection before you proceed.

After having mounted the motor mechanically as prescribed, establish the electrical connections.

10.4 Electrical Connection – Connecting the Motor

10.4.1 General Information

It is recommended that you use ready-made Rexroth connection cables. These cables provide a number of advantages, such as UL/CSA authorization, extreme load capability and resistance as well as a design suitable for EMC.

DANGER

Danger of life due to electrical power! Handling within the area of live parts is extremely dangerous.

- Any work required on the electric system must only be carried by skilled electricians. It is absolutely necessary to use power tools.
- Before the work can be started, the system must be de-energized and the power switch be secured against unintentional or unauthorized re-starting.
- Before the work can be started, an appropriate measuring device must be used to check whether parts of the system are still under residual voltage (e.g. caused by capacitors, etc.). If yes, wait until these parts have discharged.

WARNING

Injuries to persons or damage to property possible! Interrupting or connecting live lines may cause unpredictable dangerous situations or lead to damage to property.

- Connect and disconnect connectors only when they are dry and de-energized.
- During operation of the system, all connectors must be securely tightened.

WARNING

Risk of short-circuit caused by liquid coolant or lubricant! Short-circuits of live lines may cause unpredictable dangerous situations or lead to damage to property.

- Provide open sides of the power connectors with protective caps, when installing or replacing drive components.

10.4.2 Attaching the Connectors

Power/Encoder connectors

When fitting the encoder connector with a screwed end fitting, proceed as follows:

1. Place the power connector in the correct position onto the thread of the connection housing.
2. Tighten the union nut of the power connector manually. By leading the cable in further, the power connector can be steadily brought to its final position.
3. Completely tighten the union nut.



Only completely tightened union nuts guarantee the indicated IP65 protection against water and activate the vibration protection.

Installation

10.4.3 Adjusting the Output Direction

RLS1100, RLS1200 and RGS1000

The flange sockets can be turned through 240°.

The motor flange socket can be turned if an appropriate connector has been attached. Owing to the leverage of the attached connector, the flange socket can be turned manually to the desired position.

1. Connect the motor power cable to the flange socket.
2. Move the flange socket to the desired output direction by turning the plugged-in connector.



Do not use any tools (e.g. pliers or screwdrivers) to turn the motor flange socket. Mechanical damage to the flange socket when using tools cannot be excluded.

The desired output direction is set.



Whenever the flange socket is turned, the holding torque in the set position is reduced. To ensure the required holding torque of the flange socket, the output direction should be changed no more than 5 times!

11 Commissioning, Operation and Maintenance

11.1 Commissioning

CAUTION

Damage to life or property due to errors in the controls of motors and moving elements! Unclear operating states and product data!

- Do not carry out commissioning if connections, operating states or product data are unclear or faulty.
- Do not carry out commissioning if the safety and monitoring equipment of the system is damaged or not in operation.
- Damaged products must not be put into operation!
- Contact Rexroth for missing information or support during commissioning.

The following commission notes refer to the motors as part of a drive-system with drive and control unit.

Preparation

1. Keep the documentation of all products you are using ready.
2. Check the products for damage.
3. Check all mechanical and electrical connections.
4. Activate the safety and monitoring equipment of the system.
5. Make sure that the optional holding brakes are ready for operation. (described in chapter 7.9.4 Holding Brake - Commissioning and Maintenance Instructions on page 55.).

Bulk head connector

When all requirements are met, proceed as follows:

1. Carry out the commissioning of the drive system according to the instructions provided in the respective documentation. You can find the respective information in the functional description of the drive control devices.



Commissioning of drive controllers and the control unit may require additional steps. The inspection of the functioning and performance of the systems is not part of the commissioning of the motor; instead, it is carried out within the framework of the commissioning of the machine as a whole. Observe the instructions and regulations given by the machine manufacturer.

11.2 Operation

Keep the described ambient conditions during operation (cf. [chapter 11 "Commissioning, Operation and Maintenance" on page 69](#)).

11.3 Deactivation

In the case of malfunctions or maintenance, or to deactivate the motors, proceed as follows:

1. Observe the instructions of the machine documentation.
2. Use the machine-side control commands to bring the drive to a controlled standstill.

Commissioning, Operation and Maintenance

3. Switch off the power and control voltage of the drive controller.
4. Switch off the main switch of the machine.
5. Secure the machine against accidental movements and against unauthorized operation.
6. Wait for the discharge time of the electrical systems to expire and then disconnect all electrical connections.
7. Before dismantling, secure the motor against falling or movements before disconnecting the mechanical connections.

11.4 Maintenance

11.4.1 General Information

Synchronous motors operate maintenance free within the specified operating conditions and lifetime. However, operation under unfavorable conditions can lead to limitations in availability.

- Increase availability with regular preventive maintenance measures. Observe the information in the maintenance schedule of the machine manufacturer and the service measures described below.

⚠ WARNING

Burns may be caused through hot surfaces with temperatures over 100 °C

- Do not work on hot surfaces.
- Use safety gloves.

⇒ Let the motor cool down before maintenance. The thermal time constant stated in the technical data is a measure for the cooling time. A cooling time up to 140 minutes can be necessary!

⚠ WARNING

Danger of injury due to moving elements!

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

11.4.2 Cleaning

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 motors are dirty, sufficient heat dissipation via the environmental air is not possible any longer.

An insufficient heat radiation may have undesired consequences.

- The lifetime is reduced
- Overtemperature deactivation

11.4.3 Bearings

The nominal lifetime of the bearings is $L_{10h} = 20000$ h according to DIN ISO 281, ed. 1990, provided the permissible radial and axial forces are not exceeded.

The motor bearings should be replaced if

- the nominal bearing service life has been reached,

Commissioning, Operation and Maintenance

- running noises occur.



We recommend that bearings be replaced by the Rexroth Service.

11.4.4 Connecting Cables

DANGER

Death by electrocution possible due to live parts!

If the slightest defect is detected in the cable sheath, the system must be shut down immediately. Then the cable must be replaced.

Do not repair any connection lines provisionally.

- Check connection cables for damage at regular intervals and replace them, if necessary.
- Check any optional energy management chains (drag chains) for defects.
- Check the protective conductor connection for proper state and tight seat at regular intervals and replace it, if necessary.

Commissioning, Operation and Maintenance

11.5 Notice of Malfunctions

WARNING

Electrocution by live parts of more than 50 V!

Before working on live parts: De-energize the machine and secure the mains switch again unintendet or unauthorized re-energization.

Check if the voltage is dropped down under 50 V before touching live parts!

WARNING

Combustions via hot surface with temperatures over 100 °C

Let the motor cool down, before maintenance. The thermal time constant stated in the technical data is a measure for the cooling time. A cooling time up to 140 minutes can be necessary!

Do not work on hot surfaces.

Use safety gloves.

In principle, heed the notice of malfunctions in the project planning manual and the commissioning manual. Contact the manufacturer if necessary [chapter 13 "Service and Support" on page 77](#).

| Malfunction | Failure cause | Measures |
|--|---|---|
| The motor does not run | Release of the controller is missing | Activate the release of the controller |
| | Failure of the controller | Troubleshooting according to the documentation of the controller. |
| | Supply voltage is missing | Control the supply voltage |
| | Brake is not ventilated | Control the drive of the brake |
| Vibrations | The coupling element or the attachments are badly balanced | Re-balancing |
| | Adjustment of shaft end attachments (like coupling, gearbox...) is insufficient | Re-align the attachments. |
| | The fastening screws are loose. | Lock the screw connections as specified |
| Running noise | Foreign bodies within the motor | Set the motor on standstill -> repair by manufacturer |
| | Bearing is damaged | Set the motor on standstill -> repair by manufacturer |
| High motor temperature The motor temperature approaches | Operation outside of the characteristics | Reduce the weight |
| | The heat flow is impeded | Clean the motor |
| | | Clean the fan grill of the fan unit and check the function of the fan Control the coolant circuit at liquid cooling. |
| Wrong or incorrect temperature displayed | Temperature sensor not connected | Connect the temperature sensor. |
| | Temperature sensor is damaged | Set the motor on standstill -> repair by manufacturer |

Fig. 11-1: Malfunctions at QSK motors

11.6 Dismantling

DANGER

Fatal injury due to errors during the control of motors or works on moving elements!

- Do not work on unsecured and operating machines.
 - Secure the machine against accidental movements and against unauthorized operation.
 - Before dismantling, secure the motor and power supply against falling or movements before disconnecting the mechanical connections.
-

WARNING

Burns may be caused through hot surfaces with temperatures over 100 °C.


- Do not work on hot surfaces.
 - Use safety gloves.
 - Let the motor cool down, before maintenance. The thermal time constant stated in the technical data is a measure for the cooling time. A cooling time up to 140 minutes can be necessary!
-
- Observe the instructions of the machine documentation.
 - Please observe the safety notes.
 - Dismantle the motor from the machine. Store the motor properly!

12 Environmental Protection and Disposal

12.1 Environmental Protection

| | | |
|---|---|---|
| Production Processes | The products are made with 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 the case of appropriate use. Normally, our products will not have any negative influences on the environment. | |
| Significant Components | Basically, our products contain the following components: | |
| | Electronic devices <ul style="list-style-type: none"> • steel • aluminum • copper • synthetic materials • electronic components and modules | Motors <ul style="list-style-type: none"> • steel • aluminum • copper • brass • magnetic materials • electronic components and modules |

12.2 Disposal

| | | |
|-----------------------------------|--|--|
| Return of Products | <p>Our products can be returned to our premises free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt. Furthermore, the products returned for disposal must not contain any undue foreign material or foreign components.</p> <p>Send the products "free domicile" to the following address:</p> <p style="text-align: center;">Bosch Rexroth AG Electric Drives and Controls Buergermeister-Dr.-Nebel-Strasse 2 97816 Lohr am Main, Germany</p> | |
| Packaging | <p>The packaging materials consist of cardboard, wood and polystyrene. These materials can be recycled anywhere without any problem.</p> <p>For ecological reasons, please refrain from returning the empty packages to us.</p> | |
| Batteries and Accumulators | <p>Batteries and accumulators can be labeled with this symbol.</p> <div style="text-align: center;">  </div> <p>The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.</p> <p>The end user within the EU is legally obligated to return used batteries. Outside the validity of the EU Directive 2006/66/EC keep the stipulated directives.</p> <p>Used batteries can contain hazardous substances, which can harm the environment or the people's health when they are improperly stored or disposed of.</p> <p>After use, the batteries or accumulators contained in Rexroth products have to be properly disposed of according to the country-specific collection.</p> | |
| Recycling | <p>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 modules.</p> | |

Environmental Protection and Disposal

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

Products made of plastics can 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 valid legal requirements.

13 Service and Support

Our service helpdesk at our headquarters in Lohr, Germany and our worldwide service will assist you with all kinds of enquiries. You can reach us **around the clock - even on weekend and on holidays**.

| | Helpdesk | Service Hotline Worldwide |
|----------|---|---|
| Phone | +49 (0) 9352 40 50 60 | Outwith Germany please contact our sales/service office in your area first. |
| Fax | +49 (0) 9352 40 49 41 | |
| E-mail | service.svc@boschrexroth.de | For hotline numbers refer to the sales office addresses on the Internet. |
| Internet | http://www.boschrexroth.com You will also find additional notes regarding service, maintenance (e.g. delivery addresses) and training. | |

Preparing Information

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

- Detailed description of the fault and the circumstances
- Information on the type plate of the affected products, especially type codes and serial numbers
- Your phone, fax numbers and e-mail address so we can contact you in case of questions.

Index

..... 22

A

| | |
|---------------------------------------|----|
| Accumulators..... | 75 |
| Ambient temperature..... | 41 |
| Ambient temperature in operation..... | 22 |
| Attachments..... | 49 |
| Axial force..... | 48 |
| Axial load..... | 47 |

B

| | |
|------------------------------|----|
| Ball bearing pinion..... | 51 |
| Batteries..... | 75 |
| Bearing, overdetermined..... | 50 |
| Bearing lifetime..... | 47 |
| Bearing load..... | 47 |
| Brake torque..... | 52 |

C

| | |
|--|----|
| CE symbol..... | 56 |
| Climatic conditions | 42 |
| Compatibility..... | 45 |
| Conditions of installation..... | 44 |
| Connection cables | 71 |
| Connection plan..... | 39 |
| Connection time..... | 22 |
| Contained substances see "Significant components" | 75 |
| Continuous current at standstill 100 K..... | 21 |
| Continuous current at standstill 60 K..... | 21 |
| Continuous torque at standstill 100 K..... | 21 |
| Continuous torque at standstill 60 K..... | 21 |
| Cooling fins..... | 70 |
| Coupling..... | 50 |
| Couplings..... | 50 |

D

| | |
|--|----|
| Design..... | 44 |
| Discharge capacity of the component..... | 21 |
| Disconnection time..... | 22 |
| Disposal..... | 75 |
| Drag chains..... | 71 |
| Drive system..... | 7 |
| Duty cycle..... | 23 |

E

| | |
|-----------------------------------|----|
| Electric drive system..... | 7 |
| Encoder | |
| Current consumption | 22 |
| Distinguishable revolutions | 22 |
| Electric interface | 22 |
| Incremental signals | 22 |
| Number of lines | 22 |

E

| | |
|-------------------------------|----|
| ...Encoder | |
| Power supply voltage | 22 |
| Energy management chains..... | 71 |
| Environmental protection..... | 75 |

F

| | |
|------------------------|--------|
| Fit..... | 66 |
| Flange assembly..... | 65, 66 |
| Foreign materials..... | 45 |

G

| | |
|------------------|----|
| Gear pinion..... | 50 |
| Getriebe..... | 50 |

H

| | |
|-----------------------------|----|
| Hazardous substances..... | 75 |
| Heat dissipation..... | 70 |
| Holding brake | |
| Commissioning | 53 |
| electrically-released | 51 |
| Holding brakes..... | 51 |
| Danger warning | 52 |
| Holding torque..... | 22 |
| Housing varnish..... | 45 |
| Humidity | |
| Absolute air humidity | 42 |
| Relative air humidity | 42 |

I

| | |
|--|----|
| Identification..... | 62 |
| Inappropriate use | |
| Consequences, exclusion of liability | 5 |
| Installation positions..... | 44 |
| Insulation class..... | 22 |
| Intended use..... | 5 |
| IP type of protection..... | 44 |

M

| | |
|-------------------------------------|--------|
| Maximum current..... | 21 |
| Maximum speed..... | 21 |
| Maximum torque..... | 21 |
| Mean speed..... | 48 |
| Moment of inertia of the brake..... | 22 |
| Moment of inertia of the rotor..... | 21 |
| Motor assembly..... | 65, 66 |
| Motor name plate..... | 62 |
| Mounting | |
| Ball bearing pinion | 51 |
| Couplings | 50 |
| Gearbox | 50 |
| Helical drive pinion | 51 |

Index

N

| | |
|---------------------------|----|
| Non-intended use..... | 6 |
| Number of pole pairs..... | 21 |

O

| | |
|-----------------------------|--------|
| Operating hours..... | 47 |
| Operating modes..... | 22 |
| Output shaft..... | 45, 46 |
| Plain output shaft | 45 |
| Overdetermined bearing..... | 50 |

P

| | |
|-----------------------------------|----|
| Packaging..... | 75 |
| PELV..... | 12 |
| Permitted axial force..... | 48 |
| Permitted radial force..... | 48 |
| Priming..... | 45 |
| Processing cycle..... | 48 |
| Production processes..... | 75 |
| Protective extra-low voltage..... | 12 |

R

| | |
|---------------------------------|----|
| Radial force..... | 48 |
| Radial load..... | 47 |
| Radial shaft sealing rings..... | 46 |
| Rated current..... | 22 |
| Rated voltage..... | 22 |
| Recycling..... | 75 |
| Return of products..... | 75 |
| Running noises..... | 71 |

S

| | |
|---|--------|
| Safety instructions for electric drives and controls..... | 7 |
| Schrägverzahnung..... | 51 |
| Setup elevation..... | 41 |
| Shaft | |
| plain | 45 |
| Shaft load..... | 47, 49 |
| Shaft sealing ring..... | 46 |
| Shock..... | 43 |
| Shock absorber..... | 64 |

S

| | |
|-----------------------------|----|
| Significant components..... | 75 |
| Sinusoidal vibrations..... | 42 |
| Sling belts..... | 64 |
| Sound pressure level..... | 21 |
| State of the art..... | 5 |
| Support | |
| see Service Hotline | 77 |
| Switch-off temperature..... | 55 |

T

| | |
|-------------------------------|----|
| Technical Data | |
| Data sheet QSK061B-0300 | 24 |
| Data sheet QSK061C-0300 | 26 |
| Data sheet QSK075C-0300 | 28 |
| Data sheet QSK075D-0200 | 30 |
| Data sheet QSK075D-0300 | 32 |
| Data sheet QSK075E-0200 | 34 |
| Temperature sensor..... | 54 |
| Thermal time constant..... | 21 |
| Tightness..... | 46 |
| Torque constant..... | 21 |
| Type code | |
| QSK061 | 19 |
| QSK075 | 20 |
| Type of protection..... | 44 |

U

| | |
|-------------------------|---|
| Use | |
| Inappropriate use | 6 |
| Intended use | 5 |

V

| | |
|-----------------------|----|
| Varnish..... | 45 |
| Vibration..... | 42 |
| Voltage constant..... | 21 |

W

| | |
|--------------------------|----|
| Warning temperature..... | 55 |
| Weight..... | 21 |
| Winding inductivity..... | 21 |
| Winding resistance | 21 |

Notes

Bosch Rexroth AG
Electric Drives and Controls
P.O. Box 13 57
97803 Lohr, Germany
Bgm.-Dr.-Nebel-Str. 2
97816 Lohr, Germany
Tel. +49 (0)93 52-40-0
Fax +49 (0)93 52-48 85
www.boschrexroth.com/electrics



R911330321