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## CS Type Servo Press Tool Instruction Manual

### Introduction

Thank you very much for purchasing the CORETEC AC Servo Press. Please read and fully understand this Instruction Manual (hereinafter referred to as “this Manual”) before use in order to fully utilize the capabilities of this system and to ensure a long service life. Please retain and store this Manual in such a manner so that it can be readily referred to when necessary.

### Please Note:

This Manual has been prepared carefully to ensure that it includes all necessary information. Please contact CORETEC if you have any questions or comments regarding this Manual.

\* All company, brand, and product names contained in this document are registered trademarks of their respective owners.

\* This Manual must be read to ensure safety and product quality.

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## Chapter 1 For Safe Use

### [1] Precautions before use

This Manual and corresponding attached documents must be read and thoroughly understood before conducting installation, operation or maintenance in order to ensure safe and proper use of this system, and to prevent injury to the users and other persons, and damage to this system and surrounding facilities.






Injury and damage that can occur if this system is not used properly without fully understanding the information contained in this Manual are classified into "DANGER," "WARNING," and "CAUTION" and indicated as such, and the instructions to be strictly observed to assure safety are indicated as "PROHIBITED" and "COMPULSORY." The situations accompanied by warnings can result in serious injury and/or damage depending on the corresponding conditions. All instructions and information provided by warnings are important and must be strictly observed.

This Servo Press is classified into the partly completed equipment according to Machinery Directive (2006/42/EC). Therefore, after this equipment is incorporated into the final machinery, conformity with Machinery Directive (2006/42/EC) shall be needed in the final machinery.

CE marking based on Machinery Directive is not done to the partly completed machinery. Therefore, for the case that circulates by the partly completed machinery until this equipment is incorporated into the final machinery in Europe. It is necessary for the declaration of incorporation and the manual of this equipment to be appended to this equipment

### [2] Warning symbols

The warnings and symbols used in this Manual are defined as follows:

Marking	Meaning
 <b>DANGER</b>	Indicates an imminent hazardous situation that will result in death or serious injury if not strictly observed.
 <b>WARNING</b>	Indicates a potentially hazardous situation that can result in death or serious injury if not strictly observed.
 <b>WARNING</b>	Indicates a potentially hazardous or damaging situation that can result in minor or moderate injury or physical damage if not strictly observed.
 <b>CAUTION</b>	Indicates an action that is prohibited in the handling of this system.
 <b>CAUTION</b>	Indicates an action that must be performed when using this system (instructions must be strictly observed).

 **PROHIBITED**

 **COMPULSORY**

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### [3] Use precautions



#### **DANGER**

- This system is designed and manufactured based on use in normal conditions and locations. Never use this system in locations where the danger of explosion exists, including the presence of combustible gas or explosive gas. Use in such locations could result in a serious accident.
- The controller must be turned off when work is conducted near the ram of the servo press tool. Failure to turn off the controller could result in death if a person is caught up in the tool.
- Keep hands and other parts away from the moving parts of the ram during operation of the servo press. Failure to do so can result in physical injury.



#### **WARNING**

- Installation, connection, driving and operation, check and failure diagnosis shall be done by a qualified technician.
- Always turn off the primary power, and check that the CHARGE lamp (red) is not lit up, and that all the other indicators are not lit up before conducting relocation, wiring work, maintenance, or inspection. Failure to do so can result in electrical shock.
- For installation requirements of this equipment, protection against electric shock is class I, and equipment mobility is stationery equipment for indoor installation. Please make sure this equipment is grounded when installed. (PE should be marked at the protective earthing terminal)
- For the protection against the unexpected start after the power failure or voltage decreases, appropriate measures must be taken in the final machinery based on the result of the risk assessment as described in the manual.
- Do not touch the power supply terminals in this equipment within 5 seconds after the power is turned off. Failure to do so can result in electrical shock.
- Utilize covering to protect the system from direct exposure to oil or water. Failure to do so can result in fire or electrical shock.
- Prevent the formation of condensation from water or moisture. Failure to do so can result in fire or electrical shock.
- Immediately stop using the system if any irregularity or fault occurs during use, including the servo press malfunction. Failure to do so can result in fire or electrical shock.
- The cables should not be damaged, stressed, loaded, or pinched. Failure to do so can result in faults, electrical shock or malfunction.



#### **CAUTION**

- Operate the Servo Press in the environment of Pollution Degree II set forth in IEC60664-1.
- Do not use the controller and tool in a corrosive environment. Use in a corrosive environment can result in system malfunction.
- Do not remove the cover, or disassemble, repair, or modify the system. Doing so can result in electrical shock.
- It is necessary to be connected surely based on the connection diagram. Make sure all the connections for this equipment is properly connected according to the connection diagram.
- For the operation, stop, emergency stop shall be done in the final machinery into which this equipment is incorporated.
- Do not touch the motor, cables or controller while the power is on. Failure to do so can result in electrical shock.
- Do not touch the motor and the surrounding area during and immediately after tool operation. Touching the motor and surrounding area can result in burns, as these remain hot for a period of time.
- Do not use the system above the ambient temperatures specified. Doing so can result in fire or electrical shock.

- Do not use the system above the motor surface temperature specified. Doing so can result in fire or electrical shock.
- Be careful not to operate the servo press at load or travel speeds above the specified tolerances. Operating above these tolerances significantly decreases the service life of the press.
- Before operating this system, operators must fully understand the information under the section "[1] Stroke" in Chapter 5 of this Manual. Failure to fully understand the concepts related to stroke can result in serious accident or system faults.

#### [4] Design precautions



##### CAUTION

- Consult CORETEC if mounting the tool facing upwards.



##### COMPULSORY

- Always incorporate the appropriate safety measures including failsafe mechanisms if the system is used for any applications that could result in personal injury or death, or serious extended damage.
- Safety equipments such as two-hand start button, emergency stop button, light curtain and so on shall be provided in the final machinery.

#### [5] Transport precautions



##### CAUTION

- Use the original cardboard box when transport or stock.
- This is heavyweight equipment. For lifting this equipment for transportation and installation, please follow the procedures indicated in [3] Precautions for lifting of Chapter 4 in this manual.
- This equipment must be transported in an appropriate manner according to its weight. Use extra caution at a place which has differences in level on the floor during moving and transportation. Falls of equipment causes serious injury such as pinching body parts..



##### PROHIBITED

- Do not hold the tool by the motor when carrying. Carrying by holding the motor can cause tool faults.
- Do not drop the tool or otherwise expose it to any impact. The tool contains precision parts so an impact can cause tool malfunction or faults.



##### COMPULSORY

- When transporting equipment to which the tool is mounted, secure the tool and equipment to prevent impact and interference. Failure to secure the equipment can result in system malfunction or faults

#### [6] Precautions before operation



##### WARNING

- Make sure that the tool is firmly secured. Injury or system faults might result if the tool is not secured.
- If any irregularity or error occurs, including alarms, the cause must be remedied before use. Failure to remedy the cause can result in injury, malfunction, or system faults.
- Gradually change the set values used in software and other locations. Sudden large changes of set values can result in damage to work pieces or system faults.



### CAUTION

- Make sure that there is no block item or wrong ram end jig. If ram end crushes, Servo Press, machine, jig or work piece may break.

## [7] Maintenance and inspection precautions



### WARNING

- Always turn off the primary power and check that the supply power is off before handling cables or connectors. Failure to do so can result in electrical shock.



### CAUTION

- Immediately stop using the system if any irregularity is found that cannot be attributed to the factors described in this Manual. Failure to do so can result in electrical shock or fire. Contact the CORETEC distributor or sales office if such a problem occurs.



### PROHIBITED

- The controller can only be disassembled, repaired, or modified by a CORETEC service engineer or a service representative designated as such by CORETEC. Unsupervised disassembly, repair or modification can result in electrical shock, injury, fire, or malfunction.
- The tool can only be disassembled, repaired, or modified by a CORETEC service engineer or a service representative designated as such by CORETEC. Unsupervised disassembly, repair or modification can result in electrical shock, injury, fire, or malfunction.

## [7] Storage precautions



### PROHIBITED

- Do not store the system in any location where it can be subjected to water or oil, or where there is poisonous liquid or gas. Storage in such locations can cause system faults.
- Do not store the system in any location where it can be exposed to direct sunlight or to high temperatures and high humidity (higher than use environment specifications). Storage in such conditions can cause system faults.



### COMPULSORY

- Any system that has been stored without use for two years or more must undergo functional inspection conducted at CORETEC or a service representative designated as such by CORETEC. Aged deterioration can reduce system function and cause system faults.

## [8] Disposal precautions



### PROHIBITED

- Never burn the controller, the tool, or cables. Burning these components can result in fire, explosion, or poisoning due to toxic gas.



### COMPULSORY

- Always dispose of the controller, tool, cables, and the packing material according to the applicable local laws and regulations.

## Chapter 2 Before Use

### [1] Servo press features

This servo press provides production control, press-fit methods, and other operations that have previously been unavailable, through programmable operation, control and monitoring of the stroke load and stroke amount better than conventional, less sophisticated press-fit presses, clamps, and other equipment. The features of the servo press are described below.

#### (1) Recording of program execution results

Data for the results of up to 4,000 program executions can be recorded in the controller. The results/graphic data can be recorded in a PC by using PC software.

#### (2) Programmable operation

Programmable operation of various factors, as per customer requirements, including speed, load, stroke, time, and the communication with external I/O devices, is available.

#### (3) Various monitoring functions

Load, stroke and other factors can be continuously monitored using PC software.

### [2] Combination of tools and controllers

All the tools (5 kN to 50 kN) in the CS Series are supported by a single controller model.

### [3] Accessories

Tool body x 1

This Instruction Manual x 1



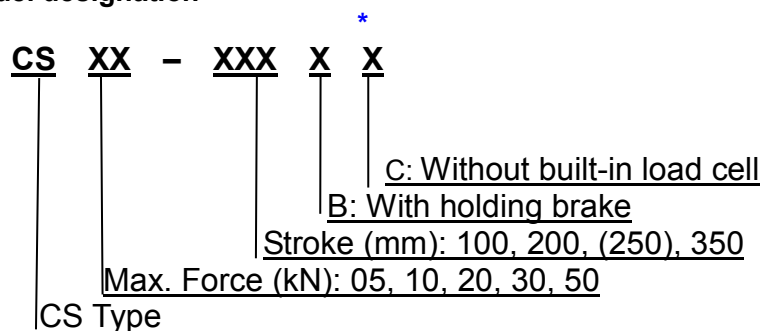
## Chapter 3 Equipment Specifications

### [1] Lineup

Model	CS05	CS10	CS20	CS30	CS50
Resolution	0.01mm				
Positional Repeatability	±0.01mm (under same condition)				
Stroke	100/250mm		100/200/350mm		
Max. Speed *1	300mm/s	180mm/s	270mm/s	240mm/s	150mm/s
Max. Press-fitting Speed	30mm/s				
Instantaneous Max. Force *2	5kN	10kN	20kN	30kN	50kN
Rated Force (Normal Value)	3kN	7kN	14kN	21kN	40kN
Load cell Accuracy	Load cell FS ±1.5% (under no overhung load) *3				
Load Repeatability	Load cell FS ±0.5%				
Ambient Temperature	0-45°C				
Ambient Humidity	Less than 85% (non condensing)				
Altitude	Below 1000m				
Motor surface Temperature	Less than 80°C				
Mounting Direction	Consult CORETEC for mounting facing upwards.				
Suitable controller	CPS-SP-75				
Service Life	Refer to the service life calculation.				
Ram End Mounting Jig Weight *4	Around 5% of Instantaneous Max. Force				
Holding load *5 (Optional brake)	0.65kN/4.2W	1.1kN/4.2W	3.7kN/7W	4.1kN/7W	5.8kN/7W

- \*1 The Max. speed refers to the Max. speed when there is no load acting on the ram.
- \*2 Do not exceed the instantaneous Max. Force, as this value does not refer to the force that can be continuously applied. Refer to the table before selecting the appropriate tool.
- \*3 Indicates the accuracy of the load cell at full-scale. Full-scale is about from 1.5 to 2 times of the Max. Force considering impact load.
- \*4 The weight should only be considered as a guide. The indicated weight may be exceeded if high-speed operation is not performed. Consult with CORETEC.  
However, optional Brake for holding is necessary.
- \*5 Never use the brake for ordinary braking of operations. The brake is designed for maintaining the tool in a stopped condition.

#### (1) Model designation



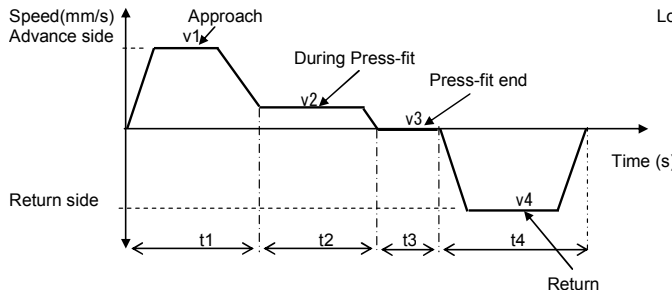
Ex.: CS30-350B: Max. Force: 30 kN, Stroke: 350 mm, and with holding brake

Behind of \* may be used for custom product.

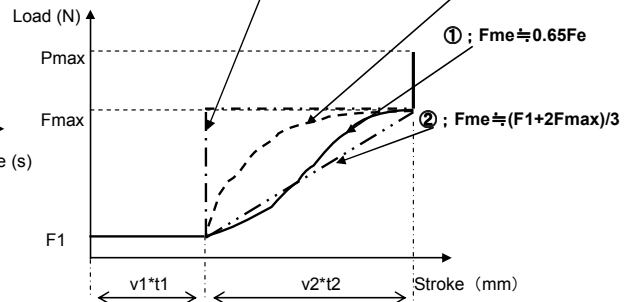
## [2] Reference items for press-fit conditions and tool service life

### Service life calculations for corresponding press-fit conditions

Press-fit process diagram



Press-fit conditions diagram ④ ;  $F_{me} \approx 1.0F_e$  ③ ;  $F_{me} \approx 0.75F_e$



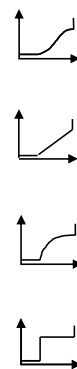
Press-fit process condition table

Model		CS05—250	CS10—250	CS20—350	CS30—350	CS50—350
Normal Force (Fmax)	KN	3	7	14	21	40
Max. Force (Pmax)	KN	5	10	20	30	50
Approach speed	v1 mm/sec	300	190	270	240	150
Speed during press-fit	v2 mm/sec	30	30	30	30	30
Speed under Max.load	v3 mm/sec	0.5	0.5	0.5	0.5	0.5
Return speed	v4 mm/sec	300	190	270	240	150
Free travel distance	v1*t1 mm	220	220	320	320	320
Press-fit travel distance	v2*t2 mm	30	30	30	30	30
Max load travel distance	v3*t3 mm	0.1	0.1	0.1	0.1	0.1
Return travel distance	v4*t4 mm	250	250	350	350	350
End jig weight	kg	10	10	20	30	50

### Number of service life cycles under corresponding press-fit conditions

(Calculation results obtained by varying press-fit travel distance condition )

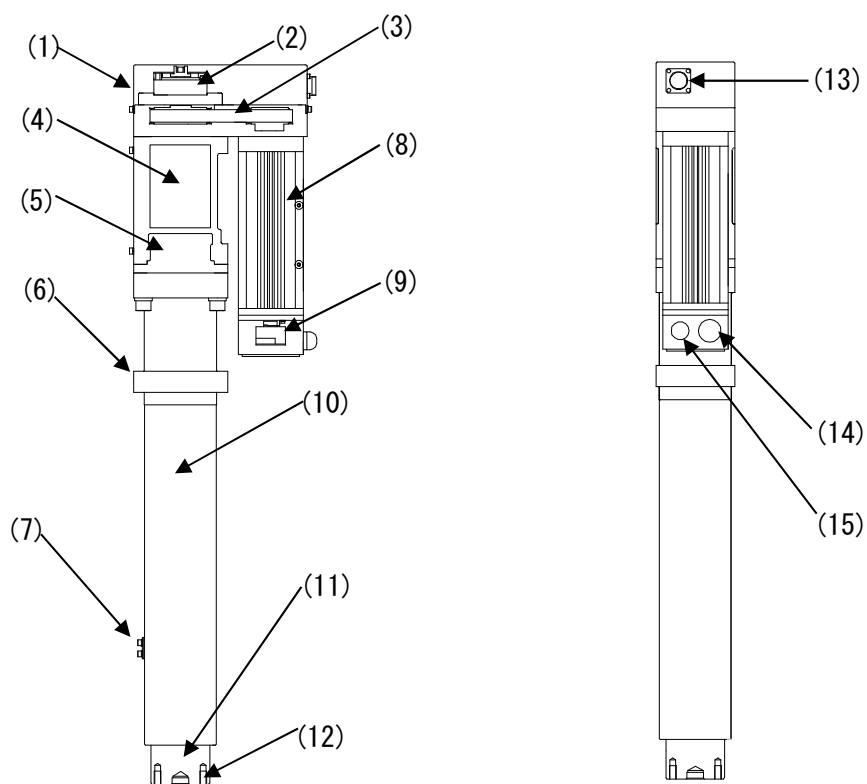
Press-fit conditions diagram ①		① ; $F_{me} = F_e * 0.65$				
Press-fit distance: 10mm	10 <sup>4</sup> cycles	1000	620	810	870	1000
Press-fit distance: 20mm	10 <sup>4</sup> cycles	1000	350	450	500	1000
Press-fit distance: 30mm	10 <sup>4</sup> cycles	1000	240	320	350	1000
Press-fit conditions diagram ②		② ; $F_{me} = (F_1 + 2F_{max}) / 3$				
Press-fit distance: 10mm	10 <sup>4</sup> cycles	1000	580	760	790	1000
Press-fit distance: 20mm	10 <sup>4</sup> cycles	1000	320	420	450	1000
Press-fit distance: 30mm	10 <sup>4</sup> cycles	1000	220	290	320	1000
Press-fit conditions diagram ③		③ ; $F_{me} = F_e * 0.75$				
Press-fit distance: 10mm	10 <sup>4</sup> cycles	1000	440	580	580	1000
Press-fit distance: 20mm	10 <sup>4</sup> cycles	1000	240	310	330	1000
Press-fit distance: 30mm	10 <sup>4</sup> cycles	1000	160	210	230	1000
Press-fit conditions diagram ④		④ ; $F_{me} = F_e * 1.0$				
Press-fit distance: 10mm	10 <sup>4</sup> cycles	1000	200	270	250	1000
Press-fit distance: 20mm	10 <sup>4</sup> cycles	1000	100	140	140	1000
Press-fit distance: 30mm	10 <sup>4</sup> cycles	800	70	90	100	820



- The values listed above are theoretical calculations. Actual service life and maintenance cycles vary depending on service conditions.

### [3] Servo press configuration

The servo press consists of the parts shown below. (The figure below shows CS30.)



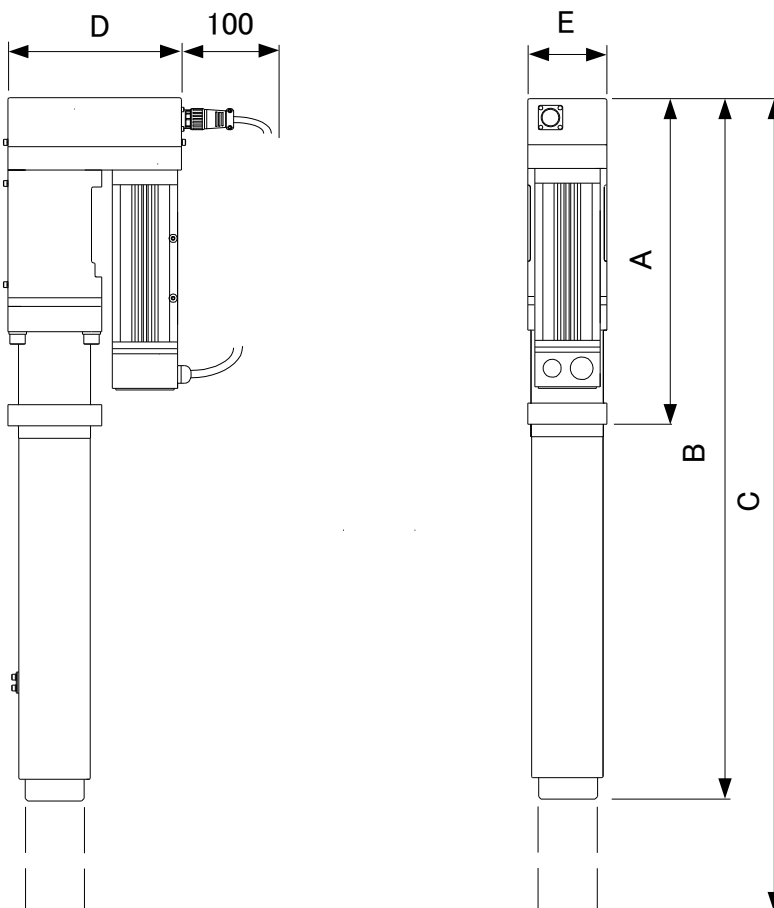
No.	Name
(1)	Belt Cover
(2)	Electromagnetic brake (optional)
(3)	Timing belt
(4)	Reduction gear unit
(5)	Load cell
(6)	Mounting flange
(7)	Key (Ram detent)
(8)	Motor
(9)	Encoder
(10)	Ram guide
(11)	Ram
(12)	Jig mounting hole
(13)	Sensor/Brake cable connector
(14)	Motor cable outlet
(15)	Load/Encoder cable outlet

#### [4] Dimensions

##### (1) Tool dimensions

Dimensions of stroke types for each tool are shown in the table below.

The indicated dimensions may vary without prior notification. Refer to the latest drawings for the actual dimensions of the corresponding tools.

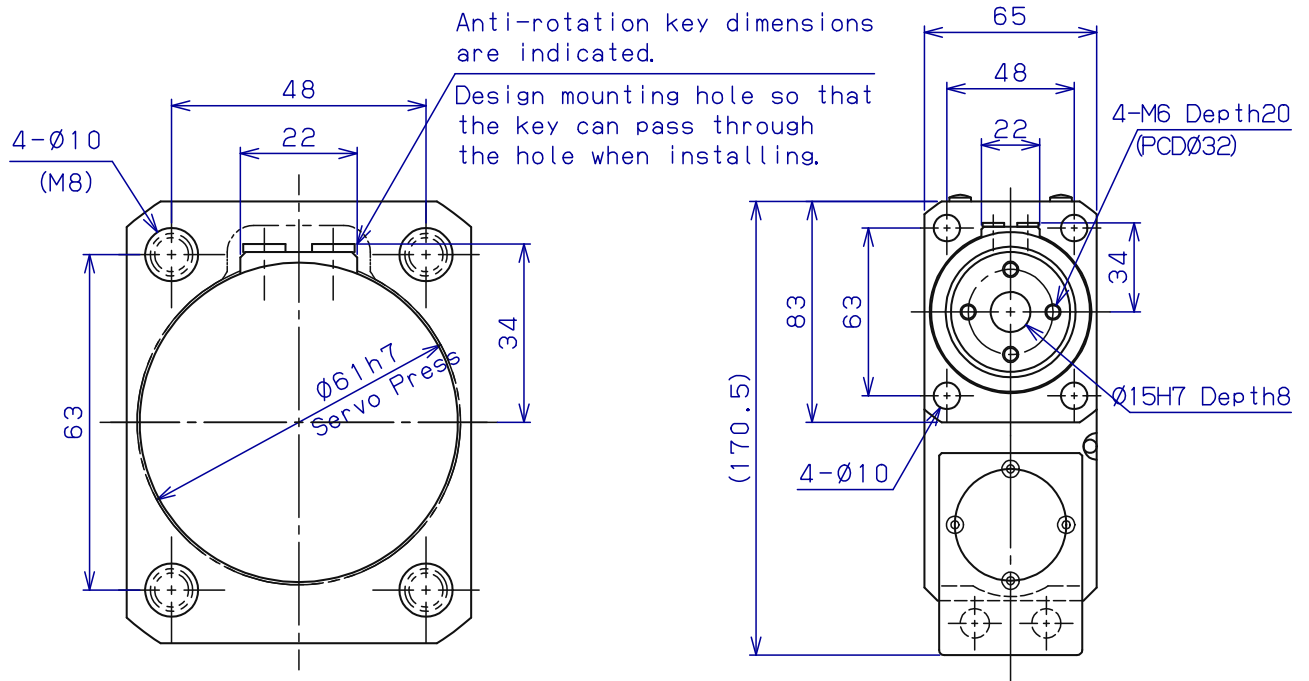


Tool dimensions [mm]

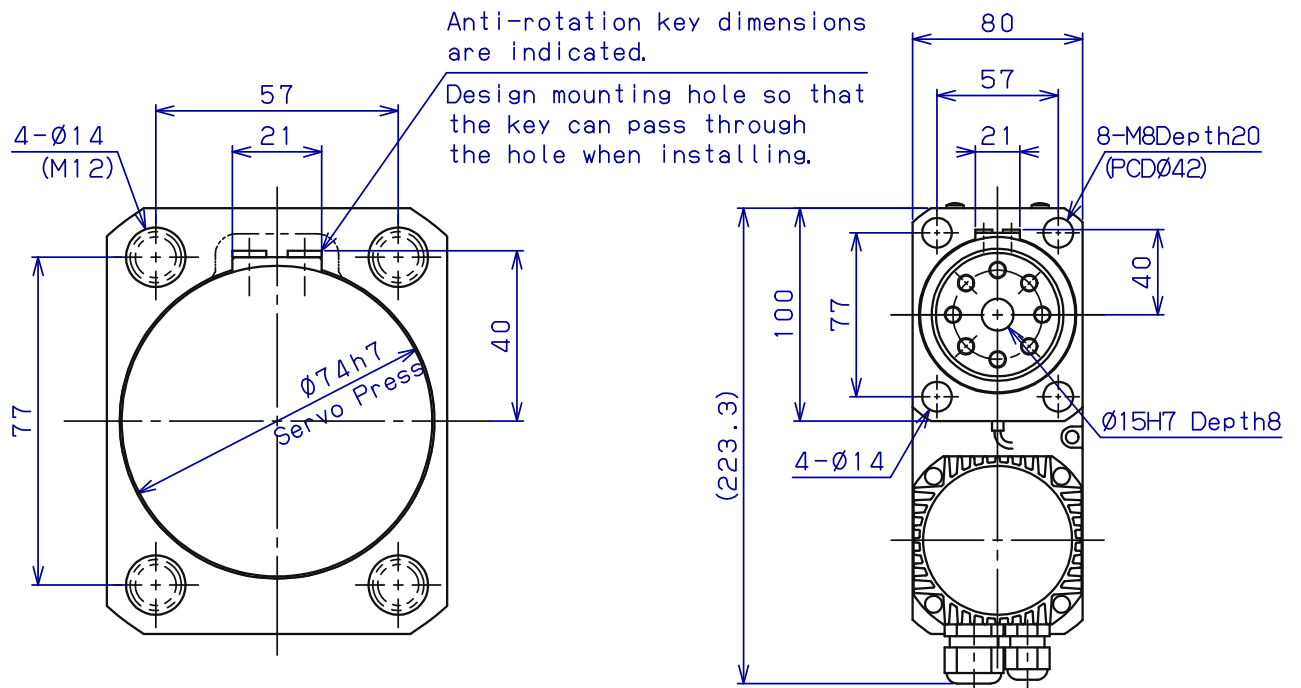
Tool type	A	B	C	D	E	Weight [Kg]
CS05-100	335	465	565	150	65	13
CS05-250		670	920			18
CS10-100	335	465	565	150	65	13
CS10-250		670	920			18
CS20-100	390	510	610	200	80	24
CS20-200		650	850			28
CS20-350		850	1200			34
CS30-100	398	555	655	215	94	32
CS30-200		680	880			36
CS30-350		860	1210			42
CS50-100	565	810	910	260	135	73
CS50-200		890	1090			79
CS50-350		1070	1420			93

## (2) Tool mounting and jig mounting surface dimensions

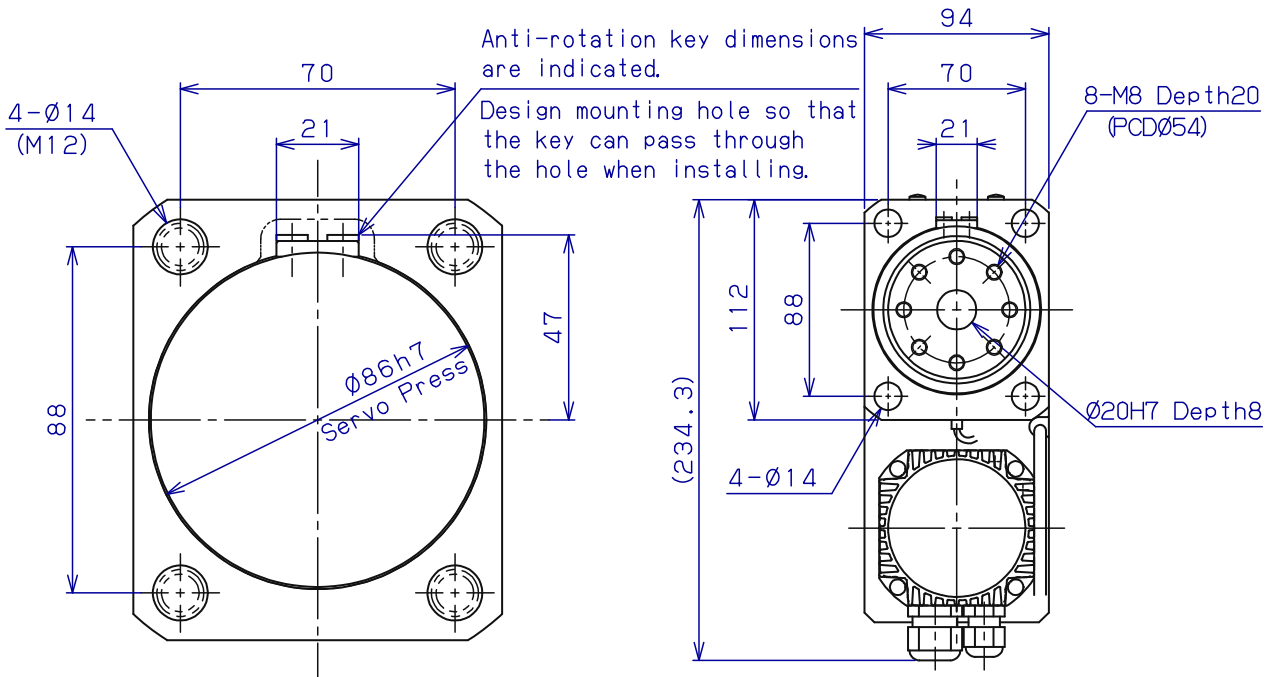
### For CS05/10



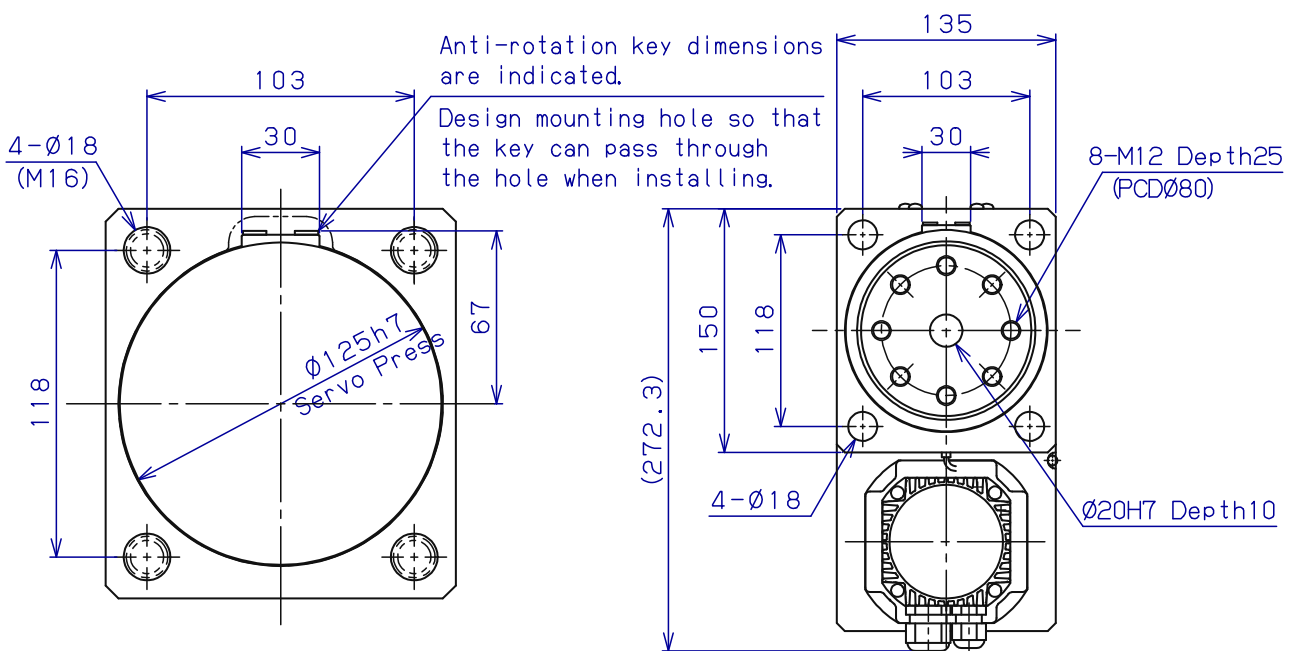
### For CS20



**For CS30**

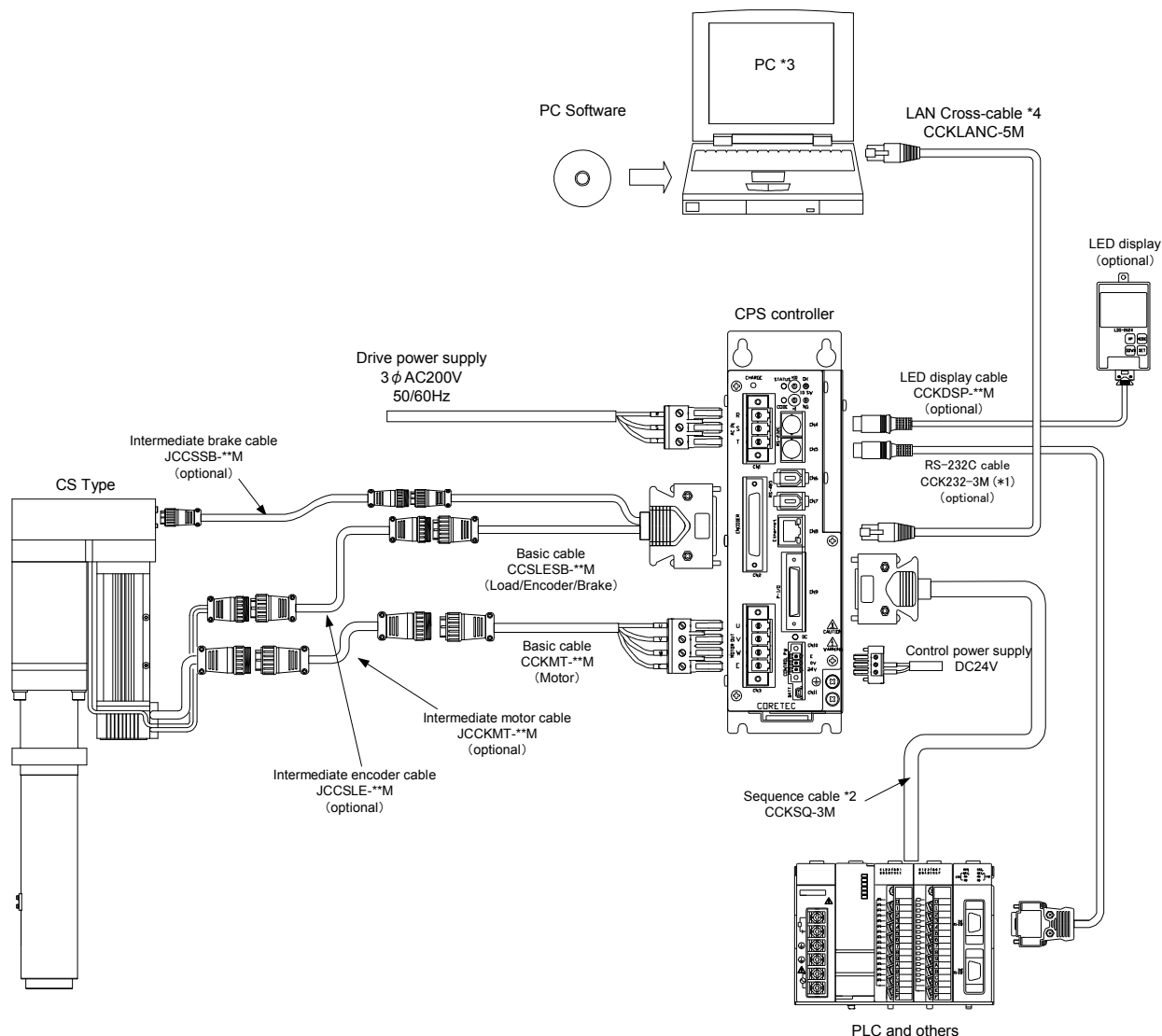


**For CS50**



## [5] Schematic diagram

### (1) Single spindle configuration (including options)



\*1 Depend on PLC type, cable names are different as below  
 For PC : CCK232-3M  
 For Mitsubishi PLC : CCK232M-3M  
 For Omron PLC : CCK232R-3M  
 For Sharp(15P) PLC : CCK232S15-3M  
 For Sharp(25P) PLC : CCK232S25-3M  
 None connector type : CCK232N-3M

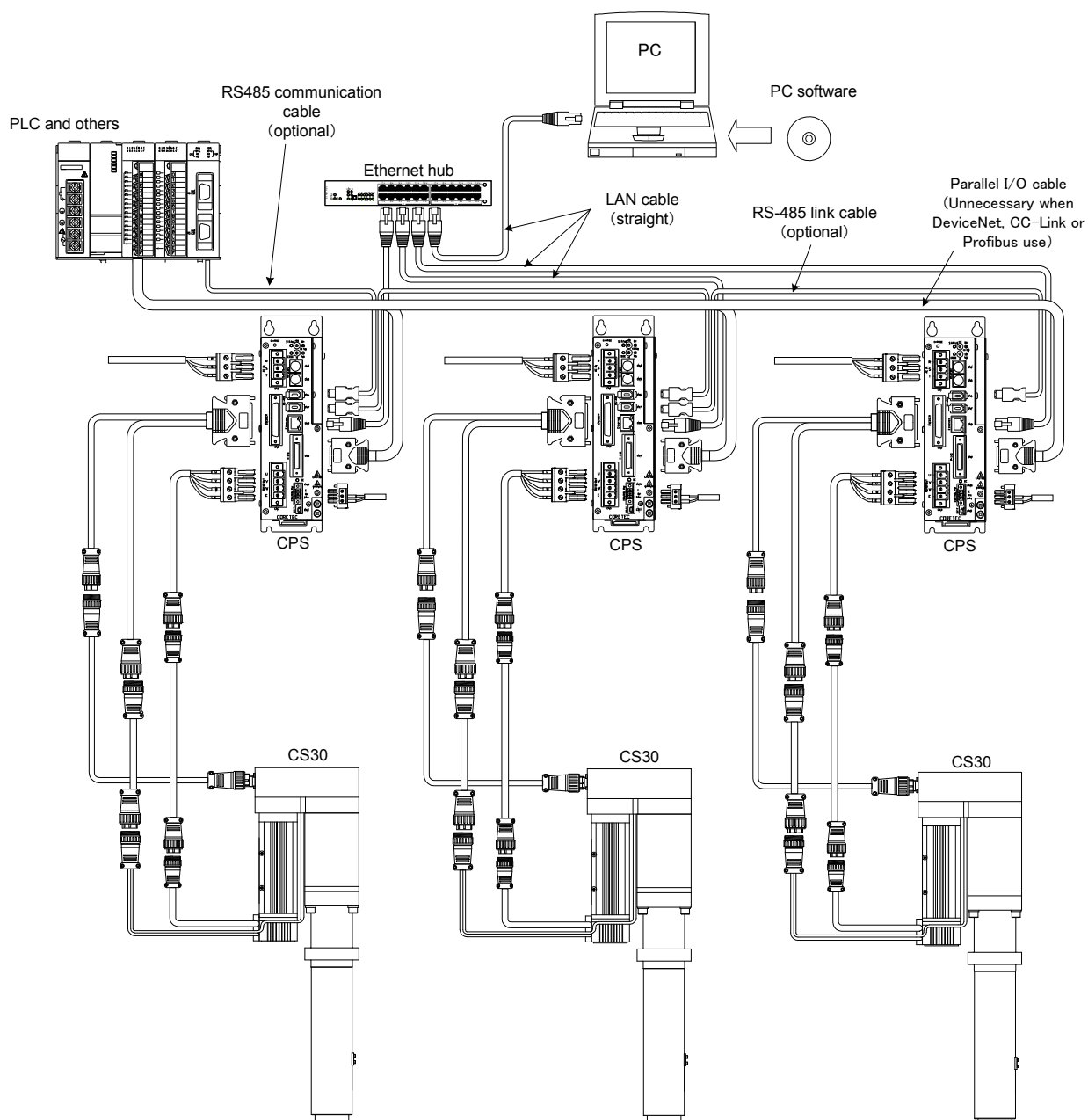
\*2 Unnecessary when DeviceNet, CC-Link or Profibus use

\*3 Provided by the user

\*4 Use CCKLANC-5M when connected to HUB

- The tools and cables for the peripheral equipment are optional.
- The controller will be damaged if the control power is off while the drive power supply is on. Pay careful attention to the on/off switching sequence of the control power and drive power supplies. Design the system so that the electromagnetic switch of the drive power supply will be turned off when the control power supply is turned off. Refer to the controller instruction manual for more information.

## (2) Multiple spindle configuration (including options)





## Chapter 4 Customer Design/Installation Precautions

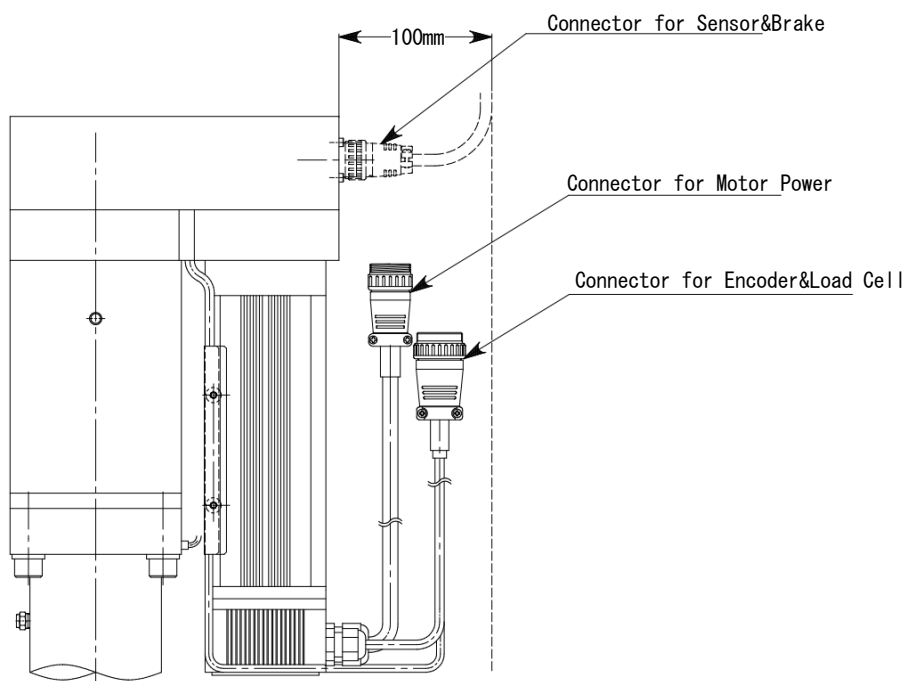
### [1] Design/Mounting precautions

Observe the following precautions when using the servo press. Failure to observe these cautions can result in decreased press-fit accuracy or system faults.

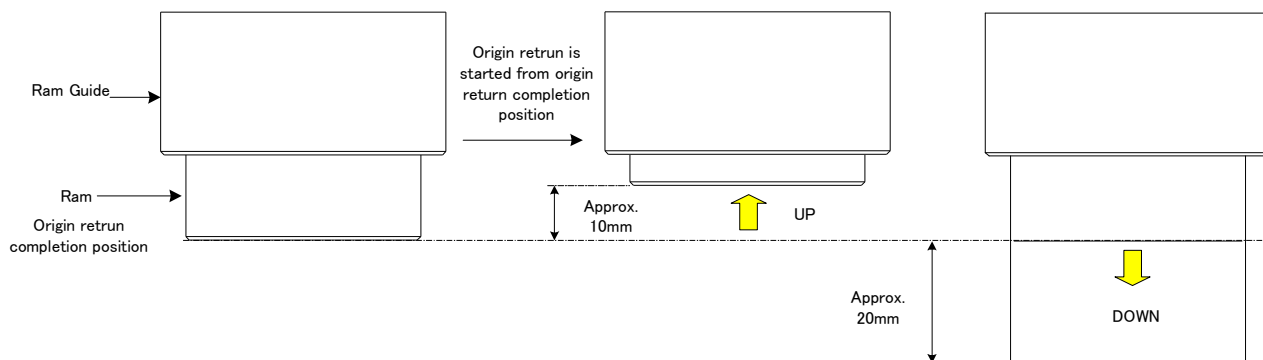


#### CAUTION

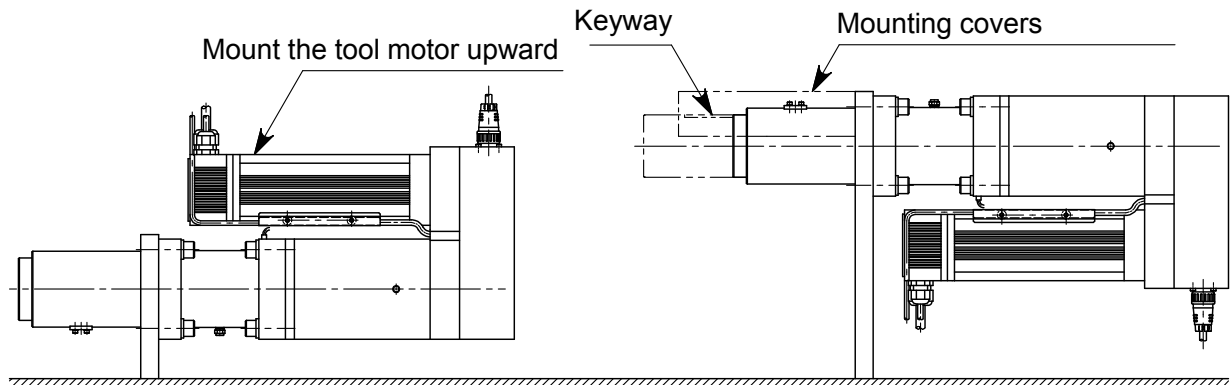
- Although there are not any specific indications regarding mounting (except for mounting facing upwards), the jig to be mounted on the ram should not exceed the allowable weight. A jig that exceeds the allowable weight will have an adverse effect on servo press service life and load accuracy. Consult CORETEC if a jig exceeding the allowable weight must be used. A jig that exceeds the allowable weight places an additional load on the regenerative resistors within the tool and controller resulting in limited operating speed and the cycle time.
- Adequate space of at least 100mm should be provided for routing cables and connectors connected to the tool. This should be considered in designing the machine and tool location.



- When origin return is conducted again from the original return completion position, the ram recedes approximately 10 mm into the guide. And also it comes out approximately 20 mm depending on the setting. This should be considered in performing machine design of a jig mounted on the end of the ram and tool location.



- The design of the tool mounting plate should be considered based on appropriate strength calculation. If the mounting plate lacks sufficient strength, the plate becomes distorted, possibly displacing the ram end position of the tool relatively.
- When horizontal use, mount the tool motor upward without fail. In case of motor downward, foreign objects may come into the tool inside from the on the ram, located opposite side of motor. Protect the ram from direct exposure to falling objects by mounting covers or taking other appropriate measures.



- Consideration should be given so that no direct external force can be exerted on the connectors and receptacles. Secure outgoing cables from motor so as not to leave them unstable. Leaving so can result in outgoing cables broken.
- The tool, work piece, or other equipment can be damaged if impact with the work piece or other parts occurs at the feeding speed (approach speed). Contact should be made at the maximum press-fit speed or lower.
- The instantaneous maximum thrust is the critical load of the tool. This thrust should be used continuously. Use the rated force as a guide during actual operation.
- Do not apply a heavy impact load to the ram during tool operation. A heavy impact load can adversely affect the servo press service life and load accuracy.
- Install guides or other appropriate devices if moment force or rotating torque is applied to the ram during tool operation (during pressurization).

**PROHIBITED**

- Do not install the system in a location where the tool can be subjected to a heavy impact (5G).
- Do not hold by the motor. Doing so can lead to tool faults.
- Do not install the system in a place where the tool is directly exposed to water or oil.

**[2] Precautions for using brake(s)**

The servo press dedicated brake is a non-excitation activated type. The brake is released when the coil is energized (at DC24V) and is applied when the coil is de-energized. The brake is automatically activated when electric circuits are turned off. In the CS Type, the brake cable is connected to the controller allowing the brake to be controlled using a program. Observe the following precautions when using a servo press with a brake.

**⚠ CAUTION**

- This brake unit is designed to be installed to prevent the servo press from falling under its weight when the servo press is inactive (servo-off) because of the jig attached to the ram. This unit is not to be installed to improve stopping accuracy. Never use the brake unit for ordinary braking.

**[3] Precautions for lifting**

Make sure the following cautions when lifting Servo Press for installation. Failure to do so can result in serious injury such as pinching or hitting body parts due to drop or falling. And Servo Press may break down.

**⚠ CAUTION**

- Servo Press is heavyweight product. Read CHAPTER3 [4] (1) Tool dimensions and check the weight, and then prepare to lift.
- Refer to the Picture 1 for slinging work. Servo Press should be vertical.
- Heavyweight Servo Press, CS30 and CS50 have (2) M8 holes for eyebolt. Refer to the Picture 2, lift Servo Press using holes. Pay attention to the balance because It does not always balance.



Picture 1



Picture 2

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#### [4] Installation precautions

Observe the following precautions when installing the servo press. Failure to observe these precautions can result in decreased press-fit accuracy or system failures.



##### **CAUTION**

- The maximum length of the cable between the tool and the controller is 30 m.
- Secure the cables so as not to apply any load to the cables themselves. Be careful that the cables are not excessively bent, restrained, or stretched.
- When wiring a cable onto a moving part, avoid interference with other units by housing the cable in cable chains or other cable protectors or taking other appropriate measures. Additionally, take care to prevent the cable from being pinched. Cable bending radius (R)  $\approx$  75 mm.
- The junction between cables should be limited to one location between the controller and tool (except the connection of the tool and the controller). The total length of an intermediate cable and the basic cable shall be up to 30 m if the intermediate cable is used for connection.
- The tool should not interfere with other tools or units.
- Tightly lock all connectors. Push in the connector, tighten the locking screws, if present, and check that the connector is completely inserted to the base.
- Turn off the power to the controller and any external devices before inserting or removing connectors.
- The connectors and cables to be connected to the controller must be used with their securing screws completely tightened.
- The connectors should be free from the interference of any other unit. Protect the connectors by wrapping them with rubber sheets or by taking other measures if the connectors could be subjected to interference or falling objects.
- If the system is used in an environment where foreign objects may fall on the tool cable outlets or connector connections, protect such parts from direct exposure to falling objects by mounting covers or by taking other appropriate measures.
- Do not strike the tool, step on the tool or subject the tool to any other large impact or force.



##### **PROHIBITED**

- Never make connections (including terminal blocks) with any other cables except for the dedicated cables.

#### [5] Final check before turning on the power

Check the following points again before turning on the power:

- Are the motor and the load/encoder cables wired properly? Are the connectors securely fastened with securing screws?
- Are the connectors on the tool side connected properly?
- Are any cables rubbing against any other part, or pinched by some equipment?
- Are the power supply voltage and wiring on the primary side correct?
- Is the grounding conductor properly wired?

## Chapter 5 Basic Points for Operation

### [1] Stroke



Concepts related to stroke must be fully understood to create user programs, and sequences, and designing a system before using the servo press. Improper stroke settings can result in a serious accident during servo press use.

#### (1) Direction

The ram extends in the positive (+) stroke direction.

#### (2) System home position

Used to conduct offset adjustments for the entire system. This value is set on the controller using the PC software. When a tool is changed, a position error that could occur after the mounting of a new tool can be easily corrected by changing the system home position.

#### (3) User home position

An offset that can be freely set in a user program. This parameter is set with reference to the system home position by using a home position table. There are 32 home position tables available from HomeTbl1 to HomeTbl32. The user can select a desired table using the PC software.

The stroke value specified in a user program utilizes the user home position as a reference point.

#### (4) System stroke limit

The maximum stroke value defined in the tool table \*1. The stroke setting can be freely changed unless this limit is exceeded. The system stroke limit is determined by the mechanical home position.

\*1 A tool table contains various settings regarding a tool. This file is located under the installation folder of the PC software. Select a desired tool type on the tool select window to view the information contained in the appropriate tool table.

#### (5) User stroke limit

A stroke limit that can be specified in a user program. This limit is handled with reference to the user home position.

#### (6) If a stroke limit is exceeded:

If any of the stroke limits listed above is exceeded, the controller will turn READY\_RUN off and force the servo to turn off. To reset the system, enter "RESET," check that READY\_RUN is on, and move the ram to within the appropriate stroke limit by manual mode.

#### (7) Indication of stroke value

The indicated stroke value of Servo Press is just calculated from encoder of motor. Therefore, strain by loading ex. load cell or ball screw and so on is not considered. However, positional repeatability is accurate if the load is completely same because physical strain is proportionated by load.

Before origin return, indicate is incorrect. Refer to [3] Origin return.

#### (8) Cautions

It becomes no interlinkage between indication of stroke value and actual ram position, in case mechanical failure happens inside of Servo Press. (ex. Broken timing belt, pulley, gear or key). If actual ram position is important to the motion of the system to prevent crushing, additional sensors for detecting ram position is recommended.

## [2] Load



This system is configured so that the load on the ram end is transmitted to a load cell built into the tool, allowing for control and judgment based on both compressive and tensile loads.

### (1) Static load

Refers to a load where the forces exerted on an object are constant in magnitude and direction regardless of time. Specifically, the stopped condition immediately after press-fit represents a static load. Load calibration generally uses a static load and accuracy is also expressed by static load.

### (2) Dynamic load

Refers to a load where the forces exerted on an object vary in magnitude and/or direction over time. The load value obtained during the operation of the servo press corresponds to a dynamic load. A dynamic load is often more unstable than a static load, and it is difficult to ascertain the actual value of a dynamic load. This system uses the moving averages of instantaneous values as the dynamic load.

### (3) Load overshoot

When load control is performed, a time delay arises between when the target load is sensed and until the next operation is performed. The load increased during this period is referred to as the load overshoot. The slower the ram speed, the lesser the load overshoot. The load peak value includes the overshoot and is greater than the target load.

### (4) Impact load

Impact load is produced when the ram comes into contact with an object during high-speed approach or is stopped by bottoming out. Although the impact load does not present major problems if it does not exceed the instantaneous Max. force value, attention must be paid to the impact load as it can damage ball screws and, especially, load cells. If the total load including the impact load exceeds the instantaneous Max. force value significantly, even at or below the Max. press-fit speed, a load cell could be disabled at one pass. If an impact load exceeding the instantaneous Max. force value is repeatedly applied even though the load cell is not disabled at one pass, the zero point will gradually move and possibly eventually exceed the adjustable range making system repairs necessary.

### (5) Sensor less system

A system not utilizing load cell can be selected if load accuracy is not an important factor, or if the usage of the system could cause load cell failure. In this case, load accuracy is approximately +/-15% since load values are calculated from motor currents.

## [3] Origin return

The CS Type tools, which employ an incremental type encoder, need to be returned to the origin every time the control power is turned on. An alarm results if a program execution instruction is issued when origin return has not been completed. Manual operation is also significantly restricted in speed and force as described below when origin return has not been completed. The speed is limited to the origin return speed. The force is also limited to from 10% to 30% of the maximum force. Origin return is not allowed when a load exceeding this limit is applied.

If origin return is activated when the system is in the origin return completion position, the ram briefly moves in the minus (-) direction. Mechanical design should be performed so as to allow the ram to move at least 10 mm in the minus (-) direction from the origin. And it also moves approximately 20mm in the pulse (+) direction depending on the setting. Paying attention to mechanical design of location of a tool and other mechanical equipment is necessary.



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#### [4] Brake

Electromagnetic brake control instructions for controlling the optional electromagnetic brake are provided in the program language. The electromagnetic brake does not require PLC control since the brake is released in synchronization with controller program execution.



##### CAUTION

- The optional electromagnetic brake, which is an electromagnetic clutch, generates surge noise when the clutch is engaged and disengaged. The CPS controller contains electromagnetic brake control circuits with noise suppressing circuits, eliminating the need of the user to supply surge killer(s) or others.



##### CAUTION

- The optional electromagnetic brake is designed for maintaining position. Do not use the brake for braking. If an electric circuit is shut off during approach, the servo will be turned off, leaving the ram to slide freely. If installed, the electromagnetic brake can suppress the amount the ram slides to approximately half. If a sudden stop is required, the following two methods are possible:

##### (1) Delayed power shutoff

If a sudden stop is required by a command from an area sensor or a kill switch, the servo will be turned off, leaving the ram coasting when the power is suddenly shut off. The problem can be solved by delaying the power shut-off. That is; by continuing to supply power to the controller after command issuance, performing the sudden stop with the servo on, and then shutting off the power. A sudden stop can be achieved as intended by delaying the time from the issue of the command to the power shutoff by 0.2 seconds.

##### (2) Use of dynamic brake unit

A method that stops a motor by short-circuiting any two phases among the U, V, and W phases of the motor.

Using magnet switch, short-circuit between motor and controller by magnet switch signal from outside. The circuit shall be prepared by end user.

#### [5] Regeneration

If an attempt is made to stop the ram against inertial force, the motor acts as a generator to produce regeneration energy. A regenerative resistor consumes this energy as heat. Generally, regeneration energy is more often produced when the reduction ratio is high, when a heavy object is attached to the ram end, and when the cycle time is short.

The PC software provides a function for monitoring the temperature of the cooling fin located near the regenerative resistor mounting position. The upper limit of the cooling fin temperature is set to 70°C. There are two methods available to prevent regeneration faults: By reducing the regeneration frequency and using a regenerative resistor with a larger capacity.

##### (1) Reducing the regeneration frequency

There are two methods available to reduce the regeneration frequency: By increasing the deceleration time and increasing the down time. Both methods lengthen the cycle time.

##### (2) Regeneration option

Regeneration anomalies can be avoided by mounting a regenerative resistor with a larger capacity instead of a standard regenerative resistor. Consideration needs to be given to temperature increase inside the control panel to counter regeneration occurring at a higher frequency due to utilizing the regeneration option. It is recommended to mount a cooling device so as to prevent the temperature inside the control panel from exceeding 50 °C.

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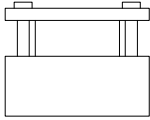
**[6] Tool type identification**

The CS Type tools contain tool-specific information written in advance, including tool type names and load cell calibration values. Since the information can be read through the controller, there is no need to set any tool-specific information on the controller. This eliminates the need to consider the combination of tools and controllers even with a multiple spindle configuration.

**[7] Other**

**(1) Servo press tool option**

The servo press tool option is shown below.

<p>Electromagnetic brake</p> 	<p><b>Electromagnetic brake</b></p> <p>Effective in preventing the ram from sliding when the servo is off.</p>
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## Chapter 6 Maintenance

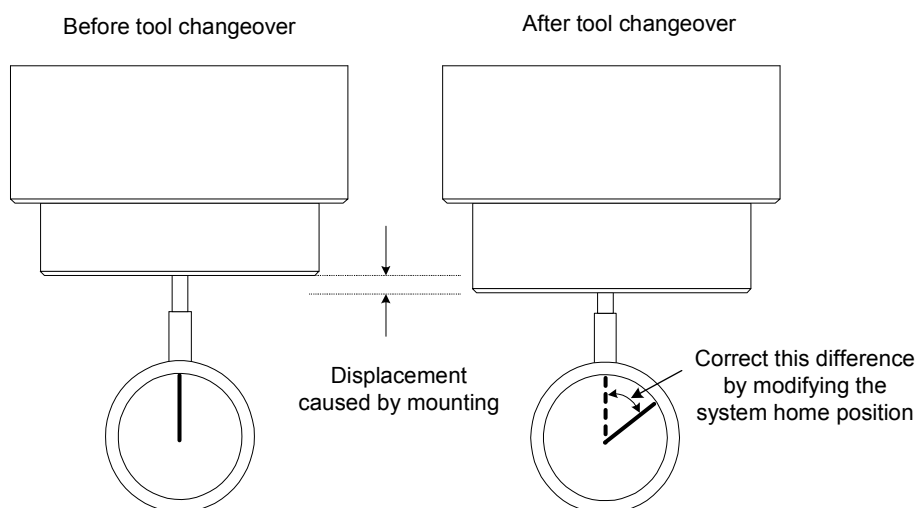
### [1] Tool changeover

The ram end position will change when a tool changeover is performed. This is due to equipment differences between tools and mounting error. For this reason, the press-fit position can also vary if the previous program is used without modification. This error caused by tool changeover is corrected by using the system home position.

Consequently, if the existing tool is replaced with a new one, these values must be checked and modified as required. The checking procedures are described below.

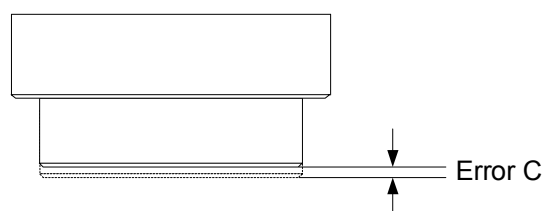
#### (1) Checking the ram end position

The equipment difference of the ram position of the servo press is  $\pm 0.5$  mm maximum, and this difference plus the error caused by mounting on devices corresponds to the ram position error. Return the existing tool to the origin position before tool changeover, and set dial gauges against the ram end and mounting jig when origin return is completed. The positions are used as a reference. Be careful not to vary the gauge positions during tool changeover. Check the difference of the gauge values between before and after the tool changeover.



#### (2) What is “relative home position” (system home position)?

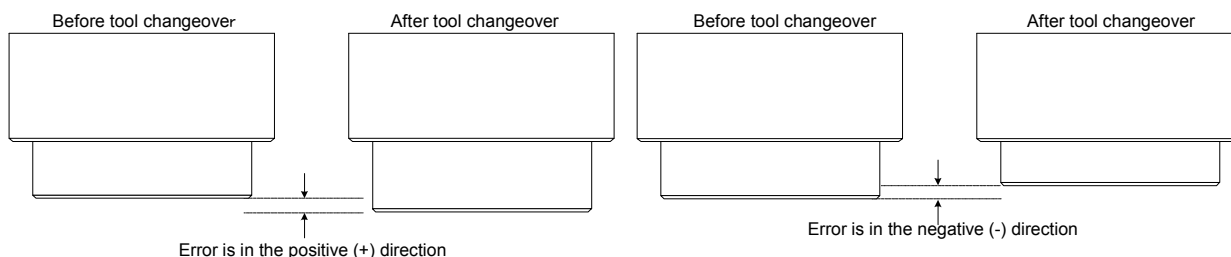
The system home position is used to correct the ram position error described above. The system home position is an origin that can be set for respective tools, and can be different from the mechanical home position. The system home position is effective for correcting a ram position error caused during tool changeover. This method eliminates the need for modifying already created programs.



### (3) How to modify the system home position

Specify the settings using the “Setup/Home Position/System Home” window of the PC software. Make modifications only for the amount of the error.

- If the error is in the positive (+) direction:  
Set the current set value minus the error value.
- If the error is in the negative (-) direction:  
Set the current set value plus the error value.

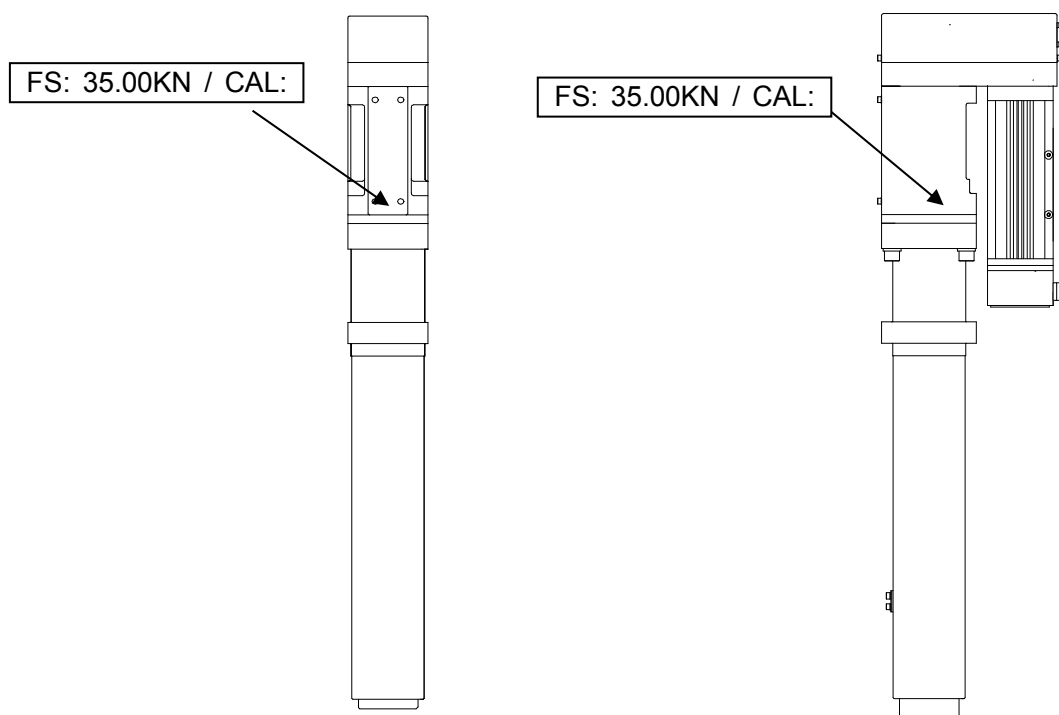


### (4) Checking load cell characteristic values

#### What are the load cell characteristic values?

There are two types of load cell characteristic values: “load cell full-scale” and “CAL voltage.” The former is a calibration parameter used to calibrate the displayed load against the load displayed by calibration equipment, and the latter refers to the calibration voltage for the load cell.

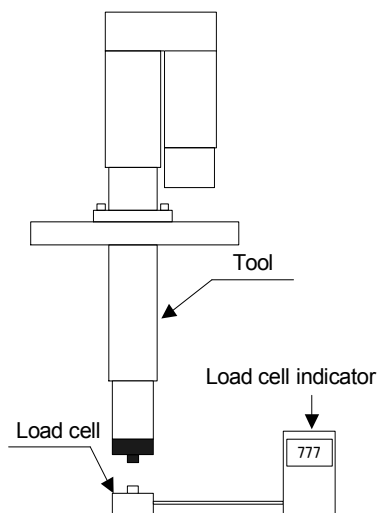
These servo press values vary by tool. In the CS Type tools, these values are stored by the tools themselves. Therefore, when a tool is changed, this information is automatically updated, and does not need to be manually entered as long as electrical settings are normally arranged. In the SP Type tools, nonetheless, always change and check the values for the tools and controller as part of the tool changeover procedures. If these characteristic values are not recognized correctly by the controller, the indicated values will vary from the actual load values. The load cell full-scale value and the CAL voltage are marked on either of the parts shown below.



## [2] Load check

The check of the load is conducted using a simple push jig mounted on the ram end. The effects of the ram guide or a complex mounting jig can interfere with accurate load measurements depending on customer use conditions. To check load values, perform according to the following procedure with the servo press mounted on equipment.

Place the load cell with the push jig assembled on the tool, as shown below.  
(The check can be facilitated by setting the display mode of the load cell indicator to "Peak Hold".)



### CAUTION

- If this "load cell full scale" is extremely different, the load cell is suspected to be faulty. Request CORETEC to repair the unit.

## [3] Daily inspection

Conduct periodical maintenance/inspection approximately once a month to maintain the servo press system in optimal operating condition. Take appropriate safety when performing maintenance/inspection measures including turning off the primary power and emergency stop.

- Any abnormal noises coming from the tool?
- The tool producing abnormal heat (80 °C or higher)?
- Any of the tool securing screws loose?
- Any of the connector connections or locking screws loose?
- Any defective timing belt? (After taking 4 bolts off and taking cover out)



### WARNING

While maintenance work, pay attention to safety measures such as power off, emergency stop and so on. Failure to do so can result in electrical shock or injured.



### CAUTION

Do not grease up by user because of the special grease using.

#### [4] Maintenance service

In general, tool maintenance should be conducted every 2 million cycles (returning motion) or every two years of operation, whichever comes earlier.

The controller manages cumulative information regarding operation cycles and ball screw travel distance. This information can be monitored using the maintenance information function of the PC software. An appropriate cycle of maintenance can be roughly determined using this information and the program load conditions. For more information, contact CORETEC personnel responsible for maintenance.

Overhauling of tools and controllers must be conducted at CORETEC. Unauthorized overhaul is not covered by the warranty.

Please contact CORETEC at the address listed below if you have any questions or comments regarding on the servo press:



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#### Revision History

Index	Ver.No.	Details	Date
1	1.01	Revised Chapter <b>4.1 Customer Design / Mounting precautions</b> , and <b>6.1.1 Checking the ram end position</b> .	09. 1.27
2	1.02	Revised Chapter <b>3.4.1 Tool dimensions</b>	09. 8.20
3	1.04	Changed brake holding loads	14. 7.22
4	1.05	Deleted the drawings of recommended tool mounting hole of Chapter <b>3.4.2</b>	16.11.21