RS

Rotary System Series

Rotary Actuator

Catalog #: RS-3A-

RS-30

Single-axis robot   Small size rotary type   30W

Model Specification Items

RS — ☐ — 30 — ☐ — ☐ — ☐ — ☐ — ☐

RS Series	Encoder type	Motor type	Speed reduction ratio	Movement range	Applicable controller	Cable length	Options
	A: Absolute specification	30: 30W	50: 1/50	360: 360 degrees	T1: XSEL-J/K	N: None	Refer to the options table below.
	I: Incremental specification		100: 1/100		T2: SCON SSEL XSEL-P/Q	S : 3m M: 5m X☐☐: Specified length	

Model Number/Specification

Model number	Encoder type	Motor output (W)	Speed reduction ratio	Movement range (degree)	Speed (degree/s)	Load inertia (Note1) (kg·m²)	Rated torque (N·m)
RS-①-30-50-360-②-③-④-L	Absolute Incremental	30	1/50	0~360	1~360	0.0578	3.3
RS-①-30-100-360-②-③-④-L			1/100		1~180	0.2303	6.65

* In the above model numbers, ① indicates the encoder type, ② indicates the applicable controller, ③ indicates the cable length, and ④ indicates the option(s).

Option

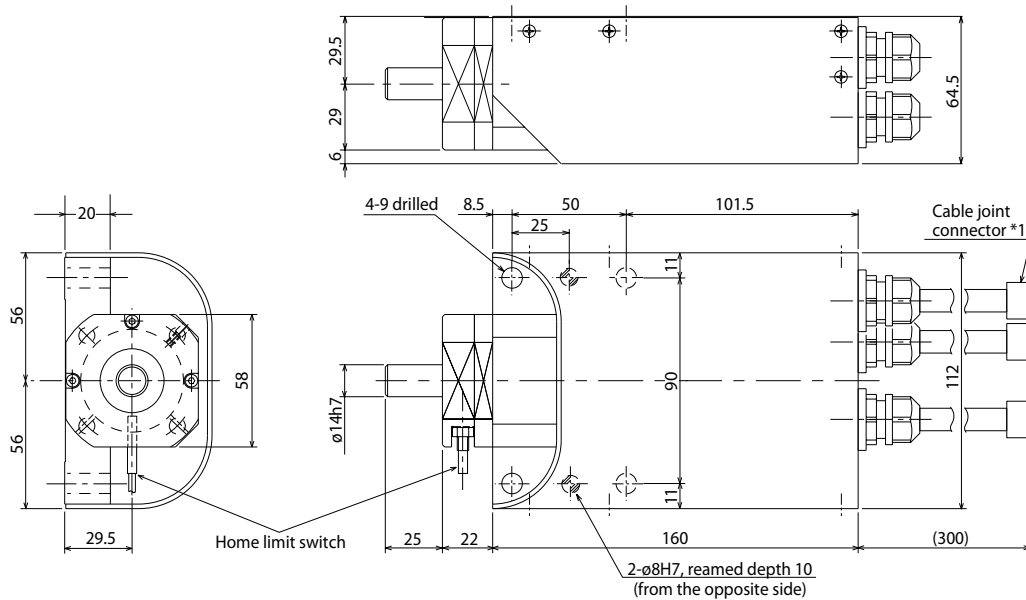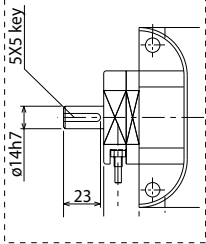| Name	Model number	Reference page	Notes
Key-slot option (output shaft)	K	Refer to the diagram below	
Home limit switch	L	Refer to the diagram below	Standard feature

* The home limit switch (L) is standard feature of the RS Series.

Common Specifications

Positioning repeatability	±0.028 degree
Speed reducer	Harmonic drive
Allowable dynamic load moment	9.8 N·m
Mass	2.0 kg
Applicable controller	T1: XSEL-J/K T2: XSEL-P/Q, SSEL, SCON
Cable length (Note 2)	N: None, S: 3m, M: 5m, X☐☐: Specified length
Ambient operating temperature/humidity	0 to 40°C, 85%RH (non-condensing)

Diagram

Key-slot shaft dimension

5X5 key
ø14h7
23

20
56
56
58
29.5

4-9 drilled
8.5
25
50
101.5
29.5
29
6
64.5

ø14h7
Home limit switch
25
22
90
11
11
160
(300)
112

Cable joint connector *1

2-ø8H7, reamed depth 10 (from the opposite side)

*1
Connect the motor cable, encoder cable, and limit switch cable. Refer to P. RS-4 & RS-5 for the cables.

Applicable Controller Specifications

Applicable Controller	Maximum number of controlled axes	Connectable encoder type	Operating method	Power-supply voltage	Reference page
X-SEL-P/Q	6 axes	Absolute/ incremental	Program	Single/three-phase 200 VAC	
X-SEL-J/K	4 axes				
SSEL	2 axes			Single-phase 100/200 VAC	
SCON	1 axis		Positioner pulse train control		

⚠ CAUTION

(Note 1) The load inertia is to be calculated based on the application conditions. The calculated load inertia is not to exceed the actuator's load inertia. (Please see P. RS-3 for further details.)

(Note 2) The maximum cable length is 30 m. Specify a desired length in meters. (Example. X08 = 8 m)

RS-60

Single-axis robot　Medium size rotary type　60W

Model Specification Items

RS — ☐ — **60** — ☐ — ☐ — ☐ — ☐ — ☐

RS	Encoder type	Motor type	Speed reduction ratio	Movement range	Applicable controller	Cable length	Options
Series	A: Absolute specification I: Incremental specification	60: 60W	50: 1/50 100: 1/100	360: 360 degrees	T1: XSEL-J/K T2: SCON SSEL XSEL-P/Q	N : None S : 3m M: 5m X☐☐: Specified length	Refer to the options table below.

Model Number/Specification

Model number	Encoder type	Motor output (W)	Speed reduction ratio	Movement range (degree)	Speed (degree/s)	Load inertia (Note1) (kg·m²)	Rated torque (N·m)
RS-①-60-50-360-②-③-④-L	Absolute Incremental	60	1/50	0~360	1~360	0.108	5.58
RS-①-60-100-360-②-③-④-L			1/100		1~180	0.421	11.1

* In the above model numbers, ① indicates the encoder type, ② indicates the applicable controller, ③ indicates the cable length, and ④ indicates the option(s).
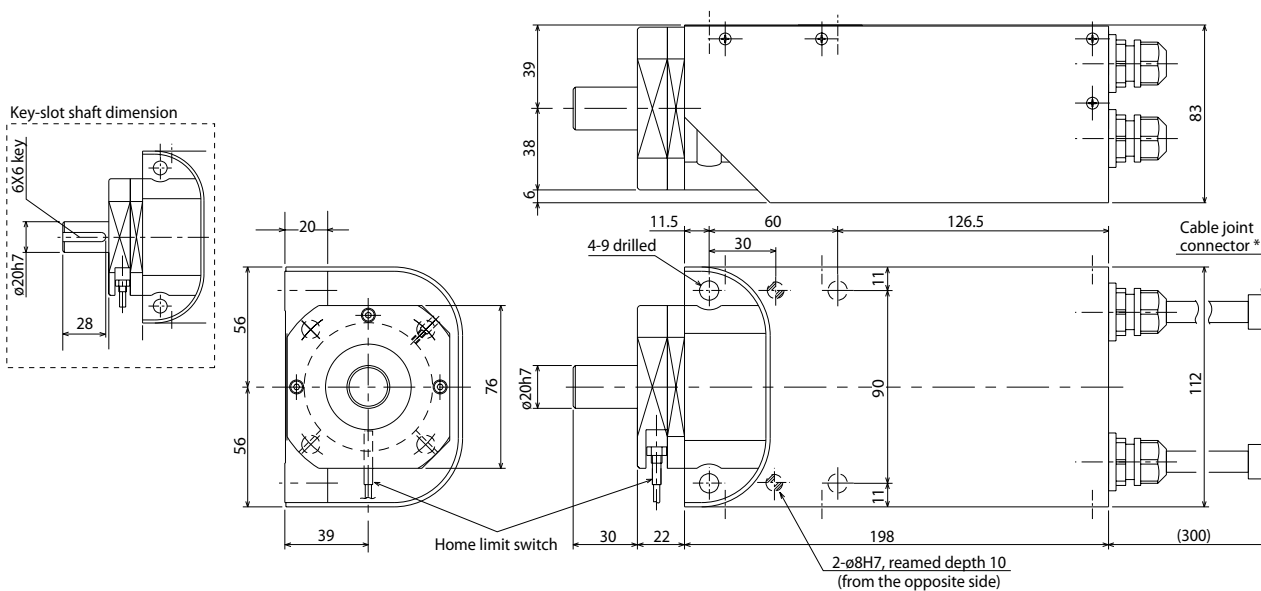* If higher torque is needed, custom order can be arranged.

Option

Name	Model number	Reference page	Notes
Key-slot option (output shaft)	K	Refer to the diagram below	
Home limit switch	L	Refer to the diagram below	Standard feature

* The home limit switch (L) is standard feature of the RS Series.

Common Specifications

Positioning repeatability	±0.028 degree
Speed reducer	Harmonic drive
Allowable dynamic load moment	23.5 N·m
Mass	3.2 kg
Applicable controller	T1: XSEL-J/K　T2: XSEL-P/Q, SSEL, SCON
Cable length (Note 2)	N: None, S: 3m, M: 5m, X☐☐: Specified length
Ambient operating temperature/humidity	0 to 40°C, 85%RH (non-condensing)

Diagram

Key-slot shaft dimension
6X6 key
ø20h7
28

39　38　6
11.5　60　126.5
83

56　76　56
20
39
4-9 drilled
ø20h7
Home limit switch
30　22　198　(300)
11　90　11
112

2-ø8H7, reamed depth 10 (from the opposite side)

Cable joint connector *1

*1
Connect the motor cable, encoder cable, and limit switch cable. Refer to P. RS-4 & RS-5 for the cables.

Applicable Controller Specifications

Applicable Controller	Maximum number of controlled axes	Connectable encoder type	Operating method	Power-supply voltage	Reference page
X-SEL-P/Q	6 axes	Absolute/incremental	Program	Single/three-phase 200 VAC	
X-SEL-J/K	4 axes			Single-phase 100/200 VAC	
SSEL	2 axes				
SCON	1 axis		Positioner pulse train control		

⚠ **CAUTION**

(Note 1) The load inertia is to be calculated based on the application conditions. The calculated load inertia is not to exceed the actuator's load inertia. (Please see P. RS-3 for further details.)

(Note 2) The maximum cable length is 30 m. Specify a desired length in meters. (Example. X08 = 8 m)

RS-2 RS-60

Rotary Shaft (RS Series) Selection Guide

For selecting the right RS Series model for your particular application, check the following points:

● **Speed and Load Inertia**

First, determine the actuator speed required in your application. Second, determine the load inertia based on the shape and the weight of the arm, chuck, or other end-effector to be attached to the rotating axis of your RS Series rotary actuator. Third, refer to the table below and select an actuator model with a larger load inertia than that required in your system.

Model	RS-30W		RS-60W	
Speed Reduction Ratio	1/50	1/100	1/50	1/100
Rated Speed (degree/s)	360	180	360	180
Load Inertia kg·m² (kgf•cm-s²)	0.058 (0.59)	0.23 (2.35)	0.11 (1.1)	0.42 (4.3)

● **Load Capacity and Load Inertia of the Motor**

Load inertia is determined by the weight and the shape of the body, and is expressed as **J=∫ r²dM**. The load inertia of a simple shaped body is expressed as **J=MK²**.

With the RS Series rotary actuators, a rotating force is applied to the payload which causes it to spin around. This rotating force is expressed as torque. Torque is also called the moment of force. **In linear motion**, when force is applied to a weight (inertia), acceleration is generated in the direction of the force.

In a rotational motion, when torque is applied to a body which has a load inertia, angular acceleration is generated. Therefore, the load capacity of a rotary actuator is expressed in terms of load inertia.
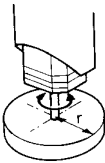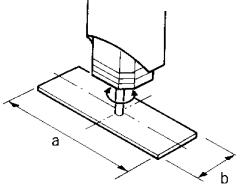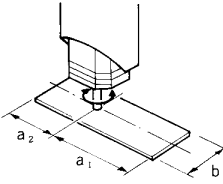
$$F = M \cdot a$$

F : Force　　　N (kgf)

M : Weight　　(kg)

a : Acceleration　(cm/s²)

$$T = J \cdot \dot{\omega}$$

T : Torque　　　　N·m (kgf-cm)

J : Load Inertia　　kg·m² (kgf•cm-s²)

$\dot{\omega}$: Angular Acceleration　(rad/s²)

● **Determining the Load Inertia of a Typical Shaped Body**

J : Load Inertia (kg·m²)　　　M : Load Weight (kg)　　　r, a, a₁, a₂, b : Distance (m)

① **Cylinder (includes Thin Circular Plate)**	② **Thin Rectangle (Rectangular Parallelepiped)**	③ **Thin Rectangle Plate (Rectangular Parallelepiped)**
Rotating axis is at the center of the axis.	Rotating axis goes through the center of gravity of the plate, and is perpendicular to the axis.	Rotating axis goes through a point on the plate, which is perpendicular to the axis.
$J = M \cdot \dfrac{r^2}{2}$	$J = M \cdot \dfrac{a^2 + b^2}{12}$	$J = M_1 \cdot \dfrac{4a_1^2 + b^2}{12} + M_2 \cdot \dfrac{4a_2^2 + b^2}{12}$

RS Series Lineup

RS-60W　　　　RS-30W

● **Guidelines for Rotary Actuator Model Selection**

To select the right RS Series actuator for your application, consider the position of the payload to be attached to the output shaft of the actuator. Refer to the model selection guidelines below:

A. Payload is centered and located directly below the actuator.

Weight of circular plate (kg) — RS-60, RS-30 — Radius of circular plate (cm)

<Reduction Ratio 1/50>

Weight of circular plate (kg) — RS-60, RS-30 — Radius of circular plate (cm)

<Reduction Ratio 1/100>

B. Payload is offset from the rotating axis shaft of the actuator.

(Load) — r (Offset distance) — Payload weight (kg) — RS-60, RS-30 — Offset distance (cm)

<Reduction Ratio 1/50>

Payload weight (kg) — RS-60, RS-30 — Offset distance (cm)

<Reduction Ratio 1/100>
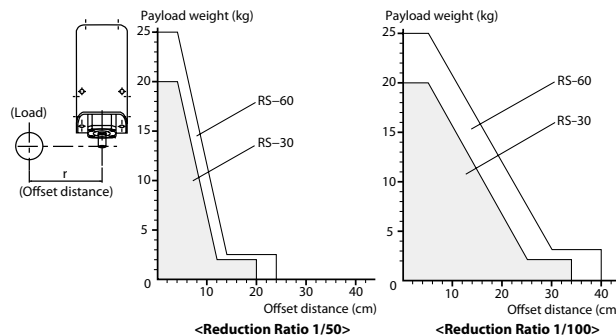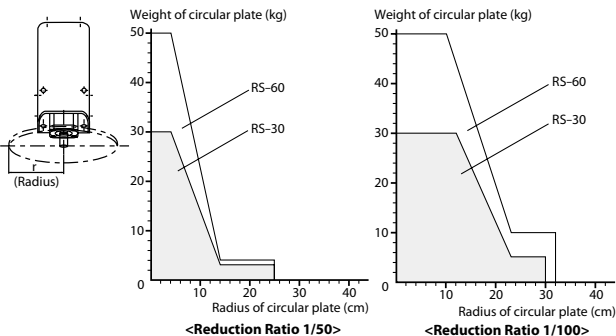
Technical Reference **RS-3**

Motor Cable / Encoder Cable

These are joint cables to connect the actuator cable joint connector and the controller.

There are two kinds of cables; a motor cable for the motor power, and an encoder cable for the encoder signals.

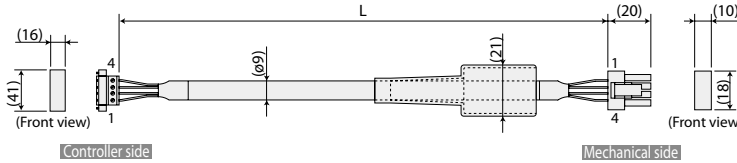Also, when you use the cable with a cable track, please use the robot cable which is heavy-duty and has excellent bending resistance. (*)

(*) For motor/encoder cables for single-axis robots, all the standard cables are robot cables.

Motor cable (for XSEL-J/K/P/Q, SSEL, SCON)

Model: **CB-X-MA□□□**

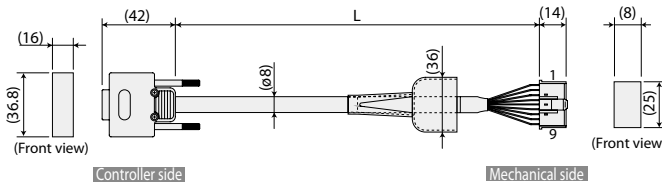* □□□ is the cable length (L); supports up to 30m.
Example: 080 = 8m

Minimum bend radius R: r = 51mm or larger (for movable use)

Wire	Color	Signal	No.		No.	Signal	Color	Wire
0.75sq	Green	PE	1		1	U	Red	0.75sq (crimped)
	Red	U	2		2	V	White	
	White	V	3		3	W	Black	
	Black	W	4		4	PE	Green	

Encoder cable (for XSEL-J/K)

Model: **CB-X-PA□□□**

* □□□ is the cable length (L); supports up to 30m.
Example: 080 = 8m

Minimum bend radius R: r = 44mm or larger (for movable use)

Wire	Color	Signal	No.		No.	Signal	Color	Wire
0.15sq (crimped)	—	—	1		1	BAT+	Black	0.15sq (crimped)
	—	—	2		2	BAT-	Yellow	
	—	—	3		3	SD	Blue	
	—	—	4		4	$\overline{SD}$	Orange	
	—	—	5		5	VCC	Green	
	—	—	6		6	GND	Brown	
	Blue	SD	7		7	FG	Ground	
	Orange	$\overline{SD}$	8		8	BK-	Gray	
	Black	BAT+	9		9	BK+	Red	
	Yellow	BAT-	10					
	Green	VCC	11					
	Brown	GND	12					
	Gray	BK-	13					
	Red	BK+	14					
	—	—	15					

The shield is clamped to the hood

Braided ground & shield wire

Limit switch cable (for XSEL-J/K)

Model: **CB-X-LC□□□**

* □□□ is the cable length (L); supports up to 30m.
Example: 080 = 8m

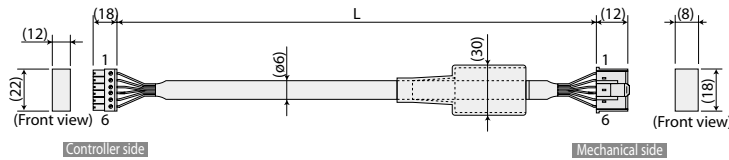Minimum bend radius R: r = 33mm or larger (for movable use)

Wire	Color	Signal	No.		No.	Signal	Color	Wire
AWG24	Light Blue	24VOUT	6		1	24VOUT	Light Blue	AWG24 (crimped)
	Pink	N	5		2	N	Pink	
	Light Green	LS	4		3	LS	Light Green	
	Orange	CREEP	3		4	CREEP	Orange	
	Gray	OT	2		5	OT	Gray	
	1B/Light Blue	RSV	1		6	RSV	1B/Light Blue	

Note) 1B indicates one black dot mark.

Encoder cable (for XSEL-P/Q, SSEL, SCON)

Model: **CB-X1-PA**☐☐☐

*☐☐☐ is the cable length (L); supports up to 30m.
Example: 080 = 8m

Plug housing: XMP-09V (Nichiatsu)
Socket contact: BXA-001T-P0.6 (Nichiatsu) x 9
Retainer: XMS-09V (Nichiatsu)

Minimum bend radius R: r = 44mm or larger (for movable use)

Wire	Color	Signal	No.
	—	—	10
	—	—	11
	—	E24V	12
	—	OV	13
	—	LS	26
	—	CREEP	25
	—	OT	24
	—	RSV	23
AWG26 (soldered)	—	—	9
	—	—	18
	—	—	19
	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	—		22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	BAT+	Purple	
2	BAT-	Gray	
3	SD	Orange	
4	SD	Green	
5	VCC	Red	AWG26 (crimped)
6	GND	Black	
7	FG	Ground	
8	BK-	Blue	
9	BK+	Yellow	

Braided ground & shield wire

Encoder Cable (for XSEL-P/Q, SSEL, SCON, and LS equipped connection)

Model: **CB-X1-PLA**☐☐☐

*☐☐☐ is the cable length (L); supports up to 30m.
Example: 080 = 8m

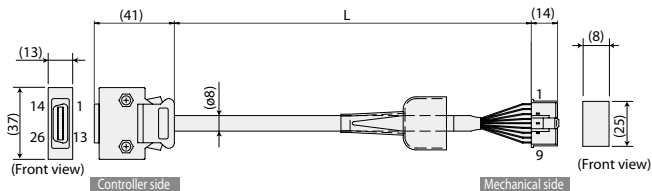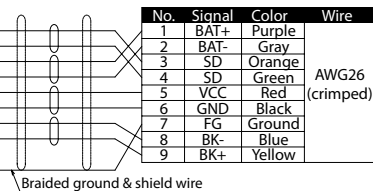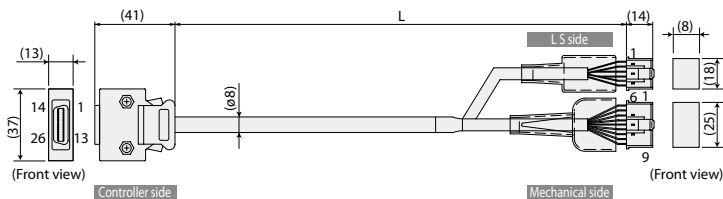Minimum bend radius R: r = 54mm or larger (for movable use)

Wire	Color	Signal	No.
	—	—	10
	—	—	11
	White/Blue	E24V	12
	White/Yellow	OV	13
	White/Red	LS	26
	White/Black	CREEP	25
	White/Purple	OT	24
	White/Gray	RSV	23
	—	—	9
	—	—	18
	—	—	19
AWG26 (soldered)	—	A+	1
	—	A-	2
	—	B+	3
	—	B-	4
	—	Z+	5
	—	Z-	6
	Orange	SRD+	7
	Green	SRD-	8
	Purple	BAT+	14
	Gray	BAT-	15
	Red	VCC	16
	Black	GND	17
	Blue	BKR-	20
	Yellow	BKR+	21
	—		22

The shield is clamped to the hood

No.	Signal	Color	Wire
1	E24V	White/Blue	
2	OV	White/Yellow	
3	LS	White/Red	AWG26 (crimped)
4	CREEP	White/Black	
5	OT	White/Purple	
6	RSV	White/Gray	

No.	Signal	Color	Wire
1	BAT+	Purple	
2	BAT-	Gray	
3	SD	Orange	
4	SD	Green	
5	VCC	Red	AWG26 (crimped)
6	GND	Black	
7	FG	Ground	
8	BK-	Blue	
9	BK+	Yellow	

Braided ground & shield wire

(White/Blue in cable color indicates the colors of line/insulator.)