Controller

Overview of Controllers

SCX11
Overview of Controllers

At Oriental Motor, a device that outputs the pulse signals required to operate a stepper motor or an AC servo motor is called a "controller". These products can perform various settings to control the motor and also permit connection with a programmable controller and sensors. Select a controller that best suits the system.

Features

- Possible to Set Positioning Operation Parameters
  The desired positioning operation parameters (number of operating pulses, starting pulse speed, operating pulse speed, acceleration/deceleration rate, etc.) can be set.

  ◇ Data Setting
  ![Diagram of data setting]
  
  # Starting Pulse Speed (VS) [Hz]
  This is the frequency at which output of pulse signals is started. The controller starts outputting pulse signals at the frequency specified by the starting pulse speed, and increases the frequency along the slope specified by the acceleration/deceleration rate.

  # Operating Pulse Speed (VR) [Hz]
  This is the target pulse signal frequency. This frequency dictates the operating speed of the motor.

  # Acceleration/Deceleration Rate (TR) [ms/kHz]
  This is the slope along which the pulse signal frequency is increased (acceleration) or decreased (deceleration).

  At Oriental Motor, the time needed to increase (or decrease) the frequency by 1 kHz is expressed in units of ms/kHz.

- Operation System
  A system configuration for controlling a positioning motor is shown below.
  The controller receives signals from the programmable controller and outputs pulse signals to the driver.

  ![System configuration diagram]
  
  ◇ Jerk Limiting Control Function for Suppressing Vibration of the Motor
  The "jerk limiting control function" allows for the suppression of the vibration that occurs when the motor is being driven or stopped. For example, it is effective in situations such as suppressing vibration from belt pulley driving.

  ◇ Measurement Condition
  Application: Belt drive
  Operating Mode: Positioning operation
  Load: 10 kg (22 lb.)

  Vibration that occurs when the operation mode is switched from acceleration and deceleration to constant speed manifests as vibration of the mechanism.

  By suppressing vibration that otherwise occurs when the operation mode is switched from acceleration and deceleration to constant speed, vibration of the mechanism is suppressed.

  ◇ These graphs are provided only as a reference. The actual effect of this function will vary depending on the mechanism of the equipment.
Offering Functions to Facilitate Motor Control

Return-to-Mechanical Home Operation Function

To perform accurate positioning operation, the mechanical home that defines the reference point must be determined accurately. Oriental Motor’s controllers are equipped with the “automatic return-to-home operation function.” All that is needed is to wire a home sensor, and the home detection function can be used right away.

Test Mode Function

When building equipment, sometimes it is necessary to perform operation verification for just the driving part before the sequence program is completed. Oriental Motor’s controllers are equipped with a “test mode”, which can be used to verify operation based on data set in the controller.

I/O Check Function

The connection (I/Os) with the programmable controller can be checked.

Traveling Amount Setting in Multiple Units such as mm

The traveling amounts can be set by angle (degrees) or mm in addition to pulses.

Setting in degrees

Setting in mm

The specifics vary depending on the product. For details, refer to the page explaining each product.
**Features**

- **100 Sequence Programs can be Stored**
  The SCX11 can store up to 100 programs and execute various operations, from simple movements like "repeated positioning operation" to complicated controls like "operation by calculating the value based on external inputs".

- **Easy Operation**
  The convenient and easy-to-use PC software, "Immediate Motion Creator for SCX Series", is provided with the SCX11. Easily start an operation with the click of a button or start key by setting the travel amount and speed. The GUI allows for easy program creation by selecting commands from the command list. Other functions available include, real time monitor for the teaching position, current position and I/O status, system parameter setting and I/O assignment.

- **Intelligent Setting**
  Program data for speed and travel amounts by setting the "User Unit" parameter. Data can be programmed in units such as "mm", "inch" and "revolution".

- **External Encoder Input**
  The SCX11 has a function for external encoder inputs which enables continuous monitoring of the feedback position and position error. Line driver, open collector and TTL inputs are compatible.

- **USB Port as Standard Equipment**
  The SCX11 has a mini USB port on the front panel which can directly connect to a PC through a commercially available mini USB cable. No special cable or converter is required.

- **Changeover from SCX10 is Possible**
  Functions like serial communication, I/O signals, commands etc. are the same as the SCX10, so changeover is easy.

The SCX11 universal controller is a highly functional and sophisticated controller, equipped with program editing and execution functions. The SCX11 is also able to control the motor via various serial ports such as USB, RS-232C and CANopen.
Network-Compatible Products, Controller

Network-Compatible Products Overview

Modbus (RTU)

EtherCAT

Network Converters

Controller Overview

SCX11

Various Interfaces for Operation

- I/O
- USB
- RS-232C-Connector
- CANopen-Connector

Stand-Alone Operation Using Sensors and Switches

The SCX11 can operate as a stand-alone controller, without a PC or programmable controller by utilizing 9 general inputs and 4 general outputs to select the desired sequences.

Direct Command Operation via CANopen

The SCX11 has a standard built-in interface for CANopen. CANopen for the SCX11 is certified by CiA (CAN in Automation).

Operation Using a PC

The SCX11 can connect to a PC via RS-232C or USB*. The SCX11 can also be connected via an RS-232C daisy chain connection for multi-axis control with another SCX11 or SCX10 controller.

Two Types of Operations

Executing Sequence Operation [Stored Program Function]

This function is available for conditional branching using general-purpose I/O, wait processes using internal timers and other operations based on sequence control including setting the positioning and speed data. The SCX11 can store up to 100 different programs that can be selected and executed via USB, RS-232C, CANopen and I/O port.

Example program:

<table>
<thead>
<tr>
<th>Seq</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V S 1 : Starting Velocity</td>
</tr>
<tr>
<td>2</td>
<td>V R 9 : Running Velocity</td>
</tr>
<tr>
<td>3</td>
<td>T A 1 : Acceleration Time</td>
</tr>
<tr>
<td>4</td>
<td>T D 2 : Deceleration Time</td>
</tr>
<tr>
<td>5</td>
<td>D I S 2 : Incremental Motion Distance*</td>
</tr>
<tr>
<td>6</td>
<td>L O O P 3 : Begin Counted LOOP Block</td>
</tr>
<tr>
<td>7</td>
<td>M I : Move Incremental Distance</td>
</tr>
<tr>
<td>8</td>
<td>M E N D : Wait for Motion End</td>
</tr>
<tr>
<td>9</td>
<td>W A I T 1 : Wait for Specified Time</td>
</tr>
<tr>
<td>10</td>
<td>E N D L : End of LOOP Block</td>
</tr>
<tr>
<td>11</td>
<td>M A : Move to Absolute Position</td>
</tr>
<tr>
<td>12</td>
<td>M E N D : Wait for Motion End</td>
</tr>
<tr>
<td>13</td>
<td>E N D : End Sequence</td>
</tr>
</tbody>
</table>

*Set the speed and travel amount as the unit of the actual motion such as "mm", "inch" and "revolution".

Multi-axis control via USB is configured with multiple USB ports.
Direct Command Operation
Operate a motor directly by sending commands via the serial port (USB, RS-232C, CANopen) from a PC or programmable controller. This function is suitable for applications where positioning data is updated frequently or managed all at once by the PC or programmable controller.

Example Commands
- DIS: Incremental Motion Distance
- VR: Running Velocity
- VS: Starting Velocity
- TA: Acceleration Time
- TD: Deceleration Time
- MI: Move Incremental Distance
- MA: Move to Absolute Position
- MCP: Move Continuously, Positive
- MCN: Move Continuously, Negative
- MGHP: Seek Mechanical Home Position
- ALMCCLR: Clear Alarm Condition

System Configuration
An example of a system configuration with the SCX11 controller.

Product Line

<table>
<thead>
<tr>
<th>Product Name</th>
<th>List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCX11</td>
<td>$349.00</td>
</tr>
</tbody>
</table>

*1 Not supplied
*2 Available for download. See website for details.

The system configuration shown above is an example. Other combinations are available.