Operating Manual
Motor Spindle 4041 DC-S

EN

(Figure, sample)

INDUSTRIAL DRIVES

SycoTec

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A 1.0 User Information

A 1.1 Symbols Used

Operating Manual / Unit

	Situations where failure to follow the instructions may lead to danger, damage to material or operating faults.
	Important information for operator and engineer
	Information on disposal
	Close, screw in, fasten, etc.
	Open, release, loosen
	Direction of rotation
	Canadian Standards Association (CSA)
	CE mark (Communauté Européenne)
	Caution! Hot surface

Packaging

	Fragile
	Keep dry
	Stacking restrictions
	Temperature range
	Air pressure
	Humidity
	Quantity

A 1.2 Important Information

Target group: This document is intended for machine manufacturers and persons responsible for putting into service and operation of the motor spindle.

The operating manual should be read by the user before starting up the unit for the first time in order to avoid incorrect operation and other damage. Duplication and distribution of the operating manual require SycoTec's prior consent.

All specifications, information and properties of the product described in the operating manual correspond to the status on going to press.
Modifications and improvements to the product as a result of new technical developments are possible. This does not imply any right to retrofitting of existing units.

SycoTec assumes no responsibility for damage arising through:
- external influences (poor quality of the media or faulty installation)
- use of incorrect information
- improper use
- improperly performed repairs.

Repair and maintenance work - apart from the activities described in this operating manual - may be performed only by qualified technical staff.

- *In the event of modifications by third parties, the licences become null and void.*
- *Use only SycoTec original parts.*

Disposal of equipment and accessories after use:
Based on EU directive (WEEE 2012/19/EU) on waste electrical and electronic equipment, we hereby inform you that this product is not subject to the aforementioned directive but may be disposed of through special channels within Europe.

Caution! Hot surface
Warning about hot surface.
Overload or a lack of cooling can lead to very high temperatures.

A 1.3 Safety Precautions

Safe operation and protection of the unit are ensured only through proper use in accordance with the operating manual and using the tools approved for the purpose.

The following should also be observed:

- the tool manufacturer's instructions,
- the occupational safety regulations,
- the accident prevention regulations.

- *Each time before switching on, check the set speed.*
- *Observe the permissible maximum speed and maximum contact pressure of the tools (according to tool manufacturer's instructions).*
- *Use safety spectacles when working with rotating tools.*

In the event of an unsatisfactory condition of the unit or improper use, e.g.:

- unsuitable tools
- tool shanks not manufactured to DIN-ISO
- improper use or use not in accordance with purpose
- non-permissible speeds for tools used
- incorrect clamping of the tools in the chuck
- insufficient retaining force of the chuck (wear, contamination, failure to follow the product care instructions for the chuck system, etc.)
- different sizes of tool shank and chuck
- lack of regular cleaning of the chuck
- failure to follow the maintenance instructions
- failure to comply with the accident prevention regulations (e.g. failure to use safety spectacles, safety guards, handpiece racks etc.)
- failure to non-conformity with the EMC Guidelines regarding radiation from low frequency, radio frequency and microwaves (it is possible to use screened cables)
- failure to take into account signs of wear and tear and damage
- tool shanks which have slipped out (potential danger = bending of the tool shanks)

there is a risk of injury and damage to material and unit, e.g. due to:

- bending of the tool shanks
- accidental withdrawal of the tools from the chuck
- eccentric rotation or shattering of tools, or
- catching and untwisting
- catapulting of material particles

In order to prevent this, safety precautions must be incorporated into the unit.

Any claim under warranty shall be excluded if defects or the consequences thereof are due to manipulation or modifications to the product by the customer or by any third parties not authorized by SycoTec.

EMC analyses must be carried out and evaluated in conjunction with the inverter within the unit.

A 1.4 Purpose and Applications

The motor spindle is designed to be used in machines for drilling, milling, cutting and engraving.

Suitable for operation at 5.000 - 50.000 min^{-1} (60.000 min^{-1} temporary)

A 2.0 Scope of Supply - Accessories

A 2.1 Scope of Supply

Motor spindle 4041 DC-S	Material no. 1.002.4700
Motor spindle 4041 DC-S-D80	Material no. 2.001.7200
Motor spindle 4041 DC-S-HF	Material no. 2.002.2500
Motor spindle 4041 DC-S-EP4	Material no. 2.002.2665
Combination wrench (10 mm)	Material no. 0.411.5232
Combination wrench (13 mm)	Material no. 0.308.0313
Set of brushes	Material no. 0.411.0190
Operating manual	Material no. 1.002.7802

Declaration of incorporation acc. to EG Machinery Directive 2006/42/EG, Attachment IIB

Assembly instruction acc. to EG Machinery Directive 2006/42/EG, Attachment VI

Check to make sure delivery is complete.

A 2.2 Accessories

Accessories available on request:

Clamping bracket 4846	Material no. 1.002.7868
Chucks	see chapter A 9.0

Motor connection cable - Motor spindle 4041 DC-S (1.002.4700)

Connecting cable 5,0 m	Material no. 1.000.1564
Connecting cable 10,0 m	Material no. 1.004.8863

A 3.0 Electrical Connection

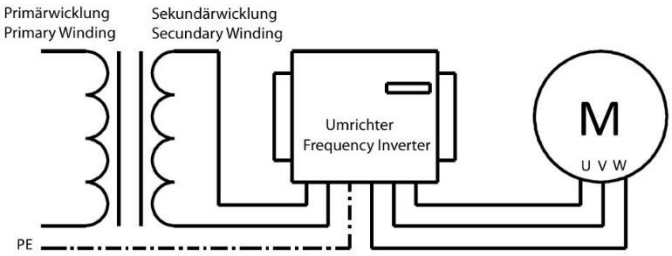
Check that the available voltage and frequency agree with the data on the frequency inverter.

Rating plate (exemplary):

See A 1.1 for symbols used.

SycoTec recommends operation with frequency inverter type e@syDrive 4426, TV 4506* (*reduced output power).

⚠ • *When using another frequency inverter, ensure that the inverter output voltage to the network meets requirements in terms of "double insulation".*
• *Safe separation with double isolation from the mains circuit between primary and secondary coil, in accordance with EN 61800-5-1 or EN 60950.*



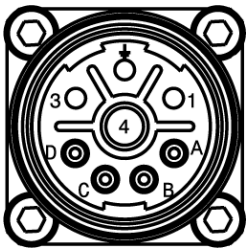
⚠ • *The parameter set in the frequency inverter is set to the respective spindle type.*
• *When using another frequency inverter, ensure that the inverter output voltage to the network meets requirements in terms of "double insulation".*

⚠ • *Installation and connection must be performed only by qualified personnel in accordance with the circuit diagrams and locally applicable safety rules. Check electrical safety before operational release.*
• *Repair and maintenance work - apart from the activities described in this operating manual - may be performed only by qualified technical personnel.*
• *Dangers from faults in the power supply, breaking of machine parts or other malfunctions, e.g.*
- unforeseen ejection
- unexpected starting
- unexpected slipping/over-revving
- incorrect direction of rotation (chuck mechanism can loosen)
must be prevented by appropriate safety features incorporated in the control unit (e.g. max. speed).
• *Before repair or maintenance work, disconnect the power supply plug from the control unit so that there is no power to the motor spindle.*

A 3.1 Assignment of the plug-type connector - Motor connection cable

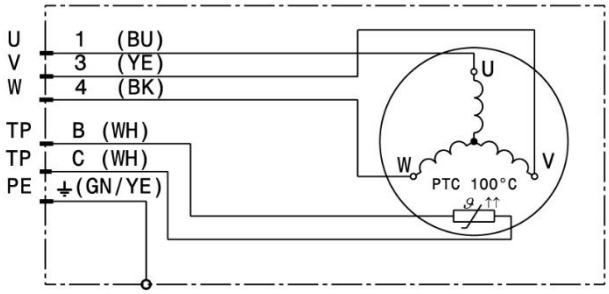
Motor spindle 4041 DC-S (1.002.4700) / 4041 DC-S-HF (2.002.2500) / 4041 DC-S-EP4 (2.002.2665)

Designation	Plug connector	Connecting cable	
Phase U	1	BK	[U L1 C L+]
Phase V	3	BK	[V L2]
Phase W	4	BK	[W L3 D L-]
PTC thermistor TP	B	BK	[BR1]
PTC thermistor TP	C	BK	[BR2]
Protective earth PE	⏚	GN/YE	



Motor spindle 4041 DC-S-D80 (2.001.7200)

Secure the connection wires to the terminals of the frequency inverter.

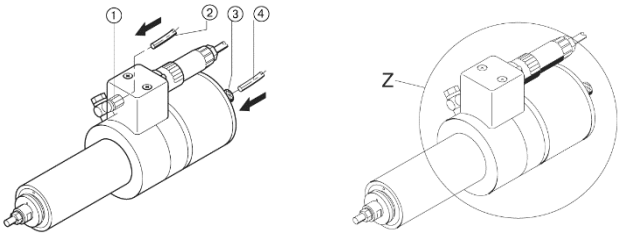


- *Ensure that the ground wire is correctly fixed to the provided grounding terminal.*
- *Take note of the direction in which the motor spindle rotates (if necessary, swap two phases).*

A 4.0 Installation and Commissioning

- *Stop machine before installing the spindle and secure it against restarting. Secure suspended axes to prevent sinking or changes in position.*
- *Connect unpressurized compressed-air lines only.*
  Before switching on/releasing the compressed-air supply, make sure that no one can be endangered due to unexpected movements or ejected parts.
- *The motor spindle must not be put into operation when not installed.*
- *The motor spindle must be clamped in the machine using a chuck suitable for the spindle. The manufacturer of the machine in which the motor spindle is installed must ensure that the mounting is capable of withstanding the forces that may be expected to arise under all operating conditions so that the motor spindle is prevented from being thrown out.*

- Attach the sealing air hose (2), inner/outer diameter 4/6 mm, to the sealing air connector (1) in the direction of the arrow ◀, then secure.
- The sealing air must be present before the coolant is activated.
- Never operate the motor spindle without air lock.
- When commencing operation of the motor spindle fit the compressed-air hose (4), inner/outer diameter 4/6 mm, in the direction of the arrow ◀ to the air connection nozzle (3) and connect up.
- Compressed air supply of 0,5 - 0,8 bar (7 – 12 psi) for air-lock, must be clean and dry.
- The whole region of the cylinder (Z), as well as the compressed air and the electric connection must be protected against the penetration of dirt and water.



Use only compressed air free from dirt, water and oil!

Compressed air purity class according to ISO 8573-1:2010

Particle class 3
The number of particles per cubic metre of compressed air must not exceed 90.000 particles in the range between 0,5–1 microns, 1.000 particles in the range between 1–5 microns
Water class 4
A pressure dew point of +3 °C or higher is required. Water in liquid form is not permissible.
Oil class 3
A maximum of 1 mg of oil is permitted per cubic metre of compressed air. This value corresponds to the total liquid oil, oil aerosol and oil mist content.

- *Motor spindles may only be mounted and operated in suitable receptacles and machines, according to the application possibilities of the motor spindles.*
- *When mounting the motor spindle pay attention to a completely cylindrical seating.*
- *The motor spindle have to be grounded!*

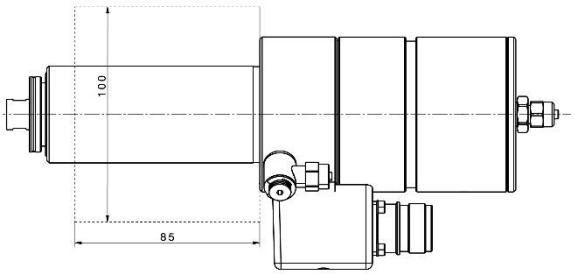
- Operation in any position between horizontal and vertical (tool pointing down) is possible.
- The motor spindle is designed to be cooled via the clamping bracket.
- The motor spindle is to be protected based on the IP degree of protection (in accordance with A 7.0).

- Only operate motor spindle with a tool or c-lock pin clamped in the chuck. Avoid, at all times, impact or blows against the motor spindle or a clamped-in tool.
- Only work with concentric tools.
- A too-high tension is to be avoided (effects the rotation and lifetime of the motor spindle).
- Ensure correct rotation in accordance with the direction of the arrow on the rating plate.

⚠ *Regulations for the prevention of accidents are to be observed!*

- It is recommended to use clamping bracket 4846 (Material no. 1.002.7868).
  Initial torque 3,0 Nm when clamping the motor spindle is to be maintained.

Position of Clamping Bracket



A 4.1 Operation

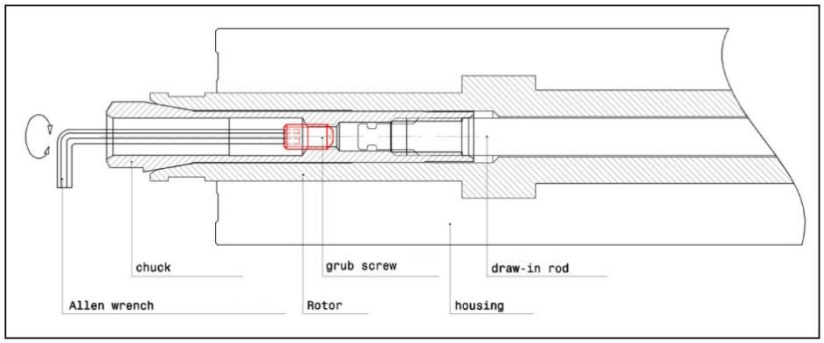
⚠
- *During commissioning and each time when operating the motor spindle, it is essential to observe the points mentioned in the section A 1.3 "Safety Precautions"!*
- *Do not operate the motor spindle without the protective devices of the machine in which it has been installed.*
- *Do not operate or lay down the motor spindle unless a tool or c-lock pin is clamped in the chuck. Use the entire clamping depth when clamping the tool.*

A 5.0 Operation

⚠ *During commissioning and each time when operating the motor spindle, it is essential to observe the points mentioned in the section A 1.3 "Safety precautions"!*

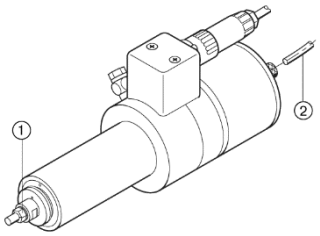
⚠ *Tools and/or chucks must be changed (pneumatically with compressed air, in accordance with A 7.0 "Technical Data") **only when the motor spindle is at a complete stand-still.** Frequency converters must be secured against accidental switching on, for example by pressing the mains power switch to "OFF".*

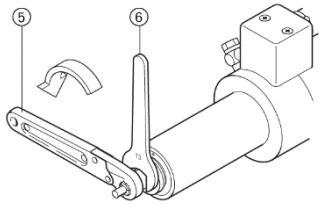
⚠ *On chucks protected against rotation by means of a grub screw, the grub screw must first be loosened before the chuck is removed.*
Attempts to remove the chuck without loosening the grub screw may cause seriouse damage to the motor spindle and the chuck.



A 5.1 Releasing the Chuck

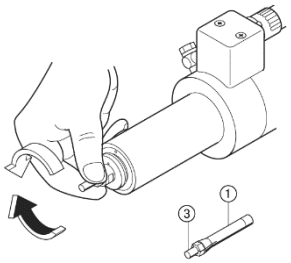
- To open the chuck (1) apply compressed air (in accordance with A 7.0 "Technical Data") (see also A 4.0). After the chuck has opened, turn it by hand in the direction of the arrow ◁ until the chuck can be removed from the front.
- Exert pressure with combination wrench 13 mm (6) and combination wrench 10 mm (5) only when the chuck is firmly applied.

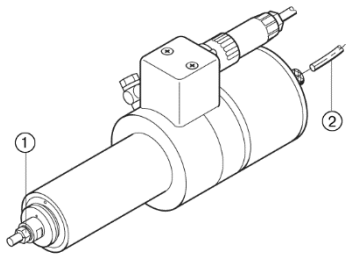




A 5.2 Inserting the Chuck

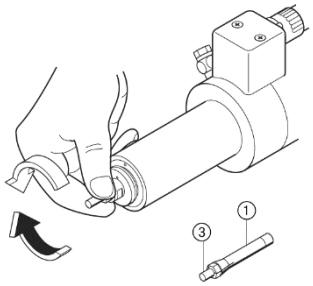
- Insert new chuck (1) with tool or c-lock pin (3) into the chuck holder.
- Tighten the chuck (1) with tool or c-lock pin (3) inserted by hand in the direction of the arrow ▶ up to the limit stop. To adjust the correct clamping path, the chuck is now turned back by 1/2 turn (loosen).
  Stop compressed air supply and allow the existing overpressure in the hose (2) to blow off.

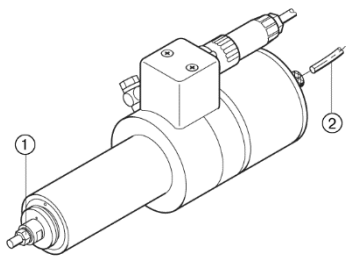




A 5.3 Changing Tools

- When changing the tool, allow compressed air (in accordance with A 7.0 "Technical Data") to flow in the motor spindle (see also A 4.0). After the chuck (1) has opened remove the so far used tool.
- A new tool must be inserted in the chuck up to the length of the stab and considering the specifications from the manufacturer. The tool itself must not touch the chuck.
  Stop compressed air supply and allow the existing overpressure in the hose (2) to blow off.

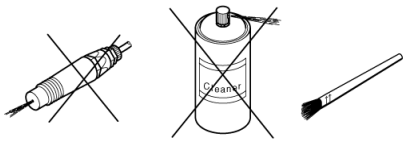




A 6.0 Maintenance

⚠ • *Repair and maintenance work - apart from the activities described in this operating manual - may be performed only by qualified technical personnel.*
• *Before repair or maintenance work, disconnect the power supply plug from the control unit so that there is no power to the unit.*
• *Before starting cleaning and maintenance work, stop the machine in which the motor spindle has been installed, disconnect the power supply and secure it against restarting.*

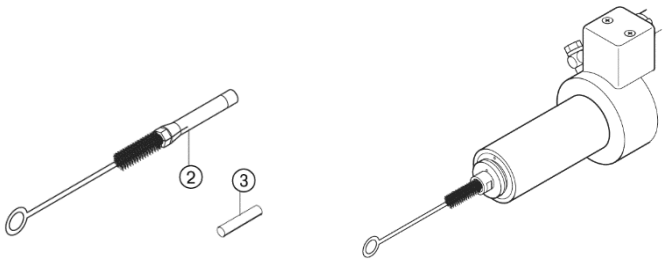
⚠ • *On no account clean the motor spindle with ultrasound, steam jet, compressed air, or similar.*
• *Use the cleaning brush from the set of brushes.*
• *Under no circumstances should detergents (e.g. spray cleaner, grease solvents, etc.) get into the inside of the motor spindle.*
• *Use only original chucks.*



A 6.1 Cleaning of Chuck and Motor Spindle

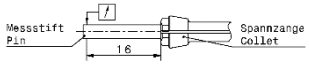
ⓘ *Clean the chuck regularly.*

• Clean chuck holder and chuck (2) with brush or similar.
• Apply a light film of oil to the chuck thread.
• Re-insert the cleaned chuck (2) with tool or c-lock pin (3) into the motor spindle (see A 5.1 - A 5.2).



A 7.0 Specifications

- *Further installation dimensions, with tolerances, are available on request from SycoTec.*
- *Applicable standard: EN 60034-1 "Rotating electrical machines".*
- *Technical data relates to operation with spindle cooling (see A 7.2 and A 7.3). Deviations are to be agreed with SycoTec.*

Clamping diameter	45 mm
Motor system	brushless DC motor (BLDC)
Speed range	5.000 - 50.000 min^{-1} / (60.000 min^{-1} temporary)
Voltage	45 V 3~
Current	max. 16 A
Torque	max. 17 Ncm
Frequency	83 - 1.000 Hz
Output power	S1: 900 W / max. 1.050 W
Weight	3,2 kg
Bearing system	3 x hybrid, lifetime lubrication
Protection category	IP 54
Motor protection	PTC - 100 °C
Protection class	III
Installation category	Cat. II
Pollution degree	P2
Load direction	axial + radial
Working position	
Run-out in spindle cone	≤ 0,0015 mm
Run-out with chuck	≤ 0,03 mm
Measuring point	
Clamping range	Ø 1,0 - 6,35 mm (incl. 1/8 + 1/4")
Tool change	
- 1.002.4700 / 2.001.7200 / 2.002.2500	pneumatic 7 - 8 bar (102 - 116 psi) (hose Ø inner/outer 4/6 mm)
- 2.002.2665	pneumatic 4 - 5 bar (58 - 73 psi) (hose Ø inner/outer 4/6 mm)
Cooling system	cooling via clamping bracket
Protected against dirt and cooling lubricant	sealing air 0,5 - 0,8 bar (7 – 12 psi) (hose Ø inner/outer 4/6 mm)
Housing material	stainless steel
PTC thermistor	protected to the mains power supply by base insulation.

Ambient Conditions

Permitted in interior rooms	
Ambient temperature	5 - 40 °C / (41 - 104 °F)
Relative humidity	max. 80 %
Max. altitude	2.000 m

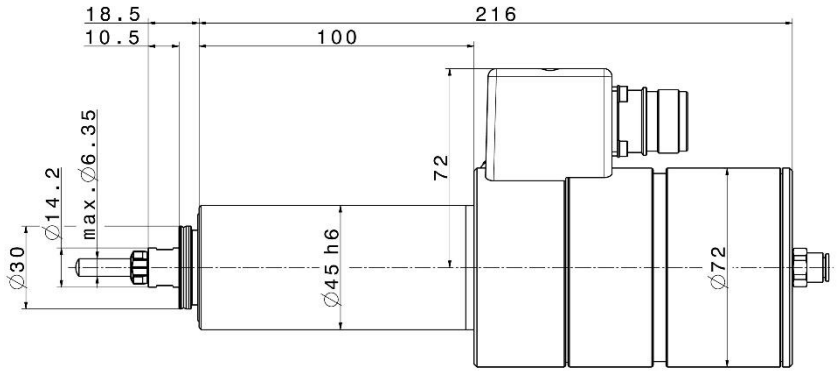
Storage and Transport Conditions

Ambient temperature	-30 - 70 °C / (-22 - 158 °F)
Relative humidity	5 - 95 %
Air pressure	700 – 1.060 hPa
Keep dry!	

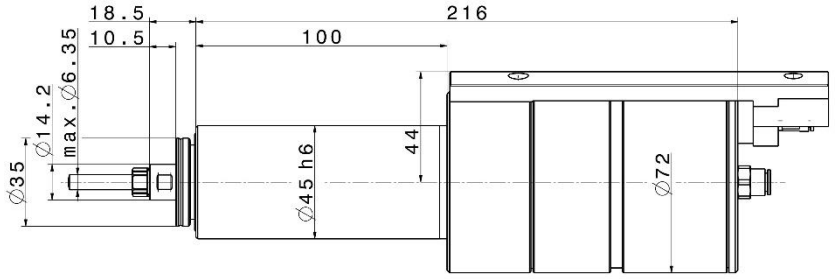
We reserve the right to make technical modifications.

A 7.1 Dimensions

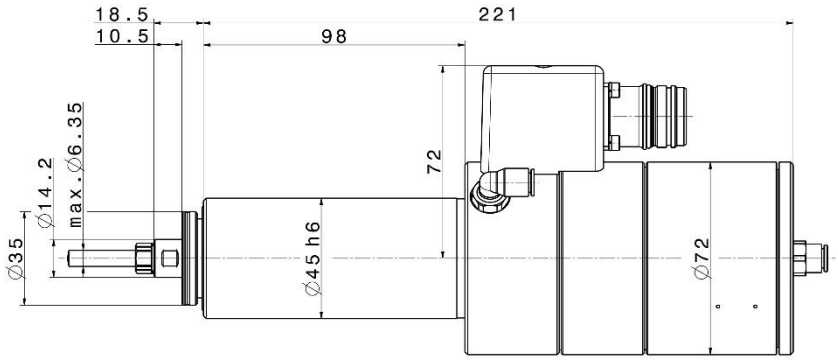
Motor spindle 4041 DC-S (1.002.4700) / 4041 DC-S-HF (2.002.2500)



Motor spindle 4041 DC-S-D80 (2.001.7200)



Motor spindle 4041 DC-S-EP4 (2.002.2665)



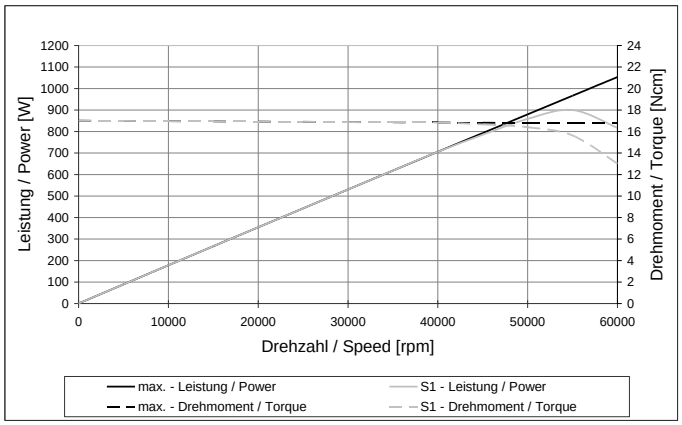
A 7.2 Spindle Cooling

Clamping bracket 4846
- contains water cooling circulation:

Material no. 1.002.7868
Flow temperature 20 °C
Flow quantity 0,5 l/min

A 7.3 Performance Diagram

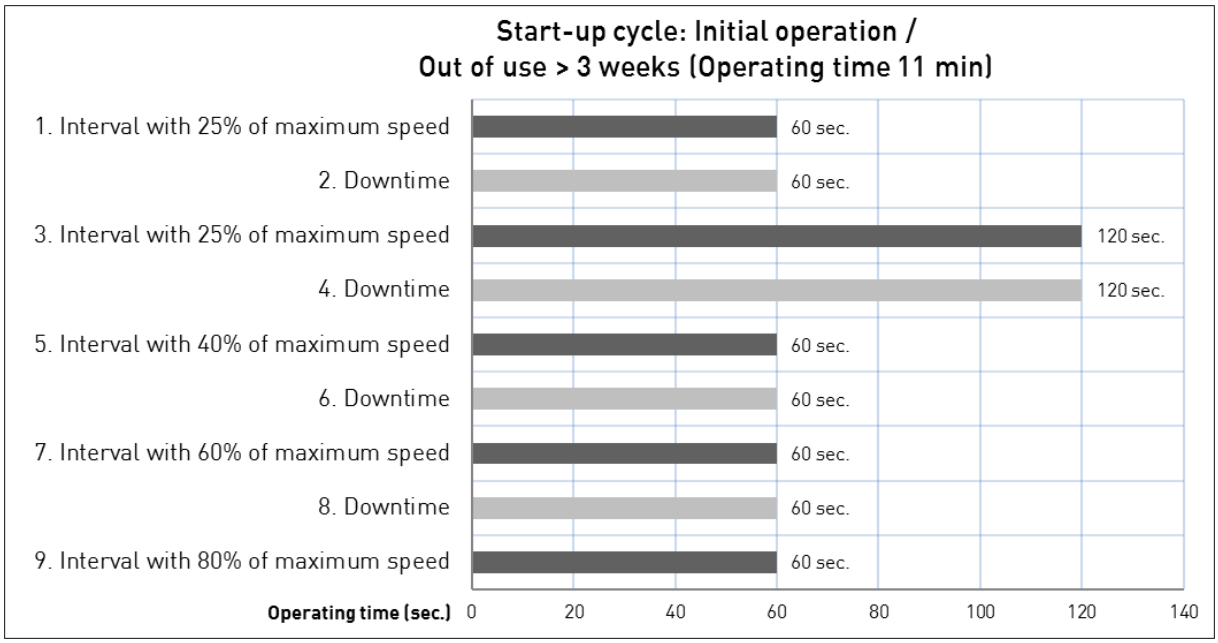
Torque power diagram, water-cooled in accordance with A 7.2, in conjunction with e@syDrive 4426

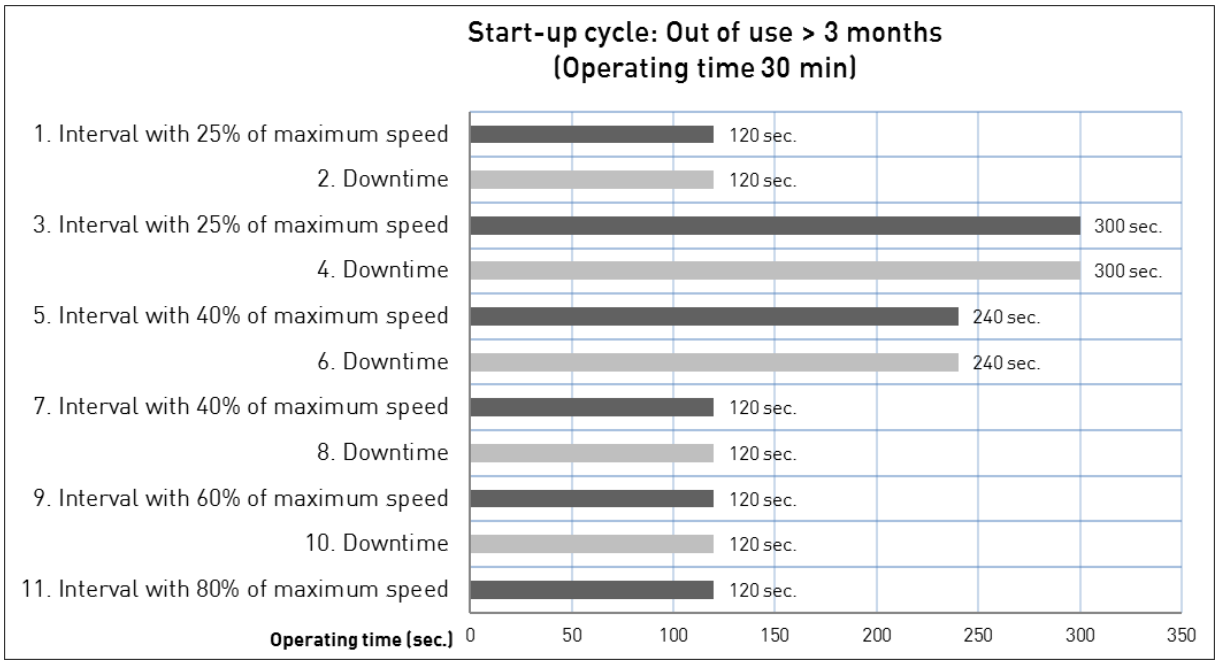


- *Values only match for the setup described above.*
- *The manufacturer's limits must be complied with.*
- *The mechanical loads must be complied with independent of the electrical ratings, and they must be checked separately for each application.*
- *Information about the individual maximum mechanical loads should be requested from SycoTec.*

A 8.0 Requirements for Starting Up

⚠ *Before initial operation and if the motor spindle has not been used for a long time, it **must** be started up according to the following requirements with a quantity of sealing air as specified in A 7.0 under "Protected against dirt and cooling lubricant". **(Grease distribution run of the spindle bearing)***
The temperature of the motor spindle must not exceed 40°C during start-up.





A 9.0 Chucks

Motor spindle 4041 DC-S (1.002.4700) / 4041 DC-S-EP4 (2.002.2665)

Standard sizes	Material no.
Ø 3,0 mm	0.675.1442
Ø 3,175 mm (1/8")	0.675.2012
Ø 3,175 mm (1/8")	0.675.1091 (with O-ring and bolt)
Ø 3,175 mm (1/8")	1.000.8455 (with O-ring and grub screw)
Ø 3,175 mm (1/8")	1.004.0223 (with cap, O-ring and grub screw)
Ø 4,0 mm	0.675.1462
Ø 6,0 mm	0.675.1482
Ø 6,0 mm	2.000.7290 (with grub screw)
Ø 6,35 mm (1/4")	0.675.1492

Special sizes	Material no.
Ø 1,0 mm	2.000.2846
Ø 1,5 mm	0.675.1552
Ø 2,0 mm	0.675.1502
Ø 2,35 mm	0.675.1512
Ø 2,5 mm	0.675.1522
Ø 3,5 mm	0.675.1542
Ø 5,0 mm	0.675.1472

Motor spindle 4041 DC-S-D80 (2.001.7200) / 4041 DC-S-HF (2.002.2500)

Ø 6,0 mm	2.001.8753 (with grub screw)

A 10.0 Service and Repair

The motor spindle should only be repaired by SycoTec or a SycoTec authorised repair workshop.

Please contact SycoTec if you need repairs (after-sales@sycotec.eu).

Warranty Conditions

Under current SycoTec delivery and payment conditions, SycoTec undertakes warranty for satisfactory function and freedom from faults in material and manufacture for a period of 12 months from the date of sale certified by the vendor.
In the event of justifiable complaints, SycoTec shall supply spare parts or carry out repairs free of charge under warranty. SycoTec accepts no liability for defects and their consequences which have arisen or could have arisen as a result of natural wear and tear, improper handling, cleaning or maintenance, non-compliance with the maintenance, operating or connecting instructions, corrosion, impurities in the air supply or chemical or electrical influences which are unusual or not admissible in accordance with SycoTec's standards. The warranty claims shall become null and void if defects or their consequences can be attributed to interventions in or modifications to the product. Warranty claims can only be validated if they are notified immediately in writing to SycoTec.
A copy invoice or delivery note clearly showing the manufacture number shall be attached if products are returned.

CE Declaration of Conformity

The CE Declaration of conformity may be requested or downloaded from www.sycotec.eu.

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(DE = original)

INDUSTRIAL DRIVES

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