

# **SERVO-TOP**

**QE5542**

**CE**

## **Instruction Manual**

### **Part 1**

The **CE** symbol confirms that the respective drive system meets the applicable safety requirements of the following EU directives:

- **EC Maschine Directive 89/392/EWG**
- **EMV Directive 89/336/EWG**
- **Low Voltage Directive 73/23/EWG**

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**Technical updatings reserved !**

# 1. General Safety Information

This 'SERVO-TOP' Sewing Drive System (hereinafter called SERVO-TOP) has been constructed and tested in compliance with the relevant regulations and safety standards and has left our factory in proper safety condition.

In order to maintain this condition and to ensure non-hazardous operation, the user is obliged to observe the information and warning notes contained in this Operating Instructions Manual.

Our SERVO-TOP is not a ready-to-use machine, but is designed for installation into machines of the sewing-thread processing industry operating in clean and dry localities. It is not allowed to operate the SERVO-TOP in any machine unless the machine destined for receiving installation of this motor is specifically identified as being in compliance with the regulations of the EC Rule on machines.

Any application or use beyond the conditions stipulated above, such as outdoors, in moist or explosion-hazardous environment, is not considered to be in compliance with specifications. Application in compliance with regulations and standards also includes close observation of the operating, maintenance and repair conditions stipulated by the manufacturer.

Our SERVO-TOP can function safely and reliably only when used in compliance with this Operating Instructions Manual and in compliance with the use it is intended for.

Read this Operating Instructions Manual thoroughly before unpacking and commissioning the SERVO-TOP. Please make yourself acquainted with all safety, installation, operating and maintenance instructions before starting operation of the SERVO-TOP, its accessories and attachments. Persons who are unfamiliar with the contents of this Operating Instructions Manual are not allowed to use the SERVO-TOP described below!

Any and all activities on and by means of the SERVO-TOP must be carried out exclusively under close observation of the general and specific safety instructions given in the ensuing sections of this Operating Instructions Manual!

All persons involved must be made thoroughly familiar with these safety instructions, requiring them to observe these closely. Non-observation of these safety instructions can cause injury to persons, damage to objects or malfunction of or damage to the drive system itself.

Any and all accident prevention regulations as well as the rules on work in compliance with proper practices and safety standards valid in the user country involved must be fully observed. This drive system is subject to installation and commissioning by properly trained personnel!

Installation and commissioning of the SERVO-TOP must be made with due care by qualified technicians so as to minimize the effects of any disturbing influences which are likely to constitute health hazards to personnel or any other perilous condition.

Doing any work on any parts or elements of the equipment being under live voltage is not permitted! Exceptions are subject to EN 50110.

Before removing any cover parts or installing any attachments or accessories - such as synchronizer, speed control unit, light barrier control etc. - switch the machine off, shut off physical connection with mains voltage, and wait for the machine to come to complete stop. Do not open the bottom cover of the control box before ten minutes have elapsed!

In order to reduce any hazard of burns, fire, electrical shock, or injury, it is basically not permitted to make any structural modifications or other changes on the SERVO-TOP. Any exceptions from this rule are possible only subject to prior approval by the manufacturer. Any approved structural modifications or changes must be made with proper care by qualified personnel and in compliance with the manufacturer's instructions.

It is not allowed to operate the equipment with any cover or protection elements removed (such as belt guard with protected V-belt entry opening and belt retainer)!

Before leaving the workplace, turn the ON/OFF switch into its OFF position. In case of prolonged pauses of operation, remove the mains plug from the wall outlet so as to safeguard the drive system against being inadvertently switched on again.

Any equipment or auxiliary facilities additionally connected to the control system of the SERVO-TOP are only allowed to be operated on low voltage generated by a safety transformer!

Never use the drive system with its ventilation louvers clogged. Make sure that ventilation louvers are unobstructed by fibres, lint, dust etc.

Do not introduce or drop any objects, such as needles, into the ventilation louvers.

Keep your hands out of the area of moving parts, such as the V-belt and its entry opening!

Do not operate the SERVO-TOP when using aerosols (sprays) or oxygen!

This Operating Instructions Manual is an integral part of the SERVO-TOP and must be passed on with it in case of change of ownership.

The instructions given in the sections below are destined for your own safety as well as for that of other persons.



Warnings given in various section of this Operating Instructions Manual for the purpose of preventing specific hazards of injury to persons or damage to the equipment are identified by the symbol shown at left.



This symbol is a warning given on the SERVO-TOP, indicating dangerous voltage.

## 2. Technical Specifications

### - Rated Values

Voltage	230 V , single phase AC
Frequency	50/60 cps
Current (drive system)	5.0 amps
Current (control system)	0.6 amps
Power (output)	550 Watts
Speed	4200 rpm
Torque	1.25 Nm
Moment of motor inertia ( $J_{mot}$ ) (without belt pulley)	7 kg/cm <sup>2</sup>
Operating mode	S5 (40 % duty cycle at $t_s = 2.5$ s) Intermittent operation with electrical brake action, relative duty cycle 40 %, operating cycle time 2.5 s
Protection type	IP40
Insulation class	E

### - Limit Values

Range of voltage	190 - 240V +/- 10% single phase
Speed	5000 rpm
Torque (acceleration)	8 Nm
Power (short-time)	1600 Watts
Maximum permissible sewing machine inertia, reduced to the motor shaft ( $J_{mach}$ )	10 kg/cm <sup>2</sup>

### - Conditions of Use

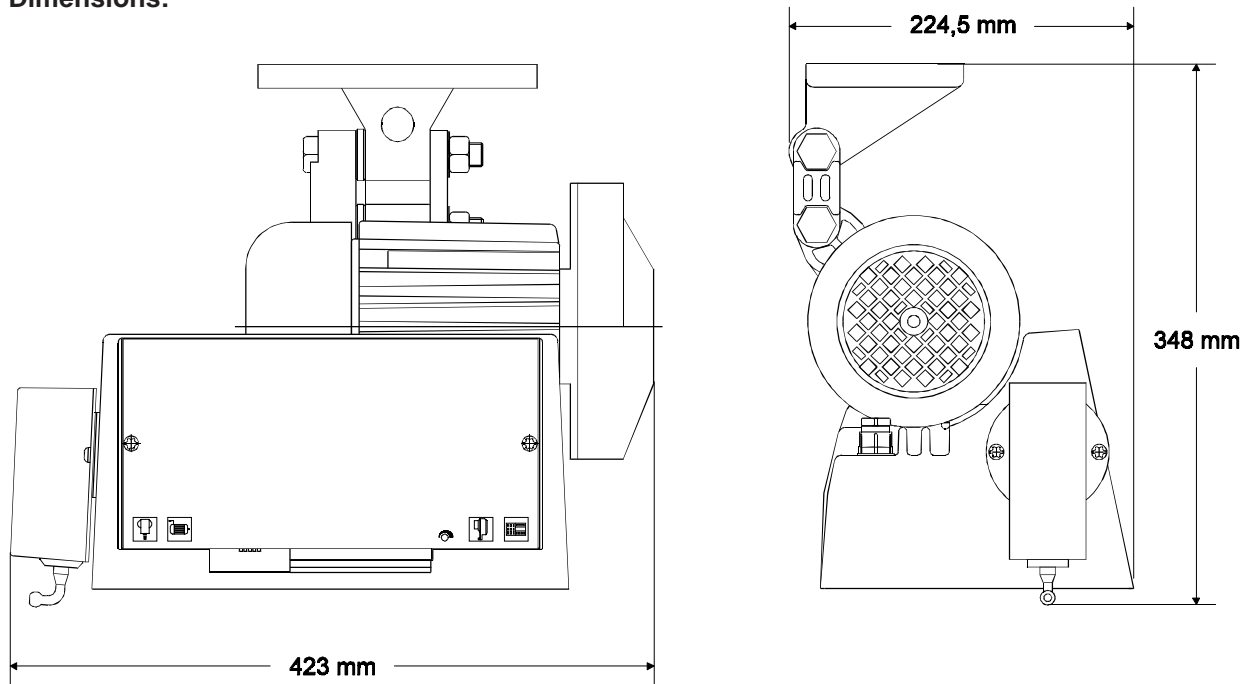
Ambient temperature	+ 5°C through 40°C
Ambient temperature (24 hour average)	< 35°C
Humidity (relative)	85 % at 30°C

### - Driving voltage of the Outputs

Idling voltage	25 VDC
Voltage under load	24 VDC at I = 4 amps (20 VDC at I = 10 amps short-time)
Power	96 Watts (200 Watts, short-time)
Load current	4 amps
Maximum load current	10 amps, (short-time)

**Note:** The accumulated load currents of all simultaneously operated outputs (solenoids, solenoid valves) are not allowed to exceed 4 amps!

**Dimensions:**



<b>Weights:</b>	Total weight	approx. 14 kg
	Motor (without belt pulley)	6.440 kg
	Base with screws	1.150 kg
	Control system	4.540 kg
	Speed control unit	0.460 kg
	Synchronizer	0.240 kg
	Belt pulley (dia.58-210 mm)	0.172 kg - 0.320 kg
	Belt guard	0.270 kg
	Power supply unit	0.715 kg

### 3. Range of Application

The SERVO-TOP is not a ready-to use machine, but is intended for installation into other machines, such as sewing units and sewing equipment used by the sewing thread processing industry.

The SERVO-TOP is destined for use in clean and dry localities.

Any application or use beyond the conditions stipulated above, such as outdoors, in moist or explosion-hazardous environment, is not considered to be in compliance with specifications.

Application in compliance with regulations and standards also includes close observation of the operating, maintenance and repair conditions stipulated by the manufacturer.

## 4. Scope of Supply

- 1x each synchronous motor with commutation transmitter
- 1x each control system
- 1x each speed control unit
- 1x each synchronizer
- 1x each mains power switch
- 1 operator panel XB2 (optional)
- 1 operator panel XB4.4 (optional) (Servo 01)
- 1 operator panel XB7.4 (optional) (Servo 01)
- 1 operator panel OC-TOP (optional)
- 1x each belt pulley
- 1x each motor suspension base
- 1x each belt guard
- 1x each pitman rod
- 1x each Operating Instructions Manual

## 5. Transport and Storage

The SERVO-TOP has left our factory after thorough final inspection.

Please check the drive system for any transport damages.

If necessary, file claims with the carrier.

Complaints for missing parts will be accepted within 14 days from the date of purchase.

The SERVO-TOP and its accessories are shipped in a carton with polyurethane insert;

outside dimensions:    L = 555 mm,  
                              W = 380 mm  
                              H = 395 mm

This packing material protects the SERVO-TOP against outside influences during transport and storage.

The SERVO-TOP is designed to withstand temperatures during transport and storage of between -25°C and +55°C and briefly, but not longer than 24 hours, up to +70°C.

Storage in the packing material must be in a dry environment.

**Handle the carton and its contents with care!**



## 6. Mounting Instructions

For ease of packing, the SERVO-TOP is not mounted ready for use when delivered to the customer. Before starting installation, please remove all parts from the packing material. The carton holds the SERVO-TOP, its accessories and this Operating Instructions Manual. Check the contents of the packing carton for completeness. If you have any questions about installation that are not clarified by the Operating Instructions Manual, please contact us or one of our after-sales service agencies. Mount the SERVO-TOP in compliance with the relevant instructions and illustrations.

### 6.1 Guidelines for Motor Mounting



When mounting the motor, make sure that the motor will not be dropped; for instance remove the sewing machine head from the table top; place the table upside down; then mount the motor upright to the table top.

- Adjust the motor so as to make the belt pulleys of motor and machine align perfectly (Fig. 6.1).
- Make sure to use the correct belt length and tension.

For belt tension note the following:

Belt tension is correct when the two opposing strands of the belt can be pulled together by approx. 2 cm between thumb and forefinger (Fig. 6.2).

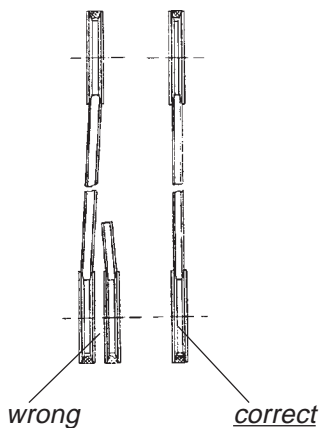


Fig. 6.1

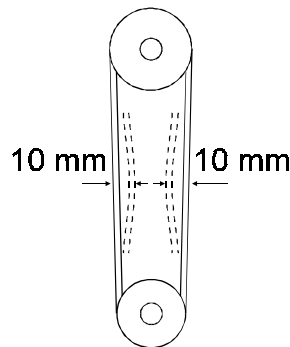


Fig. 6.2

### 6.2 Mounting the Motor to the Machine Table

The motor is suspended from the base by means of a articulation. Mount the base to the table top from beneath.

Attachment of the base to the sewing machine table depends on the material used for the table top :

- 1. Laminated wooden panel  
Attach the base by means of hexagonal head screws M8 x 35 (DIN 933).  
For this purpose, first screw insert bushes M8 x 14 (DIN 39) into the table top.
- 2. Wooden panel in general  
Attach the base by means of carriage bolts M8. For this purpose, drill 3 throughholes 9 mm dia. through the table top.

For the exact position of these holes, refer to Fig. 6.3.

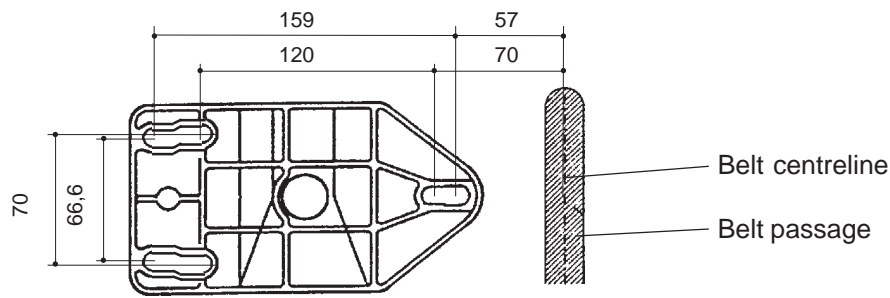


Fig. 6.3

### 6.3 Choice of the Motor Belt Pulley

To allow the motor to operate in the speed range of its optimum power (4000 rpm) at the rated speed of the sewing machine, it is absolutely required to use a properly adapted belt pulley.

The diameter of the belt pulley ( $\varnothing$ ) for the motor shaft is determined by the following equation:

$$\varnothing S_{Mot} = \frac{n_{Masch}}{n_{Mot}} \times \varnothing S_{Masch}$$

where in:

- $\varnothing S_{Mot}$  =  $\varnothing$  motor pulley diameter [mm]
- $\varnothing S_{Masch}$  =  $\varnothing$  machine pulley diameter [mm]
- $n_{Mot}$  = rated speed of the motor [4000 rpm]
- $n_{Masch}$  = operating speed of the sewing machine [rpm]

Determining the diameter of the motor belt pulley in accordance with the above equation will prevent the sewing machine from being operated at inadmissible speeds.

The diameter  $\varnothing_{Mot}$  can be easily obtained from the graphs see below (Fig. 6.4).

Explanation of the graph:

On the horizontal x-axis the machine speed ( $n_{Masch}$  [rpm]) is plotted. The diameter of the motor pulley ( $\varnothing S_{Mot}$  [mm]) can be plotted on the perpendicular y-axis. A different handwheel disk diameter ( $\varnothing S_{Masch}$  [mm]) is represented by each curve. The diameter of these handwheels can be found on the right-hand axis.

All curves on a plot are for a constant motor speed ( $n_{Mot}$  [rpm]).

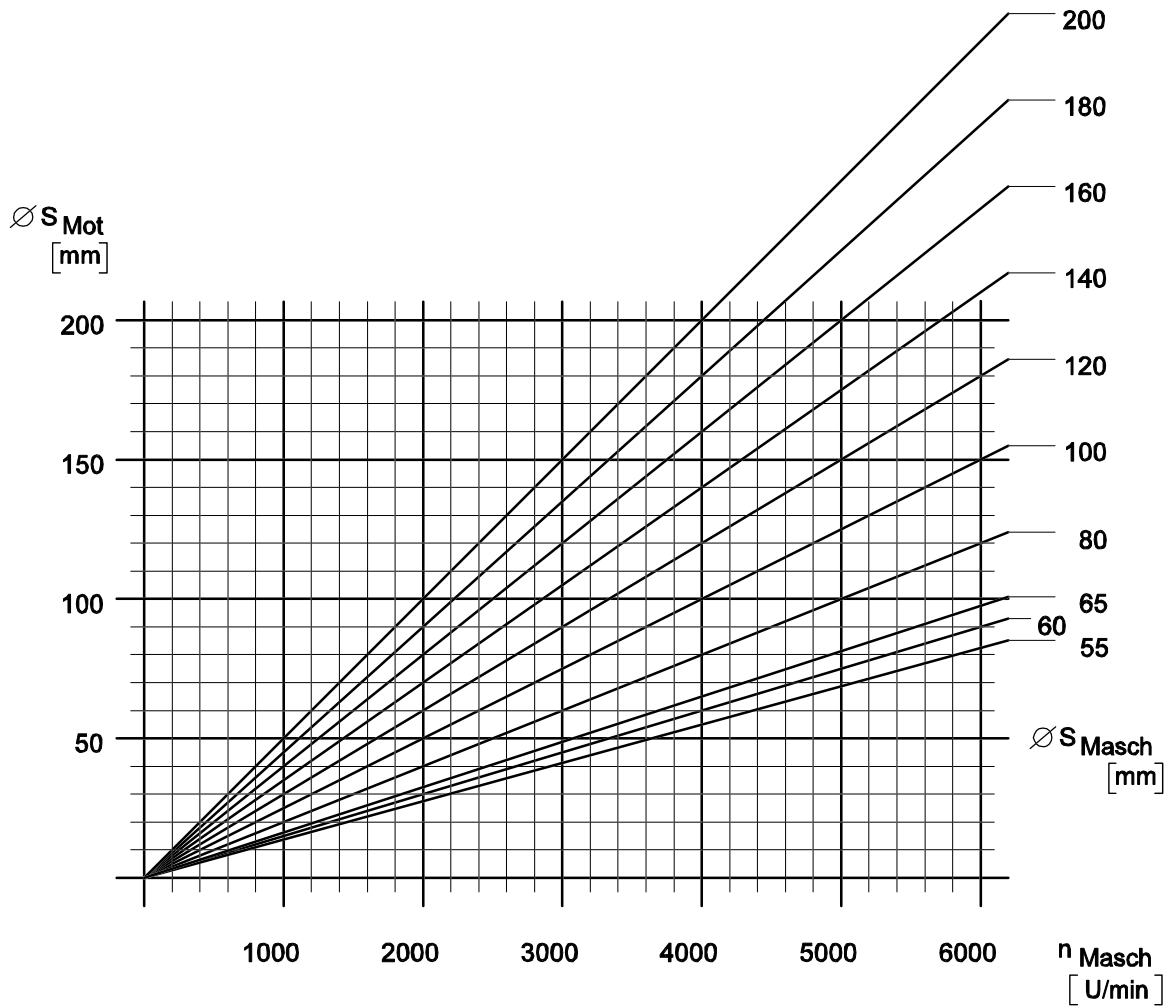


Fig. 6.4 Diagram for SERVO-TOP at  $n_{Mot} = 4000$  rpm

## 6.4 Mounting of Belt Pulley and Belt Guard

- Attach bottom part (1) of the belt guard loosely to the A end bell of the motor by means of two screws (2).

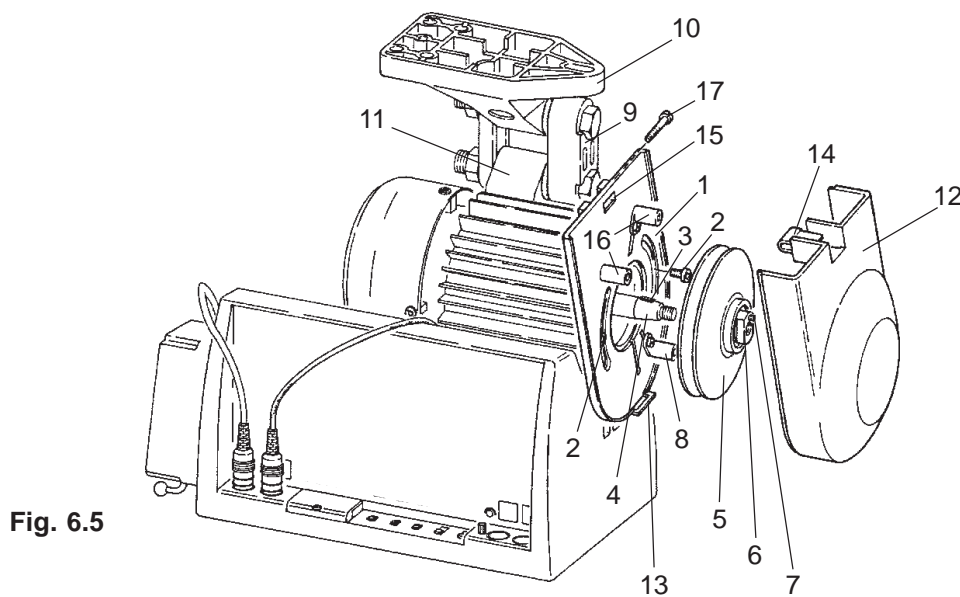
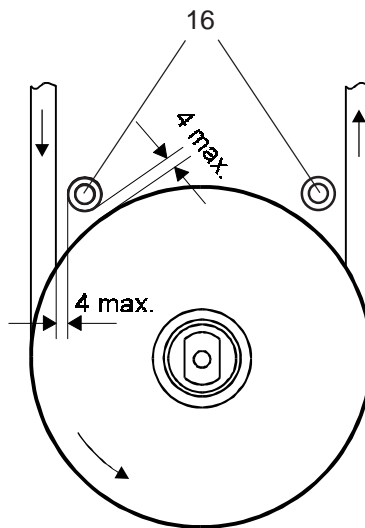


Fig. 6.5

- Loosen belt retainer (8) and the two belt guides (16) and move outward.
  - Install key (3) into the groove provided on the motor shaft (4).
  - Slide belt pulley (5) onto the motor shaft (4) so as to make key (3) engage the groove in the belt pulley bore.
  - Secure belt pulley (5) axially on the motor shaft by means of nut (6).
  - Place the belt and tension correctly by means of the articulation (9) between base (10) and motor suspension (11) (see Fig. 6.2).
  - Secure nut (6) by tightening securing screw (7).
  - Align belt guard bottom part (1) according to the belt and secure by tightening screws (2).
  - Slide belt retainer (8) towards the belt pulley (max. distance 3 mm) and tighten.
  - Move belt guides (16) on the belt entrance side inward far enough as to obtain a maximum distance of 4 mm from guide cylinder to belt pulley and from guide cylinder to belt, respectively (see Fig. 6.6)
- Tighten the belt guides in proper position.



**Fig. 6.6**

- Insert belt guard upper part (12) into eye (13) on bottom part (1) and press in as to make clip (14) on the upper part slip through slot (15) on the bottom part.
- Secure upper part (12) on the bottom part by means of screw (17).

## 6.5 Electrical Connection (to Mains Power)

All work on the electrical equipment (connection, maintenance, repair) is permitted to be performed only by or under the supervision of a properly qualified technician.

The SERVO-TOP is designed for connection to an earthed AC mains power system having a rated voltage between

**190 and 240 Volts, 50/60 cps.**

Before connecting the power supply line, make sure that your mains power voltage is within the rated voltage range specified on the nameplate of the SERVO-TOP.

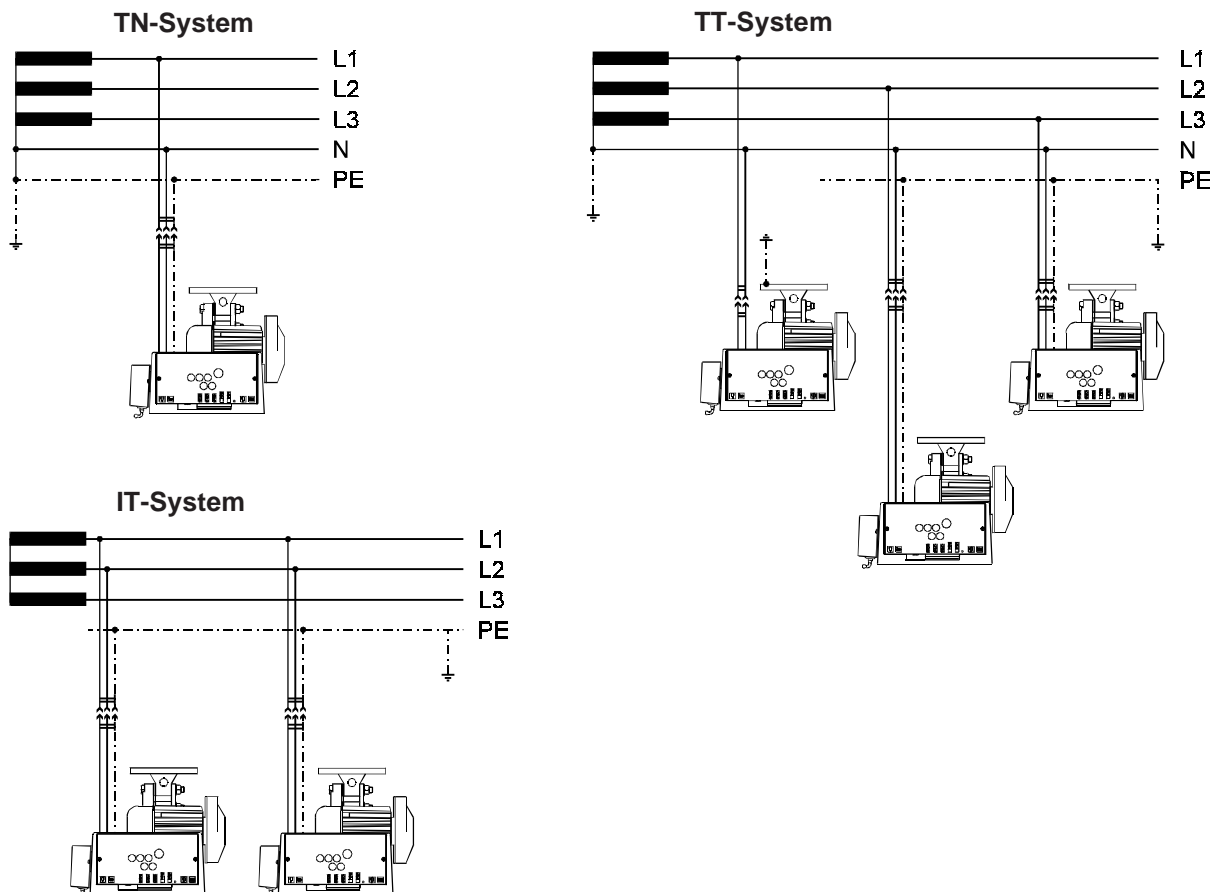
Connection to mains power is permitted only by means of a multi-contact plug with protection earth contact. Fixed connection is not permitted.

Connect the following potentials:

Phase (L1 or L2 or L3)  
Neutral conductor (N)  
Protection earth (PE)

The SERVO-TOP is designed for connection to the following types of mains power systems:

- TN (system with a directly earthed point and with a protection earth conductor (PE) connected to this point)
- TT (system with a directly earthed point, the protection earth conductor (PE) not being connected to this point)
- IT (system not directly earthed)



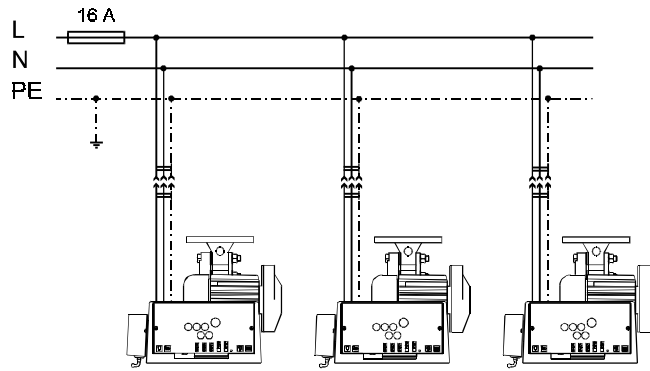
**The following applies to TT and IT systems:**

All elements protected by a common protective device must be connected to the same earthing via protection earth conductors.

All elements apt to be touched simultaneously must be connected to a common earthing.

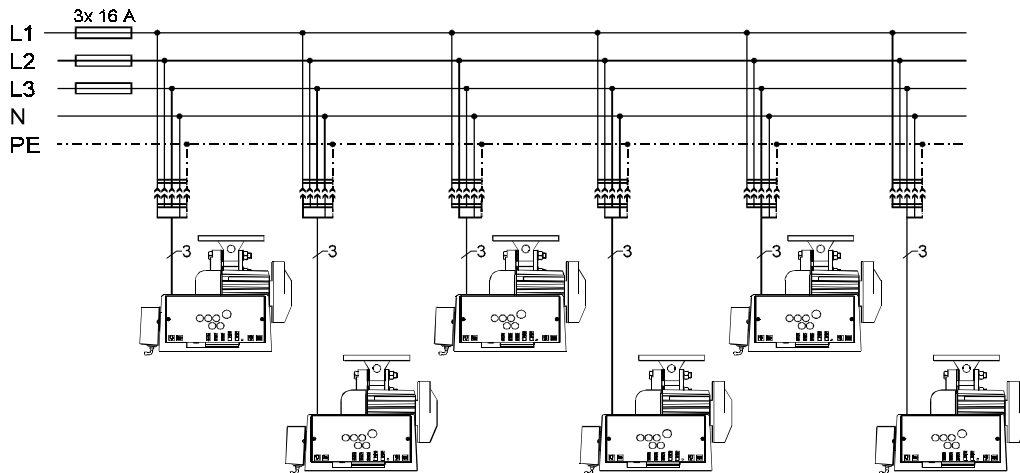
**The following applies additionally to IT systems:**

No active conductor within the installation is permitted to be earthed directly. All elements must be connected individually, in groups, or in total with a protection earthing conductor.



Single-phase connector system with protection earth conductor

Do not operate more than 3 SERVO-TOPs on one circuit fused with 16 amps.



Threephase connector system with protection earth conductor

Make sure to distribute loads evenly in a threephase AC system!

Do not operate more than 2 SERVO-TOPs on one face fused with 16 amps in order not to overload the N-conductor!

The SERVO-TOP is a protection class I device, i.e. for protection at indirect touching it comprises a protection earth connection.



The SERVO-TOP is permitted to operate only in a properly functional protection earth system in compliance with all local rules and regulations in order to avoid danger to persons by electric shock or fire hazards in case of malfunction.

It is not permitted to disable the protection system by using extension cables not equipped with a protection earth conductor.



**Caution:** Any interruption of the protection earth conductor within the SERVO-TOP or outside, or by disconnecting the protection earth connection, can result in making the equipment hazardous.  
Any intentional interruption is inadmissible.

#### Fault Current Protection Devices

If any SERVO-TOPs are to be monitored via fault current protection devices, then the latter must be shock puls proof, short pulse delayed as well as suited for alternating and pulsating constant fault currents.

For connection to the mains power system, our shipment includes a power supply unit comprising a power connection cable 3 or 5 m long.

For connections, use line types not lighter than plastic- insulated sheathed flexible cables H05 VV. The minimum conductor cross section must be 1 mm<sup>2</sup>, with the line length not in excess of 5 m. The voltage drop in the protection earth conductor is not permitted to exceed 3.3 V at a measuring current of 10 amps.

Any lines installed must be properly protected against anticipated loads and must be properly fastened.

Place and attach lines so as to maintain a minimum distance of 25 mm relative to any moving parts.

Place lines, mains power leads and low voltage circuits at a proper distance from each other to achieve adequate separation.

For replacement make sure to use exclusively fuses of the type and current rating specified.

Any bridging-over of fuses is inadmissible and will create electrical or fire hazards.

If there is reason to presume that operation without hazards will not be possible, discontinue operation of the drive system and safeguard the equipment against inadvertant use.

Reasons to presume that operation without hazards will not be possible are as follows:

- if the drive system presents visible damage, for instance mains power connection cable,
- if the drive system fails to function,
- after lengthy storage at unfavourable conditions.

The bottom cover of the control box may be opened only by properly qualified personnel and after having separated the drive system from mains power by pulling the plug out. (After switching the system off, wait at least 10 minutes.)

Insert and lock carefully the connectors on the control system after having checked the pin and socket configuration and the plug-in direction, to avoid malfunction.

The brake action will not be initiated when mains power supply is switched off or power failure occurs during operation of the SERVO-TOP.



When leaving the workplace or when doing maintenance work, separate the machine from mains power by pulling out the plug. For this, do not pull at the cable, but grip the plug and pull it out.

**Before separating the SERVO-TOP from mains power, bring all control elements into „OFF“ or „0“ position.**

## 6.6 Electro-Magnetic Compatibility (EMC)

The SERVO-TOP is designed for installation/attachment to EMC sewing units and equipment, i.e. it complies with the relevant EMC regulations (IEC 204-31 second Edition 1996-05) for a cable length of 500 mm at each input or output connector. In accordance with experience, this is adequate for sewing units.

More complicated sewing equipment may require additional action due to longer cables, unfavourable cable placement, neighbouring strong interference fields etc.

The following action can be appropriate for reducing or eliminating interference:

- The use of appropriate filters, delay units, line material or line placement.
- Lines belonging to different circuits (such as mains power, low voltage) being placed at a proper distance from each other to minimize interference.
- Reference potential conductors for the circuits, or a common connection point: star-type wiring with one or more reference points earthed via insulated conductors having a large cross section.
- Electrically conductive parts of the sewing unit or equipment should be connected via potential compensation leads to the protection earth conductor on the SERVO-TOP casing next to the cable grommet for the mains power connection cable. (Use leads suited for high frequencies: fine-gauge stranded leads with a cross section of at least 2.5 mm<sup>2</sup>, or large-area copper bands.)  
When connecting potential compensation leads, make sure to achieve good contact, i.e. use toothed washers for connections to painted parts.

Include the following parts in potential compensation:

- sewing machine head
- sewing machine stand
- treadle
- housings of solenoids or solenoid valves
- holding brackets for push-button switches
- stands for stackers, band feeders etc.
  
- Mass Connections  
Lead mass connection lines from each equipment element to a common point.  
Use large cross section braided leads between moving parts and casings while keeping mass connection as short as possible.
  
- Signal Transmission  
Use electrostatic and magnetic screening, twisted conductors and appropriate line placement to ensure that transmission of interference voltages from control or mains power lines to signal lines is prevented.  
(Right-angle line crossings are better than any lower angles; by all means avoid parallel placement.)
  
- Separation of Equipment Parts  
Equipment parts that are susceptible to interference parts (pulse-processing and/or low-level subassemblies) should be mounted separately from and/or be screened against switching devices such as electromagnetic relays, thyristors etc.
  
- Although being largely insusceptible to interference, the SERVO-TOP should not be operated in the immediate vicinity of HF welding devices or similar equipment to avoid malfunction.
  
- The SERVO-TOP is capable of complying with EMC regulations only when the control box front is provided with its cover!
  
- The front cover of the control box must remain closed during operation in order to avoid malfunction due to EMC causes as well as pollution by dust penetration.

Whenever trouble should occur, please contact the manufacturer.



## 6.7 Mounting of the Synchronizer (Position Control Unit)

- Fig. 6.7 shows a front view of the synchronizer. Slip the synchronizer onto the accommodation stub on the handwheel and secure by means of 2 socket head hex screws (a).
- The accommodation bore of the synchronizer shaft (b) has a diameter of 22.2 mm (tolerance E7).
- The accommodation stub on the sewing machine handwheel must have appropriately close tolerance!
- Before slipping the synchronizer onto the handwheel, make sure to turn the two screws (a) back far enough so as to prevent them from projecting into accommodation bore (b)!
- The diameter of the accommodation stub on the handwheel must be:  
22.2 mm (tolerance k8) for low-speed sewing machines  
22.2 mm (tolerance p6) for high-speed sewing machines

Explanation:

Tolerance	k8	p6	E7
min. deviation [ $\mu\text{m}$ ]	0	+22	+40
max. deviation [ $\mu\text{m}$ ]	+33	+35	+61

- The synchronizer housing must be secured against rotation. For this purpose, mount a fixing device, for instance a threaded pin (6 mm dia.) on the sewing machine casing. This must project into the fixing slot (c) on the synchronizer housing and thus hold the synchronizer free of clearance by means of an elastic insert.

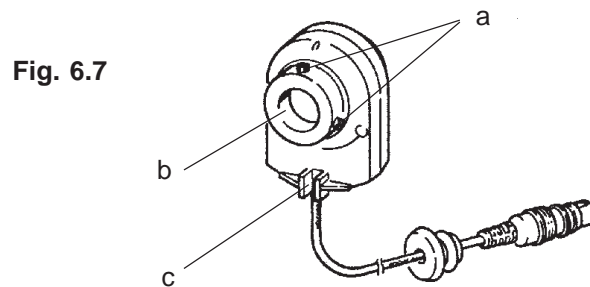


Fig. 6.7

## 6.8 Mounting of the Speed Control Unit

- Attach the speed control unit baseplate (6) to the lefthand side of control box (2) by means of two screws.
- Connect the push/pull bar of the speed control unit with the machine treadle by means of a pitman rod.
- The push/pull bar of the speed control unit and the pitman rod linking it with the treadle should form as straight a line as possible in order to ensure optimum transmission of force between the speed control unit and the treadle.
- The pitman rod and the treadle should form an angle as close to 90 degrees as possible.
- The speed control unit can be swivelled on the control box within a range of 40 degrees.
- Make sure that the treadle can move with ease!

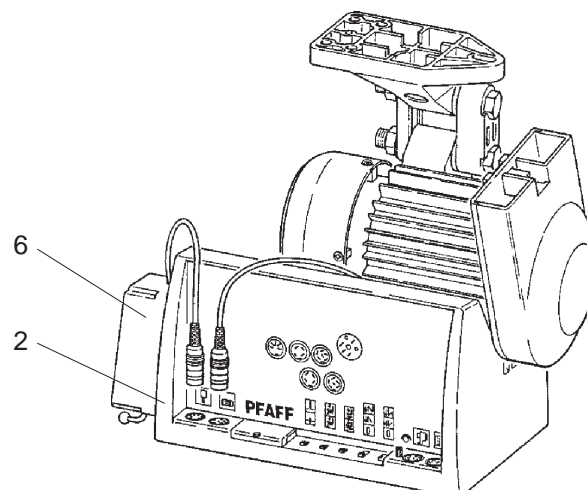


Fig. 6.8

QUICK-ROTAN Elektromotoren GmbH  
Gräfenhäuser Straße 85  
D-64293 Darmstadt  
Tel. : 06151 / 87970  
Fax : 06151 / 896246