

Operating manual

High Torque Rotary Unit

SW140

Mechanical system documentation

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Service

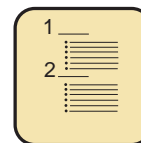
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List of contents

1. Introduction	5
1.1. Definition	5
1.2. Correct use	5
1.3. Incorrect use	5
1.4. Laws / EC Directives / Norms	5
1.5. EC Declaration	6
1.6. System-dependant documentation	6
1.7. Operating manual	7
1.8. Guarantee and liability	8
2. Safety	9
2.1. Fundamental safety instructions	9
2.2. Safety equipment for the machine	10
2.3. Residual hazards	11
3. Product description	12
3.1. Structure	12
3.2. Function	13
3.3. Technical data	13
3.4. Electrical connections	16
4. Transportation	19
4.1. Transportation damage	19
4.2. Intermediate storage	19
5. Installation	20
5.1. Safety during installation	20
5.2. Installation prerequisites	20
5.3. Assemble machine	21
5.4. Installing the safety equipment	21
5.5. Instructions on disposal of packaging material	21
6. Commissioning	22
6.1. Safety during commissioning	22
6.2. Initial commissioning	23
6.3. Recommissioning	23
7. Operation	24
7.1. Safety during operation	24
7.2. Operating the machine	24
7.3. Operating personnel workstations	24
8. Malfunctions	25
8.1. Safety when remedying malfunctions	25
8.2. Errors / Cause / Remedy	25
8.3. Customer Service	25
9. Maintenance	26
9.1. Safety during maintenance	26
9.2. Maintenance work	27
9.3. Inspections	27
9.4. Maintenance	27
9.5. Repair	27
10. Decommissioning / Dismantling / Disposal	28
10.1. Safety during decommissioning and dismantling	28
10.2. Decommissioning	28
10.3. Dismantling and disposal	29
11. Service and spare parts	30
11.1. Ordering spare parts	30
12. Appendix	31
12.1. Personal notes	33



Illustration index

General view of the rotary unit 12

Example of a type plate 14

Installation positions 14

Plug-in connections 16



1 Introduction

1.1 Definition

The High Torque Rotary Unit is a model with a direct engine and absolute rotary encoder for fast, precise and highly dynamic rotary, pivot and gripping movements.

The High Torque Rotary Unit is referred to as machine in the following text of this operating manual.

1.2 Correct use

The machine is a noncomplete machine conforming to Directive 2006/42/EC, Article 1g and 2g.

The machine is designed for integration in other machines, in other incomplete machines or equipment or for connection to these.

It may only be used within the limitations defined in the order characteristics.

Commissioning is forbidden until the conformity of the product in which the machine is installed with Directive 2006/42/EC and all other Directives governing use has been determined and confirmed.

Observance of the accompanying documentation and adherence to maintenance regulations are also component parts of correct use.

1.3 Incorrect use

Any use of the machine above or beyond the directions for correct use is regarded as incorrect and prohibited.

The machine must not be subjected to loads that exceed the maximum limits.

The machine is not suitable for use

- in wet or damp environments of any kind (water, oils, acids, steam or vapours, etc.).
- in an environment with gases or radiation.
- in potentially-explosive atmospheres.
- in environments which contain swarf.

1.4 Laws / EC Directives / Norms

The machine is designed and constructed to conform to

- applicable laws
- Directive 2006/42/EC (Machinery Directive)
- Low Voltage Directive, 2006/95/EC
- EMC Directive 2004/108/EC
- and the harmonised standards that we have cited

and meets state-of-the-art technological standards in terms of its construction.



1.5 EC Declaration

An EC Declaration as specified by Directive 2006/42/EC (Machinery Directive) is included with each machine at delivery.

The text of this EC Declaration is as follows:

WEISS GmbH Sondermaschinentechnik

Siemensstrasse 17

D-74722 Buchen, Germany

Declaration of incorporation of partly completed machinery
in accordance with EC Machinery Directive 2006/42/EC, Annex II B

Prohibition of commissioning

We hereby declare that the machine called High Torque Rotary Unit SW140 is intended for the installation into another machine or is to be assembled with other machines to a machine in terms of the directive 2006/42/EC.

Commissioning is prohibited until it has been established that the machine into which the aforementioned product should be installed satisfies the provisions of the EC Machinery Directive, and that a Declaration of Conformity in accordance with EC Machinery Directive 2006/42/EC, Annex II A has been issued.

1.6 System-dependant documentation

In addition to this manual, further documents are required to ensure safe operation of this machine. The specifications stated in these documents are to be observed.

For control system by WEISS-GmbH:

- Operating manual WAS.indexer Control SW140
- Operating manual WAS.handling Windows programme



1.7 Operating manual

This operating manual is a translation of the original operating manual and is part of the scope of delivery.

We reserve the right to undertake modifications resulting from further technological development which diverge from the data and illustrations contained in this operating manual.

The operating manual and the associated valid documentation are not subject to an automatic revision service.

Information on the respective current edition can be obtained from the manufacturer.

Local regulations must be heeded.

This operating manual describes handling of the machine and contains important instructions and information to assist you in correct use of the machine.

The operating manual is designed for trained technical personnel and instructed persons. It should be kept at the location of use of the machine at all times and read, understood and applied by all persons entrusted with work on or with the machine.

Safety instructions in individual chapters should be observed.





1.7.1 Explanation of safety instructions in this manual

This manual contains instructions which you should observe for your personal safety and to avoid material damage.

Safety instructions for your personal safety are highlighted by a sign containing a warning triangle and signal word. The associated text describes the hazard involved, avoidance options and the consequences of a failure to heed the safety instruction.

General instructions or instructions relating to possible material damage are highlighted by a sign without a warning triangle.

They are, depending on the degree of risk involved, illustrated as follows:

	<i>A warning triangle with the signal word DANGER indicates an immediate hazardous situation which, if not avoided, will lead to fatalities or grievous injuries.</i>
	<i>A warning triangle with the signal word WARNING indicates an potential hazardous situation which, if not avoided, can lead to fatalities or grievous injuries.</i>
	<i>A warning triangle with the signal word CAUTION indicates an potential hazardous situation which, if not avoided, can lead to light or medium injuries.</i>
	<i>A sign with the signal word NOTICE indicates potential material damage or provides additional information which should be observed when operating the machine.</i>

**1.7.2 Legend**

In these manual images, symbols and abbreviations with the following meaning are used for clarity:

1. Marks a numbered list.

a) Marks the second level of a numbered list.

• Marks a list.

▶ Marks the second level of a list.



The book symbol before a section of text indicates additional applicable documents.



The information symbol before a section of text marks an additional note or an important tip for use.

1.7.3 Figures

The figures used are examples. There may be differences between the illustrations and the actual delivery.

1.7.4 Index of valid pages

Pages of this operating manual including the title page: 36

1.8 Guarantee and liability

The machine is covered by a guarantee of 24 months without shift limitations.



2 Safety

2.1 Fundamental safety instructions

2.1.1 Operator's obligation to exercise diligence

This machine conforms to state-of-the-art technological standards and ensures a maximum level of safety.

However, this level of safety can only be attained under operating conditions if all measures necessary for this have been taken. The operator's obligation to exercise diligence includes planning of these measures and the inspection of their realisation.

The operator must ensure that

- the machine is only used as intended.
- the machine is only operated in faultless, functional condition and mechanical and electrical safety devices are present.
- required personal protective clothing is provided for and used by operating, maintenance and repair personnel.
- the operating manual and all other applicable documentation is maintained at all times in legible condition and is accessible at the implementation site of the machine. Ensure that all personnel who must execute activities tasks on the machine can access the operating manual at all times.
- only adequately qualified and authorised personnel maintain and repair the machine.
- such personnel are instructed regularly in all questions concerning occupational safety and environmental protection, including the operating manual and safety instructions contained therein.
- all safety instructions and warnings affixed to the product are not removed and must remain legible.
- national accident prevention guidelines and company-internal guidelines are complied with.
- VDE regulations are complied with.
- the EMC legislation is complied with during installation.



2.2 Safety equipment for the machine

2.1.2 Requirements to be met by personnel

It is imperative that the following safety instructions be observed during all operations involving the machine. This ensures avoidance of life-threatening injuries, machine damage, other material damage and environmental damage.

Personnel must ensure that

- trainees are initially permitted to only work on the machine under the supervision of an experienced person.
- all personnel who maintain the machine read the operating manual and confirm with their signature that they have understood the operating manual.
- unauthorised persons are not in the vicinity of the machine when tasks are being performed.
- supplemental to the operating manual the operating instructions as specified in labour protection legislation and work equipment use legislation are complied with.
- the operator or supervisory personnel are informed in the event of malfunction.
- required personal protective clothing is used.

The following work described in this operating manual should only be realised by qualified personnel:

- Transport
- Installation
- Commissioning
- Maintenance

2.2 Safety equipment for the machine

The operator is responsible for ensuring that a suitable safety concept is developed and applied for the safe operation of the machine.

The operator must take all measures to protect his personnel against injury by the machine.

These include:

- Safety housing with monitored safety door
- Emergency stop circuit
- Light barriers or switch mats
- Warning indicators



2.3 Residual hazards



Missing safety equipment

Operation without safety installations is dangerous. The operator is responsible for the realisation of a suitable safety concept. The operator must provide for sufficient safety measures such as protective grating, light grids, emergency stop button, covers, warning notices, etc. Operation without safety equipment is prohibited. Injuries caused by squeezing or pulling in.

Missing danger signs

Damaged or illegible danger signs no longer fulfil their purpose. Make sure the danger signs are complete and legible. Replace damaged danger signs.

Danger of explosion

Danger of explosion during operation in a potentially explosive atmosphere. Operation in a potentially explosive atmosphere is prohibited according to correct use. Only correct use is permitted. Injuries caused by an explosion.

Incorrect spare parts / mounting of ancillary equipment

The use of incorrect spare parts or the mounting of unauthorised ancillary equipment can lead to subsequent damage with the risk of injury. Only use spare parts from our spare parts list or spare parts we have approved. The mounting of ancillary equipment must be coordinated with us. Injury of persons due to subsequent damage.

Impermissible modifications

Impermissible modifications can lead to subsequent damage with risk of injury. Modifications on the machine are prohibited. Injury of persons due to subsequent damage.

Electric shock

Power and control connections may still conduct electricity after the machine has been deactivated and is stationary. Energised capacitors inside the servo amplifier may still be charged, despite the power supply being deactivated. Work on electrical equipment should only be realised by skilled electrical personnel and under observance of specifications in the electrical operating manual. Electrical connections for the machine should only be loosened or plugged in when the power supply is deactivated and secured against reactivation. The status of capacitor charging should be measured prior to working on machine electrical equipment. The procedure for measuring charges is described in the electrical operating manual. Touching energised components can lead to serious or even fatal injuries.

Squeezing or pulling in

The shaft of the machine turns at a very high speed. Extremities can be crushed or pinched when interfering with the motion sequence. Never put hands into the work area of the machine. Injuries caused by squeezing.



3 Product description

3.1 Structure

The optionally programmable, highly dynamic High Torque Rotary Unit consists of a solid Base body [A] made of aluminium with the electrical connections and the motor shaft. The motor shaft can be designed as standing shaft [B] or as hollow shaft [C]. The machine can be certified for sterile room usage.

Every machine can be delivered in different constructions.

The existing holes in the base body and different flange shapes allow versatile options of fixing.

Operator installations can be powered over the shaft .

The electric connections for the motor, rotary encoder and optional holding brake are created with plugs.

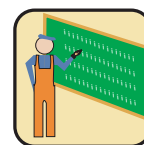
A absolute measuring system is used as a measuring system. The measuring system used depends on the order.

The following parameters of the machine are variable:

- size
- length
- rotary encoder
- holding brake
- shaft
- flange



Fig. 1: General view of the rotary unit



3.2 Function

The engine is controlled via a servo amplifier and turns, accelerates or delays the rotary disc of the machine. The shaft can be operated left-running, right-running or oscillating.

A high level of positional accuracy and repeat accuracy are achieved through the integrated measuring system.

In stillstand, the shaft can be held in its position by the optional holding brake. The brake force is created with springs. The brake is lifted by electromagnetic control and closes automatically if the voltage is turned off or in case of power outage.

3.3 Technical data

High Torque Rotary Unit	SW140
Nominal torque	15 Nm
max. Torque	36 Nm
max. speed	600/min
Nominal voltage	230 V
Nominal current	3,1 A
Peak current	7,5 A
Holding torque of the brake	15 Nm
Temperature monitoring	PTC
Heat class	F
	Heat class of the isolation system according to EN600341
Concentricity	0,01 mm
Axial run-out	0,01 mm
Weight	2.5 kg
	Weight with standard encoder and without brake
Measuring system	Interface Sick-Stegmann Hyperface
Precision	SEK90: $\pm 130''$
Measuring system	Interface Heidenhain EnDat
Precision	ECN113: $\pm 20''$
	ECN225: $\pm 10''$

3.3.1 Scope of delivery

The scope of delivery of the machine depends on the order involved. Please refer to the ordering information or order characteristics for individual components.

3.3.2 Sound level

The A-weighted emission sound pressure level do not exceed the allowable peak.



3.3.3 Type plate

The type plate is fitted to the housing of the machine and contains the details described in the illustration.

NOTICE *The illustrated type plate is merely an example of any machine and is not identical to the actual type plate of the described product.*

A second type plate is included in the scope of delivery. This second plate can be mounted at a clearly-visible location on the machine to allow viewing of performance data if the type plate fitted by the manufacturer is concealed by any other structures.

Additional barcode serial number

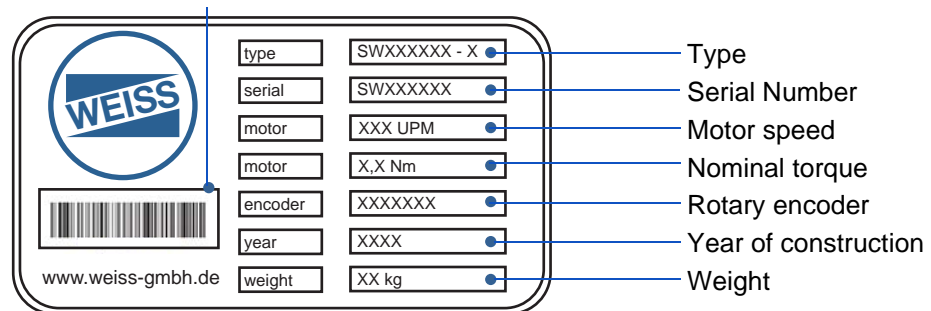


Fig. 2: Example of a type plate

3.3.4 Ambient conditions

Humidity	5 % to 95 %, non-condensing
Allowable temperature range	Storage: +5 °C to +55 °C Operation: +15 °C to +45 °C
Environment	It is not permissible to use the machine in environments that contain abrasive dusts.

3.3.5 Installation positions

Permissible installation positions for the machine are:

- horizontal and vertical at any angles.

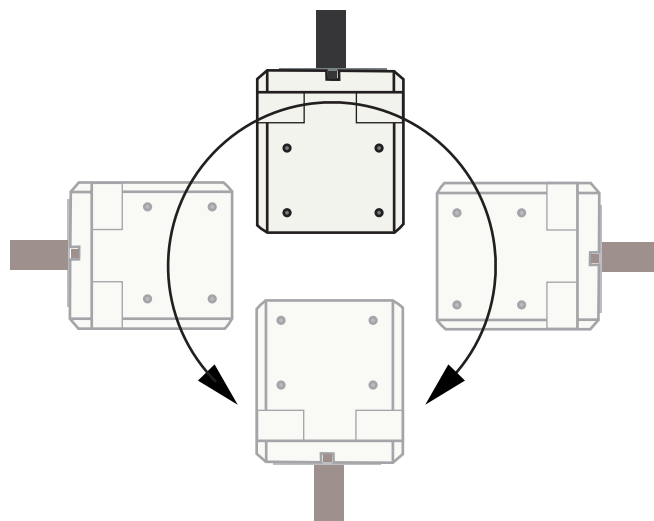
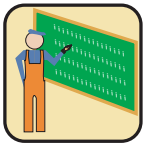


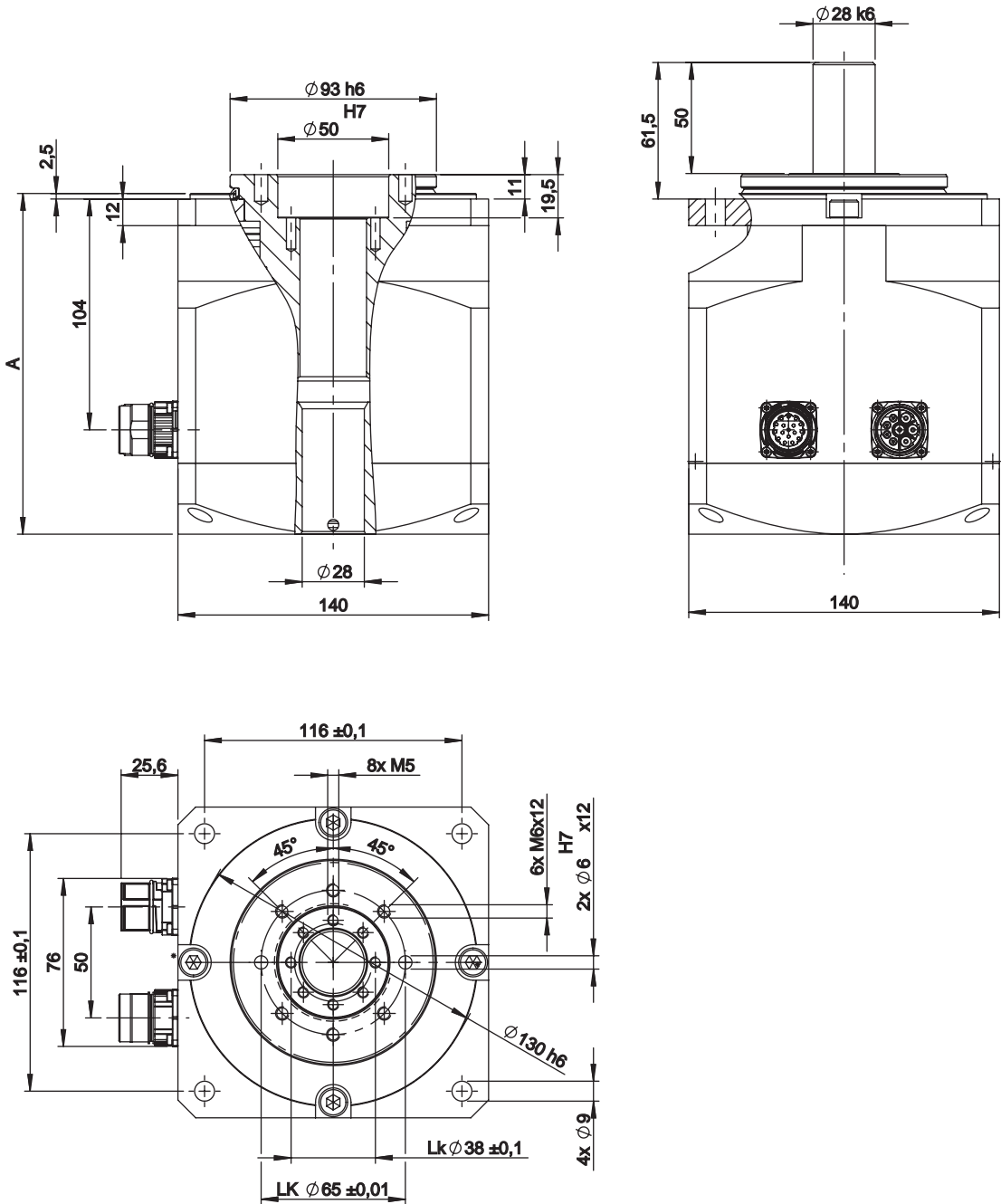
Fig. 3: Installation positions



3.3.6 Dimensions

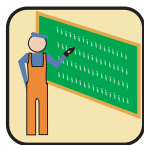
3.3.6.1 High Torque Dreheinheit SW140

☒ Option



X = Option with customer motor shaft

Measurement table: Dimensions in mm						
SW	A					
	Sick Stegmann			Heidenhain		
	SEK90			ECN113		ECN225
		with holding brake		with holding brake		with holding brake
140	154	213,8	185	241	185	241



3.4 Electrical connections

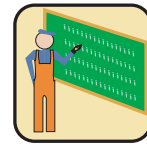
The servo amplifier and the ready-made electric cables are included in delivery when the machine is supplied with the electrical package.

3.4.1 Plug-in connections

The plugs for motor cable [A] and measuring system [B] are mounted in an easily accessible manner on the casing of the machine.



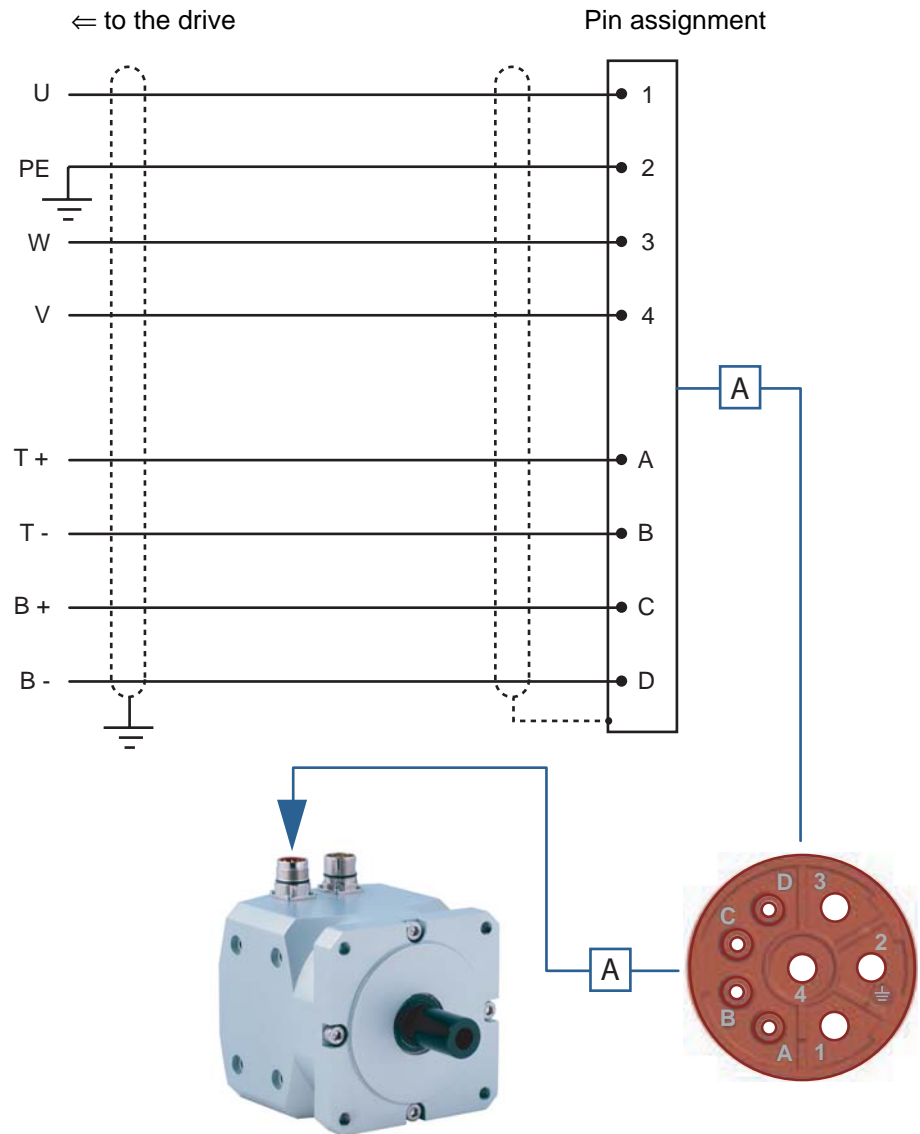
Fig. 4: Plug-in connections



3.4 Electrical connections

3.4.2 Connector pin assignment

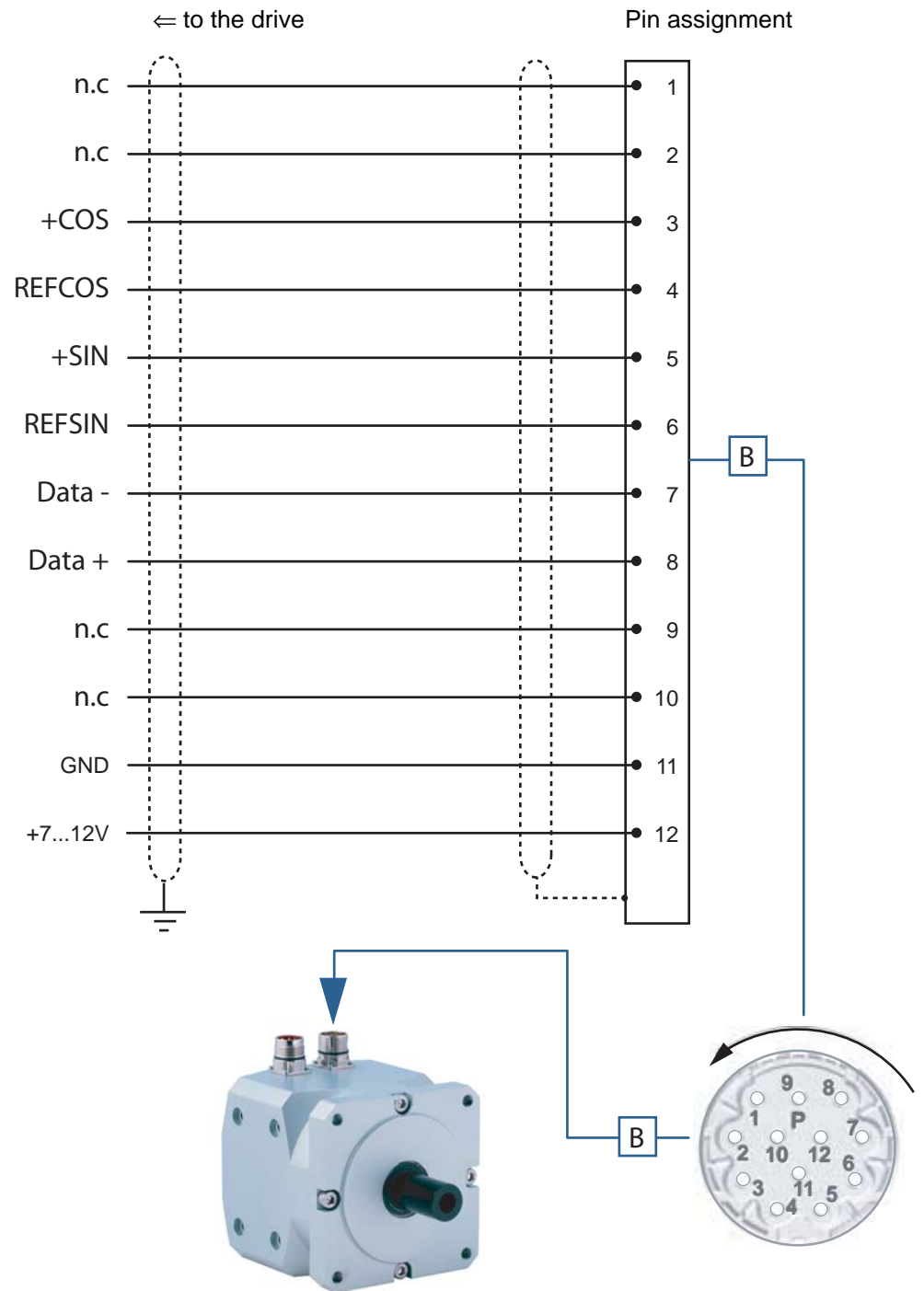
3.4.2.1 Connection motor



InterContec M25 BEGA 125 MR 13 00 0006 000



3.4.2.2 Connection encoder



InterContec M25 D_AEGA052MR04000201000



4.1 Transportation damage

4 Transportation

NOTICE

The machine must be protected against impermissible strains (mechanical strain, temperature, humidity, aggressive atmospheres) during transport and when being stored.

4.1 Transportation damage

The delivery should be inspected for damage immediately after receipt. The contents of the delivery should be checked for damage if damage to the packaging is detected, which could indicate damage to the contents. Details of the scope of delivery are provided in Chapter 3.3.1.

Damage detected should be immediately reported to and confirmed by the transportation company.

4.2 Intermediate storage

The storage conditions detailed in the table should be observed if intermediate storage over a longer period of time is planned.

Climatic zone	Packaging	Storage location	Storage duration
All	Packed in containers With moisture absorbers and humidity indicator sealed in film Protect against insect damage and mould formation through chemical treatment	Roofed over Protected against rain Not exposed to vibrations	Max. 3 years with regular inspection of packaging
	Open	Roofed over and sealed at a constant temperature and air humidity (5 °C < T < 60 °C, 50% relative humidity) No sudden temperature fluctuation and controlled ventilation with filter (free of dirt and dust) No aggressive vapours and no vibrations Protected against insect damage	2 years and longer with regular inspection. Check for cleanliness and machine damage during inspection. Check that anticorrosion protection is unspoiled.



5 Installation

5.1 Safety during installation



Injuries caused by incorrect installation.

The dimensions of the supporting ground and fastening equipment must be sufficient, so that they can withstand the stresses produced during operation.

Work should only be assigned to auxiliary personnel by company installation personnel. Create a proper electrical grounding.

5.2 Installation prerequisites

Check prior to installation whether the dimensions of the installation site and building conditions correspond to the necessary prerequisites and measurement specification in the drawing documents.

Particularly ensure that:

- The supporting floor is level and rigid.
- The dimensions of the supporting structure at the installation location must be sufficient to withstand the dynamic forces that occur.

5.2.1 Installation preparation

- Open the packaging unit prior to the assembly and remove the machine from the packaging unit.
- The customer's bores must be made based on the hole pattern in Chapter 3.3.6.
- The attachment screws must be at hand.

5.2.2 Operating media / Auxiliary media / Tools

The following are required for installation of the machine:

- One set of spanners
- One torque wrench
- One set of screwdrivers
- Screw securing agent (e.g. Loctite ® 243)
- Screws which are at least have a property class of 8.8



5.3 Assemble machine

Different holes and thread drills are available to assemble the machine.

NOTICE *The existing holes and/or thread drills must be used to assemble the machine. Additional drills or welding on the machine is prohibited. Damage to the machine.*

The machine can be assembled in the admissible installation layers at customer location using the existing drills and/or thread drills.

1. Set up the machine at the assembly position.
2. Tighten the attachment screws however, not all the way.
3. Align the machine.
4. Tighten the attachment screws all the way.
5. Make electrical connections in accordance with the circuit diagrams.

5.3.1 Installation of additional components

NOTICE *To assemble additional components, the existing holes and/or thread drills must be used. Additional drills or welding on the machine is prohibited. Damage to the machine.*

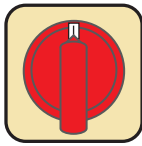
By using the existing drills and/or thread drills additional components can be mounted at the shaft.

5.4 Installing the safety equipment

The operator is responsible for providing for safety equipment and emergency stop buttons. The machine may not be operated without suitable safety equipment.

5.5 Instructions on disposal of packaging material

Packaging materials should be reused or disposed of correctly in compliance with national regulations.



6 Commissioning

6.1 Safety during commissioning



Injuries emanating from unexpected activation.

Incorrectly-established connections or external influences on electrical equipment can cause unexpected activation of the machine or uncontrolled movement. Ensure that nobody is present in the hazardous zone around the machine. Activate and check all safety equipment and emergency stop circuits prior to commissioning.

- Ensure that the machine is only commissioned by qualified personnel in compliance with the safety instructions.
- Ensure that only authorised personnel are in the work area, and that no one could be injured due to the commissioning process.

The following prerequisites must be met prior to commissioning the machine:

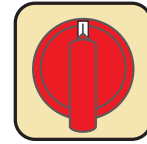
- The machine is correctly mounted.
- The electrical equipment for the power supply is available and correctly fitted.
- All cables are laid properly and correctly connected in compliance with valid electrical circuit documents.
- The shielding of the motor wires is in place.
- The static discharge must be conducted properly.
 - ▶ The shunt resistance must be measured and have a value of $< 10 \text{ MOhm}$.
 - ▶ The measurement must be recorded in a log.
- The required safety equipment and emergency stop circuits are available and functioning correctly.

Prior to commissioning the machine, check whether

- the drive is undamaged and not blocked.
- all connections have been correctly established.
- no other hazard sources are present.
- no foreign materials, tools or other objects are lying in the operating area of the machine.

The following should be checked during commissioning

- the machine runs smoothly.
 - ▶ Jerking of the shaft can be a sign for incorrect regulator parameters.
- no excessive noise development is detected.
 - ▶ A strong development of noise may indicate improper assembly or incorrect control parameters.



6.2 Initial commissioning

If the machine is delivered with servo amplifier and software, the start-up is conducted via the Weiss Application software WAS.handling Windows programme.



More information is also contained in the operating manual WAS.indexer Control .

6.3 Recommissioning

⚠ WARNING *Risk of injury emanating from an operationally unsafe machine.*

An operationally unsafe machine can cause injuries and material damage. Recommissioning should only be realised after it has been ascertained that the machine is in a functionally reliable condition and no risk emanate from it during operation.

A visual inspection of the machine should be conducted prior to re-commissioning. The following should be checked and ensured in this regard:

- No damage is present on the machine.
- No foreign materials, tools or other objects are lying in the operating area of the machine.
- All supply units are connected and operating.
- Safety equipment is ready for operation.



7 Operation

7.1 Safety during operation



Risk of injury due to incorrect alteration of operating parameters.

Improper changes of operating parameters can cause unforeseeable system behaviour. Operating parameters should only be changed by authorised personnel. Altered operating parameters should be checked in a test. Incorrect parameters can cause consequential damage and thus injuries.

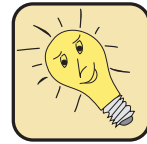
7.2 Operating the machine

The machine is designed for integration in other machines, in other incomplete machines or equipment or for connection to these.

Safe operation and control are the responsibility of the operator.

7.3 Operating personnel workstations

The operating personnel workstations are determined by the operator of the plant or product in which the machine is integrated.



8.1 Safety when remedying malfunctions

8 Malfunctions

8.1 Safety when remedying malfunctions



Injury of non-authorized personnel.

Malfunctions should only be remedied by instructed personnel provided by the operator who have been trained in and are authorised to perform these tasks. The machine should be deactivated with the main switches and secured against unintentional reactivation prior to remedy. The radius of action of moving machine parts should be secured.

8.2 Errors / Cause / Remedy



Information on malfunctions and their elimination are contained in the operating manual WAS.indexer Control .

8.3 Customer Service

Please provide the following details if you require the assistance of our Customer Service:

- Serial number of the machine
- Description of the malfunction that has occurred
- Time and attendant circumstances of the malfunction that has occurred
- Assumed cause

You can contact our Customer Service from Monday to Friday between 08:00 and 17:00 at the

Service number +49 (0) 6281 - 5208-0

or at service@weiss-gmbh.de

An answering machine will provide you with information outside of the abovementioned hours.



9 Maintenance

9.1 Safety during maintenance

! WARNING

Injuries caused by the power supply and residual energy.

All power sources should be deactivated prior to carrying out maintenance work, and secured against unintentional reactivation and marked with a sign indicating that maintenance work is in progress. All moving parts should be stationary. Loads should be secured against sagging or slipping. All components energized with electrical power should be de-energized (Extinguished LED's on the servo amplifier do not mean that all components have been completely de-energised). Check by measuring to ensure that all components are de-energised. Work on electrical equipment may only commence if the voltage is less than 42 VDC.

Injury of non-authorized personnel.

Maintenance work should only be realised by instructed personnel who have been authorised to perform these tasks. The operating instructions laid down by the operator must be rigidly adhered to.

Injuries resulting from maintenance work which has not been announced.

The working area should be secured over a wide area prior to realising maintenance work and marked with warning signs. Operating personnel must be informed that maintenance work is being carried out.

Injuries caused by the use of incorrect components or incorrect operating media.

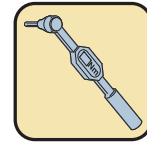
Only spare parts, which are listed in our spare parts list, may be used. Subsequent modifications on the machine are prohibited. Only the specified operating materials may be used.

! CAUTION

Hot surfaces

Motor and the brake can reach temperatures of up to 100 °C during operation. Prior to carrying out any work on these components, the machine must first cool down sufficiently to avoid any risk of burning through contact. Burn injuries will occur if there is contact with hot components.

- Ensure that only qualified electricians perform all tasks on the electrical equipment.
- Ensure that all work steps for maintenance are performed in the specified sequence.
- Ensure that specified tightening torques are observed.
- Ensure that all foreign objects are removed from the work area after the maintenance.



9.2 Maintenance work

Maintenance includes tasks for the purpose of:

- Inspection
- Maintenance
- Repair

9.3 Inspections

9.3.1 Conducting a six-monthly visual inspection

Conduct a visual inspection for

- ▶ loose bolt or pin connections.
- ▶ damaged to cables and plugs.

9.4 Maintenance

The machine is maintenance free.

9.5 Repair

The operator should not perform any maintenance or repair work on the machine.

Should maintenance or repair work become necessary, the customer service of WEISS GmbH is to be contacted.



10 Decommissioning / Dismantling / Disposal

10.1 Safety during decommissioning and dismantling



Injury of unauthorised persons.

Ensure that decommissioning and dismantling is only realised by persons trained, instructed and authorised for this purpose. These persons should be familiar with the operating manual and act in accordance with it.

10.2 Decommissioning

10.2.1 Temporary decommissioning

The machine should be deactivated for decommissioning and secured against unintentional reactivation.

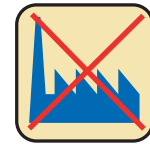
The machine should be fitted with a sign that clearly indicates that it is temporarily decommissioned.

NOTICE *For recommissioning, comply with the instructions in chapter 6.2.*

10.2.2 Ultimate decommissioning

For ultimate decommissioning and shutdown:

- Turn off the machine according to specifications.
- Secure the machine against unintended reactivation.
- Provide the machine with a notice which clearly indicates that the machine is ultimately shut down.



10.3 Dismantling and disposal

⚠ CAUTION *Injuries can occur during disassembly through falling components.*

The following points must be observed to avoid injuries and/or environmental damage during dismantling and disposal:

- In order to avoid injury, ensure that suitable tools are used and that dismantled machine components are stable.
- Wear personal protective clothing and protective equipment.

10.3.1 Disposal of components

NOTICE *Modules should be disposed of correctly!*

Incorrect disposal of modules can cause environmental damage and will be prosecuted!

Dispose of modules in compliance with valid local regulations. Ensure that auxiliary operational media are disposed of in compliance with environmental protection regulations. Local regulations governing the correct recycling and disposal of waste should be observed.

The machine consists of:

- steel and aluminium (casing, shaft, plug)
- copper (motor, electric wires)
- plastic (electric cables)
- Electronic components (servo amplifiers, boards)



11 Service and spare parts

11.1 Ordering spare parts

Please supply us with the following details when ordering spare parts:

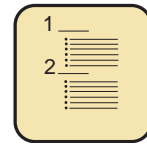
- Serial number of the machine
- Order number of the spare part obtained from the spare parts list
- Number of spare parts required

Please send your spare parts order to

WEISS GmbH
Sondermaschinentechnik
Siemensstraße 17
D-74722 Buchen/Odw.

Tel: +49 (0) 6281 - 5208-0
Fax: +49 (0) 6281 - 5208-99
eMail: service@weiss-gmbh.de
Internet: <http://www.weiss-gmbh.de>

All our representative addresses can be obtained on our website.



12 Appendix

A

Atmosphere, explosive 5

B

Base body 12

C

Casing 16

Connection, electric 12

Constructions 12

Copyright 2

D

Declaration of Conformity 6

Directive 2004/108/EC (EMC directive) 5

Directive 2006/42/EC (Machinery Directive) 5

Directive 2006/95/EC (Low voltage directive) 5

E

EMC legislation 9

Emergency stop circuit 10

Emission sound pressure, A-weighted 13

G

Gases or radiation 5

H

High Torque Rotary Unit 5, 12

Holding brake 12, 13

Hollow shaft 12

M

Machine, noncomplete 5

Measuring system 12, 13, 16

Motor 12

Motor cable 16

Motor shaft 12

O

Operating instructions 10

Operator installations 12

Operator's obligation 9

P

Parameters, variable 12

Personnel, authorised 9

Plugs 12, 16

Protective clothing, personal 9, 10

R

Regulator parameters 22

Revisions 2

Rotary encoder 5, 12

**11.1 Ordering spare parts****S**

Safety concept 10, 11
Safety instructions 7, 9, 10, 22
Servo amplifier 13, 16
Shaft 11, 13, 22, 29
Shaft, standing 12
Standards, harmonised 5
State-of-the-art 5
Sterile room usage 12

V

VDE regulations 9
Visual inspection 23

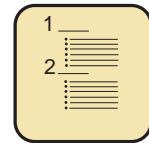
W

WAS.handling Windows programme 6, 23
WAS.indexer Control 23, 25
WAS.indexer Control ST 6

12.1 Personal notes

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[illegible]



A series of horizontal dashed lines for taking notes.



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