Dyadic
MECHATRONICS CYLINDER

Mechatronics Cylinder
SCN Series
SCL Series
Operation Manual

MIRAI INTER-TECHNOLOGIES

《For Safety》

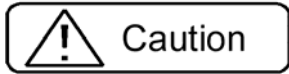 Dangerous

 Caution
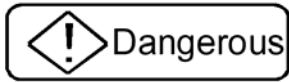
If this product is to be used in any application which has a potentially serious effect on human life and health by the failure and/or accidental movement of this product, such as machines relating to Nuclear Power, Aerospace, Transportation, Medical and safety systems, etc., please consult us.

In case of incorrect handling, some level of damage to the product may occur. This damage may lead to poor product performance.

 Caution
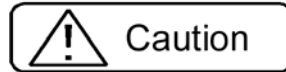
[General]

- Please do not use this product in explosive environments.
- Please do not move, work on wiring, or conduct any maintenance while the Power is ON. Wait several minutes after the Power is OFF to conduct any of the above tasks.
- Please have experts to do the job of transportation, installation, wiring, operation and maintenance, etc.
- Please use this product within the specifications.
- Please do not use damaged product.
- Any modification or reconstruction of the product by the customers voids warranty and transfers responsibility for all results to the customer.

[Mounting, Start Up]

- Please make sure that there is no Flammable material and/or product in the vicinity of the Mechatronics Cylinder.
- Please make sure that there is no obstruction to ventilation for cooling.
  Ensure appropriate assemblies guide any loading on the Mechatronics Cylinder. In case of direct coupling to the mechanism, please pay attention to the accuracy to minimize radial loading.
- Check that the direction of the movement is correct before mounting of our product.
- The Mechatronics Cylinder doesn't have mechanical protection for over load. Please provide mechanical over load protection.

[Wiring]

- Please make sure that the wiring is correct and completed with strong connections.
- Please do not bend, pull or pinch cables.
- Please make sure that the ground wires and terminals are grounded.

[Running]

- The Mechatronics Cylinder may run at high temperatures. Please do not touch with bare skin.
- The Mechatronics Cylinder has its own control built in. Please do not use other control.
- Please do not use our product without additional protection in the presence of water splashes, corrosive gas or material, or flammable material.

[Maintenance/Inspection]

- Please do not measure open circuit resistance.

[Storage]

- Please store the Mechatronics Cylinder in a cool, dry environment free of corrosive gas and liquids.

[Transportation/Receiving]

- Please pay extra caution for any damage during the transportation.
- Please check if the delivered product is the right one.

Table of Contents

1. Summary

The Mechatronics Cylinder consists of a rotary-linear motion transfer mechanism, a stepper motor, an encoder, and a servo controller. Manufactured by Dyadic Systems, this product can be a replacement for pneumatic cylinders. Motion is programmed and controlled using Dyadic's simple interfaces, allowing for a wide variety of inputs and inter-operability.

1.1. Features

1.1.1 Overcoming weaknesses of Pneumatic Cylinders

(1)   Simplifying wiring and related equipment.

MODEL		SCLT4-015 -XXX AS	SCLT4-030 -XXX AS	SCLT6-025 -XXX AB	SCLT6-050 -XXX AB
Amplifier		Built-in to actuator		External	
Stroke (mm)		50 / 100 / 150 / 200 / 300 / 400 / 500		50 / 100 / 150 / 200 / 300 / 400 / 500 / 600 / 700	
Max. Thrust (N) / (kgf)		150 / 15	300 / 30	250 / 25	500 / 50
Max. carriable vel&bw. ON (kg)		1.5	2.5	4	6
Push mode max Thrust (N)(kgf)		195 / 19.5	510 / 51	175 / 17.5	160 / 16
Ballscrew lead (mm)		12	6	12	6
Max. Speed (mm/s) * note 1		700 (680mm/s for 500mm stroke)	400 (340mm/s for 500mm stroke)	600 (500mm/s for 700mm stroke)	350 (600mm - 340mm/s) (700mm - 250mm/s)
Repeatability (mm)		± 0.02		± 0.2	
Backlash (mm)		0.1		0.1	
Max. Horizontal weight (kg)		5	10	16	30
Max. vertical load (kg)		1.5	2.5		
Load moment (Nm / kgf-cm) *2		Mp=12 / 120, My=12 / 120, Mr=31 / 310		Mp=25.7 / 257, My=25.7 / 257, Mr=58 / 580	
Program Capacity		16 Positions			
Power Supply		DC24V			
Life		3 years after delivery, or 10,000 km operation when used within all specs			
I/O	Parallel Input	Names	DC24V type Digital Input Interface Position select bits (4 bit binary coded decimal: PC1,PC2,PC4,PC8) Start (CSTR), Movement interlock (ILK)			
		Input current	Max. 4mA /port PNP Standard		Max. 4mA /port PNP Standard	
	Parallel Output	Names	DC24V type Digital Output Interface Completed Position Number (4bit binary: PM1,PM2,PM4,PM8) : (SCLT6 Only) Homed signal (ZFIN), Zone signal(ZONE), Alarm (ALM), Position complete (PFIN/INP)			
		Output current	Max. 10mA /port PNP Standard		Max. 10mA /port PNP Standard	
	Serial Signal		Serial Interface (Connector SIO) +5V, 0V, S+, S-, ASCII Protocol Freely Available			
Protection function		Overspeed, Main power over voltage, abnormal voltage, Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected			
Ambience	Operate Temperature		0 - 40 ℃			
	Storage Temperature		-20 - 60 ℃			
	Ope./Storage Humidity		=< 90% R.H. non-condensing			
Weight (kgs)		1.42/1.53/1.64/1.74/1.96/2.18/2.4		2.7 / 2.9 / 3.1 / 3.3 / 3.7 / 4.1 / 4.5 / 5.0 / 5.4	

Notes: (*1) Typical data.   (*2) This is a load that the wt(m.kg) is generated by the overhang (L.m) from the arrior slider.

Pitching :Mp   Yawing :My   Rolling :Mr

(The calculation of the load moment (kgf-cm) is: m (kg) x L (cm) = Mp, My, Mr)
The actual moment will be combinations of those moments (Mp, Py, Mr).

(2) Multiple positioning: Easy program for up to 16 motions per axis

(3) Programmable Push Force

(4) Programmable Positioning Speed: Very Slow Speed is possible, which is very difficult with Air Cylinder.

*(5) Incremental Movement: Starting from the current position. Multiple incremental moves can be used together to simulate a "Step & Direction" type of control.*
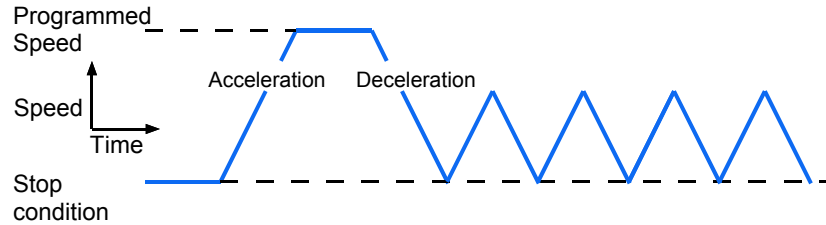

(6) Programmable Acceleration and Deceleration: Same Acceleration and Deceleration can be programmed. Optimum Acceleration and desired Deceleration can be set respectively.
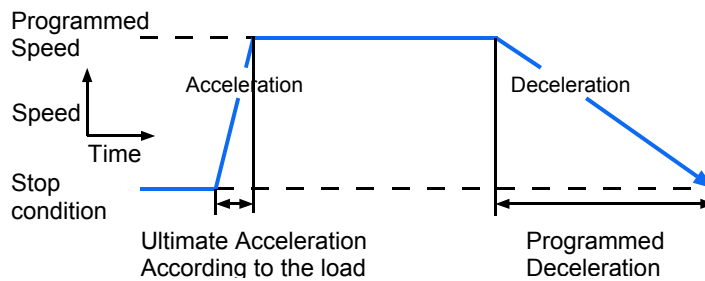
(7) Programmable Flexible Speed Profiles: Speed can be changed without stopping.
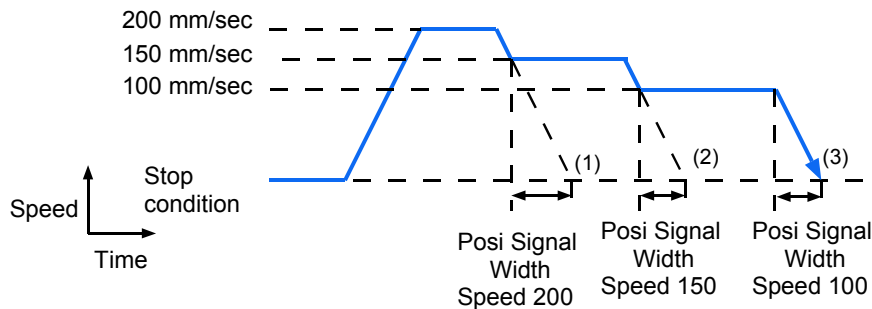
(8) Emergency Stop: During the movement of Mechatronics Cylinder, the movement will stop if the Interlock signal is interrupted.
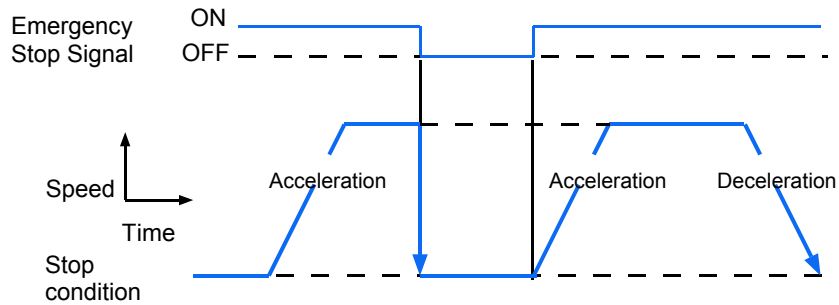
(9) Programmable Zone Signal Output: Mechatronics Cylinders can be programmed to output a Zone Signal.
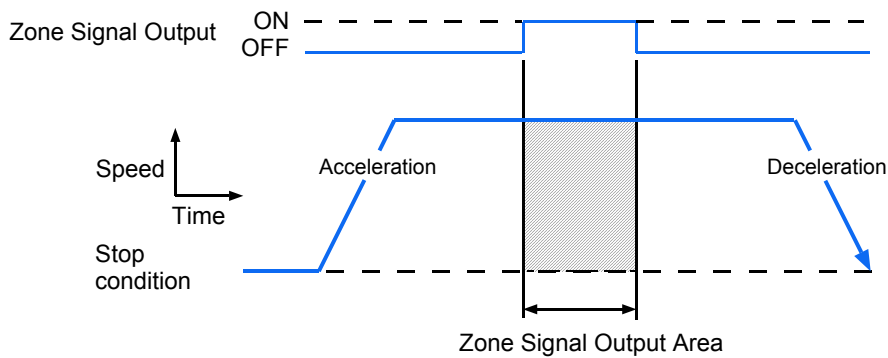
(10) An air compressor is not needed so that systems using Mechatronics Cylinders will have high energy efficiency.

(11) Oil waste is not generated so that oil collection equipment is not needed.

(12) Dampers (Shock absorbers) are not needed.

1.1.2. This section is to introduce some product features and notes in detail:

(1) SCN-5 All-In-One Actuator: The Mechatronics Cylinder model SCN5 is a fully integrated actuator including linear actuation mechanism, motor, servo drive and controller. Therefore after connecting the power supply and some signal wiring, the SCN5 is ready for operation.
Other models (SCN6, SCLL, some SCLT models) have external controllers but the programming software and ease of use are the same and the controllers are included in the part number.

(2) All actuators can be set such that the home position is at either end. The default home position is the return (motor) end. The PC tool software allows the user to change homing parameters such as speed and target thrust. The coordinate system is negative for the return home position and positive for the forward home position.

(3) There is a close correlation between thrust and speed. If the necessary thrust is large, the max speed is reduced. Please consult with the speed-thrust curve.

(4) Thrust capacity is the same for forward motion and return motion.

(5) The "Push Force" mode uses a high-speed, position-controlled approach move, followed by a lower speed force controlled move. The speed of the force-controlled part of the move can be changed on some Dyadic actuators. However, the max speed of the force controlled move will be limited by the amount of current allowed for the target force (ie the actuator will not achieve full speed in this mode if the target force is low). Also please keep in mind that high-speed impact to a hard target may shorten the life of the actuator.

(6) In vertical use, the max load at power-up is lower. This value is published in the specs for each actuator.

(7) There are 3 types of power saving functions (PC tool software is necessary to access these modes):
-1   Current setting at homing
-2   Current setting during positioning motion
-3   Current shut off after positioning

(8) Mechatronics Cylinder amplifiers have PNP models and NPN models. Please wire carefully following the correct schematics.

(9) Mechatronics Cylinder outputs are open collector type. In case of driving a load like a coil, please provide a surge absorber diode.

(10) The shafts of rod-type actuators are not designed for radial loading. Please provide external guides and ensure proper alignment as poor alignment will transfer radial stress to the shaft nut and reduce actuator life.

(11) Linear guides should be aligned within 0.1mm over the length of travel. Rough installation will reduce the product life.

(12) The short cables protruding from the actuator motor are not flex-rated. If the application requires cable motion, please use high flex cables (marked with "R" after the cable part number).

(13) Tightening torque for shaft-tip nuts is as follows: 30 kg-cm for SCN5, 45 kg-cm for SCN6

(14) Clean room actuators may be available depending on the requirement.

(15) Stroke limits for both directions can be set.

(16) The shaft tip screw is: M10, 1.25mm pitch for SCN5, M14, 1.5mm pitch for SCN6 models

(17) The front mounting block has a pilot diameter to make centering easily. (for SCN5 and SCN6)

(18) Shafts are anti-rotational. Please do not turn the shaft. (for SCN5 and SCN6)

(19) Multiple axis operation through serial communication is possible. DeviceNET, ccLink, and ASCII interfaces can be used.
The operational PLC are; Mitsubishi, Keyence, OMRON as follows:
Mitsubishi PLC - MELSEC-A series (PC link unit)
      AJ71UC24, A1SJ71US24-R2/R4/PRF, A1SJ71C24-R2/R4/PRF, A1SCPUC24-R2, A2CCPUC24(PRF)
Mitsubishi PLC - MELSEC-F series (Communication board)
      FX2N-232-BD, FX1N-232-BD, FX2NC-232-ADP
Notes: Sample programs can be provided in the project file of Mitsubishi GX Developer Version 7, therefore the customer must have the program GX Developer Version 7 or newer.
Keyence PLC – KV-700 (Communication unit) KV-L20 attached
OMRON PLC – CS/CJ series (CPU unit)
      CS1H-CPU*H, CS1G-CPU4*H, CS1H-CPU6*-V1, CS1G-CPU4*-V1, CJ1H-CPU6*H,

Internal RS232 communication port for CJ1G-CPU4*H, CJ1M-CPU2*, CJ1M-CPU1*

Notes: The DLL file is available for PC-based applications.

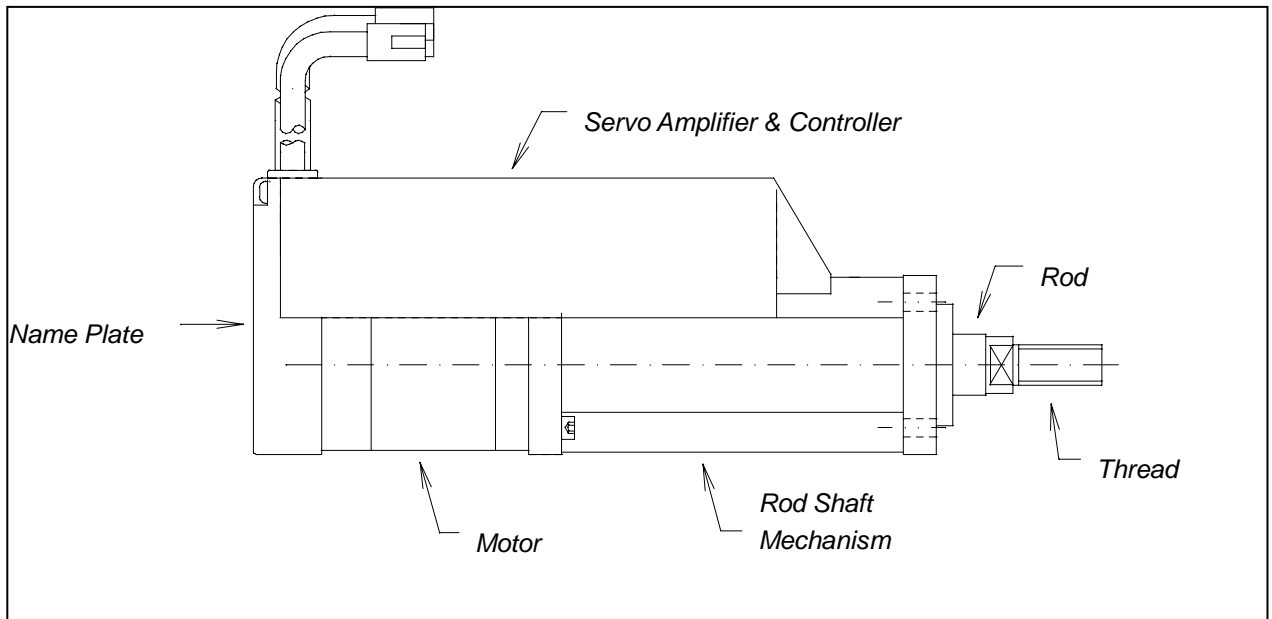(20) Dyadic programming tools can configure many advanced parameters as follows:

Available function	PC software	Teach pendant
Stopping position, Max. speed, Acceleration, Push force	O	O
Maximum acceleration (with user-defined decel.)	O	O
Incremental motion	O	O
Position complete (PFIN) window width	O	O
Servo gain	O	O
Home position direction change	O	O
Stroke limit	O	O
Zone output range	O	O
ILK signal operation (motion can be paused or cancelled)	O	O
Homing motion speed and thrust	O	X
Selection of position completion signal or in-position signal	O	X
Choose operating mode (Normal, Air 1, Air 2)	O	X

(21) 24VDC I/O can be configured for different operation in "Normal", "Air replaceable 1", or "Air Replaceable 2" modes using the TBVST software. In normal mode the cylinder uses the PC1, 2, 4, and 8 inputs in BCD combination to run 16 different motions and needs a CSTR pulse to initiate each move. In the "Air Replaceable" modes the cylinder can run up to 3 motions as commanded by the PC1, PC2, or PC4 inputs. The different modes control whether the inputs must be maintained during motion, or can be pulsed. Please see the TBVST manual for more information on the "Air Replaceable" modes.

1.2 Names of Parts

1.2.1 Names

SCN5 Model (10Kgf Type)

SCN6 Model (20Kgf & 50Kgf Type)

Power
Parallel
Connector

Serial
Connector

Face of name
plate

Motor/Encoder
Connector

Servo
amplifier
/Controller

Motor/Encoder
Connector

Shaft thread   Main body   Motor

SCLL6 Model (Slider 20Kgf Type)

AVAILABLE STROKE LENGTH

Motor/Encoder
Cable

Cover

Slider Mechanical portion

4−M6 THRU

2−ø5 REAM

Face of
name
plate

Motor

300mm

Motor/Encoder
Connector

Face of name
plate

Servo
amplifier
/Controller

300mm

Power
Parallel
Connector

Serial
Connector

1.2.2 Name Plate

The name plate is located at the back of the Mech. Cylinder. (Please refer to 1.2.1)

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┌─────────────────────────────────────┐
│ ⓢⓒ  Intelligent Cylinder           │  ──→  Model Name & Code
│ ┌MODEL┐ ┌─────────────────────┐     │
│ └─────┘ └─────────────────────┘     │
│ ┌S/N┐ ┌───────────────────────┐    │  ──   Serial Number
│ └───┘ └───────────────────────┘    │
│ ◇ Dyadic Systems Co.,Ltd  MADE IN JAPAN │
└─────────────────────────────────────┘
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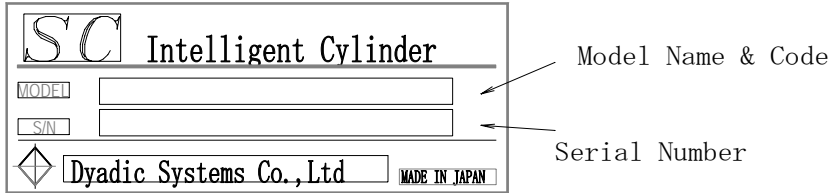
2. Safety Notes

(1) Please use the following voltages and power supplies of sufficient capacity:

Models	Power type	Power
SCN5- Built-in Amp, SCLL5- Built-in Amp, SCLG5- Built-in Amp, SCLT4- Built-in Amp		DC24V+/-10% (Max. 2A)
SCN6, SCLL6, SCLT6	Motor	DC24V+/-10% (Max. 3A)
	Control	DC24V+/-10% (Max. 0.2A)
SCLL5- External Amp, SCLG5- External Amp, SCLT4- External Amp	Motor	DC24V+/-10% (Max. 2A)
	Control	DC24V+/-10% (Max. 0.2A)

Using N axes, 2 x N (amps) power supply capacity is not necessary if the timing of axis movements varies slightly.

(2) Incorrect wiring may damage the equipment.
(3) Please do not change wiring when the power is on. Please remove and/or plug in parallel connectors (PIO) when the power is turned off.
(4) Please install the unit in a good place for sensitive electrical equipment. (Good thermal radiation, low vibration, low shock)
(5) Please make sure to provide protection from electrical noise. If the unit receives noise, the cylinder may vibrate and/or make inaccurate movement.
(6) Please do not test the unit for voltage durability or electro-magnetic susceptibility.
(7) Please hold the connector when disconnecting the cables.
(8) Please note that the coordinate system for the forward homing mode is negative and the reverse homing mode is positive. This also applies to the push force mode. This is especially important to keep in mind for Teach Pendant operation.
(9) The short cables protruding from the motor are not high flex cables.

Notes for SCLL6 Model

(10) Ensure the system is designed within the specifications of max moment load on the slider table.
(11) The acme screw in the SCLL6 is exposed to the ambient environment. Therefore it requires an application of grease approximately every 6 months. The recommended grease is Lithium type No.2. Remove the top cover by removing the 4 cover screws, and apply grease on the slider screw. Move the carriage back and forth several times to distribute the grease. Please do not apply grease to the guide bushings of the carriage.

3. Start Up

3.1. Preparation

3.1.1. Check if there is any damage
Please check the appearance of the product to ensure no damage occurred during transportation.

3.1.2 Check if the product is correct
Please verify that the product is the same as ordered.

3.1.3 Power Supply
Please provide a power source. (Regulated DC24V)

3.1.4. Tools
Tools will be required to work on wiring and connecting. (Wire Stripper, Wire connectors, etc.)

3.1.5. Programming Tool
An individual Mechatronics Cylinder doesn't include programming tools such as the Teach Pendant or PC Tool (TBVST-EN). These items are sold separately.

3.2. Wire the Power/IO cable and run from the PC programming tool

3.2.1. Check the Power & I/O cable:

Models	Power cable
SCN5-Amp built-in:	RP9100-XXX
SCN6 and all SCL actuators:	RP9120-XXX

Connection Example (SCN5 Model)

Connect the ADP Cable for communication with the PC Programming Tool or a teach pendant

Connect the Power & I/O cable (Parallel cable)
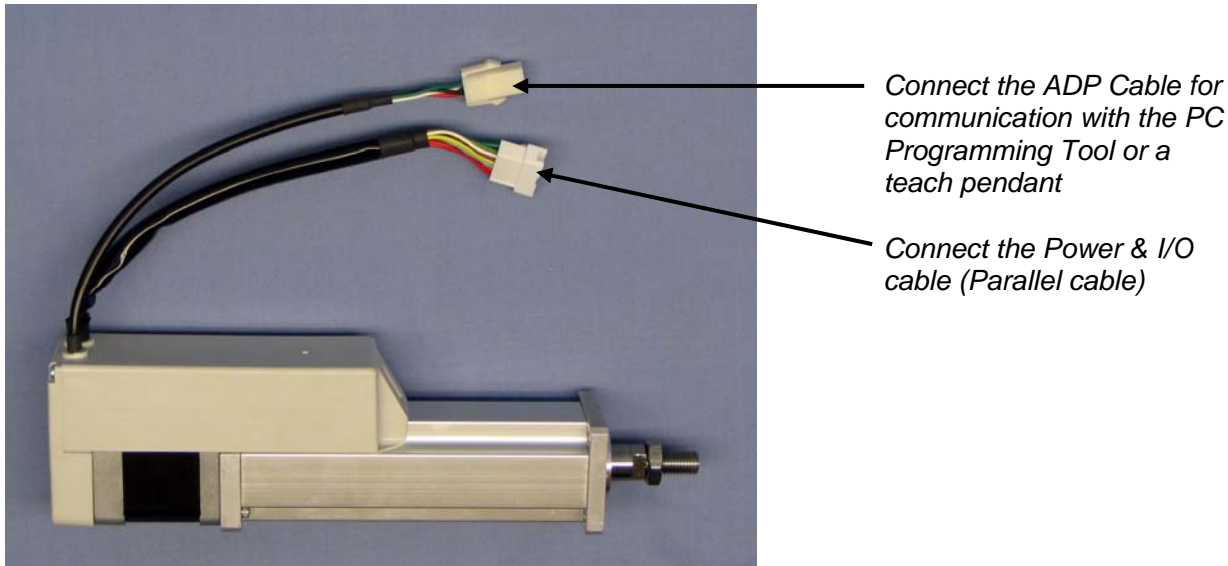
3.2.2. Check Parallel Connector Cable

The parallel cable includes the power and signal cable required to run the Mechatronics Cylinder from a PLC and/or switches.

Cable For SCN5 Actuators (RP9100-XXX)

I/O cable to connect with PLC
and/or switches
(Thicker cable)

Power connection cable
(Thinner cable)

**Connect to
Mechatronics Cylinder**

Cable For All Actuators Other Than SCN5
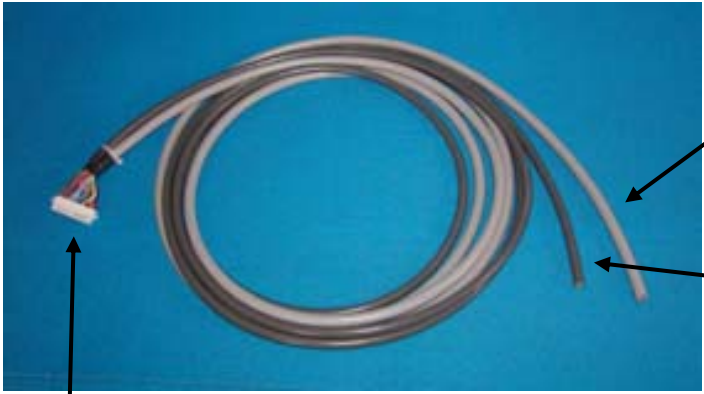
Signal cable to connect with
PLC and/or switches
(Thicker cable)

Power connection cable
(Thinner cable)

Connect to the power & I/O connection of the actuator or controller

3.2.3. Parallel Cable Preparation

Please use tips for stranded wire on the ends of all connections.

SCN5 Models (10Kgf Type)

To run from PC Tool Kit (sold separately) only, please connect the power wires (Red: +24V, Black: 0V) and ILK (Brown: +24V) at this time (see below)

Red: +24V

Black: 0V

Green: FG
  (Connect to ground)

White: FG
  (Connect to ground)

Orange: ZONE (ZONE signal)
Light Green: (ALM signal output)
Red: PC4
Green: PC8
Yellow: CSTR
White: PC2
Black: PC1
Brown: ILK (Emergency Stop) signal
  Connect with +24V

Blue: PFIN (Position Finished)
Gray: ZFIN (Homed)

Red: +24V, Motor Power
Black: 0V, Motor Power
Yellow: +24V, Controller Power
White: 0V, Controller Power
Brown: NC, please do not connect
Green: FG (ground)

Black: PC1
White: PC2
Red: PC4
Green: PC8
Yellow: CSTR
Brown: NC (No connection)
Blue: NC (No connection)
Purple: ILK, (E-Stop) +24VDC
Grey: PM1 *
Pink: PM2 *
Light green: PM4 *
Orange: PM8 *

Light blue: PFIN
Dark brown: ZFIN
White&Black: Zone
Red&Black: ALM

* SCL actuators with amp built-in do not use the PM1, PM2, PM4 and PM8 outputs.

3.2.4. Connect Parallel cable and ADP Cable with Mechatronics Cylinder

SCN5 Models (10Kgf Type)

The ADP Cable is supplied with your Programming Tool (PC Tool Software, Teach Pendant Tool). Please connect the ADP cable with the Mechatronics Cylinder after the 24VDC power is supplied.

Connect ADP Cable
(Included with Programming Tool)
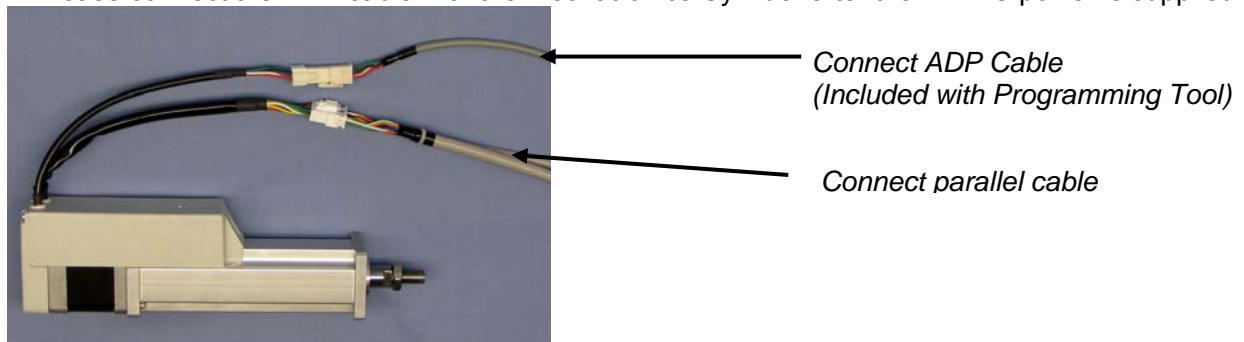
Connect parallel cable

*Connect ADP Cable
(Included with Programming Tool)*

Connect parallel cable

3.2.5. Teach Pendant Programming – Quick Start and Simple Cycling

(1) Please connect the the ADP cable with the Teach Pendant as per figure below.

Connect ADP cable to actuator serial connector

(2) Apply 24VDC power to the actuator.

(3) Approx. 4 to 5 seconds after the power is turned ON, the Servo ON LED will be turned ON and the LCD Display of the Teach Pendant will show "Make Homing" with Teach Position [0] flashing. **Please press and hold the HOMING button until the "HOMED" LED illuminates.**
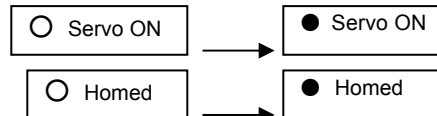
(4) When the axis has been homed, if the jog wheel on the Teach Pendant is turned to clockwise, the rod of Mechatronics Cylinder will extend. if the jog wheel is turned counterclockwise, the Mechatronics Cylinder will retract.

(5) Please press the "POSITION SELECT" button while pressing the "NORMAL POSITIONING" button. This will download the demo data from the teach pendant to Mechatronics Cylinder.

(6) Please press the "POSITION SELECT" button once - the position number will show [1].

(7) Please hold the "NORMAL POSITIONING" button and press the "HOMING" button. This will cause position 0 and position 1 to cycle repeatedly with a small delay between. The motions will cycle from 0 to whatever number is displayed when the demo mode is initiated.

(8) Please press the "NORMAL POSITIONING" button to stop the motion.

(9) Please use the operation manual of Teaching Pendant for more details, or see the next section to try programming some simple positions.
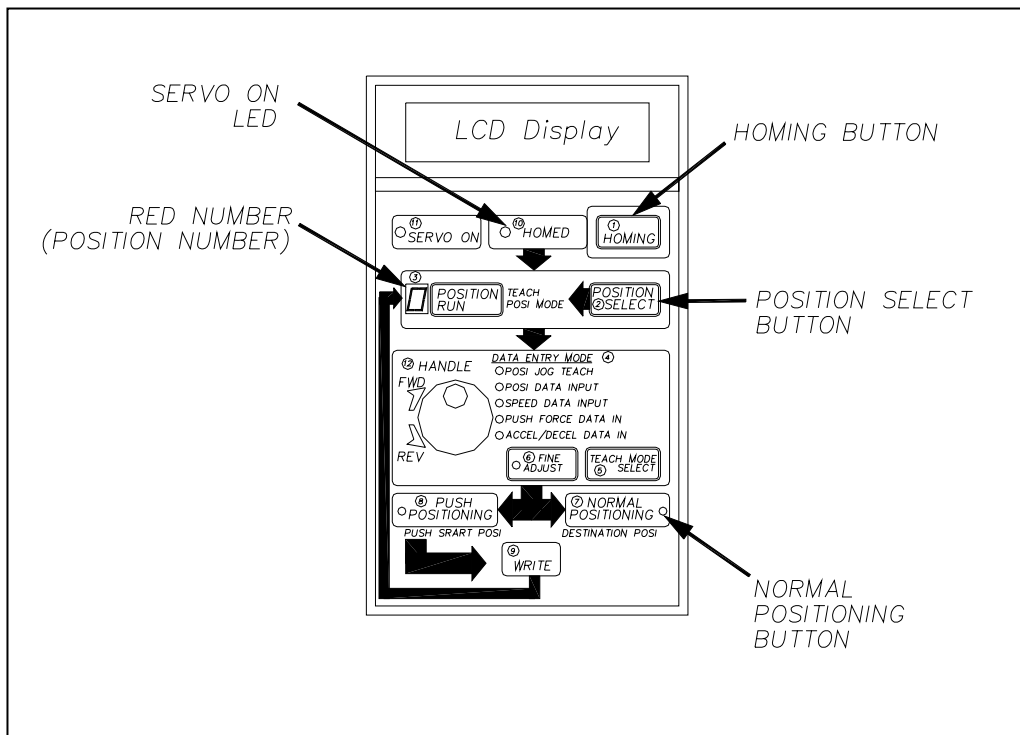
3.2.6. Quick Start – Program some Position-Controlled Motions With the Teach Pendant

	Stop position	Speed	Note
Position 0	- 5 mm	50 mm/sec	Please enter the data close to the
Position 1	- 45 mm	10 mm/sec	value. Exact value is not needed.
Position 2	- 25 mm	25 mm/sec	

Note: The default position coordinate is negative. If the home position was changed to the forward side, the position coordinate is positive.
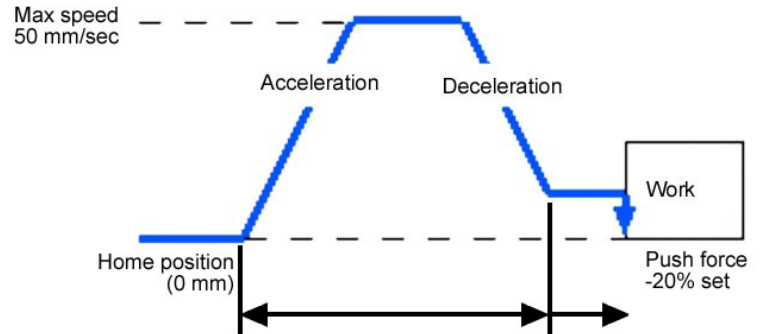
(1) Connect the ADP cable to the Teach Pendant and the serial connector on the servo controller.
(2) Wire the power cable as follows:
RP9100 power cable:
Red (Drive) with +24VDC, Black (Drive) with 0V, Brown (ILK) with +24VDC

RP9120 power cable:
Red (Drive) with +24VDC, Black (Drive) with 0V, Yellow (Control) with +24VDC, White (Control) with 0V, Purpule (ILK) with +24VDC
(3) Please turn the power ON.
(4) 4-5 seconds after the power is turned ON, the Servo ON LED of the Teach Pendant will be ON and the LCD will be display "Make Homing". Please press and hold the "homing" button until the display shows the "Homed" message.
(5) Please turn the jog wheel clockwise, so that the Mechatronics Cylinder shaft will extend.
(6) Program Position number 0
Confirm that Position 0 is displayed and the "Pos. Jog/Teach" indicator is lit. Please turn the wheel to make the LCD display [-5mm] then press "WRITE".
Please press the "DATA ENTRY MODE" button twice to cycle to the "SPEED DATA INPUT" parameter, then turn the wheel to set the speed to 50mm/sec. Please press "WRITE" to save the change.
Now position 0 has a position target of -5mm and a speed target of 50mm/sec.
(7) Program Position number 1
Please press the "POSITION SELECT" button once so that position 1 is displayed in the red seven-segment display. Now position 1 is available to change. Check that the "Pos. Jog/Teach" indicator is lit, and turn the wheel to make the LCD display [-45mm], then press the "WRITE" button.
Please press the "DATA ENTRY MODE" button twice to cycle to the "SPEED DATA INPUT" parameter, then turn the wheel to set the speed to 10mm/sec. Please press "WRITE" to save the change.
Now position 1 has a position target of -45mm and a speed target of 10mm/sec.
(8) Program Position number 2
Please press the "POSITION SELECT" button once so that position 1 is displayed in the red seven-segment display. Now position 1 is available to change. Check that the "Pos. Jog/Teach" indicator is lit, and turn the wheel to make the LCD display [-45mm], then press the "WRITE" button.
Please press the "DATA ENTRY MODE" button twice to cycle to the "SPEED DATA INPUT" parameter, then turn the wheel to set the speed to 10mm/sec. Please press "WRITE" to save the change.
Now position 2 has a position target of -25mm and a speed target of 25mm/sec.
(9) Please hold the "NORMAL POSITIONING" button and press the "HOMING" button. This will cause position 0, position 1, and position 2 to cycle repeatedly with a small delay between.
Please press the "NORMAL POSITIONING" button to stop the execution.

3.2.7. *Quick Start – Program a Force-Controlled Motion With the Teach Pendant*

Let's program the motion as per the figure on the right, such that the actuator moves 20mm at higher speed, then switches to low speed to look for a pre-set force.
Please note that the force value is negative (-) for the extend direction, positive (+) for the retract direction.

(1) Connect the ADP cable to the Teach Pendant and the serial connector on the servo controller.
(2)   Wire the power cable as follows:
   RP9100 power cable:
   Red (Drive) with +24VDC, Black (Drive) with 0V, Brown (ILK) with +24VDC

   RP9120 power cable:
   Red (Drive) with +24VDC, Black (Drive) with 0V, Yellow (Control) with +24VDC, White (Control) with 0V, Purpule (ILK) with +24VDC
(3) Please turn the power ON.
(4) 4-5 seconds after the power is turned ON, the Servo ON LED of the Teach Pendant will be ON and the LCD will be display "Make Homing". Please press and hold the "homing" button until the display shows the "Homed" message.
(5) Please turn the JOG handle clockwise and verify that the actuator shaft moves forward.
(6) The following will store push force parameters in position 4.
   Please press the "POSITION SELECT" button 4 times such that the position number display indicates [4]. Now position 4 can be programmed.
   Please press the "PUSH POSITIONING" button. Now position 4 is in push force mode.

   Check that the "POS. JOG TEACH" LED is lit, and turn the JOG handle to extend the actuator until the LCD displays position [-20mm]. Press "SAVE" button. This is the position at which the higher speed part of the move will end and the force controlled part of the move will begin. This is also referred to as the "Approach Point".

   Please press the "DATA ENTRY MODE" button twice to access the "SPEED DATA INPUT" parameter. Change the speed to 50mm/sec by turning the JOG handle, then press the SAVE button.
   Press the "DATA ENTRY MODE" button 3 times to access the "PUSH FORCE DATA IN" parameter. Set the push force to -20% by turning the JOG handle, then press the "SAVE" button.
   Now, position 4 has a force-controlled motion programmed as shown in the above figure.
(7) Turn the JOG handle counter clockwise to retract the shaft. Press and hold the "POSITION RUN" button with number 4 displayed in the seven segment display, and the actuator will operate the push force motion. If the button is released the motion will stop.

3.2.8. Quick Start – Set Up of Basic Parameters Using the PC Tool (TBVST-EN-SET)

The following sequence of operations will allow you to download a default program into your Mechatronics Cylinder Controller. This program will over-write any other program currently in the controller.

(1)   Connect the ADP cable to the CN2 jack of the Connector Junction (ADP-2-4) as per figure below. Connect the SIO cable to the CNA jack of the Connector Junction (ADP-2-4) as per figure below.

ADP Cable (RP9050)

SIO Cable (RP9041)

Connector Junction (ADP-2-4)
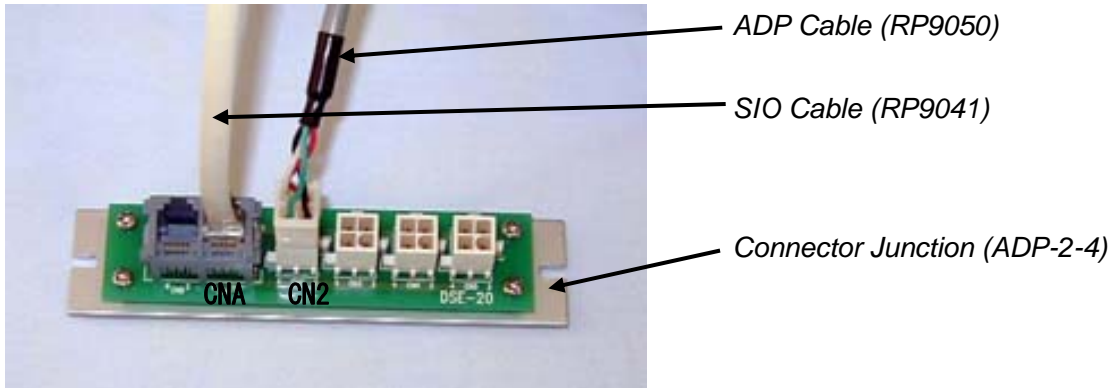
(2)   Power up the Mechatronics Cylinder, and connect the SIO cable to the RS232/485 adaptor (ADP-1) and connect it to the serial port (COM port) of your PC as per the figure below.

RS232/485 Adaptor (ADP-1)

SIO Cable (RP9041)

Connect to PC serial port (COM port)
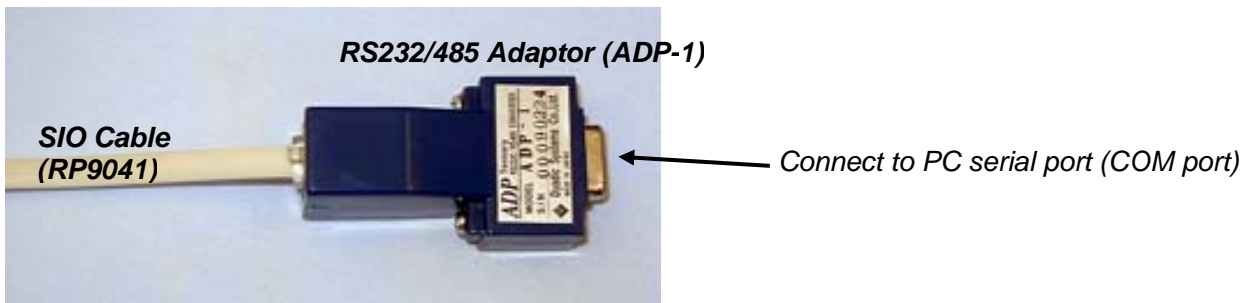
(3)   Start the PC Tool software (TBVST-EN).

(4)   The first menu is for communication setup – please select the serial port Number that the ADP-1 is plugged in to, then click $\boxed{\text{Set}}$. After few seconds, the operation menu will come up as follows.

(5)   Please click the HOMING button, so that the Mechatronics Cylinder will home itself.

Click [FILE]

[HOMING] button

If this block is dragged and moved right or left, the Cylinder will move accordingly.

(6)   Please click 【FILE】 at left top on the screen, so that following Menu will be displayed.

① Select 【Download (PC⇒Amp.)】

③ Click 【Download Start】

② File Selection
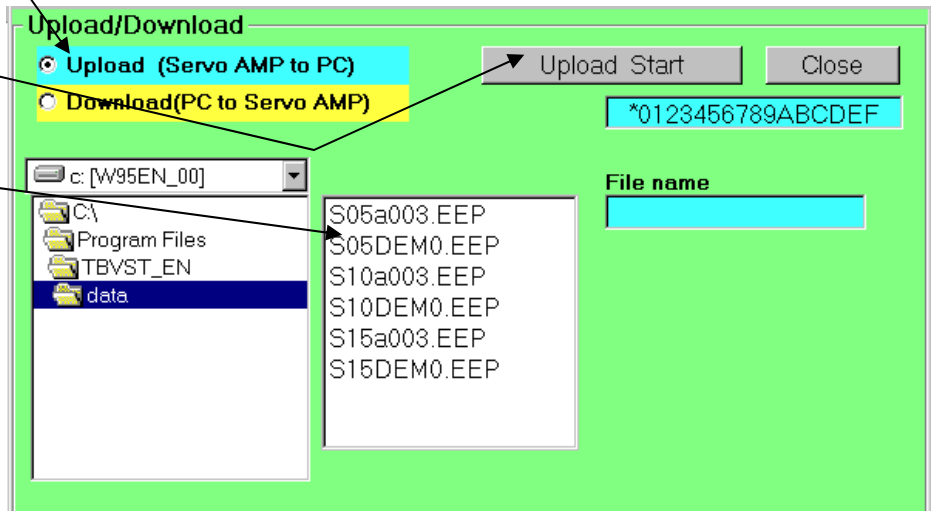
(7)   ① Please select【Download (PC→SERVO AMP)】and select the file which is suitable for the stroke of the Mechatronics Cylinder being used. Click the【Download start】button, so that the demo program will be copied to the Mechatronics Cylinder controller.

(8)   Click【Close】at the top right of the screen to return to the previous menu. Click the【Start】button to initiate the sequence entered in the text box to the left of the Start button. The Mechatronics Cylinder will repeat this sequence of moves from the downloaded demo program if there is a letter "R" at the end of the sequence.
       Please click the 【STOP】 button to stop the demo movement.

Click 【FILE】 so that the File Menu will appear on the screen

Click【START】so that the Mechatronics Cylinder will run the selected demo program.
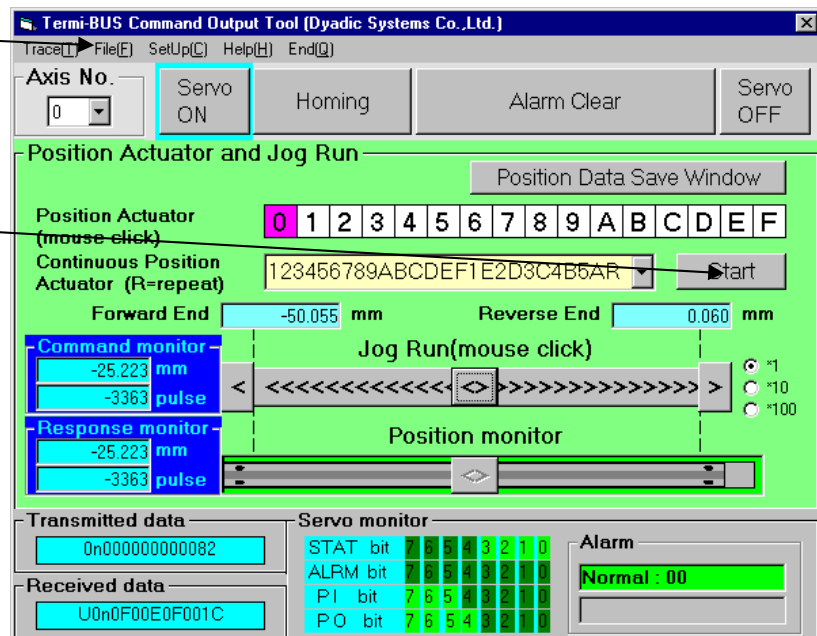
(9)   Please refer to 【HELP】 for details.

4. Installation and Test Running

4.1. Installation

If the installation and/or environment of the Mechatronics Cylinder are poor, the life of the actuator may be artificially shortened, or the Mechatronics Cylinder may malfunction. Please install the Mechatronics Cylinder with the following care:

4.1.1. The Installation Environment

The Mechatronics Cylinder is generally intended for use indoors. Please provide a place for cylinder installation that meets the following requirements:

① Free of corrosive and/or explosive gas.

② Minimal moisture and/or dust

③ Ambient temperature between 0° C ~ 40° C.

④ Ambient humidity is 90%RH or less and there is no condensation.

⑤ Accessible for maintenance.

⑥ Safe from water splashing and/or oils.

4.1.2. Recommended mounting of Mechatronics Cylinder

SCN5 Model (10Kgf Type) **SCN6 Model (20Kgf, 40kgf, 50Kgf Type and 60 kgf)**

The Mechatronics Cylinder is intended to be mounted with a flat washer, a split washer and an M5 cap screw at the 4 holes in the mounting Flange. Placing the flat washer before the Spring washer is important to avoid scratching the Mounting Flange.
The recommended screw torque is 20 kg-cm for SCN5 models, 45 kg-cm for SCN6 models.
Foot mounting brackets are available.

SCL Models
Please mount the slider on a flat surface with the M6 nuts located on the bottom face slots.

4.1.3. Use of the shaft tip screw

SCN5 Model (10Kgf Type) **SCN6 Model (20Kgf, 40kgf, 50Kgf Type and 60 kgf)**

The Mechatronics Cylinder uses a non-rotating Linear Actuation Mechanism. However it is not designed to withstand significant torque. Please use a wrench to hold the shaft flats while the nut is tightened onto the rod tip threads.
The recommended nut tightening torque is 30 kg-cm for SCN5 models, 45 kg-cm for SCN6 models.
If the rotary moment load is big and/or the backlash of the rotary direction is critical, please use an anti-rotating mechanism.

4.1.4. Load installation accuracy

SCN5 Model (10Kgf Type) **SCN6 Model (20Kgf, 40kgf, 50Kgf Type and 60 kgf)**

Please ensure your guide is parallel to the rod of the Mechatronics Cylinder to within 0.1mm along the entire length of stroke. A simple way to check this dimension is to install the actuator with loose mounting screws (at the flange), then move the shaft through its stroke. If the back of the Mechatronics Cylinder moves less than 0.1mm, it is acceptable.

Moved

External guide
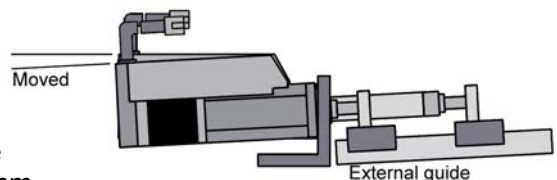
4.1.5. Servo Amplifier Mounting and Environmental Installation Limits

(1) Ambient temperature under 40°C.
(2) Minimal shock and vibration. (should be lower than 0.5G)
(3) Environment free of corrosive gas and dust.
(4) Ambient humidity under 90%RH, non condensing.
(5) Please use 2 ea of M3 screws to mount amplifiers as per the sketch below. Please leave 10mm distance or greater between amplifiers, and leave 50mm or greater space for cables:

Vertical mounting **Horizontal mounting** **Installation distance**

Motor, Encoder cables

Top

Motor, Encoder cables

Top

Lower

Power parallel cable &
Serial cable

Lower

Power parallel cable &
Serial cable

50mm *Min.*

10mm *Min.*

50mm *Min.*
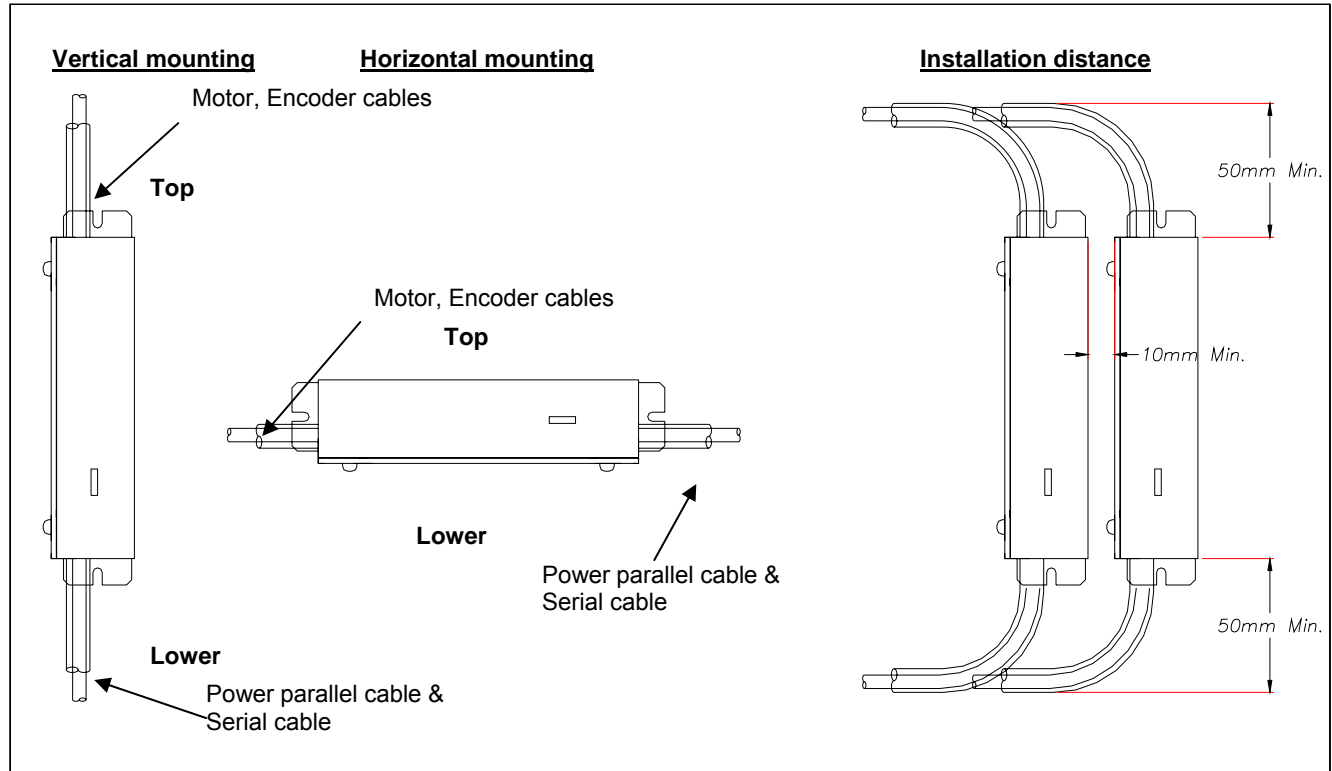
4.2. Wiring

<div style="background:blue;color:white;text-align:center;font-weight:bold">PNP Type</div>

Please wire with reference to section 3.2.3.

4.2.1. Wiring

(1) The following precautions may help to avoid problems with electrical noise:
　① The wires from the Controller to the PLC and noise filter should be as short as possible.
　② Power to coils of relays and solenoids should be managed by surge hardware.
　③ Separate the wiring from other equipment.
(2) When the Mechatronics Cylinder system is being controlled by 24V I/O:
　① Design the system to allow shut off of the 24V line to the actuator in case of "SERVO ALARM".
　② The sequences of power up and down should be as follows:

SCN5 Model (10Kgf Type)

Actuator Movement: No thrust / Beginning of Thrust

Power: 24V Power ON

Alarm output: Normal operation

Positioning complete output: Completion of operation preparation

trd
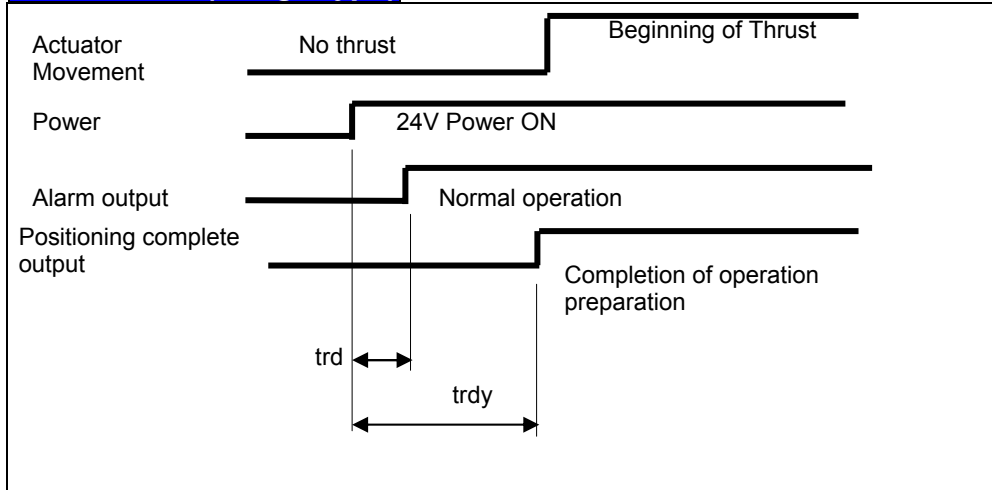
trdy

Names	Time	Application
Trd	50msec Max.	Power ON=> ALM signal start up
trdy	250msec (normal)	Power ON=> Completion of operation prep.

SCN6 Models, SCLL models, SCLT models
SCLL6 Model (Slider 20Kgf Type)

In case of Power turned ON

Actuator Movement: No thrust / Beginning of Thrust

24V control power

tpp

24V drive power

Alarm output: Normal operation

Position compl. output: Completion of operation preparation

trd

trdy

Completion of operation preparation

In case of Power turned OFF

Actuator Movement: Beginning of Thrust / No thrust

24V control power

tpp
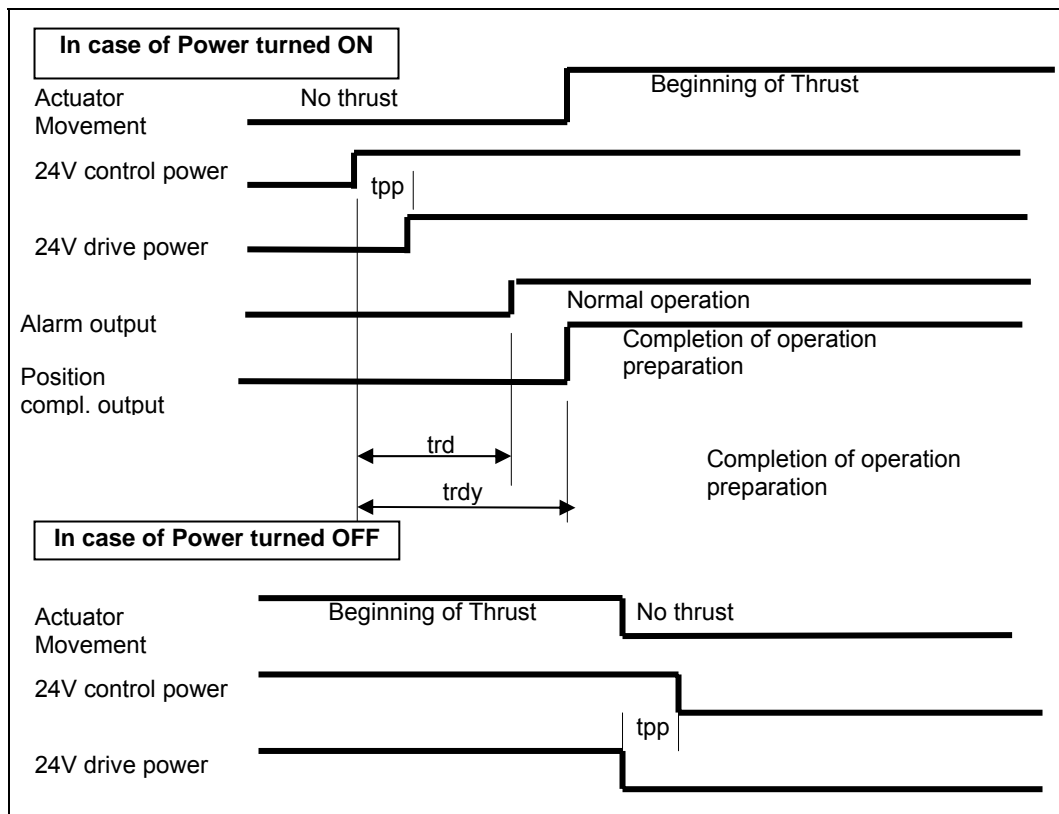
24V drive power

Names	Time	Application
Tpp	0msec Min.	Control power ON=> Drive power ON *Drive power OFF=> Control power OFF*
Trd	50msec Max.	Control power ON=> ALM signal start up
trdy	250msec (general value)	Control power ON=> Completion of operation prep.

(3) Wiring for Serial Control
   ① When planning a RS232C interface with the main control system, the ADP-1 (RS232C/RS485 converter) is necessary. Please refer to section 6.3 regarding the ADP-1.

4.3. Notes for wiring and connections

<div style="background:blue;color:white;text-align:center;font-weight:bold">PNP Type</div>

4.3.1. Power shut down

When shutting down 24VDC power to the Mechatronics Cylinder, please open both 24V and 0V lines from the power supply, or open the 24V side.
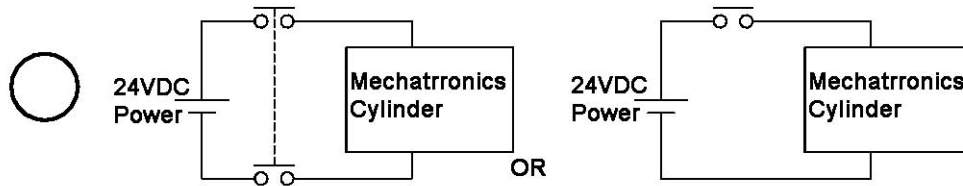
If 0V of 24 VDC power supply is shut down, the power circuit of the Mechatronics Cylinder may be damaged.
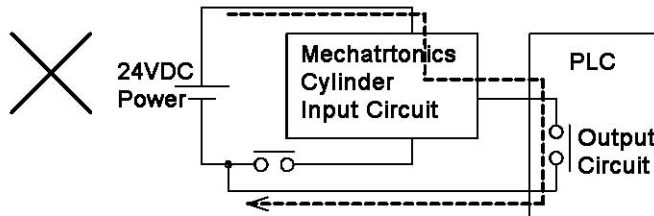
4.3.2. +24VDC Ground

Please do not connect +24VDC power to ground**.**

<div style="background:blue;color:white;text-align:center;font-weight:bold">PNP Type</div>

4.3.3. Power input circuit

Ensure all I/O of the Mechatronics Cylinder are connected to either 0VDC or 24VDC±10%. Connection to any voltage in between these values may result in damage to the input or output.

The input circuits of the Mechatronics Cylinder are designed as non-isolated dedicated source drive circuits as described below. Therefore it is necessary to connect (ON) with +24V terminal, or open (OFF) with +24V terminal by using source type output circuit.

As shown below, <u>**the input circuit will receive over current and the internal circuit will be damaged if a PNP input is driven by a sinking output circuit or connected with 0V directly**</u>.
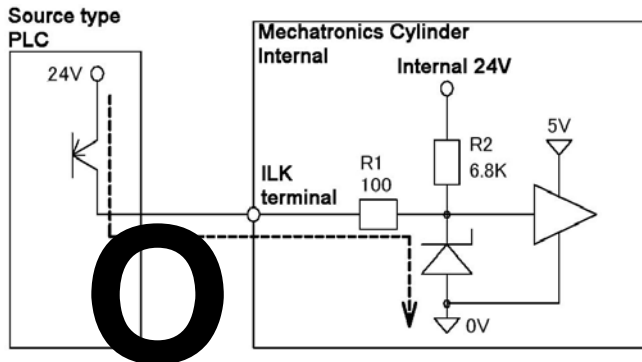
Fig. 2 Good PNP Input Circuit   **Fig. 3 Bad circuit (PNP) example**
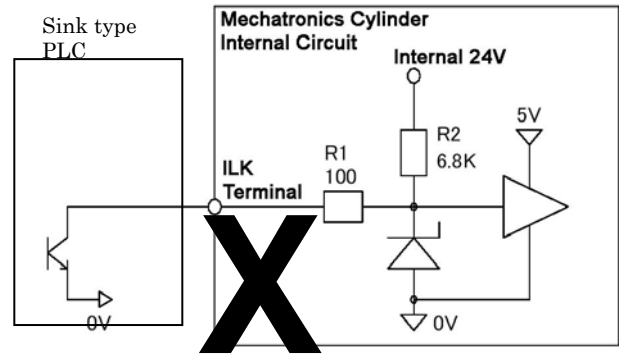
4.3.4. When Driving Coils or Other Inductive Loads

When using outputs to drive induction loads:
The output circuits of the Mechatronics Cylinder are open collector outputs as shown below. Therefore when driving an external load (such as a coil), please use an external surge diode or solid state relay. Surge voltage can damage the output circuit.
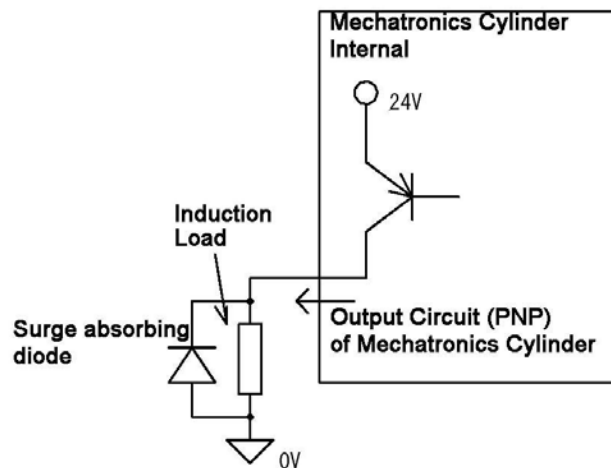
4.4. Wiring examples of outside connections

Connection of Parallel Interface (Parallel cable, I/O Control – PIO Connection)

SCN5 Model (10Kgf Type, PNP)

Power Shut Down Order

24V

Please ground at ground resistance 100ohm or smaller

Position No. Set List

PositionNo	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PC1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
PC2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
PC4	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
PC8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
CSTR																

+24V
0V
FG
PC1
PC2
PC4
PC8
CSTR
ILK
PFIN/INP
ALM
ZONE
ZFIN
TRx+
TRx-
+5V
0V

Position No.F

Position No.1
Position No.0

SCN6 PNP Model / SCLT Models.
SCLL PNP Model .

Power Disconnect Order

+24V

Connector

+24V(Drive)
0V(Drive)
+24V(Control)
0V(Control)
FG
PC1
PC2
PC4
PC8
CSTR
ILK
PM1
PM2
PM4
PM8
PFIN/INP
ALM
ZONE
ZFIN

Please ground. Level 3 ground. Ground register 100Ω or smaller

Position No. Combination Table

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PC1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
PC2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
PC4	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
PC8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
CSTR																

Position F
(Stop position to be programmed)

Position 1
Position 0

Amplifier

Connection of Serial Interface (SIO Connection)

SCN5 Model (10Kgf Type)

Power Shut Down Order

+24V
0V
FG
PC1
PC2
PC4
PC8
CSTR
ILK
PFIN/INP
ALM
ZONE
ZFIN
TRx+
TRx-
+5V
0V

24V

Please ground at ground resistance 100ohm or smaller

Connector Converter

RS-232C/RS-485 Converter

ADP Cable

To RS-232C Serial (COM) Port

SIO Cable

(Program desired stop position)

SCN6 PNP Models / SCLL PNP Models
SCLT PNP Model   (External Amp Type)

Power Disconnect Order

Connector Names

+24V(Drive)
0V(Drive)
+24V(Control)
0V(Control)
FG
PC1
PC2
PC4
PC8
CSTR
ILK
PM1
PM2
PM4
PM8
PFIN/INP
ALM
ZONE
ZFIN

+24V

Please ground. Level 3 ground. Ground register 100Ω or smaller

Connector Converter

RS232C /RS485 Converter

ADP Cable

TRx+
TRx−
+5V
5G

To RS232C Serial (COM) Port

SIO cable

Position F
Position 1
Position 0

Amplifier

(Stop position to be programmed)

(Note1)   For serial (SIO) control of one or more Mechatronics Cylinders using the RS-485 protocol, requirements are one ADP cable per cylinder, one connector converter (ADP-2 or ADP-2-4) for every 4 axes, and one SIO cable for every 4 axes. Networks of up to 16 axes can be connected. When using RS-232C to control one or more Mechatronics Cylinders the ADP-1 RS232C/RS485 protocol converter is recommended as a simple solution for connecting to your 9-pin RS232 port.

(Note 2)   It is recommended to program the system to cycle power if an alarm condition occurs. Follow guidelines shown in Section 4.3.1.

(Note 3)   It is recommended to use a solid-state relay to turn ON/Off main power to minimize electrical spikes.

(Note 4)   Power required is DC 24V+/-10%, Max 3A.

(Note 5)   Power, I/O and programming cables and converters are not included. Please purchase separately.

(Note 6)   The Mechatronics Cylinder and cables are not water resistant.

(Note 7)   The SIO cable is generally intended for use inside a panel.

4.5. Trial run

The user may wish to complete a trial run with no load connected to ensure the cylinder program is as expected. Please follow the steps below:

(1)   Power up the cylinder and controller, then complete the serial connection.
(2)   Ensure the cylinder is not connected to any load
(3)   Check the wiring to ensure all connections are tight and all connectors are securely connected. In using serial control (SIO) for a multiple cylinder network, ensure a unique number is assigned to each axis (using the Axis Number Change software utility).
(4)   Check each movement individually.
(5)   After checking individual movements, operate the system.

5. Specifications of Mechatronics Cylinder

## 5.1. Specification of Servo Cylinder

5.1.1. Specifications
SCN5 Model (10Kgf Type)

Models			-010-050	-010-100	-010-150	-010-200	-010-250	-010-300
Life			3 years after delivery or 10,000 km operation when applied within published specs					
Stroke (mm)			50	100	150	200	250	300
Max thrust (N)/(kgf)			100/10.2					
Max. thrust at push mode (N)/(kgf)			70/7.1					
Max. speed (mm/s): typ. data			400			200	160	120
Speed at push force mode (mm/s)			7.5					
Repeatability (mm)			+/-0.01 (when homing to hard stop and pushing on same side)					
Backlash (mm)			0.3					
Radial load (N)			15	10	5	4	3	2.5
Shaft diameter (mm)			15 Dia					
Shaft tip screw thread			Standard: M10 Pitch 1.25 (303 SS)					
Housing			Extruded Aluminum					
Positioning capacity			16 motions, each with programmable acceleration, velocity, position					
Power			DC24V+/-10% (max. 2.0 A)					
Input /Output signal	Parallel input signal		DC24V type DI/DO Interface (Connector PIO), Position number (4bit binary: PC1,PC2,PC4,PC8) Start (CSTR), Axis Movement Interlock (ILK)					
		Input Current	Max. 4mA / port					
	Parallel output signal		Position complete (PFIN/INP), Homed signal (ZFIN), Zone signal(ZONE), Alarm (ALM), 24VDC Digital I/O Interface, PNP Standard					
		Output Current	Max. 10mA / port					
	Serial signal		Serial Interface (Connector SIO) +5V, 5G, S+, S-					
Protection			Over speed, Main power over voltage, Voltage fault, Overload, Sensor fault, Servo fault, Encoder wire disconnected					
Ambient conditions	Operation Temperature		0 ˚ C ~ 40 ˚ C.					
	Storage temperature		-20 ˚ C ~ 60 ˚ C.					
	Operation/Storage moisture		≦90%RH, non condensing					
Weight (kg)			1.1	1.2	1.4	1.6	1.8	2.0

Note 1) Specifications are subject to change without notice.
Note 2) Push force value as figure below is typical value. Actual value may vary.

Thrust vs speed   Push force set value vs Actual Push force
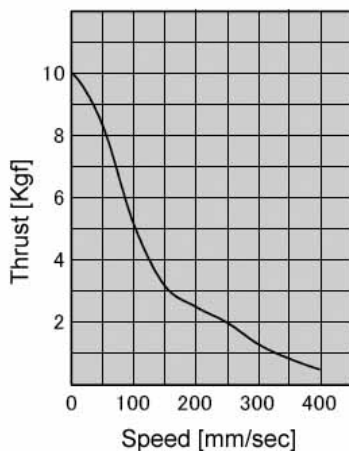
Notes: The max vertical load force is 7 kgf.
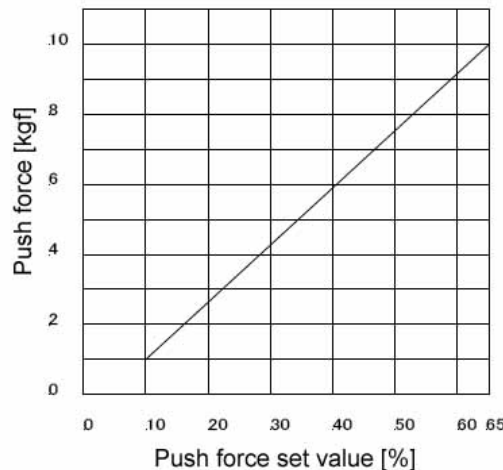
Notes: Push force set is negative (-) value for the shaft forward direction, positive (+) value for the opposite direction.

### SCN6 Models (20Kgf, 40kgf, 50kgf & 60kgf Types)

MODEL	SCN6-020						SCN6-040						SCN6-050						SCN6-060					
	050	100	150	200	250	300	050	100	150	200	250	300	050	100	150	200	250	300	050	100	150	200	250	300
Stroke (mm)	50	100	150	200	250	300	50	100	150	200	250	300	50	100	150	200	250	300	50	100	150	200	250	300
Life — Other than seal	3 years after the delivery, or 10,000 km operation under the use within the specs.																							
Life — Seals	6 months, or 2,500 km run (Dust Proof Model Only)																							
Max. Thrust (N) / (kgf)	200 / 20.2						400 /40.8						500 / 51.0						650 /66.3					
Max. vertical carriable wt at power ON	14						28						30						45					
Push mode max. Thrust (N)/(kgf)	140 / 14.2						280 / 28.5						350 / 35.5						450 / 45.9					
Max. Speed (mm/s) * note 1	200						100						100						100					
Repeatability (mm)	± 0.1																							
Backlash (mm)	0.3																							
Radial Load Capacity (N)	30	20	10	10	10	10	30	20	10	10	10	10	75	50	25	18	15	12	75	50	25	18	15	12
Rod Diameter (mm)	Ø 22																							
Rod Tip Thread	M14 Pitch 1.5 (303SS)																							
Program Capacity	16 Motions																							
Power Supply	DC24V ± 10% (Drive Power max. 3.0 Amps, Control power max. 0.2A)																							
I/O — Parallel Input — Names	DC24V type DI/DO Interface (Connector PIO) / Position number (4 bit binary: PC1,PC2,PC4,PC8) / Start (CSTR), Axis Movement Interlock (ILK)																							
I/O — Parallel Input — Input current	Max. 4mA / port																							
I/O — Parallel Output — Names	DC24V type DI/DO Interface (Connector PIO), Position complete(PFIN/INP), / Completed Position Number (4bit binary: PM1,PM2,PM4,PM8), / Homed signal(ZFIN), Zone signal(ZONE), Alarm (ALM)																							
I/O — Parallel Output — Output current	Max. 10mA / port																							
I/O — Serial Signal	Serial Interface (Connector SIO) +5V, 0V, S+, S-																							
Protection function	Over speed, Main power over voltage, abnormal voltage, / Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected																							
Ambience — Operate Temperature	0 ~ 40°C																							
Ambience — Storage Temperature	-20 ~ 60°C																							
Ambience — Ope/Storage Humidity	≤ 90% RH, non-condensing																							
Ambience — Vib./shock Duravility	2G/10 times																							
Ambience — Protection	IP-40 equivalent (Standard), IP-54 (Dust proof sealed model)																							
Weight (kgs)	1.6	1.9	2.2	2.5	2.8	3.1	1.9	2.2	2.5	2.8	3.1	3.4	1.9	2.2	2.5	2.8	3.1	3.4	1.9	2.2	2.5	2.8	3.1	3.4
Functions	- Positioning with speed, Accele - Increment movement - Stroke Limit end set - Zone Signal output - Push Force Mode / - Home Direction Set - Suitable Auto Max. Accel - Zone Signal output - Complete signal range set - Servo Gain Adjust																							

Notes: (*1) Typical data (*2) Stroke 200mm, 250mm and 300mm are available.

Speed vs Thrust Curves

SCN6-020-□□□

SCN6-040-□□□
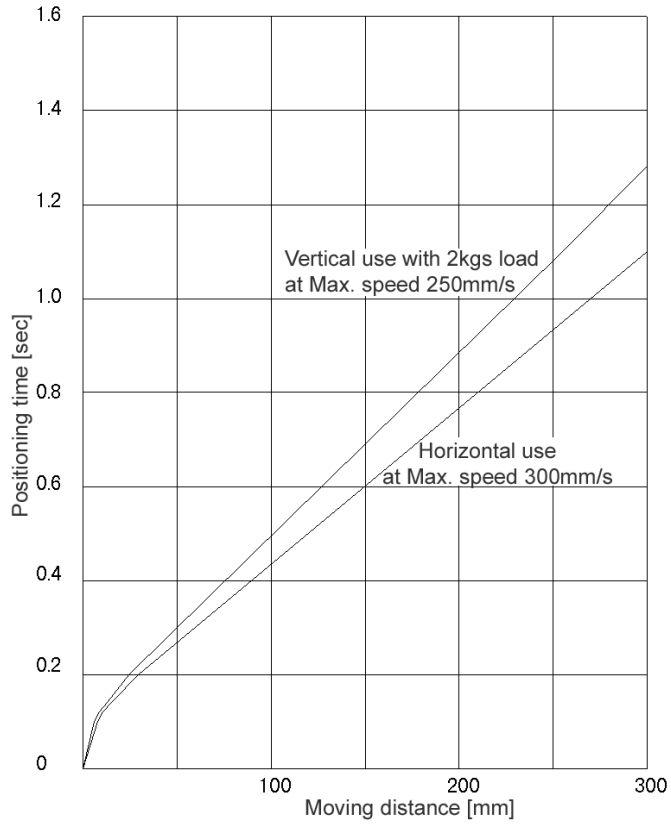

SCN6-050-□□□

SCN6-060-□□□
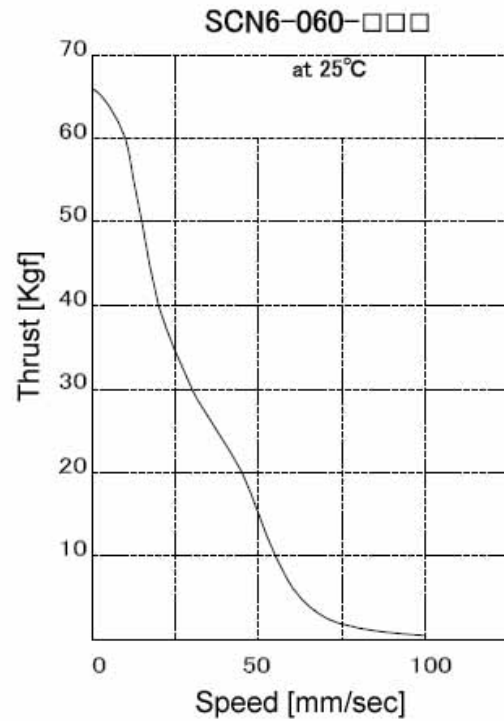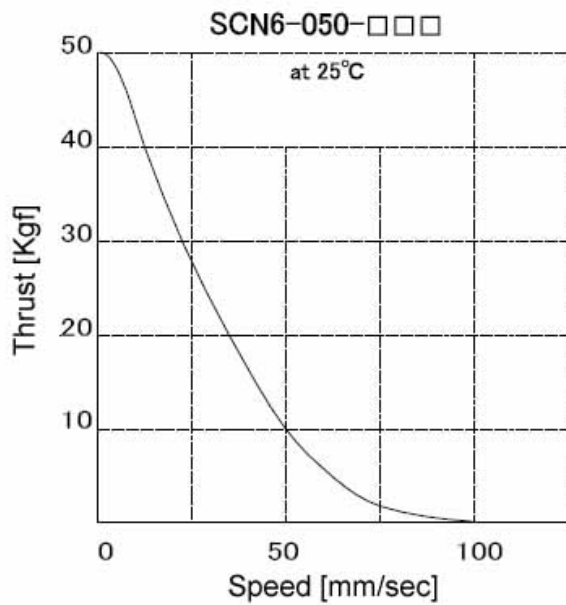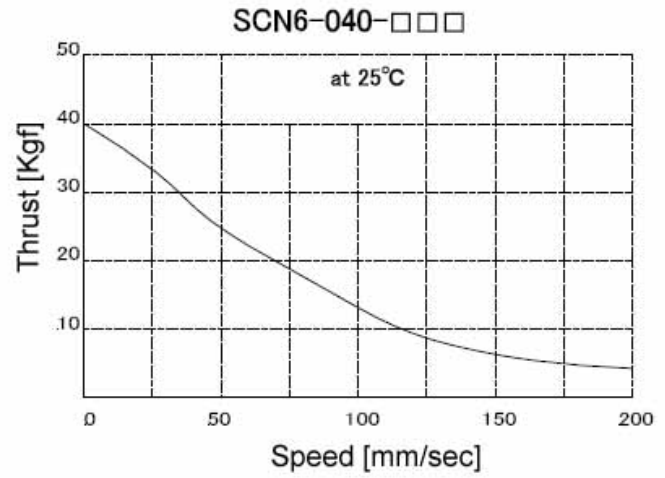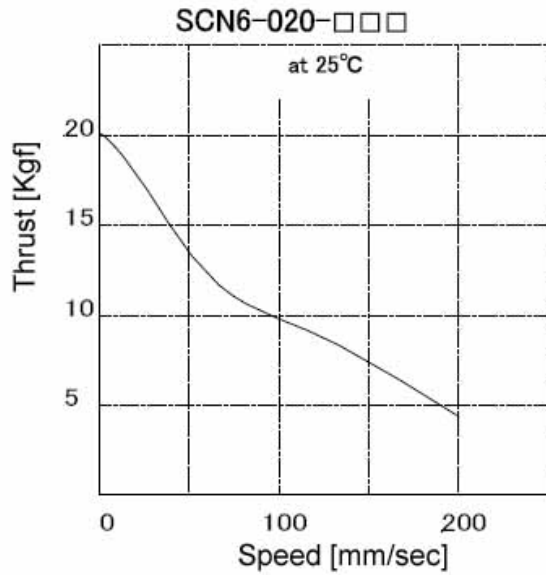
SCLL6 Model (Slider 20Kgf Type)

MODEL			SCLL6-020-300A	SCLL6-020-400A	SCLL6-020-500A	SCLL6-020-600A	SCLL6-020-700A	SCLL6-020-800A	SCLL6-020-900A	SCLL6-020-A00A
Stroke (mm)			300	400	500	600	700	800	900	1000
Max. Thrust (N) / (kgf)			200 / 20.4							
Max. vertical carriable wt at power ON			2.5 kgs							
Push mode max. Thrust (N)/(kgf)			140 / 14.2							
Max. Speed (mm/s) * note 1			300				280	220	180	150
Repeatability (mm)			± 0.1							
Backlash (mm)			0.3							
Max. Load weight (kgs)			5			2			1	
Max. vertical load (kgs)			2.5			2			1	
Load moment (kgf-m)			Mp=0.5, My=0.5, Mr=0.5			Mp=0.3, My=0.3, Mr=0.3		Mp=0.2, My=0.2, Mr=0.2		
Overhang length (mm)			150 or shorter							
Program Capacity			16 Positionings							
Power Supply			DC24V ± 10% (Drive Power max. 3.0 Amps, Control power max. 0.2A)							
Life			3 years after the delivery, or 10,000 km operation under the use within the specs.							
I/O	Parallel Input	Names	DC24V type DI/DO Interface (Connector PIO) Position number (4 bit binary: PC1,PC2,PC4,PC8) Start (CSTR), Axis Movement Interlock (ILK)							
		Input current	Max. 4mA / port							
	Parallel Output	Names	DC24V type DI/DO Interface (Connector PIO) Completed Position Number (4bit binary: PM1,PM2,PM4,PM8), Positioning complete(PFIN/INP), Homed signal(ZFIN), Zone signal(ZONE), Alarm (ALM)							
		Output current	Max. 10mA / port							
	Serial Signal		Serial Interface (Connector SIO) +5V, 0V, S+, S-							
Protection function			Over speed, Main power over voltage, abnormal voltage, Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected							
Ambience	Operate Temperature		0 ~ 40°C							
	Storage Temperature		-20 ~ 60°C							
	Ope/Storage Humidity		≤ 90% RH, not dew on the products							
Weight (kgs)	Actuator		3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7
	Amplifier		0.5							
Functions			Positioning with speed, Accele/Decel Servo Gain Adjust Push Force Mode Stroke Limit end set Home Direction Set Zone Signal output Speed Profile Suitable Auto Max. Accel							

Notes: (*1) Typical data,   (*2) Rodless Actuators with stroke of 600 ~ 1,000mm are not stock items. Please call for delivery.

5.1.2. Rod speed-thrust curve

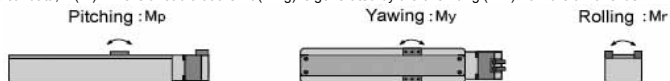**SCLL6 Model (Slider 20Kgf Type)**

Graph with Y-axis "Positioning time [sec]" from 0 to 1.6, and X-axis "Moving distance [mm]" from 0 to 300.

Labels on graph:
- Vertical use with 2kgs load at Max. speed 250mm/s
- Horizontal use at Max. speed 300mm/s

SCLL5 Model (Slider 10Kgf Type)

MODEL			SCLL5-010-050A	SCLL5-010-100A	SCLL5-010-150A	SCLL5-010-200A	SCLL5-010-300A
Stroke (mm)			50	100	150	200	300
Max. Thrust (N) / (kgf)			50 / 5				
Max. vertical carriable wt at power ON			1 kg				
Push mode max. Thrust (N)/(kgf)			30 / 3				
Max. Speed (mm/s) * note 1			300				
Repeatability (mm)			± 0.1				
Backlash (mm)			0.3				
Max. Load weight (kgs)			5 (Horizontal)				
Max. vertical load (kgs)			2.5				
Load moment (N-m) (kgf-cm)			Mp=0.5 / 5.1, My=0.5 / 5.1, Mr=2 / 20.4 (* note 2)				
Overhang length (mm) * note 3			100 or shorter				
Program Capacity			16 Motions				
Power Supply			DC24V ± 10% (Drive Power max. 3.0 Amps, Control power max. 0.2A)				
Life			3 years after the delivery, or 10,000 km operation under the use within the specs.				
I/O	Parallel Input	Names	DC24V type DI/DO Interface (Connector PIO) Position number (4 bit binary: PC1,PC2,PC4,PC8) Start (CSTR), Axis Movement Interlock (ILK)				
		Input current	Max. 4mA / port				
	Parallel Output	Names	DC24V type DI/DO Interface (Connector PIO), Position complete (PFIN/INP) Completed Position Number (4bit binary: PM1,PM2,PM4,PM8), Homed signal(ZFIN), Zone signal(ZONE), Alarm (ALM)				
		Output current	Max. 10mA / port				
	Serial Signal		Serial Interface (Connector SIO) +5V, 0V, S+, S-				
Protection function			Over speed, Main power over voltage, abnormal voltage, Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected				
Ambience	Operate Temperature		0 ~ 40°C				
	Storage Temperature		-20 ~ 60°C				
	Ope/Storage Humidity		=< 90% RH, non-condensing				
Weight (kgs)	Actuator		1.0	1.2	1.3	1.5	1.8
	Amplifier		0.5				
Functions			Positioning with speed, Accele/Decel Servo Gain Adjust Push Force Mode Stroke Limit end set Home Direction Set Zone Signal output Speed Profile Suitable Auto Max. Accel				

Notes: (*1) Typical data,   (*2) This is a load that the wt (m kg) is generated by the overhang (L m) from the arrior slider.

Pitching : Mp   Yawing : My   Rolling : Mr
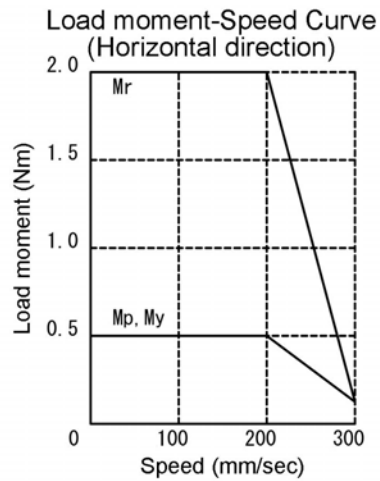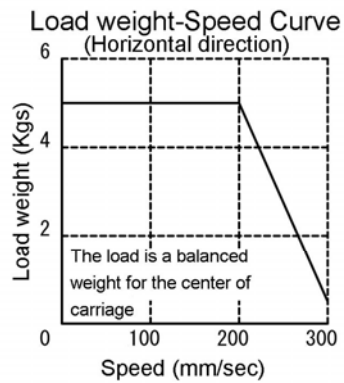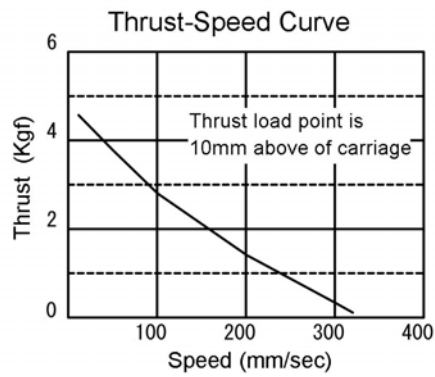
(The calculation of the load moement (kgf-cm) is: m (kg) x L (cm) < Mp, My, Mr)

The actual moment will be combinations of those moments (Mp, Py, Mr).

Notes: (*3) This is the acceptable over hand length from the slider carriage.

SCLL5 Model (Slider 10Kgf Type)

Thrust-Speed Curve

Thrust load point is
10mm above of carriage

Load weight-Speed Curve
(Horizontal direction)

The load is a balanced
weight for the center of
carriage

Load moment-Speed Curve
(Horizontal direction)

Mr

Mp, My

SCLG5 Model (Slider High Rigidity Type)

MODEL			SCLG5-010-050A	SCLG5-010-100A	SCLG5-010-150A	SCLG5-010-200A	SCLG5-010-300A
Stroke (mm)			50	100	150	200	300
Max. Thrust (N) / (kgf)			100 / 10.2				
Max. vertical carriable wt at power ON			3 kgs				
Push mode max. Thrust (N)/(kgf)			70 / 70.1				
Max. Speed (mm/s) * note 1			300				
Repeatability (mm)			± 0.1				
Backlash (mm)			0.3				
Max. Load weight (kgs)			10 (Horizontal)				
Max. vertical load (kgs)			2.5				
Load moment (N-m) (kgf-cm)			Mp=1.5 / 15, My=1.5 / 15, Mr=5 / 51 (* note 2)				
Overhang length (mm) * note 3			150 or shorter				
Program Capacity			16 Motions				
Power Supply			DC24V ± 10% (Drive Power max. 3.0 Amps, Control power max. 0.2A)				
Life			3 years after the delivery, or 10,000 km operation under the use within the specs.				
I/O	Parallel Input	Names	DC24V type DI/DO Interface (Connector PIO) Position number (4 bit binary: PC1,PC2,PC4,PC8) Start (CSTR), Axis Movement Interlock (ILK)				
		Input current	Max. 4mA / port				
	Parallel Output	Names	DC24V type DI/DO Interface (Connector PIO), Position complete (PFIN/INP) Completed Position Number (4bit binary: PM1,PM2,PM4,PM8), Homed signal(ZFIN), Zone signal(ZONE), Alarm (ALM)				
		Output current	Max. 10mA / port				
	Serial Signal		Serial Interface (Connector SIO) +5V, 0V, S+, S-				
Protection function			Over speed, Main power over voltage, abnormal voltage, Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected				
Ambience	Operate Temperature		0 ~ 40°C				
	Storage Temperature		-20 ~ 60°C				
	Ope/Storage Humidity		=< 90% RH, non-condensing				
Weight (kgs)	Actuator		1.3	1.5	1.7	1.9	2.3
	Amplifier		0.5				
Functions			Positioning with speed, Accele/Decel Servo Gain Adjust Push Force Mode Stroke Limit end set Home Direction Set Zone Signal output Speed Profile Suitable Auto Max. Accel				

Notes: (*1) Typical data,   (*2) This is a load that the wt (m kg) is generated by the overhang (L m) from the arrior slider.

Pitching : Mp   Yawing : My   Rolling : Mr

(The calculation of the load moement (kgf-cm) is: m (kg) x L (cm) < Mp, My, Mr)

The actual moment will be combinations of those moments (Mp, Py, Mr).

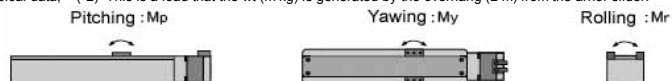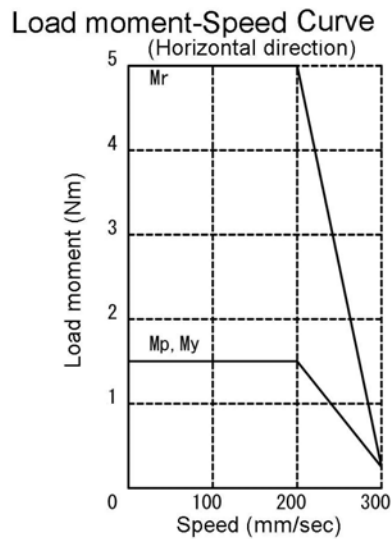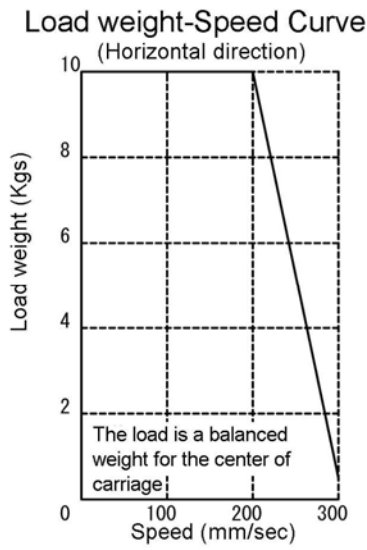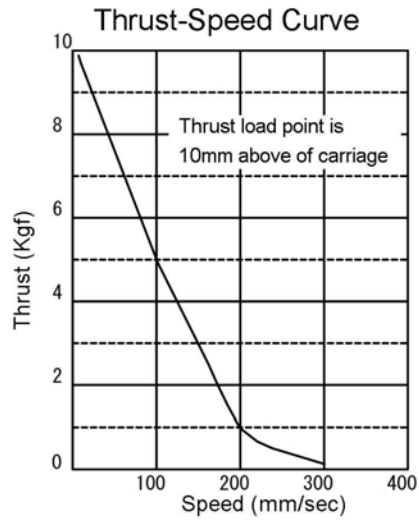Notes: (*3) This is the acceptable over hand length from the slider carriage.

Thrust-Speed Curve

Thrust load point is
10mm above of carriage

Thrust (Kgf) vs Speed (mm/sec)

Load weight-Speed Curve
(Horizontal direction)

Load weight (Kgs) vs Speed (mm/sec)

The load is a balanced
weight for the center of
carriage

Load moment-Speed Curve
(Horizontal direction)

Mr

Mp, My

Load moment (Nm) vs Speed (mm/sec)

SCLT Models (15Kgf, 25kgf, 30kgf & 50kgf Types)

MODEL	SCLT4-015 -XXX AS	SCLT4-030 -XXX AS	SCLT6-025 -XXX AB	SCLT6-050 -XXX AB
Amplifier	Built-in to actuator		External	
Stroke (mm)	50 / 100 / 150 / 200 / 300 / 400 / 500		50 / 100 / 150 / 200 / 300 / 400 / 500 / 600 / 700	
Max. Thrust (N) / (kgf)	150 / 15	300 / 30	250 / 25	500 / 50
Max. carriable wt at pwr ON (kg)	1.5	2.5	4	6
Push mode max. Thrust (N)/(kgf)	105 / 10.5	210 / 21	175 / 17.5	350 / 35
Ball screw lead (mm)	12	6	12	6
Max. Speed (mm/s) * note 1	700 (680mm/s for 500mm stroke)	400 (340mm/s for 500mm stroke)	600 (500mm/s for for 700mm stroke)	350 (600mm: 340mm/s) (700mm: 250mm/s)
Repeatability (mm)	± 0.02	± 0.02	± 0.2	± 0.2
Backlash (mm)	0.1	0.1	0.1	0.1
Max. Hor Load weight (kg)	5	10	16	30
Max. vertical load (kg)	1.5	2.5	4	6
Load moment (Nm / kgf-cm) *2	Mp=12 / 120, My=12 / 120, Mr=31 / 310		Mp=25.7 / 257, My=25.7 / 257, Mr=58 / 580	
Program Capacity	16 Positions			
Power Supply	DC24V ± 10% (Drive Power max. 2.0 Amps, Control power max. 0.2A)			
Life	3 years after delivery, or 10,000 km operation when used within all specs.			

I/O	Parallel Input	Names	DC24V type Digital Input Interface Position select bits (4 bit binary coded decimal: PC1,PC2,PC4,PC8) Start (CSTR), Movement Interlock (ILK)			
		Input current	Max. 4mA / port, PNP Standard		Max. 4mA / port, PNP Standard	
	Parallel Output	Names	DC24V type Digital Output Interface Completed Position Number (4bit binary: PM1,PM2,PM4,PM8) : (SCLT6 Only) Homed signal (ZFIN), Zone signal(ZONE), Alarm (ALM), Position complete (PFIN/INP)			
		Output current	Max. 10mA / port, PNP Standard		Max. 10mA / port, PNP Standard	
	Serial Signal		Serial Interface (Connector SIO) +5V, 0V, S+, S-, ASCII Protocol Freely Available			

Protection function	Over speed, Main power over voltage, abnormal voltage, Overload, Sensor abnormal, Servo abnormal, Encoder wire disconnected			
Ambience Operate Temperature	0 ~ 40°C			
Storage Temperature	-20 ~ 60°C			
Ope/Storage Humidity	=< 90% RH, non-condensing			
Weight (kgs)	1.42/1.53/1.64/1.74/1.96/2.18/2.4		2.7 / 2.9 / 3.1 / 3.3 / 3.7 / 4.1 / 4.5 / 5.0 / 5.4	

Notes: (*1) Typical data,   (*2) This is a load that the wt (m kg) is generated by the overhang (L m) from the arrior slider.

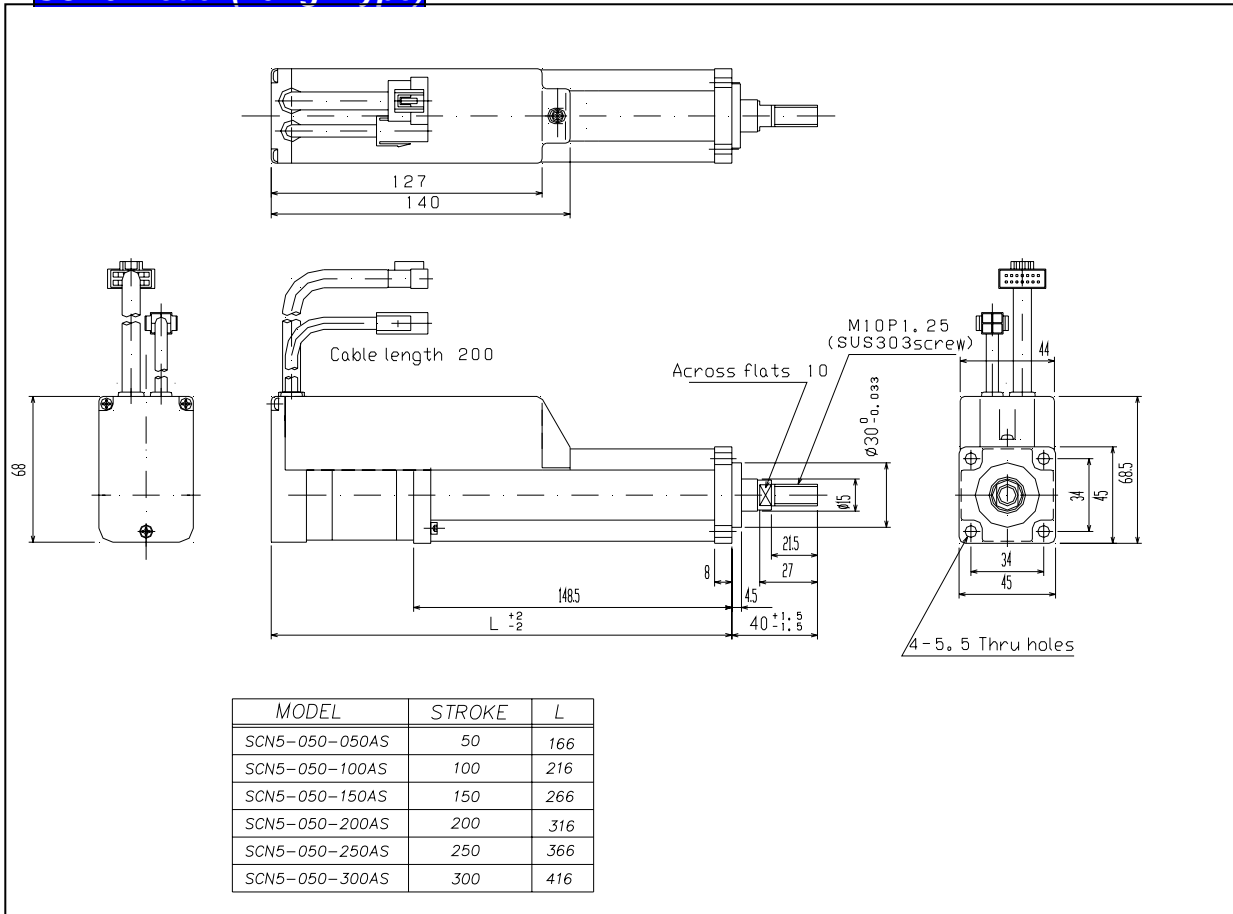Pitching : Mp   Yawing : My   Rolling : Mr

(The calculation of the load moement (kgf-cm) is: m (kg) x L (cm) < Mp, My, Mr)

The actual moment will be combinations of those moments (Mp, Py, Mr).

5.1.3. Dimensions

Actuator layout drawings:

SCN5 Model (10Kgf Type)
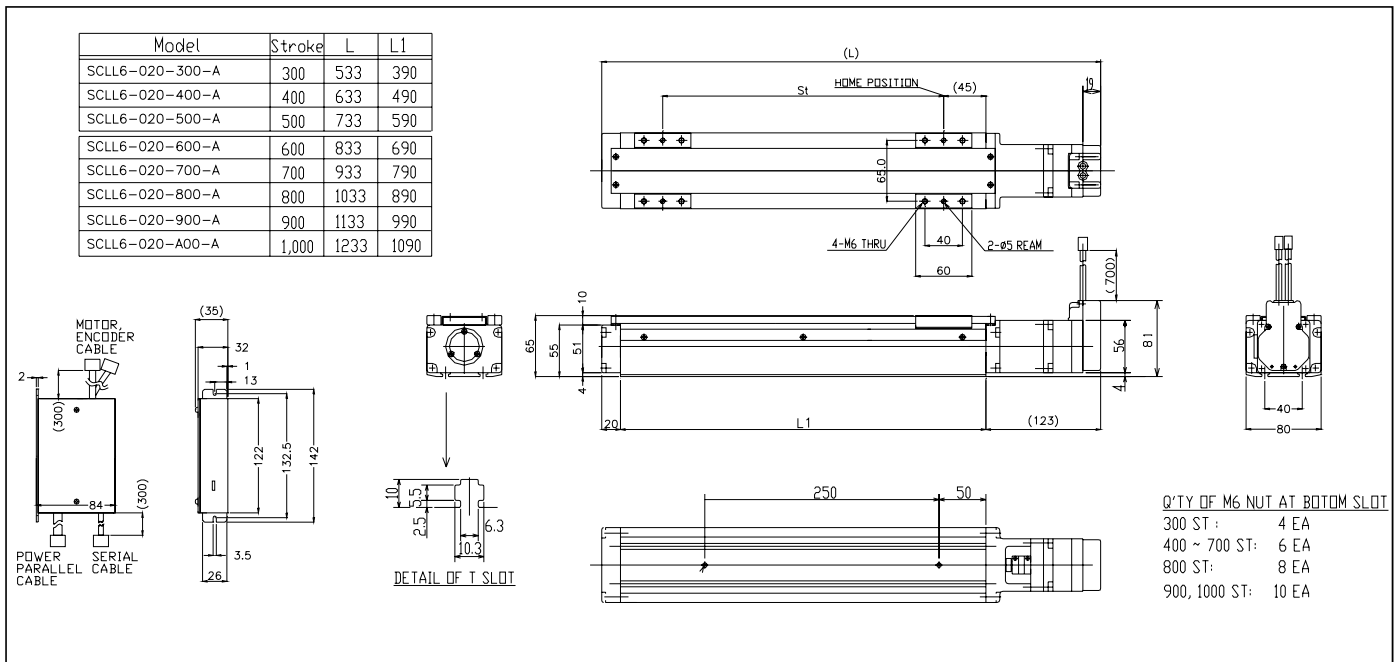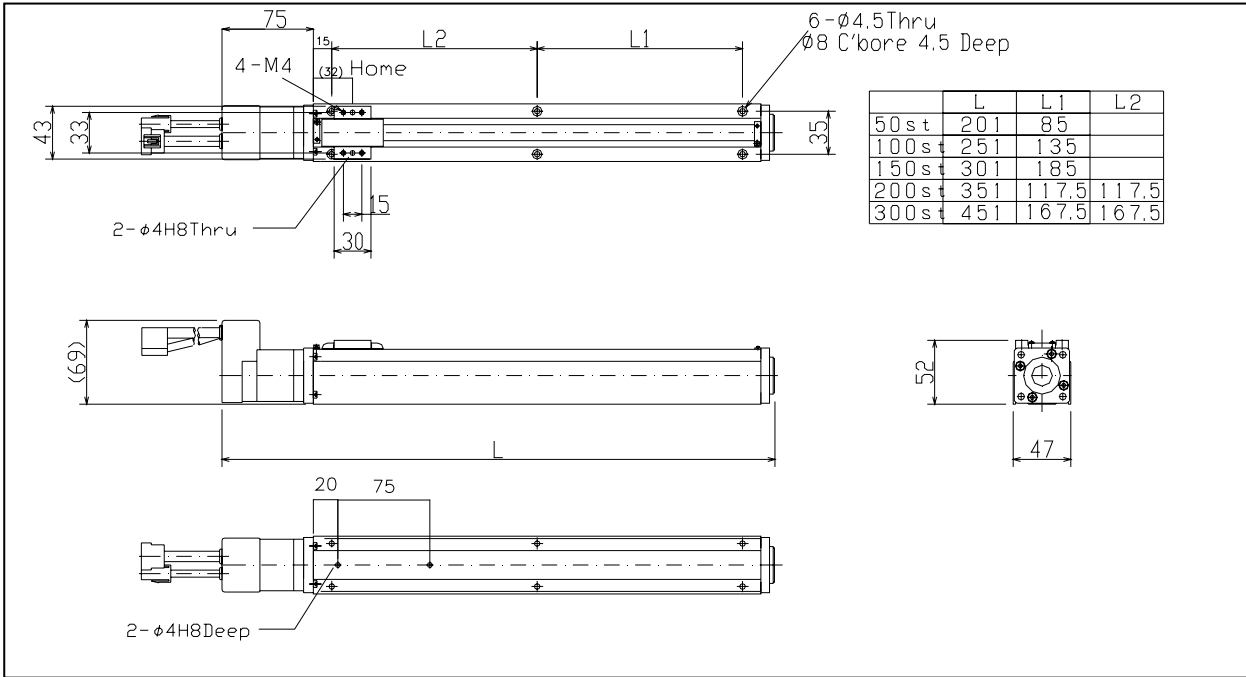

MODEL	STROKE	L
SCN5-050-050AS	50	166
SCN5-050-100AS	100	216
SCN5-050-150AS	150	266
SCN5-050-200AS	200	316
SCN5-050-250AS	250	366
SCN5-050-300AS	300	416

SCN6 Models (20Kgf, 40kgf, 50kgf & 60kgf Types)

Model	Dim L	Model	Dim L	Model	Dim L	Model	Dim L
SCN6-020-050	189	SCN6-040-050	223	SCN6-050-050	201	SCN6-060-050	223
SCN6-020-100	239	SCN6-040-100	273	SCN6-050-100	251	SCN6-060-100	273
SCN6-020-150	289	SCN6-040-150	323	SCN6-050-150	301	SCN6-060-150	323
SCN6-020-200	339	SCN6-040-200	373	SCN6-050-200	351	SCN6-060-200	373
SCN6-020-250	389	SCN6-040-250	423	SCN6-050-250	401	SCN6-060-250	423
SCN6-020-300	439	SCN6-040-300	473	SCN6-050-300	451	SCN6-060-300	473

SCLL6 Model (Slider 20Kgf Type)

Model	Stroke	L	L1
SCLL6-020-300-A	300	533	390
SCLL6-020-400-A	400	633	490
SCLL6-020-500-A	500	733	590
SCLL6-020-600-A	600	833	690
SCLL6-020-700-A	700	933	790
SCLL6-020-800-A	800	1033	890
SCLL6-020-900-A	900	1133	990
SCLL6-020-A00-A	1,000	1233	1090

Q'TY OF M6 NUT AT BOTTOM SLOT
300 ST : 4 EA
400 ~ 700 ST : 6 EA
800 ST : 8 EA
900, 1000 ST : 10 EA

SCLL5 Model (Slider 10Kgf Type)

	L	L1	L2
50st	201	85	
100st	251	135	
150st	301	185	
200st	351	117.5	117.5
300st	451	167.5	167.5

SCLG5 Model (Slider High Rigidity Type)

	L	L1	L2
50st	201	85	
100st	251	135	
150st	301	185	
200st	351	117.5	117.5
300st	451	167.5	167.5

SCLT4 Models (15Kgf & 30kgf Types)

Strokes	ST	L1	L2	n	N	Wt(Kgs)	Strokes	ST	L1	L2	n	N	Wt(Kgs)
50mm	50	206	151	1	2	1.5	400mm	400	556	501	5	6	2.2
100mm	100	256	201	2	3	1.6	450mm	450	606	551	5	6	2.3
150mm	150	306	251	2	3	1.7	500mm	500	656	601	6	7	2.4
200mm	200	356	301	3	4	1.8							
250mm	250	406	351	3	4	1.9							
300mm	300	456	401	4	5	2.0							
350mm	350	506	451	4	5	2.1							
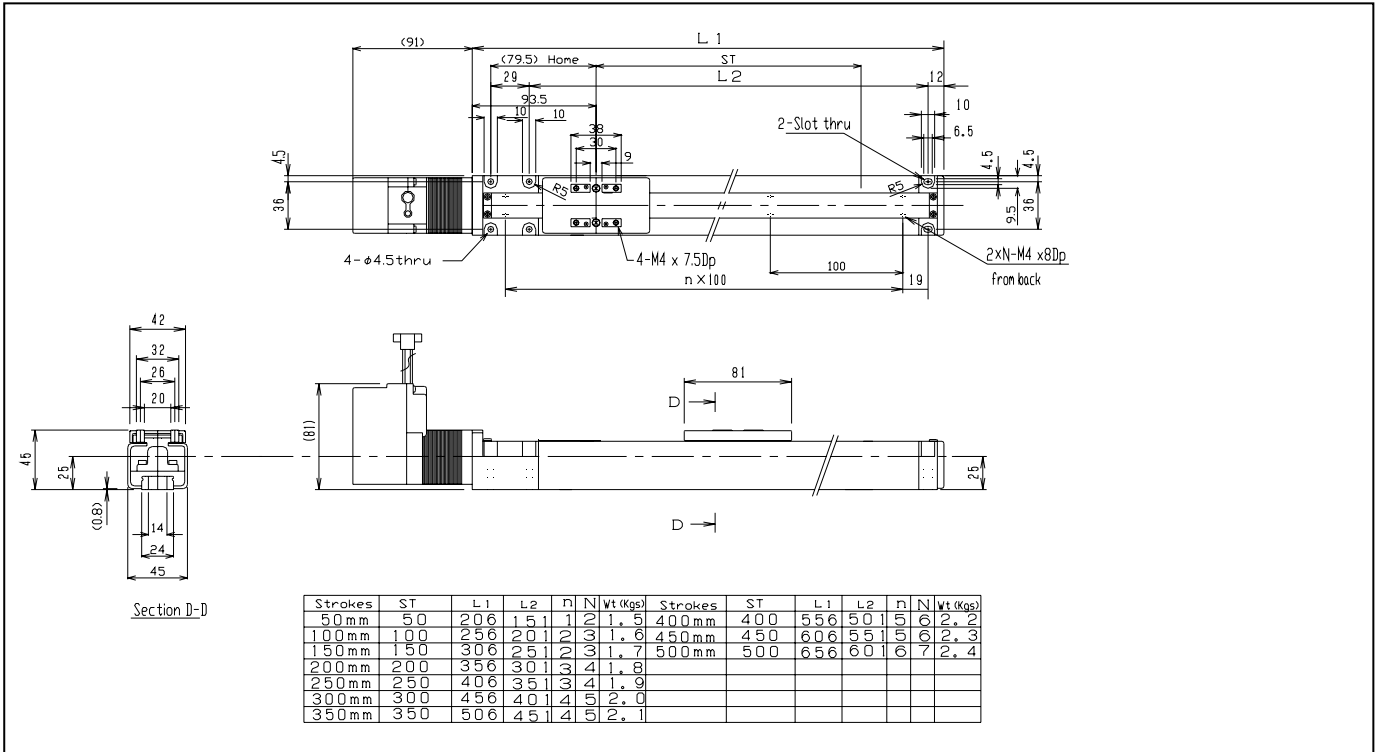
SCLT6 Models (25Kgf & 50kgf Types)

Strokes	ST	L1	L2	n	N	Wt(Kgs)	Strokes	ST	L1	L2	n	N	Wt(Kgs)
50mm	50	237	171	1	2	2.4	400mm	400	587	521	5	6	3.8
100mm	100	287	221	2	3	2.6	450mm	450	637	571	5	6	4.0
150mm	150	337	271	2	3	2.8	500mm	500	687	621	6	7	4.2
200mm	200	387	321	3	4	3.0	550mm	550	737	671	6	7	4.5
250mm	250	437	371	3	4	3.2	600mm	600	787	721	7	8	4.7
300mm	300	487	421	4	5	3.4	700mm	700	887	821	8	9	5.1
350mm	350	537	471	4	5	3.6							

Motor & Encoder Connectors

2.0

(35)
31.7
1.0
13.0

(30)

84.0

(30)

122.0
132.5
142.0

3.5

26.0

Parallel   Serial

Motor Connector
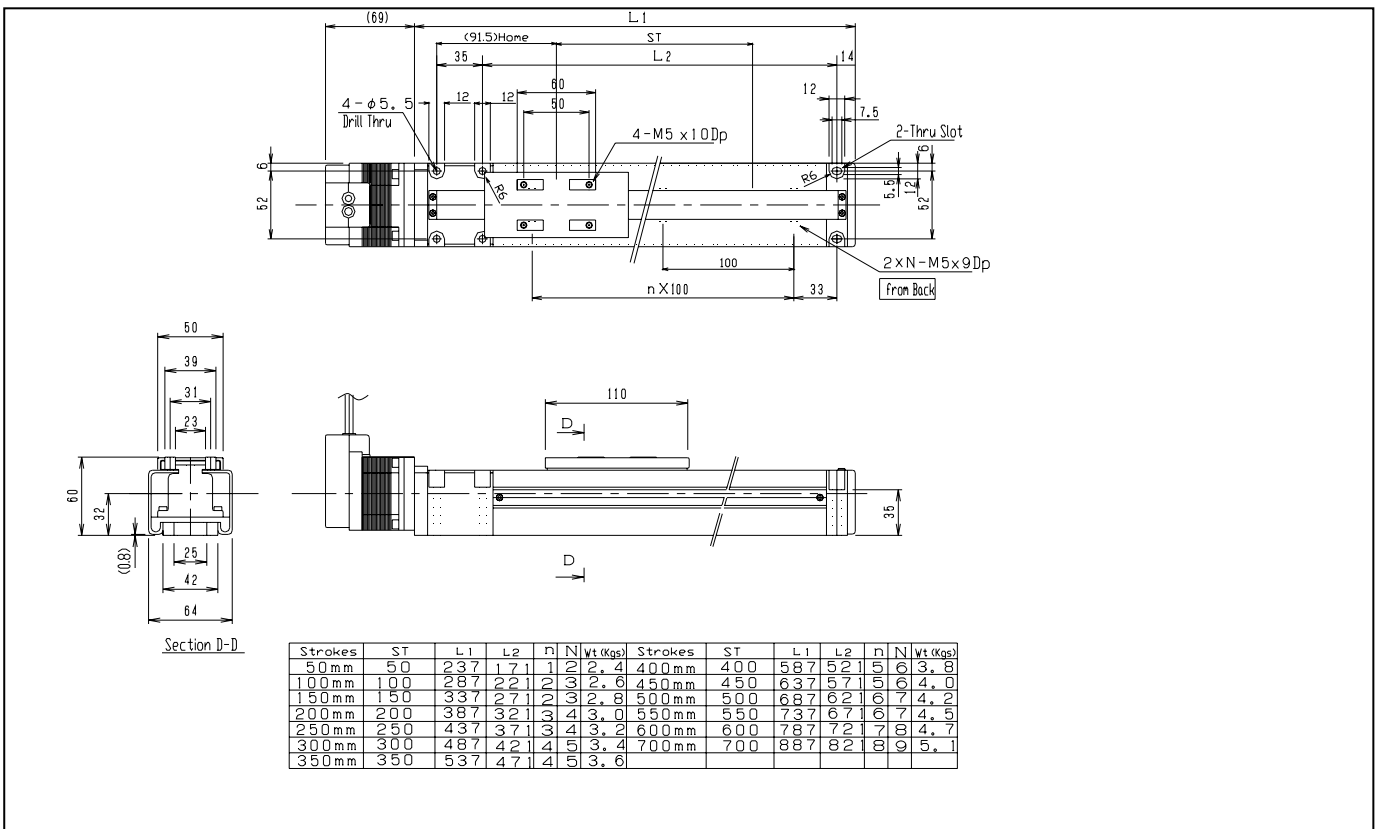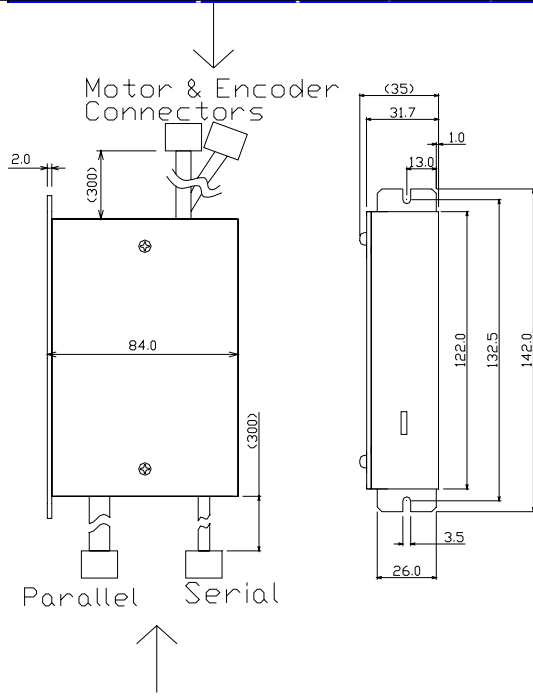
Pin No.	Signals
1	A
2	/A
3	B
4	/B

Encoder Connector

Pin No.	Signals
1	ENA
2	/ENA
3	ENB
4	/ENB
5	–
6	–
7	0V
8	5V
9	FG

Parallel Connector

Pin No.	Signals
1	24V(Drive)
2	0V(Drive)
3	24V(Control)
4	0V(Control)
5	PC1
6	PC2
7	PC4
8	PC8
9	CSTR
10	(NC)
11	(NC)
12	ILK
13	(NC)
14	(NC)
15	PM1
16	PM2
17	PM4
18	PM8
19	PFIN
20	ZFIN
21	ZONE
22	ALM
23	(NC)
24	FG

Serial Connector

Pin No.	Signals1
1	5V
2	TRX+
3	0V
4	TRX-

Note: Above connector layout is according to the face from the arrow at Amplifier drawing.

6. Interface specifications

6.1. Circuit Diagrams for 24VDC I/O (PNP)

(1) PIO (24VDC) Input circuit
   Input signal ON is defined as electrical connection of
   +24V with Input signal.
   Input signal OFF is electrical open of Input
   signal.   The max. input current is 4mA.
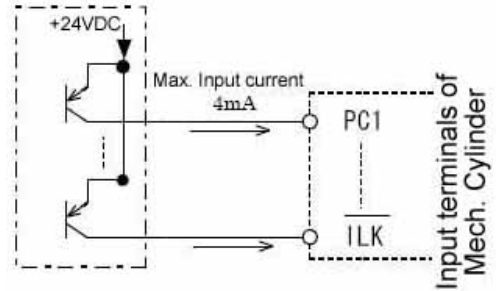
(2) PIO (24VDC) Output Circuit
   Output signal ON is defined as electrical connection of OVDC with Output signal.
   Definition of Output signal OFF is electrical open of Output signal

(3) SIO (Serial I/O) Circuit

SN75176

(Terminal Resistance)
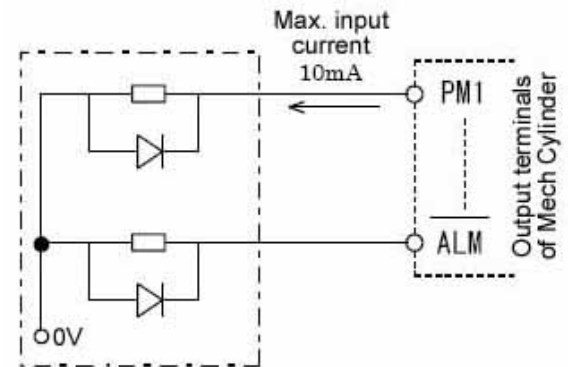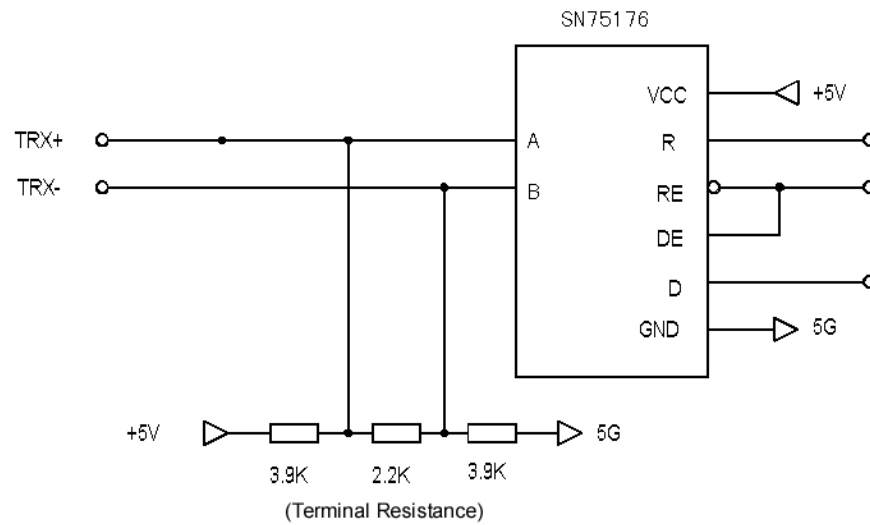
6.2. PIO specifications

6.2.1. Input signals

SCN5 Model (10Kgf Type)

Number	Symbol	Functions
1	+24V	Power DC24V, positive
2	0VDC	Power DC24V, common
3	PC1	Input of Position registration number: Total of PC1 to PC8 ON means 1, OFF means 0
4	PC2	Input of Position registration number: Total of PC1 to PC8 ON means 2, OFF means 0
5	PC4	Input of Position registration number: Total of PC1 to PC8 ON means 4, OFF means 0
6	PC8	Input of Position registration number: Total of PC1 to PC8 ON means 8, OFF means 0
7	CSTR	Strobe input for Input of Position registration number 1. At the edge of OFF=>ON, the controller reads the sum of PC1~8, then it will move the cylinder to the target position. (same as positioning order) 2. At the edge of OFF=>ON of when Home is unknown, it will move the cylinder to home, then move it to the target position.
8	ILK	Axis movement Interlock input 1. If turned OFF during a move, the cylinder will stop, then register the position where the cylinder stopped as the temporary target position, maintaining the original target position in memory. 2. When the ILK signal is turned ON, the registered temporary position will be deleted and the original target position will become the target position. Motion will resume immediately. ("Cancel" function is also available)

Number	Symbol	Functions
1	+24V	Main Power DC24V, positive
2	0V	Main Power DC24V, common
3	+24V	Control Power DC24V, positive
4	0V	Control Power DC24V, common
5	PC1	Input of Position registration number: Total of PC1 to PC8 ON means 1, OFF means 0
6	PC2	Input of Position registration number: Total of PC1 to PC8 ON means 2, OFF means 0
7	PC4	Input of Position registration number: Total of PC1 to PC8 ON means 4, OFF means 0
8	PC8	Input of Position registration number: Total of PC1 to PC8 ON means 8, OFF means 0
9	CSTR	Strobe input for Input of Position registration number 1. At the edge of OFF=>ON, the controller reads the sum of PC1~8, then it will move the cylinder to the target position. 2. At the edge of OFF=>ON of when Home is unknown, the cylinder will move to home, then move to the target position automatically.
10	NC	No connection
11	NC	No connection
12	ILK	Axis movement Interlock input **E-Stop Input Mode** 1. If the ILK signal is interrupted (switched to OFF) during the rotation, it will stop the cylinder with full power and register the position where the cylinder stopped as its temporary target position. 2. When the ILK signal is resumed, the registered temporary position will be deleted and the axis will immediately resume the previously commanded motion to the original target position. ("Cancel" function is also available)
13	NC	No connection
14	NC	No connection

Reference : Position number combination Table (for all models)

Position Number Resister	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
PC1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
PC2	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1
PC4	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1
PC8	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
CSTR					⤒	(At Starting up, Data of PC1 to PC8 will be read)										

6.2.2. Input signal details

[+24V]
Power input. The control power for the Mechatronics Cylinder is +5V generated within the servo controller.
The alarm signal will be reset by turning OFF the main power input and CSTR signal turning ON after the cause of the alarm is fixed.

[0V]
Common. This is common with the lower voltage (Ground) of the control power circuit and the lower voltage side of serial interface.

[PC1] [PC2] [PC4] [PC8]
These are the destination position number inputs. When the input signal edge of CSTR changes (OFF => ON), the destination position numbers inputs are checked (their bit weight is 2^0 of PC1, 2^1 of PC2, 2^2 of PC4 and 2^3 of PC4). Please note that the inputs of PC1 to PC8 must be ready when the CSTR signal changes from OFF to ON. If the input conditions of PC1 to PC8 change after the rising edge of the CSTR input, there won't be any influence to the motion (when the cylinder is configured in Normal mode)
If the application requires only 2 places, only any one of the position number inputs is needed.
For example:
[PC1] input can select position numbers 0 and 1.
[PC2] input can select position numbers 0 and 2.
[PC4] input can select position numbers 0 and 4.
[PC8] input can select position numbers 0 and 8.

[CSTR]
This is a strobe input. When CSTR goes high (OFF => ON), the destination position numbers (PC1, 2, 4, and 8) are read in 4-bit binary and summed to determine which motion to run. Due to the internal filter, the CSTR signal must be ON for 4ms or longer. If this signal edge is detected before homing has been completed (when ZFIN output is turned OFF), the homing operation will be executed automatically, after which the actuator will immediately run the requested motion.
The CSTR and PC1, 2, 4, and 8 inputs can theoretically be turned on at the same time, however, some PLCs may have slight delays in the response of their outputs, in which case the PC1, 2, 4, and 8 inputs may not finish switching before the rising edge of the CSTR input is registered. To be safe it is recommended to switch the PC1 to 8 inputs at least 4ms before the CSTR input is turned ON.
When the CSTR signal is turned ON, the PFIN signal will be turned OFF. If the CSTR signal is kept ON when the actuator has reached its destination, the PFIN signal won't be turned ON. Please keep the CSTR signal ON for at least 4ms and turn it off before the actuator finishes its move.

[ILK]
The ILK input will either cancel or pause the motion of the actuator when the input status drops to 0VDC. The teach pendant or PC Tool software can change this behavior. The default setting is the "Pause" mode. The ILK input should be always turned ON for normal operation.
Details for the Pause mode (Default):
> If the ILK signal is turned OFF during motion, the actuator will start to decelerate (at maximum or programmed decal) then stop. This stop position is designated as the temporary destination position but the original destination position is still stored.
> When the ILK signal turns back ON, the temporary destination position is deleted, and the original destination position is set to the current destination. The moves restarts to the original destination position.
> If a new position command is executed (using PC1, 2, 4, 8 and CSTR) while the ILK signal is turned OFF, the actuator will move to the new position after the ILK signal is turned back ON.

If the ILK signal is turned OFF and the actuator stops, the PFIN signal stays OFF, however, the PFIN signal will turn ON after the ILK signal is resumed (ON) and the actuator reaches the destination position.

Move command cancel input mode:

If the new MOVE command is entered when the ILK signal is turned OFF and the actuator stops, the new MOVE command will be disregarded.

If the ILK signal is turned OFF and the actuator stops, the PFIN signal is turned ON. The PFIN signal stays ON when the ILK signal is turned back ON.

6.2.3 Output signal

SCN5 Model (10Kgf Type)

Number	Symbol	Functions
9	PFIN	**Position completion output** ① ON: The output goes high when the Mechatronics Cylinder has moved to within the position width tolerance of the target position. Please note that PFIN signal won't be turned ON until the CSTR signal is turned OFF. ②OFF: The output goes low when motion to a new target position is initiated. *Notes:* *-The tolerance used to determine when the PFIN output goes high is set by the "At Position Width" variable in the programming device.* *-This output will not operate properly if the "CSTR" signal is left high. The CSTR signal should be pulsed OFF-ON-OFF to initiate motion, and therefore is expected to be OFF when motion finishes.*
10	ZFIN	*Homing completion output* ① ON: The output will be ON after homing completion. ② OFF: The output is OFF after the Mechatronics Cylinder is first powered up and /or when an encoder-related alarm occurs. ZFIN won't be turned ON until the homing is completed.
11	ZONE	*Zone signal output* ① ON: The output will be ON when the position of the axis is within the range programmed to be the "Zone". ②OFF: The output will be OFF if the axis has not been homed or if the rod is outside the programmed zone.
12	ALM	*Controller alarm output* ① ON: The output will be ON during normal operation. ②OFF: The output will be OFF in case of Alarm.

No.	Symbol	Functions
15	PM1	Completion signal output: Total of PM1 to PM8 ON means 1, OFF means 0
16	PM2	Completion signal output: Total of PM1 to PM8 ON means 2, OFF means 0
17	PM4	Completion signal output: Total of PM1 to PM8 ON means 4, OFF means 0
18	PM8	Completion signal output: Total of PM1 to PM8 ON means 8, OFF means 0
19	PFIN	**Position completion output** ① ON: The output goes high when the Mechatronics Cylinder has moved to within the position width tolerance of the target position. Please note that PFIN signal won't be turned ON till CSTR signal is turned OFF. ②OFF: The output goes low when motion to a new target position is initiated. Notes: -The tolerance used to determine when the PFIN output goes high is set by the "At Position Width" variable in the programming device. -This output will not operate properly if the "CSTR" signal is left high. The CSTR signal should be pulsed OFF-ON-OFF to initiate motion, and therefore is expected to be OFF when motion finishes.
20	ZFIN	Homing completion output ① ON: The output will be ON after homing completion. ② OFF: The output is OFF after the Mechatronics Cylinder is first powered up and /or when an encoder-related alarm occurs. ZFIN won't be turned ON until the homing is completed.
21	ZONE	Zone signal output ① ON: The output will be ON when the position of the axis is within the range programmed to be the "Zone". ②OFF: The output will be OFF if the axis has not been homed or if the rod is outside the programmed zone.
22	ALM	Controller alarm output ① ON: The output will be ON during normal operation. ②OFF: The output will be OFF in case of Alarm occurs.
23	NC	No connection
24	FG	Frame Ground

6.2.4. Output signal details

[PFIN]
This is the position completion signal.
The output first goes high after the power supply is turned ON and the servo amplifier is ready for operation.
The PFIN signal will be turned OFF when the CSTR signal is turned ON to command a move. PFIN will be turned back ON when the current actuator position is within the range of the "At Position Width" parameter (set in the programming package) from the programmed destination position if the CSTR signal has been turned OFF.
The PFIN signal will also be turned OFF if the actuator is beyond the software stroke limit.

[ZFIN]
This is the homing completion output.
This output will be low when the power is turned ON and if any error/alarm relating to encoder has occurred.
This output will be high after the homing operation is completed.
The ZFIN signal won't be turned OFF during operation except in case of position feedback errors or control power shut down.

[ZONE]
This output signal will be high when the actuator position is within the zone boundaries set in the programming software or teach pendant.
This output will be low before homing completion (when the ZFIN output signal is OFF) and when the actuator is outside of the programmed ZONE range.
The ZONE output won't be affected by alarm conditions.

<u>[ALM]</u>
This is the alarm output and this output signal will be high when the operation is under normal conditions. This output signal will be low when an error has occurred. Alarm codes can be read from the pendant or software and referenced in section 9.

6.2.5. Timing Chart

Following is timing chart of the operation with parallel interface connection (PIO connection):

SCN5 Model (10Kgf Type)
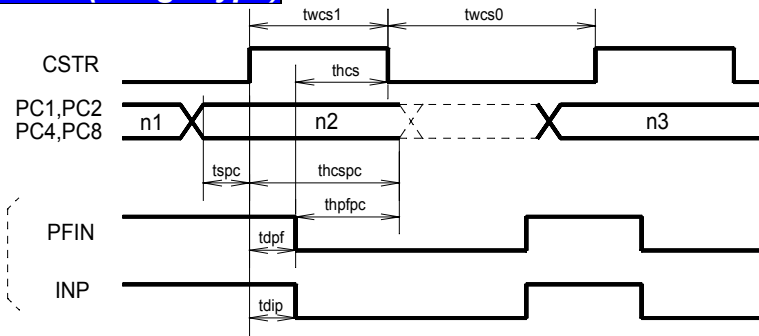
Name	Min.	Max.	Descriptions
twcs1	4 msec		CSTR ON shortest timing duration
twcs0	4 msec		CSTR OFF shortest timing duration
thcs	0 msec		PFIN OFF=>PC1 holding time
tspc	0 msec		CSTR ON=>PC1~PC8 set up time
thcspc	4 msec		CSTR ON=>PC1~PC8 holding time
thpfpc	0 msec		PFIN OFF=>PC1~PC8 holding time
tdpf		4 msec	CSTR ON=>PFIN OFF delay time
tdip		4 msec	CSTR ON=>INP OFF delay time

(Note 1) Above is timing in case of 10K Ω load or smaller of output circuit.
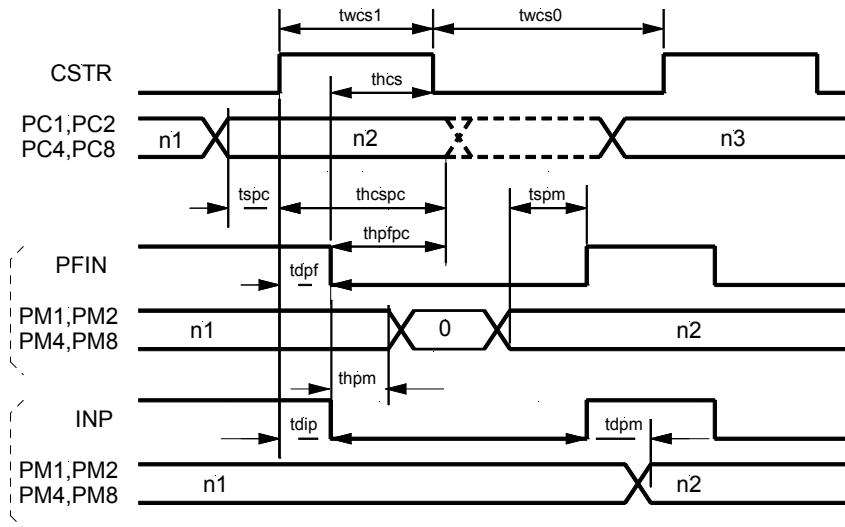
Name	Min.	Max.	Descriptions
twcs1	4 msec		CSTR ON shortest timing duration
twcs0	4 msec		CSTR OFF shortest timing duration
thcs	0 msec		PFIN OFF=>CSTR holding time
tspc	0 msec		CSTR ON=>PC1~PC8 set up time
thcspc	4 msec		CSTR ON=>PC1~PC8 holding time
thpfpc	0 msec		PFIN OFF=>PC1~PC8 holding time
tdpf		4 msec	CSTR ON=>PFIN OFF delay time
tspm	0 msec		PFIN ON=>PM1~PM8 set up time
thpm		4 msec	PFIN OFF=>PM1~PM8 0 Output delay time
tdip		4 msec	CSTR ON=>INP OFF delay time
tdpm		4 msec	INP ON=> PM1 ~ PM8 establishment delay time

(Note 1) Above is timing in case of 10K Ω load of output circuit or smaller.

6.3. Specification of SIO

In case of use of SIO, please refer the enclosed manual of "Termi-BUS Interface".

6.3.1. Summary

Electrical specification: Compatible with RS485
Speed: Selectable in the range of 9.6 kbps ~ 115.2 kbps
(9.6 kbps only after the BREAK order)
Synchronizing method: Micro timing adjusting method
Data (1 character) length: 8 bit
Parity: None
Start/Stop bit: 1 bit
Xon/Xoff: Non
Pallet length: 16 characters
(Structure: STX + data 12 characters + check sum 2 characters x etx)
Connection type: BUS connection (multi point connections: Max 16 axes)
Connectors: Connectors made by AMP company

Mechatronics Cylinder Connector Pin Layout

No.	Name	Functions
1	+5V	
2	TRx+	Transmitter/Receiver+
3	5G	Signal Ground
4	TRx-	Transmitter/Receiver-
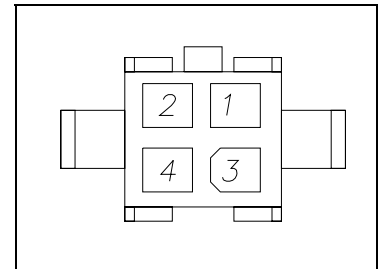
7. Support equipment

7.1. PC Tool (Model: TBVST-EN-SET)

PC Tool is a PC software kit to operate JOG and other set up for single axis.
(1) Contents of PC Tool, Model: TBVST-EN-SET *(see red circle in the following figure)*

①-1 PC Setting Tool : TBVST-EN (to install it in PC for Online operation)
①-2 Offline Setting Tool : CTA-1EX (to install it in PC for Online/Offline operation)
①-3 PC PLC Software : CTC-Tool (to install it in PC for sequence program)
①-4 Motor Set Up Tool : MVST-EN (to install it in PC for RSA servo motor set up)

② RS232/RS485 Adaptor : ADP-1 (to connect with PC serial port)

③ Connector Junction : ADP-2-4 (Junction for cables)

④ ADP Cable (1m) : RP9050-010 (to connect Mechatronics Cylinder and ADP-2-4)

⑤ SIO Cable (1m) : RP9041-010 (to connect ADP-1 and ADP-2-4)
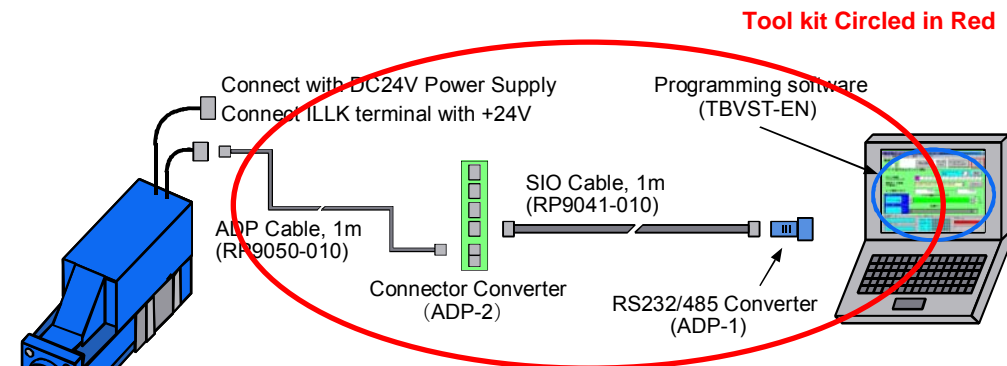
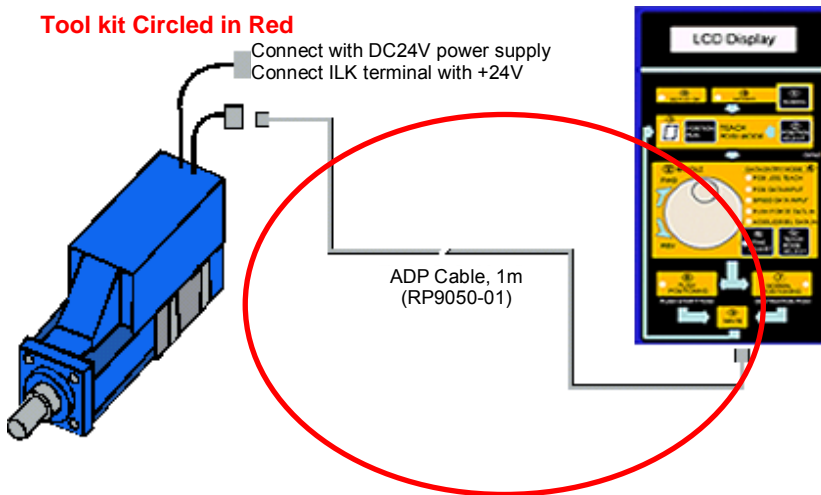Refer to the PC-Tool Manual for more information.

(2) How to install
Installation condition of PC is as follows:
WINDOWS 95, 98, 2000, NT 4.0

Please click the program button to start installation.

7.2. Teaching Pendant Tool (Model: CTA-23EN-SET)

(1) Contents of Teaching Pendant tool kit, Model: CTA-23ENS-SET *(see red circle in the following figure)*

① *Teaching Pendant* : *CTA-23EN* *(to connect with Mechatronics Cylinder)*

② *ADP Cable (1m)* : *RP9050-010* *(to connect Mechatronics Cylinder and CTA-23)*

Tool kit Circled in Red
Connect with DC24V power supply
Connect ILK terminal with +24V
ADP Cable, 1m
(RP9050-01)

(2) View of Teaching Pendant

(3) Please refer to the Teaching Pendant operation manual for details.
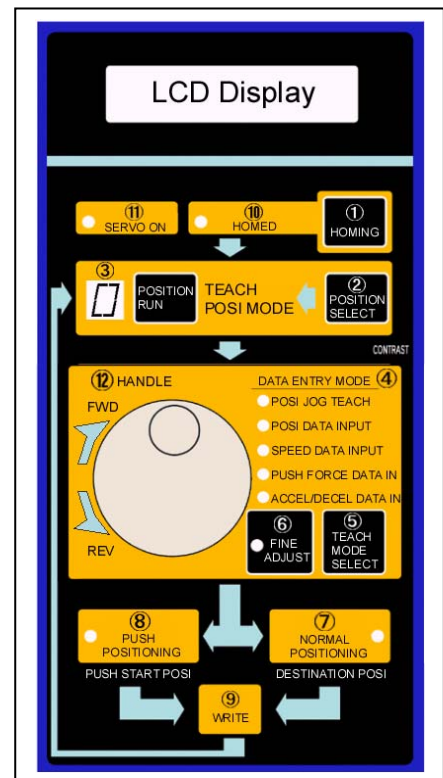
7.3. RS232C/RS485 Junction Converter Circuit

(Model: ADP-1)

(1) Model No.:   ADP-1
(2) Dimensions

61

34

22

15

TM2REA－0606
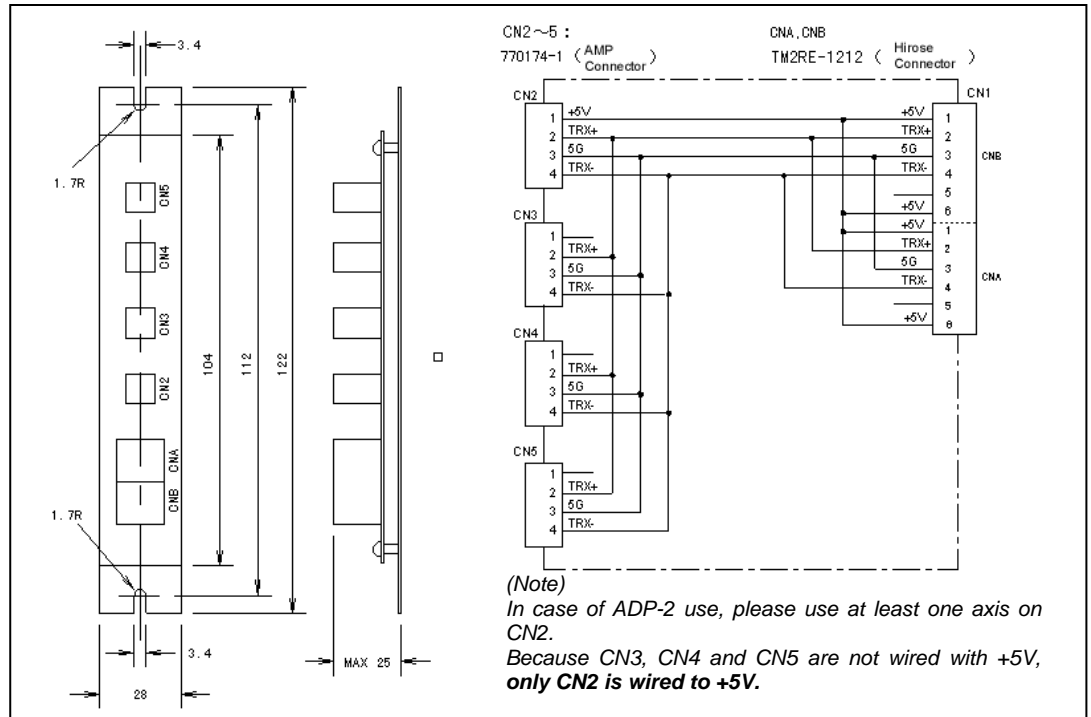manufacturer: Hirose

(Note 1)

Dsub 9 Pin
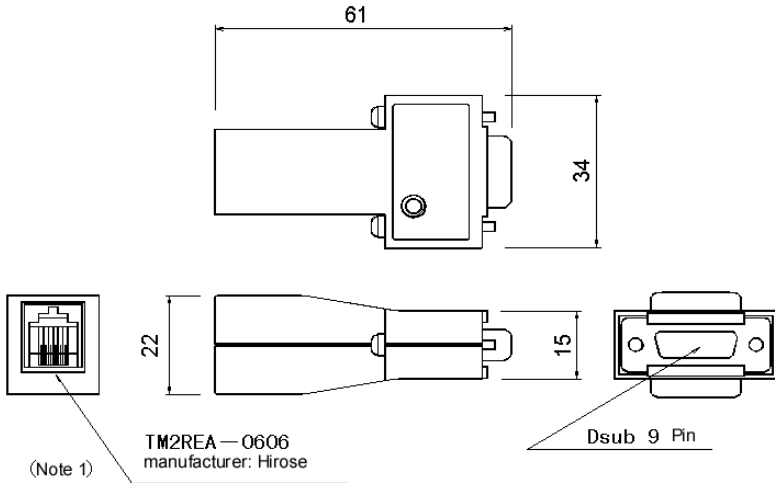
Please refer to 4.4 (wiring examples of outside connections) for connector connection. Please use SIO cable (6 conductors) for connector cable.

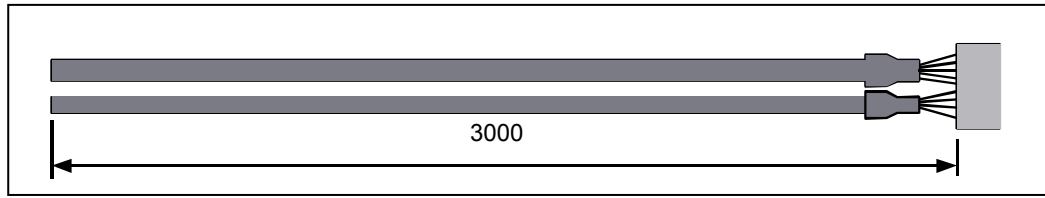## 7.4. Connector Converter: ADP-2-4

(1) model: ADP-2

(2) Dimensions
    and circuit diagram

(Note)
In case of ADP-2 use, please use at least one axis on CN2.
Because CN3, CN4 and CN5 are not wired with +5V, **only CN2 is wired to +5V.**

7.5. Cables

(1) Parallel connector cable

3000

SCN5 Model (10Kgf Type)

(Model: RP9100-030)

Connector	Made by Hirose
Socket	DF1B-14DES-2. 5RC
Pin	DF1B-2022SC (AWG22-20) DF1B-2428SC (AWG26-24)

3	PC1	Black
4	PC2	White
5	PC4	Red
6	PC8	Green
7	CSTR	Yellow
8	ILK	Brown
9	PFIN	Blue
10	ZFIN	Gray
11	ZONE	Orange
12	ALM	Light green

1	+24V	Red
2	0V	Black
13	FG	Green
14	FG	White

SCN6 Models / SCLT Models.
SCLL Model (External amplifier type)

(Model: RP9120-030)

Connector	Made by Hirose
Socket	DF1B-24DES-2. 5RC
Pin	DF1B-2022SC (AWG22-20) DF1B-2428SC (AWG28-24)

5	PC1	Black	15	PM1	Grey
6	PC2	White	16	PM2	Pink
7	PC4	Red	17	PM4	Light Green
8	PC8	Green	18	PM8	Orange
9	CSTR	Yellow	19	PFIN	Light blue
10	NC	Brown	20	ZFIN	Dark Brown
11	NC	Blue	21	ZONE	White/Black
12	ILK	Purple	22	ALM	Red/Black

1	+24V	Red	4	0V	White
2	0V	Black	23	NC (No connection)	Brown
3	+24V	Yellow	24	Ground	Green
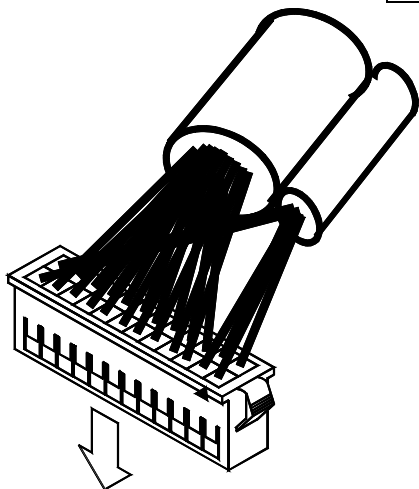
Parallel cable pin number
locations of RP9120)

24
23

1
2

Triangle Mark
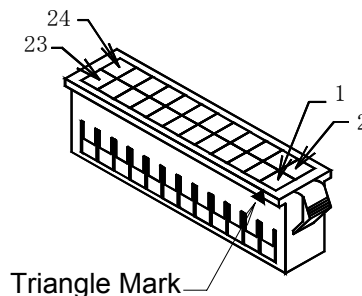
To the Mechatronics Cylinder Controller

(2) Serial connector cable (model: RP9050-030)
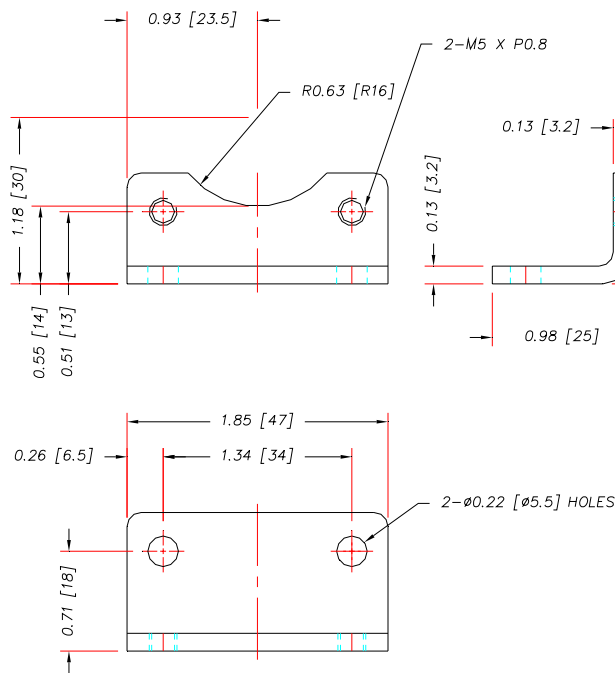### (applicable for any Mechatronics Cylinders)

1	+5V	Red
2	TRx+	White
3	0V	Black
4	TRx-	Green

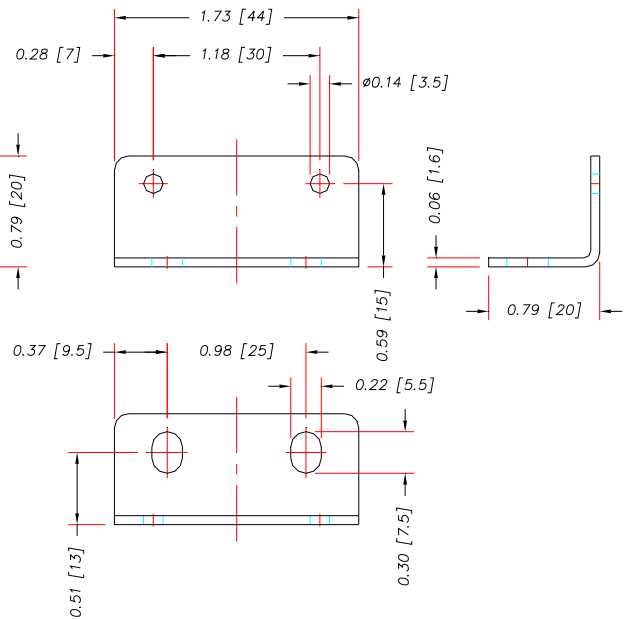| Connector	Made by AMP Co.
Socket	172167-1
Plug	170365-1

7.6. Foot mounting brackets

FT001: for SCN5
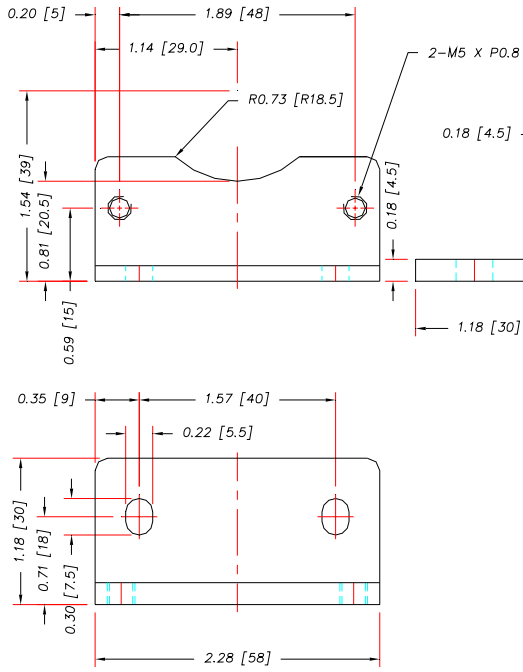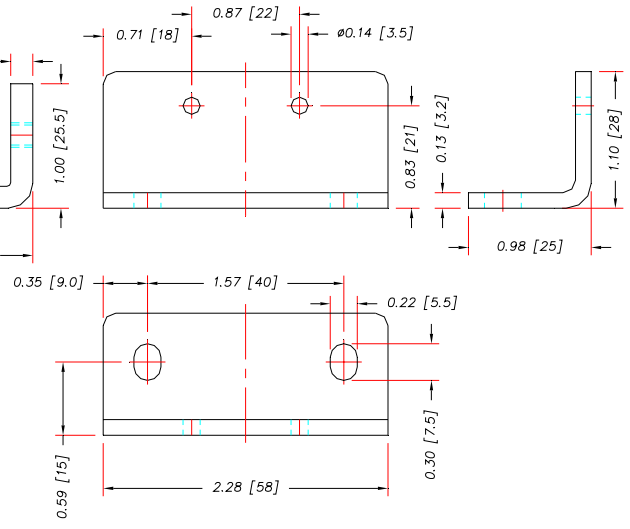
FRONT BRACKET

REAR BRACKET

FT002: for SCN6

FRONT BRACKET

REAR BRACKET

8. Maintenance

8.1. Maintenance & Inspection

Please inspect your Mechatronics Cylinder periodically following the chart below.

	Check Up Items	Points	Notes
Mechatronics Cylinder	Vibration and sound	Sound level should not be higher than usual	Check if there is no noise increase from regular operations.
	Appearance	Clean with cloths and/or air	
	Parts clean up	No major dust, dirt, oil, etc.	Clean with cloths and/or air
	Tightness of screws	No loose screws	Tighten screws

Notes: Ambient temperature should be within the specification. If the actual ambient temperature is greater than the specification, the actuator life will be shortened.

8.2. Warranty

In case of defects discovered upon delivery of your actuator, Mirai Inter-Technologies will replace the defective products. This warranty doesn't cover damage to products caused by the customer or incorrect orders by the customer.

9. Diagnosis of Abnormal Operation

9.1. Diagnosis by Alarm Codes

If an Alarm is detected, please investigate it using the following chart, and then remove the cause.
The controller will send an Alarm code (see following chart) through the SIO line.

Name of Alarm	Alarm Code	Conditions	Cause	Action
Bank 30 data error	B0	Occurs when bad data was entered	Out of range data entered	Modify data to fall within the range
Bank 31 data error	B1			
Encoder stall judge error	B8	Occurs when power was turned ON	Defective controller	Replace product
			Defective motor	Replace product
		Occurs other than above case	Defective controller	Replace product
Encoder counter error	B9	Occur when power was turned ON	Defective controller	Replace product
			Defective motor	Replace product
			Shaft seized	See Below (Action 1)
Homing time out error	BE	Occurs when homing	ILK signal is not turned ON	Turn ILK signal ON
			Defective motor	Replace product
Over speed	C0	Occurred when power was turned ON	Defective controller	Replace product
		Occurs during Cylinder operation	Defective motor encoder	Replace product
Servo error	C1	Occurred when power was turned ON	Defective controller	Replace product
Main power over voltage	D0	Occurred when power was ON	Defective controller	Replace product
		Occurred when power was ON	Over voltage of supply power	Correct supply power within the specification
		Occurs during Cylinder operation	Over load	Correct the load within the specification
Regenerative Voltage error	D1	Occurred when power was ON	Defective controller	Replace product
			Over voltage of supply power	Correct supply power within the specification
		Occurs during Cylinder operation	Over load	- Review mechanical design of customer to reduce load within the specification - Reduce the acceleration
			Incorrect parameter	Check parameter
Deviation counter error	D8	Occur when power was turned ON	Defective controller	Replace product
		Occurs during Cylinder operation	Over load	Check load
			Cylinder is being locked	Unlock
Over heat	E0	Occurred when power was turned ON	Defective controller	Replace product
		Occurs during Cylinder operation	Over load	Check load
			High ambient temperature	Cool down ambient temperature under 40°C
			Shaft is seized	See Below (Action 1)

		Cylinder runs for a while but not enough thrust, after a while, cylinder stall	Over load	Check load
		Occurs even though low thrust	Over load	Check load
Encoder wire disconnected (Both A wire, B wire)	E8	Occurred when power was turned ON	Wiring mistake of encoder	Repair wiring
			Defective amplifier	Replace amplifier
			Defective encoder of Cylinder motor	Replace product
		Occurs during Cylinder operation	Wiring mistake of encoder (defective connection)	Repair wiring
Encoder wire disconnected (A wire)	E9	Occurred when power was turned ON	Wiring mistake of encoder	Repair wiring
			Defective amplifier	Replace amplifier
			Defective encoder of Cylinder motor	Replace product
		Occurs during Cylinder operation	Wiring mistake of encoder (defective connection)	Repair wiring
Encoder wire disconnected (B wire)	EA	Occurred when power was turned ON	Wiring mistake of encoder	Repair wiring
			Defective amplifier	Replace amplifier
			Defective encoder of Cylinder motor	Replace product
		Occurs during Cylinder operation	Wiring mistake of encoder (defective connection)	Repair wiring
EEPROM Check Sum Error	F8	Occurred when power was turned ON, or during Cylinder operation	Defective control	Reset power (Turn power OFF, then turn power ON) If this error occurs again, replace product

9.2. Error Diagnosis by error operation of Mechatronics Cylinder

In case of error operation of Mechatronics Cylinder with no Alarm detection, please investigate the problem using the following chart.

Error Operation	Cause	How to check	Action
Cylinder doesn't start	Power is not turned ON or connected	- Check the voltage of power supply - Check the wiring of power	Power wiring to be corrected
	Loose connectors	Check connectors	Tighten loose connectors
	Shaft seized	Check if external load causing the shaft seized.	See Below (Action 1)
	External wiring mistake of connector	Check external wiring	Repair wiring

	Over load	Try to run Cylinder only without any load	Load to be within specs
	No movement signal	Check position program	Position program to be corrected
Cylinder moved just a moment but stalled	Wiring is wrong		Wiring to be corrected
Unstable Cylinder motion	Wiring connections are not stable	Check connections (Terminals, connectors, etc.) and wiring	Wiring to be corrected
Cylinder vibrates	Servo Gain is too high	Check Gain	Reduce Gain – factory default is 6
	Cable gets noise from other equipment	Test with other equipment off or isolated	Route cable away from noise source and/or Cable to be shielded
Cylinder heats up	Ambient temperature is too high	Check the ambient temperature	Lower the ambient temperature to under 40°C
	Cylinder surface is not clean	Check the appearance of Cylinder	Remove dust, oil etc. on the surface of Cylinder
	Overload	Try to run Cylinder without any load	Reduce the load and/or review the guiding design
Abnormal noise	Mounting is loose	Check the mounting of Cylinder and other machine, Loose mounting screws, incorrect concentricity, etc.	Correct the mounting and/or joint to load
	Other machine /equipment is vibrating	Check the moving parts of other machine	Check with the manufacturer of other machine
	Defective Cylinder	Try to use other good Cylinder	Replace product
	Cylinder hits the over stroke limit end due to over run	Reduce the Acceleration/Deceleration of Cylinder	Correct position accel /Deceleration
SIO communication is not valid	Communication method is not suitable	Check if output of main control system is RS485	In case of main control system RS232C, use a protocol converter for communication
	Output port # is set wrong		Correct output port number and setting
	Wrong axis number		Correct axis number
	Reply time of Cylinder is longer than receiving time of upper control System (PC)	Check if longer receiving time of main control system (PC) helps to communicate	Set shorter reply time of Cylinder

REFERENCE:

Action 1 – Shaft Seized

1. In this condition the actuator won't move. If this condition continues, the over-load alarm (code E0) will be output. If the problem (shaft seized) is not resolved when the main power is cycled (shut down and turned back ON), the encoder counter error (code B9) will be output.

2. Remedy
Please turn the power OFF and remove the external load to the actuator.
Please turn the power back ON, and try to run the actuator without any load.
If the shaft remains seized, please turn OFF the power and try several times to move the actuator
manually in the direction that the actuator was trying to move.
If the problem cannot be resolved, please replace the actuator.

Manufactured by:

Dyadic Systems Co.,Ltd.

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Ishikawa-Ken, 920-0342 Japan
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