Teknomotor Spindle Manual

Technical documentation for COMTC410018

ATC MOTOR ATC41-C-2DB-ISO20-LN-HY-LC 2.2KW 220V 400HZ 24000RPM

Teknomotor Srl

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1. PRODUCT MANUAL: COMTC410018

1.1 PRODUCT OVERVIEW

Motor Category: ATC MOTOR

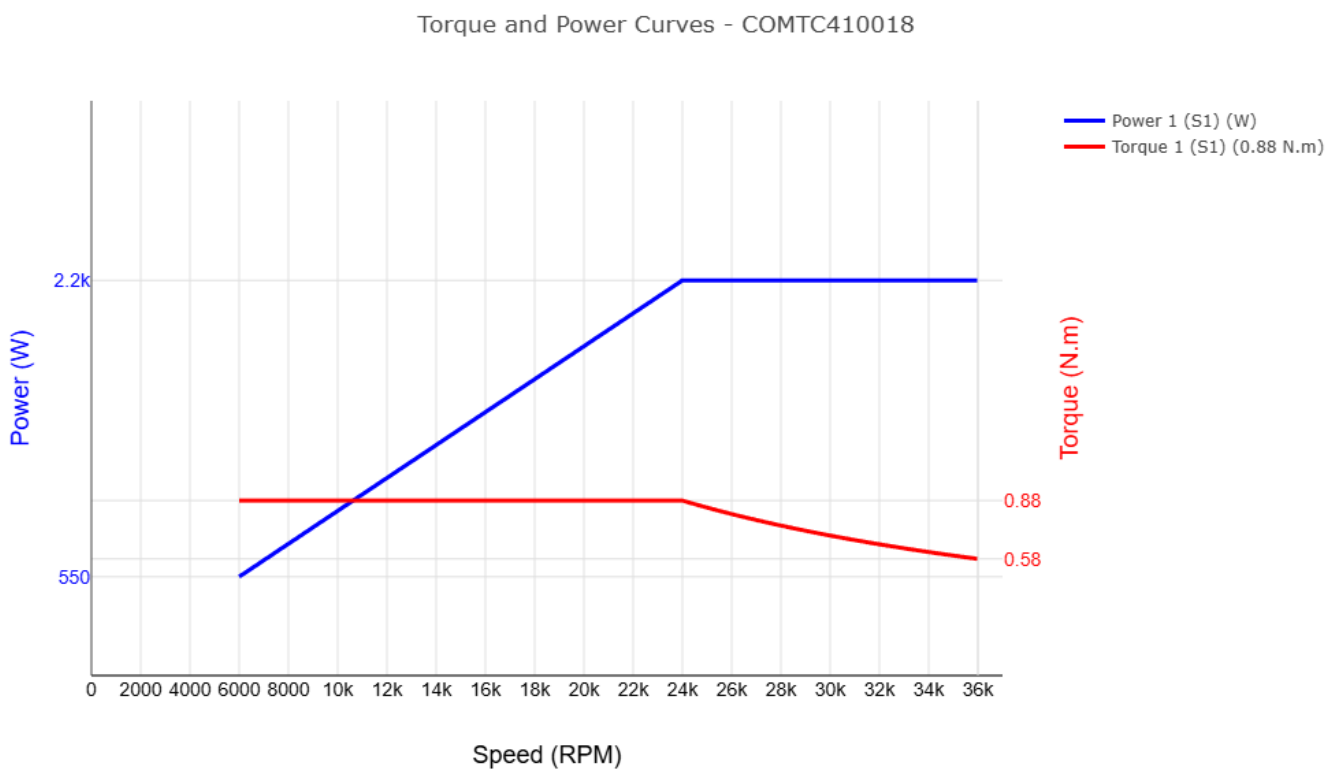
Description: ATC MOTOR ATC41-C-2DB-ISO20-LN-HY-LC 2.2KW 220V 400HZ 24000RPM

Series: TC41

1.2 TECHNICAL SPECIFICATIONS

Attribute	Value
Power	2.20 kW
Nominal Speed (RPM)	24000 RPM
Nominal Frequency (Hz)	400 Hz
Voltage	Δ 220 V
Current	Δ 8.40 A
Duty Cycle	S1
IP Rating	54
Insulation Class	F
Poles	2
Max Speed	40000 RPM
Min Speed	6000 RPM
Balancing Degree according to ISO 21940	G2.5

1.3 TORQUE



The formula used to calculate the nominal torque is:

$$\text{Nominal Torque [Nm]} = 9549 \times \frac{\text{Nominal Power [kW]}}{\text{Nominal Speed [RPM]}}$$

1.4 TORQUE CALCULATIONS

1.4.1 Nominal Torque for Duty Cycle S1:

For this product, with a nominal power of **2.2 kW** and nominal speed of **24000 RPM**, the calculated nominal torque is:

$$\text{Nominal Torque} = 9549 \times \frac{2.20}{24000} = 0.88 Nm$$

Attribute	Value
Nominal Power	2.20 kW
Nominal Speed	24000 RPM
Calculated Nominal Torque	0.88 Nm

2. DOCUMENT HISTORY:

Revision no.	Revision date	Revision description	Author
00	18/12/2034	Emissione	D. Bottarel

This manual is drawn up by the technical office of Teknomotor Srl.

This manual is aimed at installers, maintenance workers and other users who work with Teknomotor’s electrospindles.

TEKNOMOTOR SRL supplies the latest version of this manual together with the electrospindle at the time of its purchase.

3. ATTACHMENTS:

The documents listed below are an integral part of the user manual and must be read and understood in conjunction with it to avoid missing important information:

- MANUFACTURER DECLARATION OF CONFORMITY (EU)
- ELECTROSPINDLE DRAWING

The listed attachments may be embedded within this user manual or provided as separate documents or data sheets.

Ensure that all the above documents are available before installing, operating, or maintaining TEKNOMOTOR S.R.L. electrospindles covered by this user manual.

For any missing information or documentation, please contact the Technical Department of TEKNOMOTOR S.R.L. at tecnico@teknomotor.com.

4. INTRODUCTION

4.1 PURPOSE OF THE MANUAL

This manual contains important instructions and precautions, and must accompany the electrospindle at all times, as it is essential for the safe operation of the electrospindle and its operators.

Keep this manual in a safe place and ensure that all personnel involved with the electrospindle are aware of it and have access to it.

The safety precautions contained herein are designed to protect all personnel from the residual risks associated with the electrospindle.

The instructions provided are necessary for the correct operation of the electrospindle, as required by the manufacturer.

Make sure to read and fully understand all documentation supplied with the electrospindle to avoid incorrect operation and reduce the risk of personal injury.

Store this manual in a suitable location near the machine, where it will always be easily accessible for operators' reference.

	THE ELECTROSPINDLE MUST ONLY BE USED FOR THE PURPOSE FOR WHICH IT IS DESIGNED. SAFE OPERATION DEPENDS ON ADHERENCE TO THIS REQUIREMENT. SAFETY ALSO DEPENDS ON THE CORRECT INSTALLATION OF THE ELECTROSPINDLE, AS DESCRIBED IN THE FOLLOWING SECTIONS OF THIS MANUAL. THE INFORMATION PROVIDED IN THIS MANUAL IS ESSENTIAL TO ENSURE THE ELECTROSPINDLE IS INSTALLED AND USED SAFELY AND CORRECTLY.

4.2 GENERAL SAFETY SYMBOLS

In this manual, important instructions and precautions are marked with the following symbols:

	IMPORTANT: Identifies crucial information that requires special attention.
	WARNING-DANGER: Identifies situations that could result in electrical shock.
	WARNING-DANGER: Identifies situations that could lead to personal injury.

5. WARNING AND SAEFTY PRECAUTIONS

	Teknomotor S.r.l. does not, and cannot, know how end users will install their electrospindles. Therefore, the installer or customer must perform a risk assessment specific to each installation and application.

It is also the responsibility of the installer to ensure that adequate guards are provided to prevent accidental contact with moving parts.

The installer and the operator must also consider other types of risk, particularly those associated with foreign bodies, explosive, flammable, toxic, or high-temperature gases.

Risks associated with maintenance operations must also be mitigated. Maintenance must be performed under conditions of maximum safety, and only with the electrospindle fully stationary and switched off.

Once the electrospindle has been installed as decided by the installer and/or customer, the machine becomes a “finished machine” as defined for the purposes of the Machinery Directive. An overall risk assessment must therefore be performed on the finished machine, and a declaration of conformity must be produced in compliance with Appendix IIA of the 98/37/CE Machinery Directive.

5.1 RISKS ASSOCIATED WITH IMPROPER USE AND HANDLING

- Never impede the functioning of, remove, modify, or interfere with any safety device, guard, or control of individual parts or the electrospindle as a whole.
- Never place your hands, arms, or any other part of your body near moving machinery.
- Never push objects through the cover grill or into the electrospindle, whether it is stationary or operating.
- Do not use the electrospindle in atmospheres or environments where there is a risk of explosion.
- Unless you are duly authorized, never attempt to repair faults or malfunctions in the electrospindle, and never interfere with its operation or installation in any way.
- Upon completion of servicing work, during which guards, covers, or any other protections have been removed, always ensure that they have been correctly and securely replaced and are fully functional before restarting the electrospindle.
- Keep all protection and safety devices in perfect working order. Also, ensure that all warning and informative plates, labels, and symbols are correctly positioned and fully legible.
- When troubleshooting the electrospindle, always adopt all the safety precautions listed in this manual to prevent injury and/or damage to personnel and/or property.
- After adjusting any mechanical part, make sure to fully tighten all screws, bolts, or ring nuts you may have slackened or removed.
- Before starting the electrospindle, ensure that all safety devices are installed and fully functional. Do not start the electrospindle if this is not the case, but immediately inform the personnel responsible for machine safety or your direct superior.
- Ensure that you have and use all the personal protective equipment (PPE) required by law. Do not wear loose or hanging clothing (e.g., ties, wide sleeves, etc.).
- Never use tool holders that do not correspond to the models specified in this manual, as this may cause the risk of breakage or improper attachment of the tool holder cone.

5.2 RISKS SPECIFIC TO ELECTROSPINDLE MAINTENANCE

- During all maintenance and cleaning operations, take great care if a tool is fitted. It is advisable to remove any tool before starting cleaning or maintenance.
- Disconnect the electrospindle from the main supply before carrying out any maintenance operations.
- The electrospindle can still turn under the effect of inertia even after it has been switched off. Make absolutely sure that the electrospindle is not still spinning before starting any maintenance on it.
- Perform scheduled maintenance as specified in this manual to avoid the risk of mechanical failures from advanced wear.

	NEVER start any maintenance before making absolutely sure the electrospindle has stopped spinning. NEVER start any maintenance on the electrospindle without first disconnecting it from the electrical power supply. NEVER attempt to clean the electrospindle while it is rotating.

6. GENERAL INFORMATION

6.1 PROPER USE OF ELECTROSPINDLE

The electrospindle is designed to operate as part of a machine.

The frame of the machine to which it is fitted must be sufficiently rigid to provide adequate support for the weight of the electrospindle and to withstand the stresses caused by machining.

The product cannot operate independently: it is a part of a machine and is designed to be assembled with other machine parts or incorporated into a machine to form a machine in accordance with Directive 2006/42/EC.

It is forbidden to set the product into operation before the machine into which it is incorporated complies with the provisions of Directive 2006/42/EC and its subsequent amendments

6.2 RANGE OF APPLICATION

The product is designed for milling and boring operations in the fields of wood and its derivatives, plastics, composite materials, aluminum, and light machining operations on other metals.

The quick replacement of the shaft unit, complete with bearings, is possible on all models using the shaft kit. For further information, contact the Teknomotor’s Technical Office.

All electrospindles are equipped with a mechanical reaction system that almost completely cancels the axial force of the pistons on the bearing during the tool-changing phase, ensuring the long life of the front precision bearings.

6.3 GENERAL CONDITION OF SALE

FOREWORD
These General Conditions of Sale, except when specifically agreed between the Parties in writing:
-shall regulate any present or future sales contracts, proposals/offers as well as any other agreement stipulated between Teknomotor S.r.l. (hereinafter "Seller" or "TM") and the Buyer or Customer; and
-cancel and replace all previous conditions of sales of TM and constitute the reference basis for all agreements with the Buyer. Any general conditions of sale of the Buyer in contrast with the present provisions are not applicable except if confirmed by the Seller in writing.

1) STIPULATION AND EFFECTIVENESS OF THE AGREEMENT

The signing of a sales contract between the Parties, in whatever form, involves the Buyer's acceptance of these General Conditions of Sale.

The sales contract shall be considered as accomplished when, following receipt of an order conforming to the provisions under Art. 3 below, the Seller has sent the Buyer a written confirmation of it. Any matter not expressly or implicitly dealt with by the sales contract shall be ruled by: i) CISG (United Nations Convention on Contracts for the International Sale of Goods; ii) insofar as not covered by CISG, the law of the country where the Seller has its residence.

2) PRODUCT FEATURES

Any information or data regarding technical specifications and/or characteristics of the products contained in leaflets, pricelists, catalogues or similar documents shall be binding only if expressly mentioned and defined as binding in the sales contract.

The Seller reserves the right to alter the products insofar as, in its sole judgment, modifications are deemed necessary or recommended and providing they do not alter the fundamental features of the products.
The Seller is not obliged to adapt, alter or withdraw the products from the market if legal regulations on the application, quality or use of the products are changed subsequently to the accomplishment of the agreement.

3) ORDERS

The Buyer's purchase order, however called, is always subject to written acceptance by TM. Notwithstanding the acceptance of telephone agreements, all orders must be subsequently sent and confirmed by the Buyer via facsimile, surface or electronic mail.

All subsequent order modifications must be notified in writing subject to the Seller's new written acceptance. The Seller's offer is to be deemed firm and irrevocable only if so, stated in writing and if it specifically shows a validity term for the provision. Otherwise, it shall be considered not binding or as a mere reply to a quotation request. Any negotiations carried out by agents, licensees, representatives or sales assistants of the Seller are not binding for the latter until receipt of the Seller's express confirmation. Exclusively in case of materials not included in the Catalogue, i.e., in case of materials for which special agreements have been met between Teknomotor S.r.l. and the Customer, cancellation of the order by the Buyer involves TM's right to withhold any deposits paid by the Customer or to apply a penalty amounting to 20% of the value of the order, notwithstanding the Seller's faculty to ask for further damages.

4) DELIVERY TERMS AND DELAYED DELIVERY

Except if otherwise agreed upon in writing, sales are made "EX-WORKS" even when the full or partial shipment is organized by the Seller. All the delivery terms mentioned by the Seller are to be considered as purely indicative except if expressly mentioned as binding in writing. In case of non-fulfilment of the Customer's settlement obligations, the Seller shall have the right to change delivery terms. Delivery terms start from the date of receipt from the Seller of the deposit as provided by the sales contract.
Any delay in delivery shall not in any case provide a reason for the Buyer to ask for damages, and the full effectiveness of the sales contract shall remain unchanged.

5) TRANSPORT, TRANSFER OF RISKS, FAULTS AND COMPLAINTS

In default of other agreements, the Seller shall choose the type of transport to be adopted, which is always at the Buyer's expense. The goods travel at the Buyer's risk, and the Seller waives any responsibility therefore from the moment the goods are released to the first carrier within the boundaries of Italy. Upon the Buyer's demand, the Seller may insure the goods against damage caused during transport. However, the Buyer must duly check the goods as soon as they have reached the Buyer's premises.

Any claim relating to package conditions, quantity, number or external appearance of the products ("obvious flaws") shall be notified to the Seller by registered letter (previously sent by facsimile) within eight (8) days from the date of receipt of the products, containing a detailed list of flaws and non-conformities. Later claims or claims not conforming to this clause shall be rejected.

Any claims relating to faults which could not be detected by accurate checking at the moment of receipt ("latent defects") shall be notified to the Seller by registered letter (previously sent by facsimile) containing a detailed list of faults and non-conformities within eight (8) days from the date of detection of those faults and

anyway no later than twelve (12) months from delivery. Failure to observe these conditions shall lead to the rejection of such claims.

Any return of the goods by the Buyer shall only be accepted if previously authorized by the Seller. In case the Buyer has used the goods or altered their condition in such a way that the Seller cannot check them, the Buyer shall have no right to make any claim. Whenever a claim has resulted to be unfounded, the Buyer shall also refund the Seller for any costs incurred for the checking of the products.
It is understood that any claim or dispute directly or indirectly relating to the products shall give the Buyer no right to interrupt or delay payments of the products involved nor of any other supplies with pending payments.

6) PRICES AND PAYMENTS

All prices are meant EX-WORKS (Seller's premises). Prices shall be increased of the applicable value added tax and any other enforceable tax.

Prices are inclusive of normal packing, whereas they do not include customs duties, transport or insurance costs.

Current prices are mentioned in observance of the Seller's specifications and remain valid until the relevant pricelist updating.

Notwithstanding the above, the Seller reserves the right to alter prices in the short term in case of increase in costs applied by the Seller's own suppliers.

In case of increase in raw material costs, the Seller is entitled to update prices provided the Buyer is informed of such updating, and the Buyer shall have the right to cancel orders within 3 days from receipt of such notification.

Payments shall be addressed by the Buyer to the Seller's premises no later than the terms established by TM and made by bank transfer following the Seller's instructions. Invoices shall be paid in full with no deductions except if justified by a Credit Note issued by the Seller.

In case of delayed payments, even of one single installment, the Buyer's right to deferred terms shall cease without any formal notification by the Seller as provided by Art. 1186 of the Italian Civil Code, and the Buyer shall pay the Seller a penalty interest amounting to the applicable rate as provided by the Law plus 8%, within the threshold admitted by Act no. 108/96, notwithstanding any further claims for damages that the Seller may make.

7) LIEN AGREEMENT

The ownership of the products shall only be transferred to the Buyer after full payment of the goods supplied including any interests, if due. The Buyer undertakes to stock such goods separately and with due diligence and to mark them clearly as the Seller's property. The Buyer also undertakes to assist the Seller in taking all necessary measures to protect the Seller's rights.

This lien agreement does not affect the transfer of risks as stated under 5 above.

If the law of the State where the goods are stored does not admit the right to retain ownership, a form of guarantee similar to this and enforceable in that State shall be applied. If, in order to make this guarantee enforceable, the Buyer's action is required, the Buyer shall take all necessary measures to adopt and maintain this guarantee.

8) WARRANTY

Within the limits of the following provisions, the product is guaranteed for one (1) year (12 months) against material, working and manufacturing faults. Any guarantee on faults not to be attributed to the Seller is excluded. During the guarantee period, starting from the day of transfer of risks, the Seller shall only have the obligation, at its own discretion, to either i) repair any faulty products on the spot, or ii) repair any faulty parts free of charge provided the product or part of it has been returned, or iii) send a product or part of it similar to the faulty one as a replacement. Whenever the Seller asks for any faulty goods to be returned for replacement or repair, the Buyer assumes, except if otherwise agreed, any transport freight or risk (delivery "carriage free").

The Seller's responsibility is limited to faults arising in the usage conditions as specified in the sales contract and upon correct use of the parts involved. It does not cover, in particular, any faults deriving from wrong installation, maintenance or repair made by anyone other than the Seller or the Seller's authorized staff, nor any alterations made without the Seller's written consent or due to normal wear and tear. Except in the case of willful misconduct or gross negligence, the Seller shall only be bound, in case of vices, quality loss or non-conformity of the products, to repair the same and supply replacements for them as above specified.

It is agreed that the above guarantee, i.e., the Seller's obligation to repair or replace the products, incorporates and replaces any guarantee or liability as provided by the law and excludes any other contractual or tortious liability however arising from the finished products, including, without limitation, refund of damages, gain loss, collection campaigns, idle time losses, loss of clientele or damaged reputation, etc.

The products or their faulty parts which have been replaced according to the provisions stated herein shall be made available to the Seller for the time necessary for checking.

The greatest liability of the Seller, also in case of non-predictable damage, shall in no case exceed the price of the faulty product. For no reason shall the Buyer ask for damages for interruptions of its business activity.

In no case Teknomotor S.r.l. or its suppliers shall accept any responsibility for damage (including but not only, damage to the unit, damage incurred for lost production and income, down-time in manufacturing, loss of information or other economic losses) deriving from the use of Teknomotor products, even if Teknomotor has been advised of such risks in advance.

The Seller shall not accept any return of goods if not previously authorized in writing. The goods which have been authorized for return shall be accompanied by a relevant DDT (Document of Transport, or equivalent), a description of the problem, and a specific indication of how the product was used. In case the Seller has committed itself to repair the product, the cost for its shipment back to the Buyer is entirely at the Buyer's charge.

The warranty becomes automatically null and void if the customer fails to notify Teknomotor S.r.l. in writing of any faults found in the electrospindle within 15 days of their occurrence. The warranty likewise becomes null and void if the customer fails to permit the electrospindle seller to perform all necessary checks and tests, and if, when the seller requests the return of the defective electrospindle, the customer fails to do so within two weeks of the request.

The warranty does not cover faults arising from wear of parts normally subject to continuous or rapid wear (e.g.: seals, belts, bearings, etc..). In particular Teknomotor S.r.l. provides no guarantee as to the working life of the unit's bearings since this depends on a number of factors such as tool balance, type of machining operation, impacts, and/or other mechanical stresses not specified by the customer.

Dimensioned drawings and photographs are provided only for information purposes and to facilitate understanding of text.

Teknomotor S.r.l. has a policy of constant development and improvement, and reserves the right to make functional and stylistic modifications to its products, to change the design of any functional or accessory part, and to suspend manufacturing and supply without notice and without obligation to third parties. Furthermore, Teknomotor S.r.l. reserves the right to make any structural or functional change to the units, and to change the supply of spare parts and accessories without any prior notice.

Teknomotor S.r.l. declines all responsibility for non-compliance of the electrospindle caused by failure to follow the precautions and instructions given in this manual or by improper use or handling of the electrospindle. The customer has the right to replacement of all parts shown to be defective, unless the defects are caused by unauthorized tampering, including the fitting of non-original Teknomotor spare parts and/or the replacement of parts not described or authorized in this manual unless authorized beforehand and in writing by Teknomotor S.r.l.

9) FORCE MAJEURE

Either Party shall have the faculty of suspending the execution of their contractual obligations when such execution is made impossible or unreasonably costly by an unpredictable event which goes beyond the Parties' will such as, for example, suppliers' non-performance of duties, energy or raw material shortages, strikes, lock-outs, declared or non-declared war, civil war, terrorist acts, embargoes, etc.

The Party wishing to enforce this clause shall immediately notify the other Party in writing of the beginning and the end of such circumstances of force majeure.

Whenever the force majeure event lasts more than 6 weeks, either Party shall have the right to rescind the contract with a written notice sent to the other.

10) LIABILITY

The Seller shall not be held liable for damage or accidents to things, people, or loss of gain deriving from the use of its motors.

11) COOPERATION BETWEEN THE PARTIES

The Buyer shall promptly inform the Seller of any claim forwarded to the Buyer by its customers or by third parties regarding the products delivered or intellectual property rights on them.

12) SEVERANCE CLAUSE

Whenever one or more provisions contained herein are declared void based on the Buyer's local legislation, the Buyer is obliged to promptly inform the Seller and, in such case, those void provisions shall be modified in writing by adding an appendix hereto which shall be construed in such a way as to have the nearest possible financial purpose of the original one(s), whereas the provisions not declared as void shall remain binding.

13) INTELLECTUAL PROPERTY

Except if otherwise agreed between the Parties, the Buyer does not acquire any intellectual property right on any software packages and/or drawings released to it by the Seller. The Buyer undertakes to treat any information received by the Seller as confidential. The Seller remains the only owner of any intellectual property right relating to the products.

14) TRANSFER OF RIGHTS TO THIRD PARTIES

The Buyer shall not transfer or assign this agreement or any of the rights originating from it to any third parties without the Seller's written consent.

15) LANGUAGE OF THE SALES CONTRACT

The sales contract and the present General Conditions of Sale are originally drawn up in Italian and have full value in this language, whereas any versions in other languages shall be intended as informal translations. Only the version in Italian shall constitute a reference in case of disputes relating to the content or effectiveness of a clause contained herein.

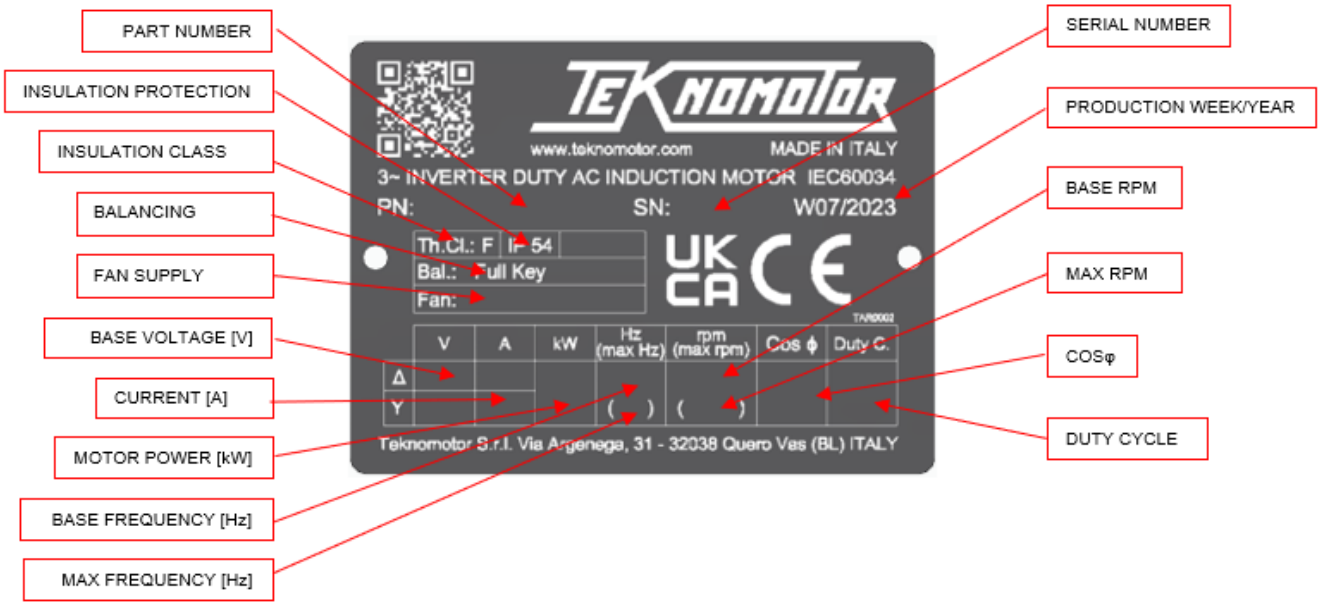
16) PLACE OF JURISDICTION

The applicable law is the Law of Italy. Any dispute arising directly or indirectly from the contractual relationship between the Parties shall be exclusively submitted to the Court of Belluno, Italy, notwithstanding the faculty of the Seller only to file a lawsuit before the Buyer's competent Court.

7. TECHNICAL SPECIFICATIONS

7.1 IDENTIFYNG THE MOTOR DATA FROM THE NAME PLATE

The part number (P.N. or TYPE) and the serial number (S.N.) are critical for identifying the electrospindle and are printed on the nameplate. These identifiers are the only way the manufacturer recognizes the electrospindle. Therefore, it is essential to ensure that these numbers remain legible throughout the unit's entire operational life. The location of the nameplate and the arrangement of the data on the nameplate may vary from model to model.



7.2 GENERAL VIEWS, OVERALL DIMENSIONS

Please refer to the attached documents. If the document is unavailable, kindly contact the Teknomotor’s Technical Office.

8. TRANSPORT, PACKAGING, UNPACKAGING AND STORAGE

8.1 PACKAGING AND LIFTING

- Lifting and moving the electrospindle can create situations of risk to personnel nearby. Always follow the instructions provided by this manual, follow all possible safety instruction for the handling of heavy loads. Always use suitable lifting equipment. The responsibility for the safety of the personnel involved in handling, moving and lifting operation is of the customer.
- Installation and assembly work must be performed only by specialist technicians.
- Always use great care in lifting and moving electrospindles and their components. Avoid impacts which can damage the body or the shaft or the bearings of the electrospindle.

	It is the responsibility of the customer to ensure that the lifting equipment used is suitable for the purpose in terms of functioning and load capacity. Never lift the electrospindle by its fan cover. This can break, damaging the electrospindle and possibly causing personal injury. Never drill parts of electrospindle to attach elements useful to move electrospindle.

Load characteristics

The load is to be considered too heavy for a single personnel when:

- It weighs for more than 30 kg for men
- It weighs for more than 20 kg for women

Do not drill the electrospindle to fit any hoisting tool.

8.2 STORAGE

If the electrospindle is to be stored for any length of time, make sure that it is protected against the elements and in particular against damp, dust, and other forms of damage by the atmosphere or storage environment.

STORAGE TEMPERATURE: from -5°C to +55°C

NON-CONDENSING RELATIVE HUMIDITY: from 5% to 15%

	The storage time of Teknomotor electrospindle is 12 months. After this time-limit the product must be inspected by an authorized Teknomotor service. If you need more information, please contact Teknomotor S.r.l..

9. INSTALLATION

9.1 CHECKING FOR DAMAGE

Before starting the installation, check the following:

- That no part of the electrospindle has been damaged during transport and/or handling.
- That there are no signs of moisture or water inside the connection terminal board.
- That the terminal board and its cover are not damaged in any way.

	**If the electrospindle is damaged inform immediately the transporter and Teknomotor S.r.l.**

9.2 PROVISION OF ON-SITE INSTALLATION EQUIPMENT

All work in preparation for the installation of the electrospindle is the responsibility of the customer (e.g., preparation of electrical power supplies, compressed air pipes, etc.).

Ensure that the electrical power line to the electrospindle is of adequate size and capacity. The connection of the unit to the power supply must only be performed by qualified electricians. The customer is responsible for all aspects of the electrical power supply to the electrospindle.

	ATTENTION: The customer is expressly reminded that the electrospindle must be properly connected to earth. Furthermore, the earth connection must comply with the applicable regulations in the country where the unit is installed and must be thoroughly checked and tested by a qualified electrician.

9.3 TOOL CHANGE SYSTEM

The tool holder magazine must position the cones with a concentricity error between the spindle shaft axis and the tool holder cone axis of 0.2mm.

9.4 FIXING ELECTROSPINDLE

When choosing the location for the electrospindle, ensure a clearance of at least 100mm from the back, so as not to obstruct the flow of cooling air in case of air cooling electrospindle.

The resting surface where the electrospindle is fixed must have a planarity of less than 0.02mm.

The electrospindle should be fixed to the slide or the spindle holder support, using the screws with the proper dimension and length, please see the electrospindle drawing. Different length of screws can deform the framework of the electrospindle and produce incorrect blocking, with negative consequences for the precision of the machining operation and the safety.

For the correct alignment use the slot.

	Different length of screws deforms the framework of the electrospindle, compromising the precision of the machining operation and also the safety.
	While fixing the unit in place, take care not to block off the cooling fan grill or otherwise impede the flow of cooling air. Always leave the maximum gap around the unit specified in the overall dimension drawings (100mm).

9.5 PNEUMATIC CONNECTION

	Supply the electrospindle with compressed air in accordance with ISO 8573-1, classes 2,4,3: class 2 for solid particles: solid particles size < 1µm class 4 for the humidity: dew point < 3°C (37.4°F) class 3 for the total oil: concentration of oil < 1mg/m3 Failure to comply with these specifications may result in product malfunction. The guarantee is not valid if pollutants are found during repair operations.

	Follow the indication below: If a lubricated air circuit is present in the machine, it should be insulated from the dry air circuit through a non-return valve. The filters indicated in this section should be installed as near the electrospindle as possible. Taking into account the fact that the efficiency of the filters is < 100%, it is essential that the machine be fed with properly treated air; as a general guide, introduce compressed air with a purity rating complying with ISO 8573-1, class 7, 6, 4: class 7 for solid particles: solid particles size < 40 µm class 6 for the humidity: dew point < 10°C (50°F) class 4 for the total oil: oil concentration < 5mg/m3 at the end of the working day, empty the pneumatic system to enable the automatic purging of filters. Carry out regular maintenance operations of the filters according to the manufacturer’s indications, and replace them when they are saturated and lose effectiveness (approximately every 6/12 months).

9.6 PNEUMATIC CONNECTION DIAGRAM

	The cylinder is double-acting: it must be kept under pressure to maintain the piston in the upper position, far from the rotating parts.

Item	Description
A1	Tool holder release air inlet (6 bar)
A2	Nose pressurization air inlet (max 1.5bar)
A3	Tool holder hook-up air inlet (6 bar)
A4	Cone cleaning air inlet (1.5-6 bar)
A5	Air cooling (1.5 bar) optional
06	Air filter and drier group
07	Pressure regulator (6bar)
08	Pressure switch (5.5bar)
09	Piston 5/2 valve 1/8”
10	0.1um air filter
11	Air pressure regulator (1.5bar)
12	Cone cleaning 2/2 valve 1/8”
13	Cone cleaning air flow regulator 1/8”
14	Cone cleaning air
15	Nose pressurization air

The electrospindle nose has pneumatic seals that blocks every dust and coolant particles inside the bearings. The pressurization must be active during all the time even when the electrospindle is not running.

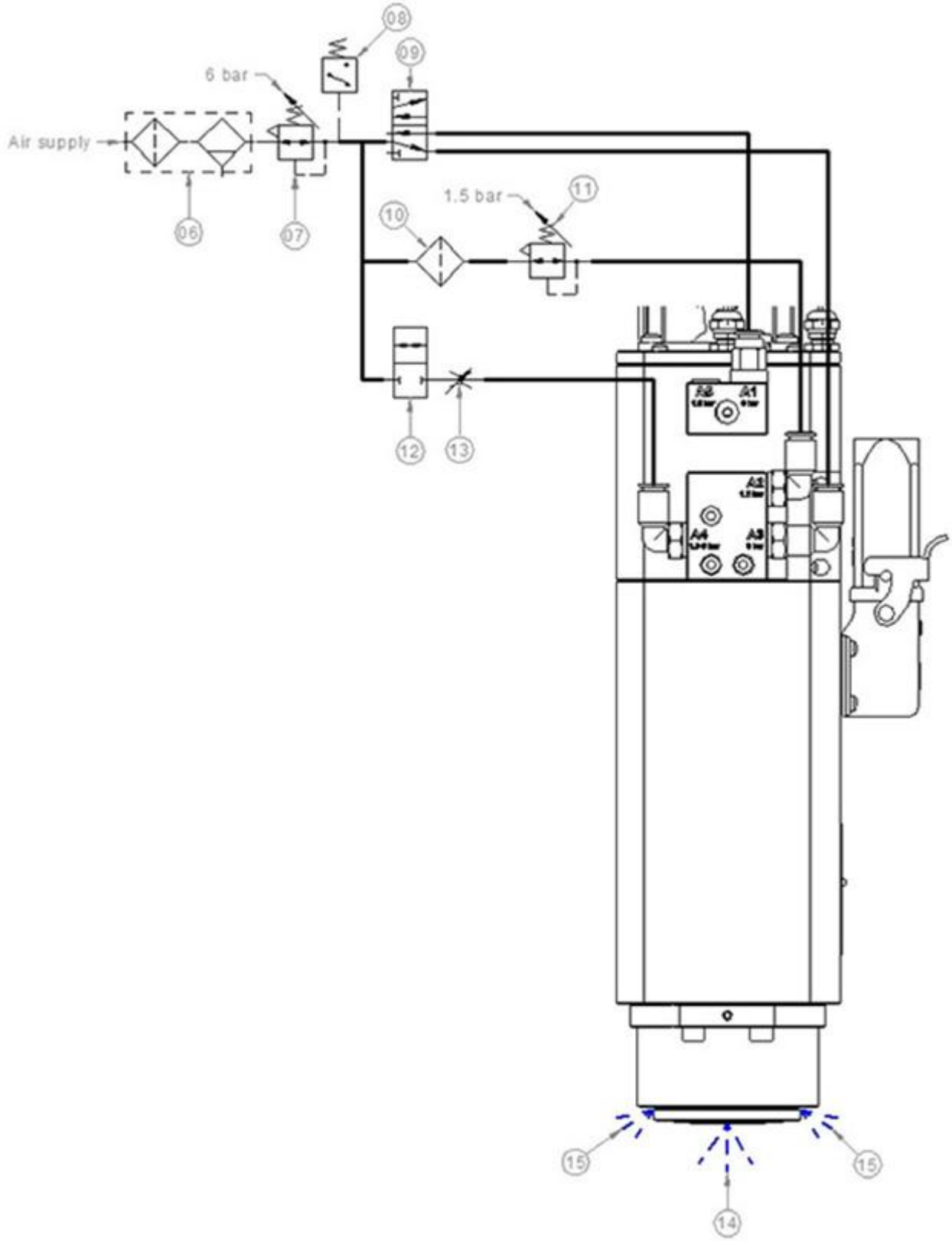


Figure 3 Air connections

9.7 ELECTRICAL CONNECTIONS

See data sheet and inverter configuration.

See motor data in the beginning of the manual

	ATTENTION: always use power cable of adequate cross section for the rated current of the electric motor. Never fit or remove connectors with the electrospindle powered on.

Protections for electric motor

All electrical circuits must be protected against damage resulting from faults or malfunctions due to short circuits, overloads, overcurrent, interruption or reduction of supply voltage, excessive speed of machinery components, and overheating in the case of a high number of on-load starts. For the safety of people and/or objects, protections must be provided against direct contact with live parts, as well as indirect contact with parts that are not live under normal conditions but may become live in the event of a fault.

If the motor shaft stops due to a power cut, precautions should be taken to prevent rotation in the opposite direction. If the safety of the machine depends on the direction of the motor shaft, precautions should be taken to avoid phase inversion. In such cases, the direction of rotation must be indicated with a visible label.

Refer to the inverter manual to determine the appropriate protections for short circuits, overcurrent, and overload.

See the electrospindle drawing for the pin connection.

9.8 LIQUID COOLING

The electrospindle is cooled by an internal circuit system through which liquid flows. This system must remain supplied even when the spindle is not operating.

Typically, a chiller or cooler is used to cool the electrospindle. A pump inside the chiller or cooler circulates the liquid to maintain a constant temperature inside the electrospindle (contact Teknomotor for more information).

Below are the specifications for the liquid coolant/refrigerant:

- **Coolant type:** Water + 10% Ethylene Glycol + corrosion inhibitors
- **Temperature setting**: +25 ± 2°C (+77 ± 5°F)
- **Minimum flow rate**: 4 liters/minute
- **Maximum pressure:** 3 bar

Refer to the drawing for the inlet and outlet cooling pipe connections.

	The pump of the liquid cooling system must remain ON at all times when the machine is active even if the electrospindle is not operating.

10. GENERAL CHECKS AFTER INSTALLATION IN THE MACHINE AND PRIOR START-UP

10.1 CHECKING ON THE ELECTROSPINDLE PRIOR TO START-UP

Position

- Ensure there is sufficient space behind the electrospindle cooling grill, at least 100mm.
- Electrical connection
- Ensure that the electrospindle earthing cable or earthing terminal is properly connected to the machine’s earth.
- Ensure that the signal from the motor’s thermal protection is appropriately processed and connected in series with the machine’s stop circuit.

Programming the inverter

- Ensure that the maximum supply voltage value corresponds to the value specified on the electrospindle motor data plate
- Ensure that the frequency value at maximum voltage corresponds to the value specified on the electrospindle motor data plate
- Ensure that the maximum frequency value corresponds to the value specified on the electrospindle motor data plate
- The inverter must be programmed with the V/f constant ratio.

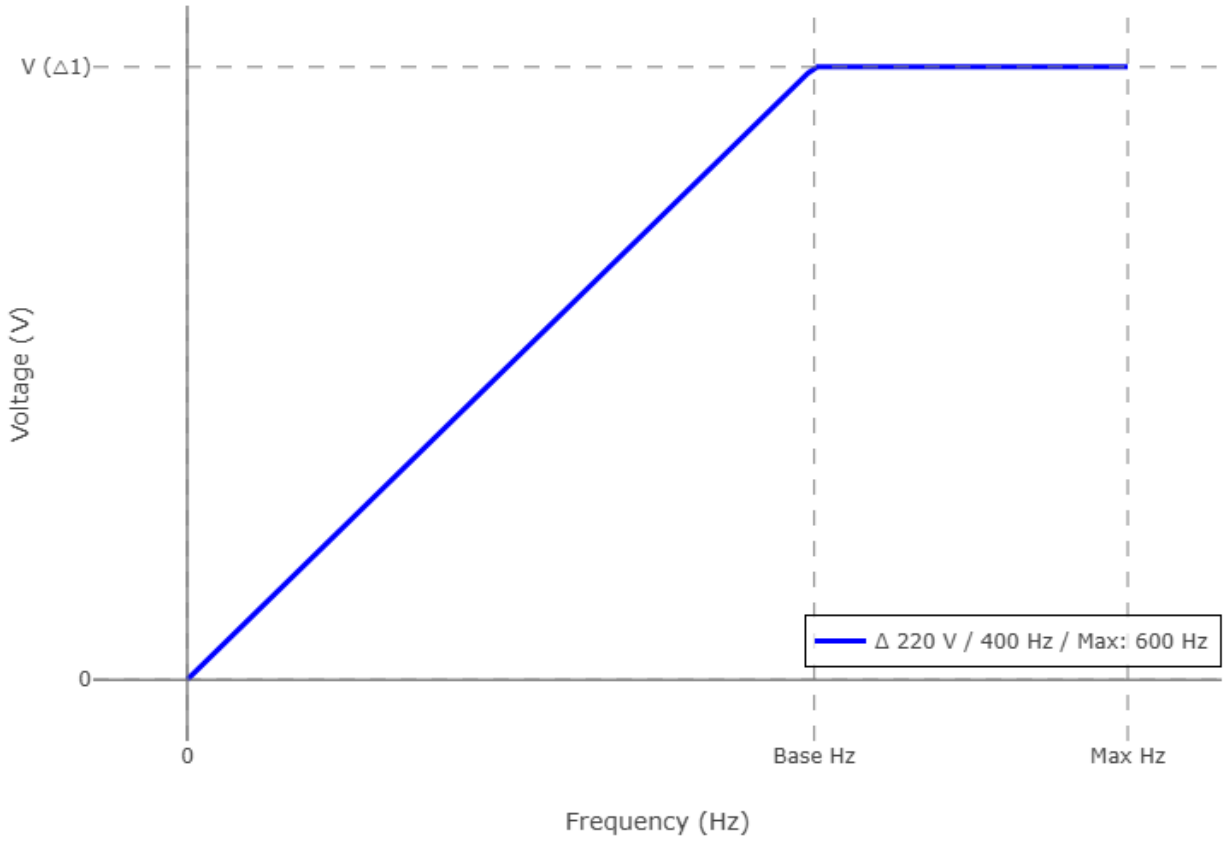


Fig. 4 V/F pattern

Contact Teknomotor S.r.l. if you need to verify other inverter parameters.

Specification	Value
Power	2.20 kW
Duty cycle	S1
Base Frequency	400 Hz
Base Speed (RPM)	24000 rpm
Max Frequency	670 Hz
Max Speed	40000 rpm
Min Speed	6000 rpm
Voltage Δ	220 V
Current Δ	8.40 A
Poles	2

	ATTENTION: wrong inverter setting could cause instantaneous damage on the electrospindle.

10.2 CHECKING ON THE ELECROSPINDLE AT THE TIME OF FIRST START-UP

- Check that the direction of rotation of the spindle shaft corresponds with the NC and the direction symbol on the body of the electrospindle. An incorrect direction of rotation can cause the nut to unscrew.
- Run the electrospindle briefly without load to warm it up
- Ensure that the cooling air draft produced by the fan exits from all four air channels in the nose of the spindle.

10.3 CHECKING ON THE ELECTROSPINDLE BEFORE RUNNING IT

	The cylinders of these electrospindles are double-acting. It is essential to maintain pressure in the cylinder to keep the piston at the upper end stop, away from the fast-rotating parts.
	Never run the motor, even for a brief test, without an air supply. The motor can be damaged if the cylinder moves from the upper position to the lower position. In the lower position, the cylinder will make contact with the housing of the ATC, preventing the load on the cylinder from being transferred to the ball bearings. If the motor is running and the cylinder moves to the lower position, it will result in catastrophic failure of the motor..

11. OPERATION OF THE ELECTROSPINDLE

11.1 CLIMATIC LIMITATIONS

Unless specified otherwise, all Teknomotor electrospindles are designed to operate within the following ranges:

- Altitude not exceeding 1000 m above sea level
- Maximum ambient air temperature not exceeding 40°C
- Minimum ambient air temperature not below 10°C

11.2 FORECAST AND NON-FORECAST USE

Teknomotor electrospindles are designed to be mounted on machine tools for chip removal. It is the customer's responsibility to ensure that any necessary interventions are carried out on the machine to make it compliant with Directive 98/37/EC.

The electrospindle may only be used if the machine on which it is mounted complies with Directive 98/37/EC.

Use the electrospindle only for machining materials specified when placing the order to avoid any inconvenience. In general, the electrospindle is not suitable for use in foggy environments or with a coolant jet directed at the spindle nose. Specific pneumatic-sealed electrospindles are available for such environments (contact our technical office for more information).

Teknomotor S.r.l. declines all responsibility for non-compliance of the electrospindle due to failure to follow the precautions and instructions in this manual, or due to improper use or handling of the electrospindle.

Forecasted use:

- Use the electrospindle only for machining materials specified at the time of order placement, such as wood, PVC, and aluminum.
- Always use sharpened and balanced tools.
- Always use high-precision collets.

Non-forecasted use:

- Never use the electrospindle in foggy environments or with a coolant jet directed at the spindle nose.
- Never use the electrospindle with excessively heavy or long tools.
- Always secure the electrospindle to the machine tool chassis before use. Never use the electrospindle as a manual tool.
- Never operate the electrospindle faster than the maximum speed indicated on the electrospindle nameplate.
- Never operate the electrospindle faster than the maximum speed specified on the tool body.

If you have any doubts regarding the correct use of the electrospindle, please do not hesitate to contact our technical office.

11.3 TOOL-HOLDER LOCKING AND EXPULSION DEVICE

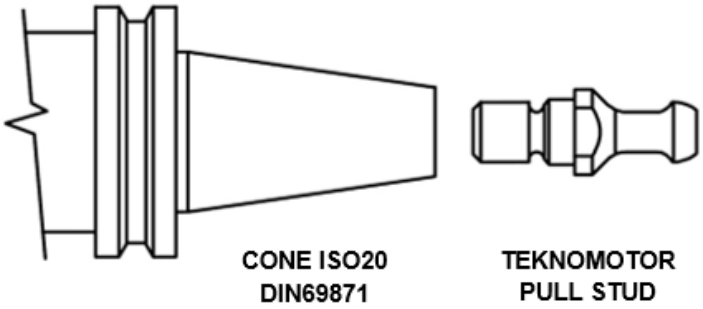
The blocking and expulsion of the tool-holder are carried out by the movement of a pneumatic piston, which is activated by compressed air.

The tool-holder is mechanically locked in place with elastic springs.

Electrospindle model	Axial force on the tool-holder	Expulsion of the tool-holder cone
ISO 20	950N ± 10%	0.5 – 1.5 mm

The electrospindles feature a mechanical reaction system that neutralizes the axial force of the piston on the shaft during the tool-changing phase, ensuring the integrity of the angular contact bearing.

TOOL-HOLDER CONE



- The taper must comply with the DIN69871 standard for ISO20.
- The tool-holder ISO20 cone must have an AT3 precision rating.
- At the maximum rated speed of the electrospindle, the dynamic balancing level must be G 2.5 or better (ISO 1940 standard).
- The balancing must be carried out with the tool-holder assembled (cone, mill, collet, ring nut, tool).
- The pull stud must be the one supplied by Teknomotor.

INSTALLATION OF THE PULL STUD ON THE ISO20 CONE

- Carefully clean the pull stud and its housing in the ISO20 cone.
- Cover the thread of the pull stud with thread-locking liquid (LOCTITE 270 or an equivalent product).
- Tighten the pull stud to the cone with a torque of 32 Nm.
- Allow the cone to rest until the thread-locking liquid becomes solid (follow the manufacturer’s instructions).

	The use of non-original Teknomotor pull studs, or improper installation, may cause the accidental release of the tool-holder.
	It is forbidden to use ISO tool-holders that do not conform to the conditions described above. Failure to observe these instructions presents a risk of breakage or incorrect attachment of the tool-holder cone, posing a serious risk to the user.

11.4 GENERAL RECCOMENDATION FOR THE TOOL HOLDER CONES

- The choice of tool-holder is a determining factor for safety purposes.
- The taper surface of the tool-holder and its housing on the spindle shaft must be kept thoroughly clean to ensure secure attachment.
- During machining operations, avoid any contact between the non-cutting rotating parts and the workpiece.
- The tool-holder cone seat must always be protected against any impurities that may enter.
- At the end of the working day, always remove the tool-holder cone from the electrospindle to prevent it from sticking.

11.5 TOOL MOUNTING – TOOLHOLDER

1. Use only fully sharpened tools and ensure that they are securely locked in the spindle.
2. Never use bent, damaged, chipped, or unbalanced tools.
3. Do not exceed the speed indicated on the tool body or specified in the tool’s user manual.
4. Always ensure that the following essential requirements are met before using any tool at high speed:

- The tool must have a compact, short, and lightweight design.
- The tool must be a precision instrument, with inserts securely held in place.
- The tool must be balanced and must mate symmetrically with the tool holder.
- The cutting surfaces of the tool must be located near its center of rotation.

	The recommended balancing grade for tools exceeding a speed of 6000 rpm is G2.5 (ISO 1940 standard) at maximum speed.
	For Tool-Holders with Conical Seat for ER DIN 6499 If the tool protrusion exceeds 80mm, absolutely use extra precision collets. Please refer to section of this manual.
	For Tool-Holders with Cylindrical Shaft Unless otherwise requested by the customer, tool-holders with a tool engagement key are balanced with the key in place (full key balancing – FK).

Because of the many factors to consider, it is not possible to summarize in table form the diameters and maximum weights of tools for any specific speed.

	Always verify the maximum operating speed of tools. This information is typically engraved on the tool or specified by the tool manufacturer. While machining, take great care to avoid any contact between non-cutting rotating parts (such as the spindle shaft, tool-holder, tool ring nut, etc.) and the workpiece or other parts of the machine. Accidental contact can cause damage to the electrospindle or result in injury to the operator. Never start the electrospindle when fitted with tool engagement keys unless a tool is properly inserted and securely tightened in the tool holder.
	The tool edges are very sharp and can cause serious injuries. Always wear protective gloves, goggles, clothing, helmets, and other personal protective equipment (PPE) during the tool fitting operation.

11.6 TOOL MOUNTING – IN THE CONICAL SEAT FOR ER DIN 6499

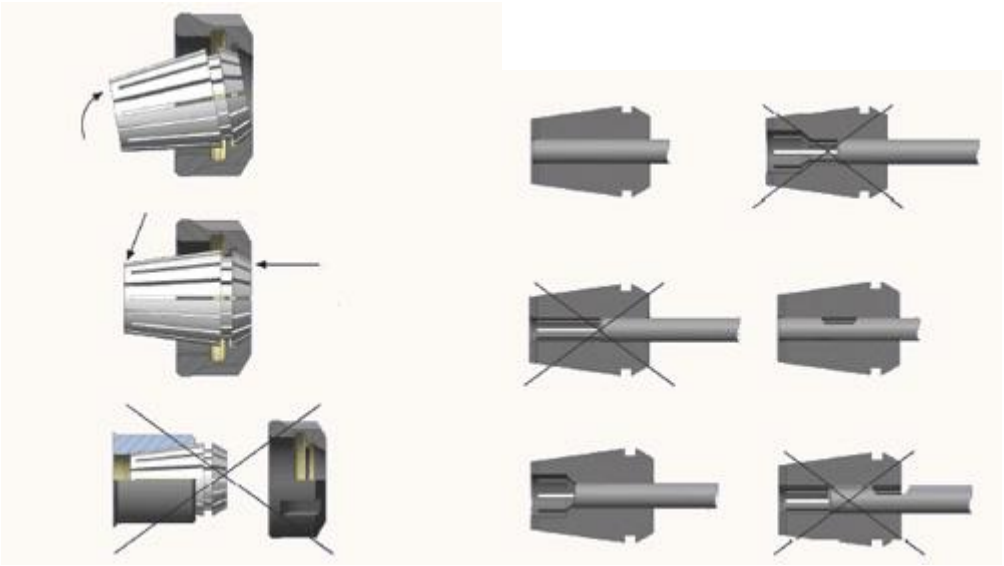
The tool mounting process is a critical operation as it directly impacts the lifespan of the electrospindle.

	Excessive tool run-out can lead to premature wear of the bearings in the electrospindle, reducing its efficiency and lifespan. It's crucial to ensure proper tool alignment and secure mounting to minimize run-out.

Here are the steps for proper tool mounting on the tool-holder:

1. **Clean the tool-holder and components:**
   - Blow out the tool-holders inside taper, the nut, the collet, and the tool using compressed air to remove debris.
   - Clean the components using a mixture of thinner and oil (92% thinner and 8% oil) to remove any processing residues. Use soft paper if needed to avoid damaging surfaces.
2. **Prepare the collet and nut:**
   - Fix the collet onto the nut and ensure it turns freely.
3. **Insert the collet and nut:**
   - Insert the collet and nut into the tool-holders inside taper. Screw in the nut by hand to ensure proper placement.
4. **Insert the tool:**
   - Place the tool into the collet and ensure it can move axially, confirming the tool is not obstructed.
5. **Position the tool:**
   - Position the tool so that the collet clamps it along its entire length of contact for secure fixing.
6. **Tighten the nut:**
   - Tighten the nut using the recommended torque and the specific wrench for secure clamping.
7. **Check the tool’s alignment:**
   - Verify the tool's run-out to ensure proper alignment. If checking run-out is not possible, assess the vibration level of the motor to ensure smooth operation.

Following these steps ensures the tool is securely fixed, preventing excessive run-out and promoting the longevity and precision of the electrospindle.



To ensure proper tool alignment and minimize wear and damage to the electrospindle, follow these guidelines for checking run-out and vibration:

Maximum Tool Run-Out:

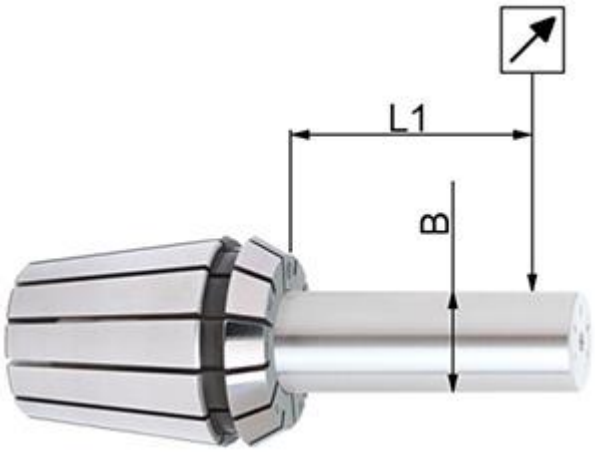
- **Measurement Method:** Use a high-resolution dial gauge (0.001 mm) to measure the tool run-out.
- **Allowed Tolerance:** The maximum run-out is 0.02mm at 100mm from the collet (L1).
- **Note:** If measuring the tool run-out is not feasible due to the tool design, proceed to the vibration check.

Vibration Check:

- Measurement Method: Use a vibrometer to measure the vibration levels of the motor.
- **Allowed Vibration:** The maximum vibration value should not exceed 2.0-2.5mm/s.

Concentricity Values (DIN 6388):

- Refer to the table below for specific concentricity values based on DIN 6388 standards for different types of tool-holders and tools.



To prevent premature wear of the electrospindle bearings, particularly the rear bearings, it is crucial to ensure that the tool is mounted properly with minimal run-out. The run-out values for different types of collets used in tool holders, as well as their impact on the electrospindle, are essential to follow for optimal performance.

Run-Out Values for Different Collet Types:

Collet Type	Maximum Run-Out (at 100mm from collet)
Standard Collet	0.05 mm
Precision Collet	0.02 mm
High-Precision Collet	0.01 mm

Impact of Tool Run-Out:

- **Heavy Tools (e.g., Milling Tool Ø 16 mm):**
- When using larger or heavier tools, such as a milling tool, the **extra precision collet** is required to ensure that the tool is securely clamped and aligned. This is especially critical in applications like door machines, where tools tend to be larger and subjected to more force during operation.
- **Consequences of Excessive Run-Out:**
- **Premature Bearing Wear:** Excessive tool run-out, especially when using heavier tools, increases the radial load on the electrospindle's rear bearings. This additional strain causes them to wear out prematurely, leading to potential failure and the need for more frequent maintenance or replacement.

Recommendations:

- For heavy-duty applications or tools with larger diameters, always use **high-precision collets** to minimize tool run-out.
- Ensure that the tool is balanced properly and that the collet is in good condition to reduce vibrations and stresses on the electrospindle.
- Always measure run-out with a **dial gauge** or check the motor vibrations to ensure they fall within the specified limits.

By following these guidelines, you can extend the lifespan of the electrospindle and ensure smooth, efficient operation.

	To guarantee a long life of your electrospindle, always use extra precise collets. These high-precision collets ensure minimal tool run-out and proper tool alignment, which are critical for reducing wear and tear on the electrospindle bearings. Proper tool alignment helps prevent excessive stress on the electrospindle's components, extending its lifespan and maintaining optimal performance. Key Benefits of Using Extra Precise Collets: Reduced Tool Run-Out: Extra precise collets provide a much lower run-out (typically 0.01mm at 100mm from the collet), which minimizes vibrations and ensures that the tool is securely positioned during operation. Minimized Bearing Wear: With less run-out, the axial and radial forces exerted on the electrospindle bearings are reduced, preventing premature wear and damage. Improved Tool Performance: High-precision collets ensure that tools are securely clamped and aligned, enhancing machining accuracy and cutting efficiency. Conclusion: Using extra precise collets is crucial for maintaining the performance, durability, and longevity of your electrospindle. Always choose high-quality, high-precision collets for heavy-duty applications or high-speed operations to prevent damage and ensure optimal tool life.

11.7 SPEED LIMITS

It is essential to observe the maximum rotational speed (rpm) specified by the tool manufacturer to ensure the safe and efficient operation of both the tool and the electrospindle.

Reasons to Follow Maximum Speed Specifications:

1. **Prevent Tool Damage**: Exceeding the recommended rpm can cause the tool to overheat, lose its cutting edge, or break, leading to tool failure and potential damage to the electrospindle.
2. **Avoid Vibrations**: High rotational speeds beyond the tool's limits can induce excessive vibrations, which can negatively affect the electrospindle's performance and cause premature bearing wear.
3. **Safety**: Operating the tool at speeds beyond its design limits can be hazardous, potentially leading to catastrophic failures or accidents. The tool may become unstable, which poses a risk to the operator and equipment.
4. **Preserve Electrospindle Life**: The electrospindle is designed to work efficiently at specific speeds. Exceeding the tool's maximum rpm can lead to increased load on the spindle bearings, reducing the electrospindle's overall lifespan.

Steps to Ensure Safe Operation:

- **Consult the Tool's Manual**: Always check the tool manufacturer's specifications for the maximum safe rpm before use.
- **Monitor Operating Conditions**: During operation, ensure that the electrospindle speed does not exceed the maximum rpm specified by the tool.
- **Use a Tachometer**: Utilize a tachometer or a machine control system to monitor and control the rpm to avoid over speeding.

By adhering to the recommended rpm limits, you can ensure optimal performance, prevent damage, and extend the lifespan of both the tools and the electrospindle.

	Observe the maximum rotational speed (rpm) specified by the tool manufacturer.

11.8 WHAT TO DO IF THE TOOL IS BLOCKED ON THE PIECE BEING WORKED

If the machine goes into **emergency mode** or stops with the **tool blocked** on the piece being worked, it is crucial **not to move the spindle along the Z-axis** for the following reasons:

Reasons to Avoid Moving the Spindle Along the Z-Axis:

1. **Prevent Tool and Workpiece Damage**: If the tool is jammed or stuck in the material, moving the spindle along the Z-axis could cause unnecessary force to be applied, potentially damaging both the tool and the workpiece. This could also lead to tool breakage or part deformation.
2. **Avoid Damage to the Electrospindle**: Moving the spindle while the tool is blocked could put excessive strain on the electrospindle, particularly the bearings, and could lead to long-term damage or even failure of the spindle components.
3. **Ensure Operator Safety**: Emergency situations often indicate abnormal conditions in the machine's operation. Moving the spindle prematurely or improperly could expose the operator to safety risks, especially if the tool is stuck and there’s a possibility of the tool becoming dislodged suddenly.
4. **Prevent Jamming of the Mechanism**: Moving the Z-axis when the tool is blocked might worsen the situation by causing a jam or other malfunctions in the machine's mechanical components.

	If the machine goes into emergency mode or stop with the tool blocked on the piece being worked, do not move the spindle along the Z-axis.

Correct Procedure in Case of Emergency Stop:

1. **Ensure the Machine is Safely Powered Down**: Before making any adjustments or trying to resolve the issue, confirm that the machine is properly shut down and powered off for safety.
2. **Assess the Situation**: Carefully inspect the cause of the tool being blocked. It might be due to tool wear, improper setup, or other mechanical issues.
3. **Release the Tool**: Follow the manufacturer’s recommended procedure for tool release. In many cases, this might involve using a manual release mechanism or activating specific safety procedures to free the tool safely.
4. **Seek Professional Assistance**: If you cannot resolve the issue or are unsure of the cause, consult a technician or the machine’s service manual for the correct course of action.

By refraining from moving the spindle along the Z-axis in these situations, you ensure the safety of the operator, preserve the integrity of the machine, and protect the tool and workpiece from unnecessary damage.

In case the piece is blocked and cannot be released automatically, follow these steps to release the piece and change the tool manually, if possible:

Manual Release and Tool Change Procedure:

1. **Release the Piece Manually:**

   If accessible, release the piece manually from the tool to prevent any additional damage to the workpiece or tool.

2. **Manual Tool Change (If Possible):**

   If the tool is accessible and can be safely changed, proceed with a manual tool change.

3. **If Manual Release Is Not Possible, Proceed as Follows:**

- **Supply Air to the Tool Changing Circuit:**

  Ensure that the pneumatic system is activated by supplying air to the tool-changing circuit to allow the mechanism to function.

- **Slowly Move the Spindle Away from the Piece:**
- Begin moving the spindle along the Z-axis to create space between the tool and the workpiece.
- This movement should be done slowly and carefully to avoid further damage and ensure the tool is disengaged.
- As the spindle moves away from the workpiece, ensure that the collet opens (sensor S2's "ON" output indicates this).
- **Check if the Collet Has Released:**
- Once the spindle is moved sufficiently, verify that the tool is free from the collet.
- This can be confirmed visually or by checking the mechanical operation of the collet.

4. **Move the Spindle Completely Away from the Piece:**

   Ensure the spindle is fully retracted from the piece being worked on, allowing complete separation of the tool and workpiece.

5. **Remove the Blocked Tool Manually:**

   If the tool is still blocked or stuck, remove it carefully by hand, ensuring there is no damage to the electrospindle or other components.

Important Notes:

Proceed Slowly and Carefully: When manually moving the spindle or releasing the tool, make sure to proceed slowly and avoid forceful movements that could cause further damage to the machine, electrospindle, or tool.

Check All Safety Precautions: Ensure the machine is in a safe condition, and all proper safety protocols (e.g., powering down the machine, wearing protective equipment) are followed during this process.

By following these steps, you can safely release the blocked piece and change the tool without damaging the electrospindle or other components of the machine.

11.9 SENSORS

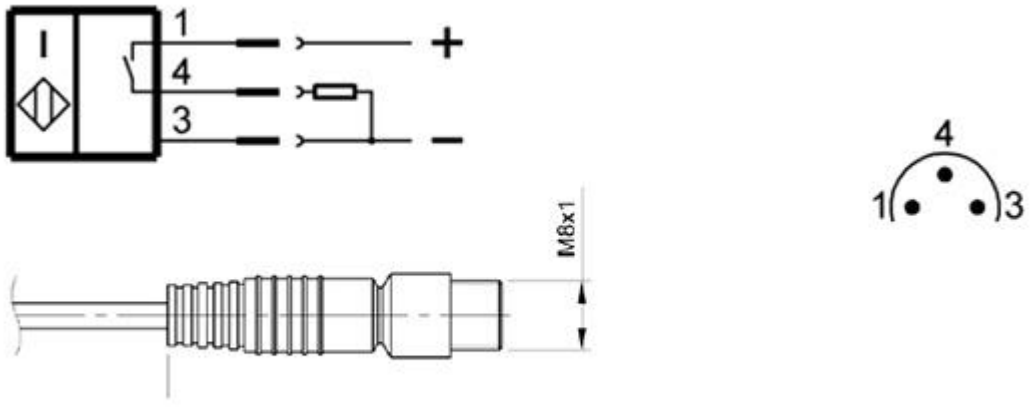
The electrospindle is equipped with inductive sensors for monitoring its status, and a thermal alarm to protect the electric coils.

SENSOR	INFORMATION
S1	Tool-holder cone attached correctly
S2	Collet open
S3	Tacho – shaft stopped (OPTION)
S5	Piston at upper position (OPTION)
Thermal alarm PTC	Motor overheated – stop the electrospindle

All the sensors are equipped with output light that turns on when the sensor output turns on. So, it is easy to see the functioning of the sensors.

TECHNICAL CHARACTERISTICS OF THE INDUCTIVE SENSORS

Type proximity PNP normally-open (NO)	
Supply voltage	10-30V DC typically 24V DC
Maximum load	100 mA
Power consumption with no load	<10 mA
Nominal detection distance	0.8mm
Max switching frequency	3000Hz
Degree of protection	IP67



The sensors are PNP NO (normally open) 24V DC.

STATUS MODES OF THE ELECTROSPINDLE AND CORRESPONDING OUTPUTS

	The "ON" condition corresponds to an output equal to the sensor's supply voltage, while the "OFF" condition corresponds to an output of 0V.

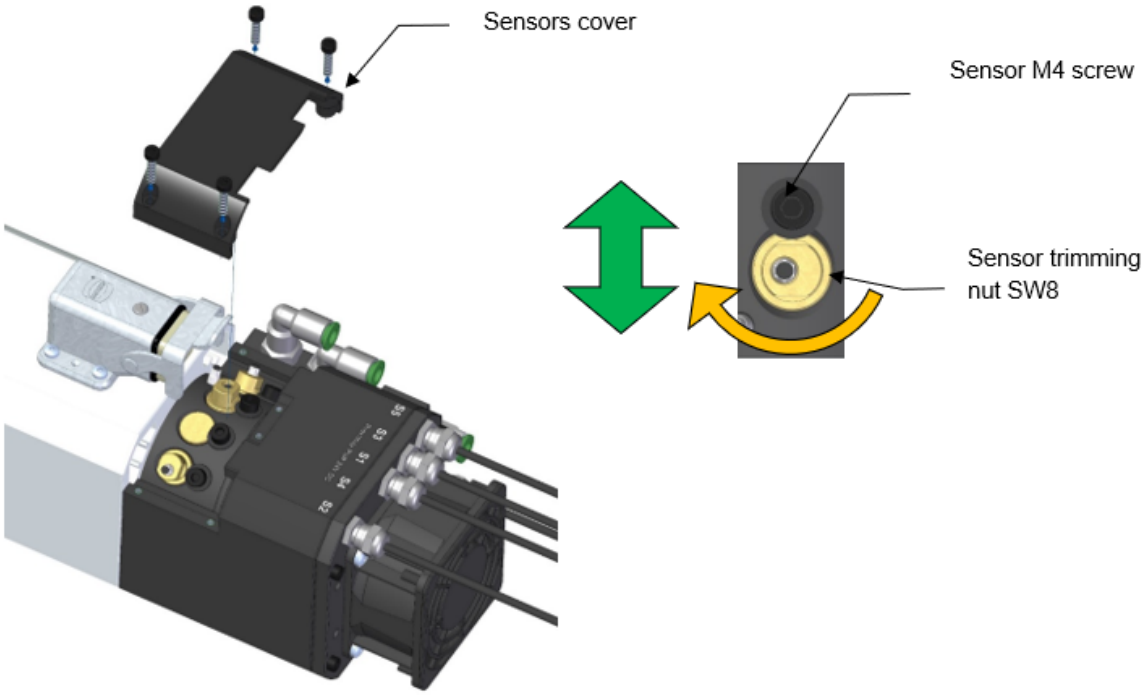
STATE	S1	S5 (option)	S2	ACTION
Collet open	OFF	OFF	ON	The tool holder is released, and the electrospindle cannot operate
Collet closed but tool-holder absent	OFF	ON	OFF	The tool holder is not properly engaged, and machining is not allowed. The electrospindle cannot operate.
Tool-holder blocked correctly	ON	ON	OFF	Machining is allowed.

	The electrospindle can only operate when sensors S1, S4, and S5 are all "ON" at the same time. If any of the sensors (S1, S4, or S5) turn "OFF," the electrospindle shaft rotation will stop immediately.

TRIMMING SENSORS

The sensors are pre-trimmed at the factory. However, if trimming is necessary, please refer to the following instructions:

I. Plug in the circular M8 sensor connector and power it on. II. Unscrew the 4x M4 screws of the sensor cover, as shown in the figure below. III. Loosen the M4 screw on the sensor slightly. IV. Turn the sensor adjusting nut (SW8) until the sensor turns on, then continue rotating for an additional 15°. Please refer to the following chapters for more details. V. While holding the adjusting nut (SW8), tighten the M4 screw. VI. Verify the correct functioning of the sensor. VII. Reinstall the sensor cover and tighten the 4x M4 screws.



S1 SENSOR TRIMMING

- Engage the toolholder onto the electrospindle.
- Turn the sensor adjusting nut (SW8) until the sensor turns "ON," then continue rotating for 15°.
- Change the toolholder and verify that the sensor functions correctly. Repeat this process 30 times.
- If the sensor does not function correctly, repeat the trimming process.

S2 SENSOR TRIMMING

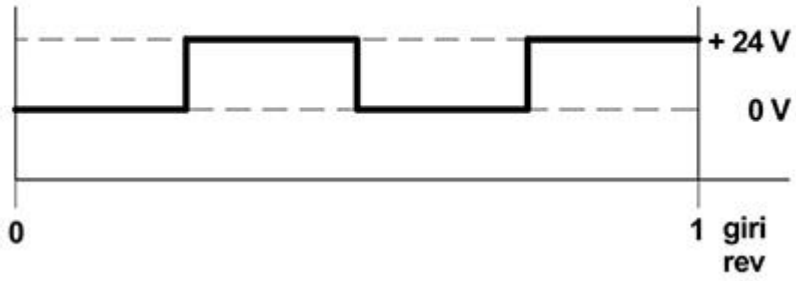
- Actuate the piston to open the collet.
- Turn the sensor adjusting nut (SW8) until the sensor turns "ON," then continue rotating for 15°.
- Change the toolholder and verify that the sensor functions correctly. Repeat this process 30 times.
- If the sensor does not function correctly, repeat the trimming process.

S5 SENSOR TRIMMING (Optional)

- Actuate the piston to move the piston to the upper position.
- Turn the sensor adjusting nut (SW8) until the sensor turns "ON," then continue rotating for 15°.
- Change the toolholder and verify that the sensor functions correctly. Repeat this process 30 times.
- If the sensor does not function correctly, repeat the trimming process.

SENSOR S3 OUTPUT (Optional)

- The S3 sensor does not require trimming.
- The output of sensor S3 provides information about the electrospindle's speed. Sensor S3 operates by generating two pulses per revolution of the shaft. See the diagram below.



	The sensor’s switching frequency is higher than the shaft's frequency at maximum speed, allowing for complete control of the electrospindle's speed range. It is also possible to use a frequency-to-analog converter to convert the S3 sensor's digital signal into a proportional analog signal.

12. IMPORTANT SAFETY AND MAINTENANCE INSTRUCTIONS FOR ELECTROSPINDLE

Before performing any maintenance on the electrospindle, carefully read this section. It contains critical information for the safety of maintenance personnel and the reliability of the maintenance process.

All necessary safety precautions must be followed whenever maintenance work is carried out on the electrospindle. Specifically:

- **Qualified Personnel Only**: Maintenance and/or lubrication should only be carried out by qualified, expert personnel, authorized by factory management, in compliance with relevant safety regulations and standards, and using appropriate tools and instruments.
- **Appropriate Clothing**: Always wear suitable work attire, such as tight-fitting work overalls and safety shoes. Avoid wearing loose or baggy clothing, or clothes with parts that could get caught.
- **Signage**: When performing maintenance, clearly cordon off the machine and display panels with the warning "MACHINE UNDERGOING MAINTENANCE."

During maintenance work, always ensure the electrospindle is:

- **Disconnected from Electrical Power**: Ensure that the electrospindle is disconnected and insulated from the electrical power supply.
- **Fully Stopped**: Confirm that the electrospindle is not still rotating.

Maintenance managers should ensure that their teams are adequately trained to maintain proper coordination and safety. All personnel performing maintenance must remain fully visible to their colleagues at all times, so they can signal for assistance if needed.

	**Use only appropriate lifting and handling equipment to disconnect or remove heavy components from the machine.**
	Inside the electrospindle, there is a pre-loaded spring with a force of several hundred kilograms. This spring is connected to a tie-rod, which may be ejected violently. Follow the operations outlined in this manual carefully, paying close attention to the instructions provided.
	Only adjustment and replacement operations using original Teknomotor spare parts, as described in this chapter, are permitted. Any other type of operation is not allowed and will void the product warranty.
	Special tools are generally not required for electrospindle maintenance.

12.1 SCHEDULED MAINTENANCE AND CLEANING THE SPINDLE SHAFT TOOL HOUSING

Always keep the tool housing on the spindle shaft perfectly clean and free from dust, grease, coolant, oil, metal shavings, corrosion, or limescale.

Dirty housings can cause improper tool seating, misalignment with the spindle’s axis of rotation, and tool slippage. Additionally, dirt can damage the housing surface, leading to poor machining precision and posing a risk of injury to operating personnel.

For this reason, check the cleanliness of the spindle shaft, taper, tool housing, and tool itself at every tool change for manual tool-changing spindles, and at least once a day for automatic tool changer electrospindles.

These parts can be cleaned using standard commercial detergents designed for metal surfaces. While cleaning, also inspect the condition of the surfaces for wear or damage.

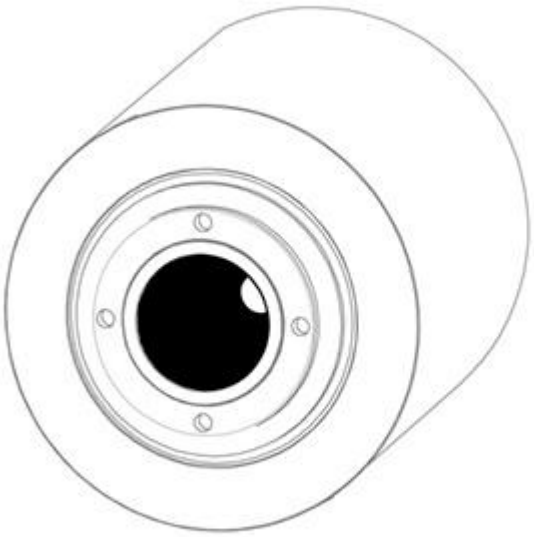
12.2 CHECK THE CLEANING OF TOOL-HOLDER CONE AND CONICAL HOUSING OF THE ELECTROSPINDLE SHAFT

Frequency: DAILY

Before using the electrospindle, ensure that both the conical surface of the tool holders and the conical surface of the electrospindle shaft are thoroughly clean, free from dust, grease, coolant, oil, or any other particles.

ISO

Conical surface of the ISO tool-ho (highlighted in black)



Conical surface of the ISO spindle shaft (highlighted in black)

	Do not direct jets of compressed air into the spindle shaft when the tool holder is absent. Do not direct jets of compressed air onto the spindle nose, especially in the area of the labyrinth seals.

12.3 PROTECTING THE CONICAL SEAT IN THE SPINDLE SHAFT

Frequency: DAILY

	The seating of the electrospindle shaft cone must always be protected from impurities. Use a closing device to prevent contamination.
	At the end of the day, once machining operations are complete, always remove the tool holder from the electrospindle to prevent any issues with sticking between the tool holder and the electrospindle shaft. Also, protect the electrospindle shaft cone from dust.

12.4 CLEANING THE TOOL-HOLDER CONE

Frequency: EVERY TWO WEEKS

Carefully clean the conical surface of the tool holders with a clean, soft cloth and ethyl alcohol.

12.5 CHECK THE CONNECTIONS

Frequency: MONTHLY

Check the integrity of both the power and signal electrical cables, as well as the secure attachment of the connectors. Inspect the seals of the tubes and connectors in the compressed air circuits.

12.6 OCCASIONAL MAINTENANCE

Clean the cooling fan grille and remove any objects obstructing the airways. Also, check the security of the fixing screws.

	The bearings are lifetime-lubricated and do not require additional greasing.

Component parts should only be removed and refitted by qualified personnel authorized by Teknomotor S.r.l.

	Only the replacement of parts with original Teknomotor spares, followed by the necessary adjustment of the newly fitted parts, is authorized. Any other type of work is not permitted and will result in the cancellation of the warranty. For further information, please contact Teknomotor S.r.l.

13. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Excessive vibration during machining	• Unbalanced tool. • Incorrectly fitted tool. • Excessive cutting parameters. • Incorrect inverter settings. • Tool too big or too heavy.	• Balance the tool. • Check that the tool is correctly fitted. • Adjust (reduce or increase) the various cutting parameters. • Check the inverter settings. • Try machining with smaller tools.
Bearings noise	• Damaged bearings.	• Send the electrospindle to Teknomotor S.r.l.
The electrospindle gets very hot and is stopped by the thermal protection signal	• Incorrect inverter settings. • Power settings too high. • Machining speeds too low for the power requirement. • Cooling fan grill blocked. • Cooling fan broken.	• Set the inverter parameters according to the plated values. • Contact the Teknomotor Technical Office. • Check the cooling fan grill and remove any blockage. • Replace the broken fan.

14. DISPOSING OF THE ELECTROSPINDLE

At the end of the electrospindle's working life, it is the customer's responsibility to dispose of it properly. First, clean the unit and separate the various components into mechanical and electrical parts. Then, sort the components by material type: electric motors (copper windings), metal parts (e.g., body), plastic parts, etc. Dispose of the materials in accordance with the laws and regulations applicable in the country where the electrospindle was installed.

15. USEFULL ADRESSES

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