SCARA robot

Control-related

CONTENTS

Controller
KSL3000

A controller for SCARA robots.
Compatible with all field networks.

Note: The set model number of the main body and controller is mainly used. Contact CKD for controller model numbers.
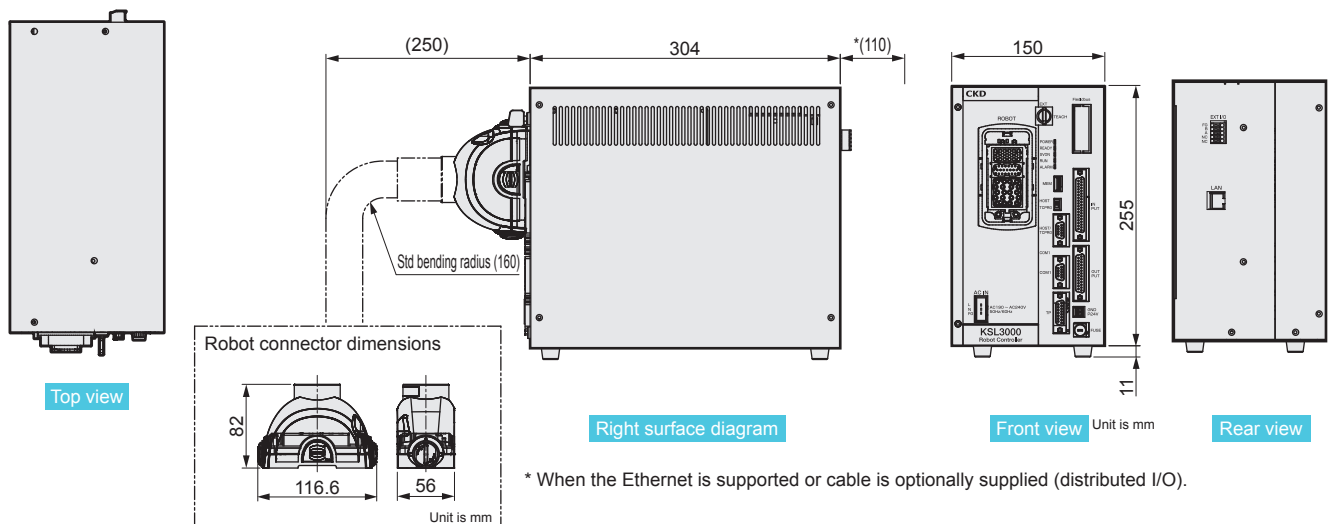
Specifications

No. of control axes		Max. number of axes: 4
Operation mode		PTP, CP (straight, arc), shortcut, arch movement
Storage capacity		Total: Approx. 6400 points + 12800 steps 1 program: Approx. 2000 points + 3000 steps
Number of registered programs		Up to 256 (user files: 247, system files: 9)
Programming language		Technical term "SCOL"
Teaching device (optional)		Handy terminal: KSL-TP1000 Program creation by PC software TSAssist (model No. KSL-TSA)
External I/O signal		8 input points/8 output points
Hand control signal		8 input points/8 output points
External operation signal	Input	Program selection, startup, stop, program reset, etc.
	Output	Servo ON, operation ready, failure, cycle stop, etc.
Communication port		RS-232C 1 port (HOST/TCPRG, switch change) only RS-232C 1 port (COM1) general purpose RS-485 1 port for distributed I/O only RS-422 1 port for KSL-TP1000 only Ethernet
Other functions and features		Torque limit, interrupt function, self-diagnosis, operating signal / communication processing, coordinate calculation, built-in PLC, fanless design, etc.
Power supply		Single-phase 190 to 240 VAC 50/60 Hz
Dimensions and weight *1		150 (W) x 266 (H) x 304 (D) mm, 7 kg
PC software (Option)		KSL-TSA: Program creation support software High-performance 3D simulation High-performance program editor, teaching function, etc. KSL-TCP: Program editor for built-in PLC
Option *2		External signal polarity ("N-type", "P-type"), I/O signal expansion, Fieldbus function added (PROFIBUS, DeviceNet, CC-Link, EtherNet/IP, EtherCAT, PROFINET), external input signal cable External output signal cable, controller mounting bracket

*1 Height H is the dimension including rubber feet. Installation requires peripheral space for cable wiring, etc. Contact CKD for details on dimensions.

*2 Ethernet is a registered trademark of XEROX Corp. of the United States. CC-Link is a registered trademark of CC-Link Association. DeviceNet and EtherCAT are registered trademarks of ODVA. PROFIBUS and PROFINET are registered trademarks of PROFIBUS User Organization. EtherCAT® is a patented technology licensed by Beckhoff Automation GmbH, Germany, and is a registered trademark.
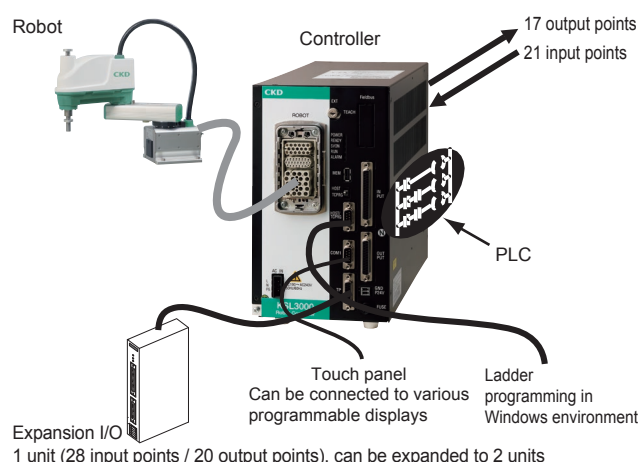
Product subject to the EAR (EAR99)

Dimensions

(250)   304   *(110)   150

Std bending radius (160)

255

11

Top view

Robot connector dimensions

82

116.6   56

Unit is mm

Right surface diagram

Front view   Unit is mm

Rear view

* When the Ethernet is supported or cable is optionally supplied (distributed I/O).

Built-in PLC function

The controller has a built-in simple PLC (Tcmini).
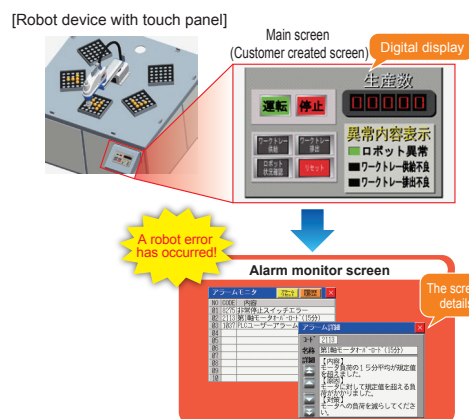I/O signals can be controlled by the ladder program regardless of robot operation.

- TCmini can control the standard I/O, expansion I/O and touch panel I/O with a ladder program and pass them to the robot program.
- It expands the flexibility of system design and allows peripheral devices to be controlled without using a commercially available PLC, making it extremely cost effective.
- Ladder programs can also be created, monitored and debugged using the PC software TCPRGS-W (model No. KSL-TCP) (sold separately).
- The scan time is 5 ms for 1K words. It can be connected to various programmable controllers and displays.
- Expansion I/O is sold separately.

Robot

Controller

17 output points
21 input points

PLC

Touch panel
Can be connected to various programmable displays

Ladder programming in Windows environment

Expansion I/O
1 unit (28 input points / 20 output points), can be expanded to 2 units

Compatible with digital cockpit parts

The status of the robot can be checked on the touch panel display.

- When an error occurs in the robot, the error details can be checked on the alarm monitor screen.
- In addition, the robot I/O monitor, current position monitor, I/O time chart, connected component data transfer function and various other screens are available.
- The above robot screen can be downloaded free of charge from the Digital Electronics Corporation website. As screen creation does not take a long time, it can be used on the day of purchase.
  http://www.proface.co.jp/otasuke/sample/download/common/connection_robot_con_ts_j.html
- Even a person who cannot operate the handy terminal can check the status of the robot.
- The robot and device information are displayed on the same display, allowing the cause of the trouble to be easily investigated.

[Robot device with touch panel]

Main screen (Customer created screen) Digital display

A robot error has occurred!

Alarm monitor screen

The screen displays the details of the error.

*A joint system of Toshiba Machine Corporation and Digital Electronics Corporation.
*Contact Digital Electronics Corporation for details of touch panel products compatible with this system.
http://www.proface.co.jp/otasuke/sample/detail/common/connection_robot_con_ts_j.html

Connection with image processing system

Allows direct connection with image processing systems manufactured by Keyence Corporation, OMRON Corporation and Panasonic Corporation. Contact CKD for details.

Handy terminal
KSL-TP1000

It can be connected to the controller to perform operations such as program and parameter input, jog, inching and servo free.
Equipped with an enable switch for safety.

How to order

KSL - TP1000 NN

Product subject to the EAR (EAR99)

Cable length	
NN	5 m (Standard)
10	10 m
15	15 m

PC software

A support tool that allows system upgrade to be performed efficiently in a short time. Compatible with all field networks.

How to order

| KSL | - | TSA |

| PC software	
TSA	TS Assist
TCP	TCPRGOS-W

KSL-TSA

1. High-performance 3D simulation   Can be used offline (preliminary study / design stage)

Interference check, trajectory display, accurate simulation by timer (cycle time measurement), placement of simple workpieces and simple models, importing 3D CAD data, saving 3D simulation video files, multi-angle view

These functions enable high-precision and high-quality estimations for automation. From simple simulations for grasping images to accurate simulations that are close to the actual equipment, they provide powerful support from the conceptualization and planning of pre-introduction studies for automation using robots to their implementation, as well as work to improve and convert existing automation equipment.

* Dedicated conversion software (Virfit Agent) is required to import 3D CAD data.

3D STEP file

CAD converter

Import
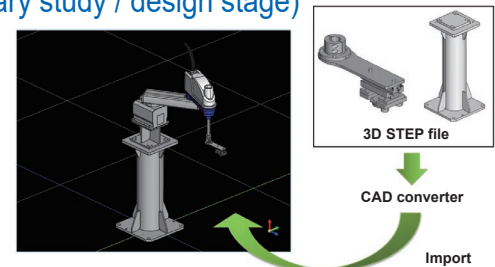
2. High-performance program editor

Language input support function (keyword suggestion function), outline display, split screen display

The point data edit screen (operation teaching position information) offers sort, search and filter functions. In the "3D edit" mode, the robot can be guided by mouse, and teaching points can be created by clicking on the model surface. These functions eliminate complicated teaching point calculation.

These convenient functions enable efficient programming. It also reduces coding errors.
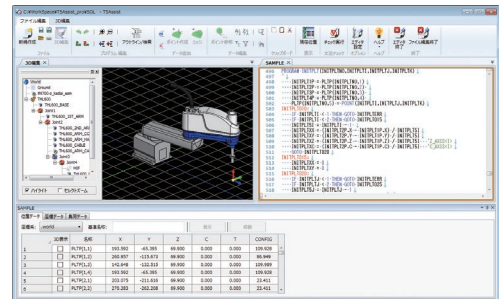
3. Easy to operate and ready to use

Easy to see and understand screen design, ribbon interface, window dock function that enables customization of the operation panel

It is easy to understand for robot programming beginners, allowing one to quickly learn the programming skills. Experienced robot users can customize their screens and use the functions of the program editor to improve programming efficiency.
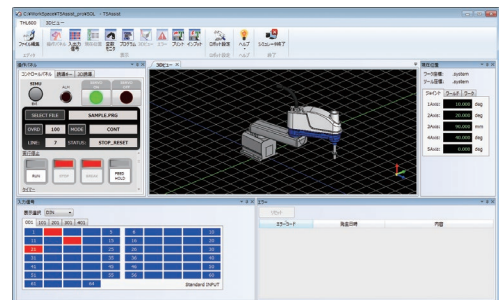
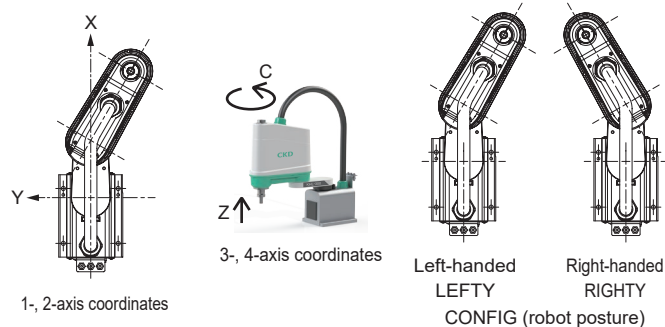## KSL-TCP sequence program creation (software for built-in PLC function)

1. Can be easily programed in ladder language without the knowledge of C or assembly language.
2. In addition to program creation, it can be used to monitor the ladder program and I/O online, which can greatly reduce the development and debugging period.
3. Various functions such as address map display, comment display and search are available.

CKD
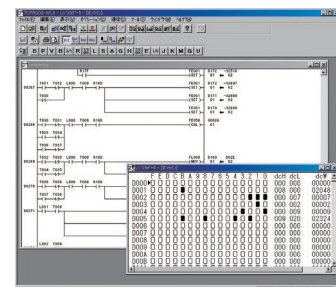
Teaching point

The teaching points of the robot are shown below.
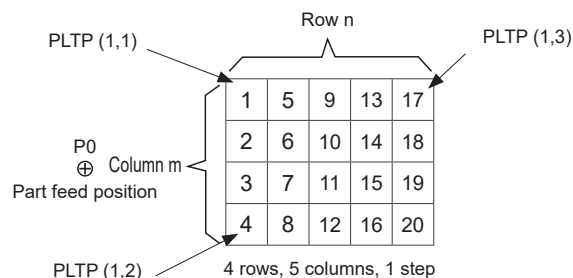Teaching point A1 = X Y Z C T CONFIG (posture)

X

C

Y

Z

3-, 4-axis coordinates

1-, 2-axis coordinates

Left-handed
LEFTY

Right-handed
RIGHTY

CONFIG (robot posture)

PTP (Point to Point) movement

The MOVE command is used to move from the current position to the specified position.

Text	Explanation
"MOVE position"	· Moves from the current position to the specified position. · All axes of the robot start moving at the same time. Since the robot moves along an easy-to-move path, the tip of the robot does not move in a straight path. · Set the teaching point name starting with an alphabet character and make it no longer than 10 characters.

Program examples	Explanation
PROGRAM MAIN MOVE A1 MOVE A2 MOVE A3 END	← Moves to teaching point A1 from the current position ← Moves to teaching point A2 from the current position ← Moves to teaching point A3 from the current position

X
+

A2

Path of robot tip

A1

A3

Current position

Teaching point

Y
+

-

-
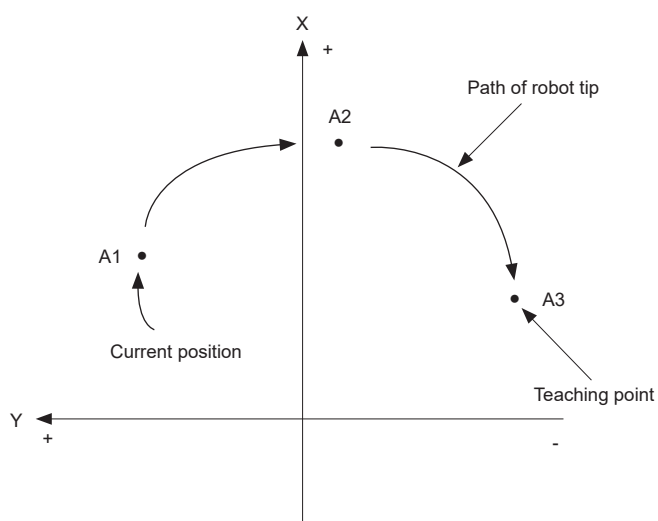
Palletizing

Palletizing is to move to target positions arranged in a grid. If the pallet has one step, there are only three teaching points.

PLTP (1,1)   Row n   PLTP (1,3)

1	5	9	13	17
2	6	10	14	18
3	7	11	15	19
4	8	12	16	20

P0
⊕ Column m
Part feed position

PLTP (1,2)   4 rows, 5 columns, 1 step

Program examples	Explanation
GLOBAL LOADLIB PALLET.LIB	← Loads pallet library *1
DIM PLTP(1,7) AS POINT END	← Declares pallet point The "1" in (1,7) is the number of pallets, "7" is a constant

PROGRAM MAIN
  INITPLT(1,4,5,1)
  FOR J=1 TO 20 STEP 1
	←INITPLT(k,m,n,p)
	 Initial pallet setting: kth sheet, row m, column n, step p

MOVE P0
  'HAND CLOSE
  MOVE P0+POINT(0,0,30)
  MOVEPLT(1,J,0,0,30,0)
	← Moves to P0
	 ← Grips parts
	 ← Retracts by 30 mm
	 ← Jth position of the pallet, moves 30 mm above

MOVEPLT(1,J,0,0,0,0)
  'HAND OPEN
  MOVEPLT(1,J,0,0,30,0)
  NEXT J
 END
	← Extends by 30 mm
	 ← Places parts
	 ← Returns to 30 mm above

*1 Pallet library: Pallet coordinate calculation software