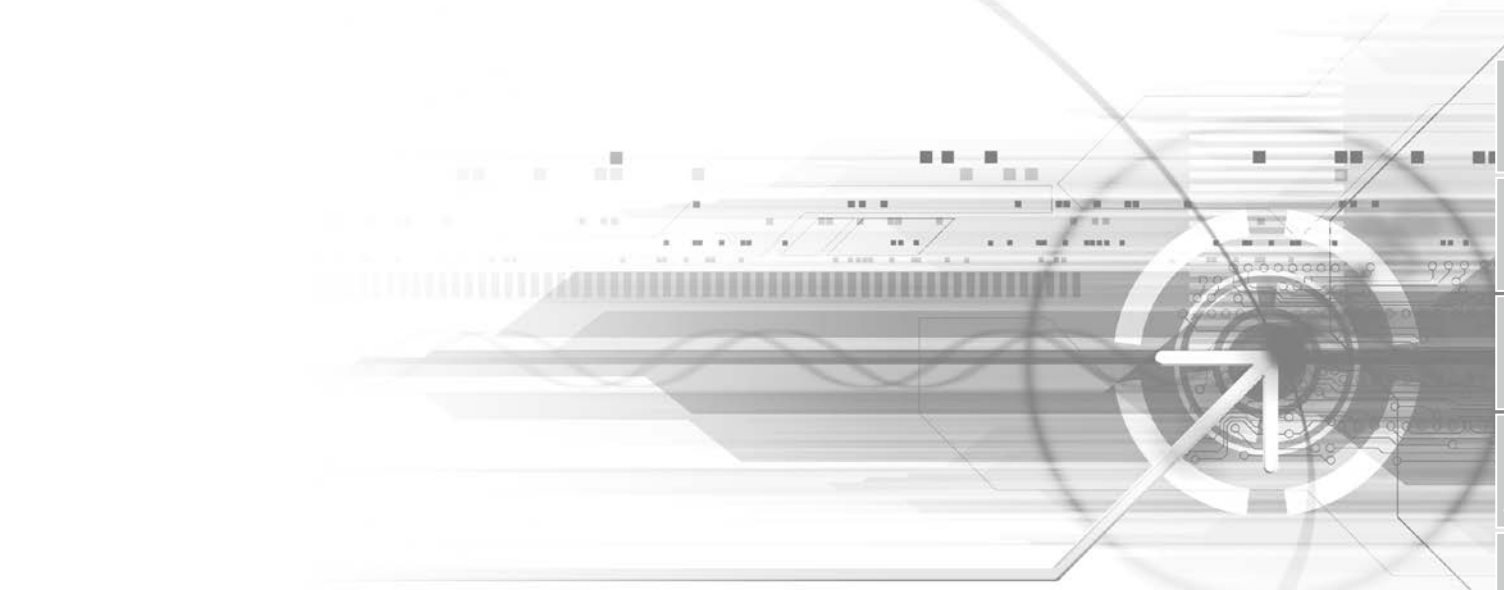


ALL TYPES OF INFORMATION

INFORMATION

CONTENTS

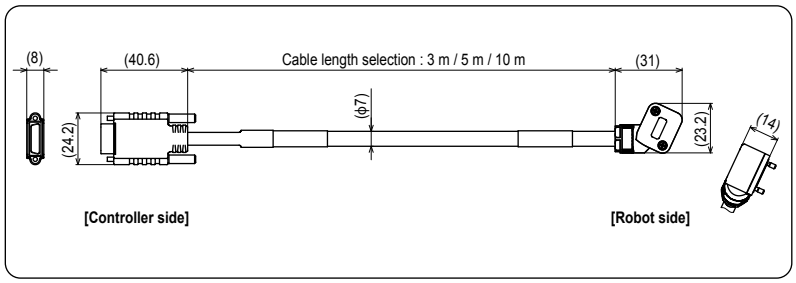
Robot cable table

The robot cable is a cable joining the robot to the controller.

Single-axis robot cable

YHX cable

[Encoder cable (Common for GX series)]



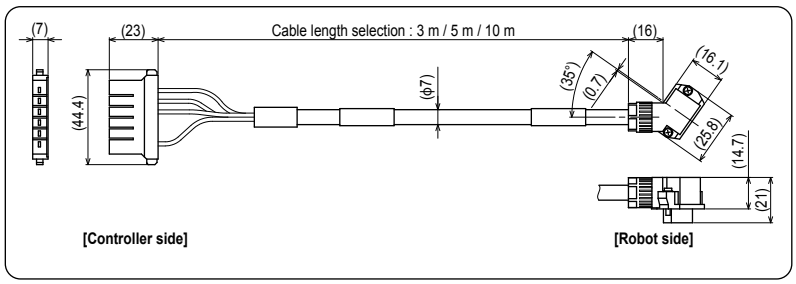
Rear **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-ENC-R3R	KES-M4751-30
5m	GXCC-ENC-R5R	KES-M4751-50
10m	GXCC-ENC-R10R	KES-M4751-A0

Front **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-ENC-R3F	KES-M4755-30
5m	GXCC-ENC-R5F	KES-M4755-50
10m	GXCC-ENC-R10F	KES-M4755-A0

[Power cable (GX05 / GX05L / GX07)]

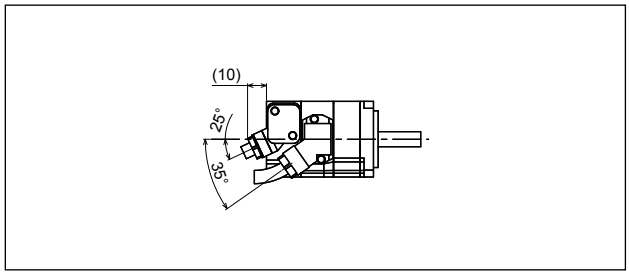


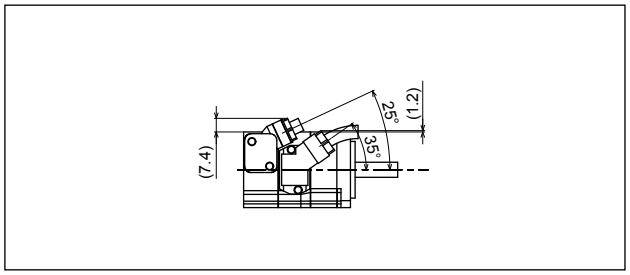
Rear **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW40-R3R	KES-M4752-30
5m	GXCC-UVW40-R5R	KES-M4752-50
10m	GXCC-UVW40-R10R	KES-M4752-A0

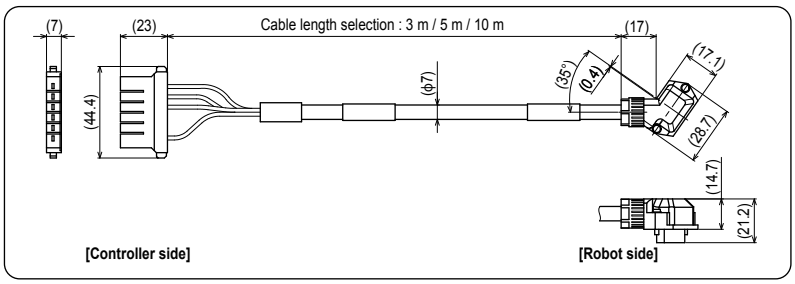
Front **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW40-R3F	KES-M4756-30
5m	GXCC-UVW40-R5F	KES-M4756-50
10m	GXCC-UVW40-R10F	KES-M4756-A0



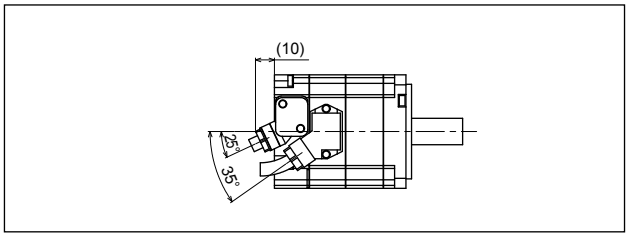


[Power cable (GX10 / GX12)]



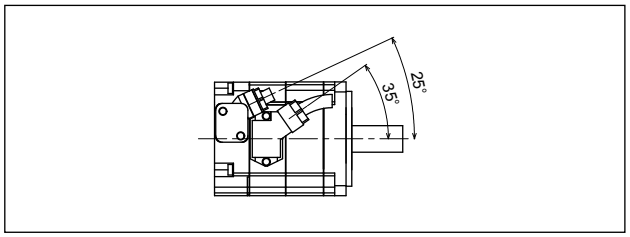
Rear **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW60-R3R	KES-M4753-30
5m	GXCC-UVW60-R5R	KES-M4753-50
10m	GXCC-UVW60-R10R	KES-M4753-A0

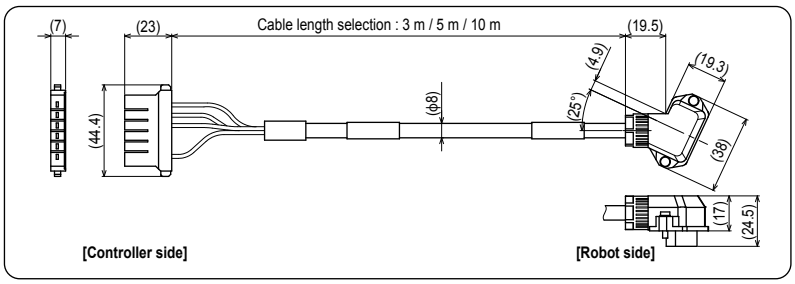


Front **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW60-R3F	KES-M4757-30
5m	GXCC-UVW60-R5F	KES-M4757-50
10m	GXCC-UVW60-R10F	KES-M4757-A0

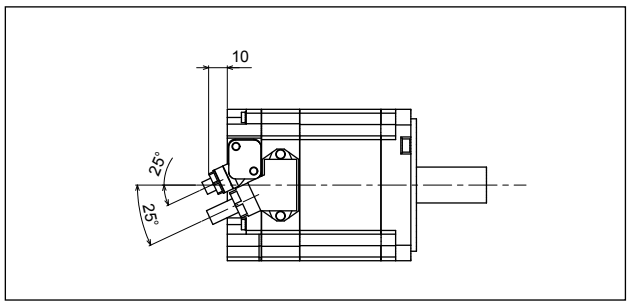


[Power cable (GX16 / GX20)]



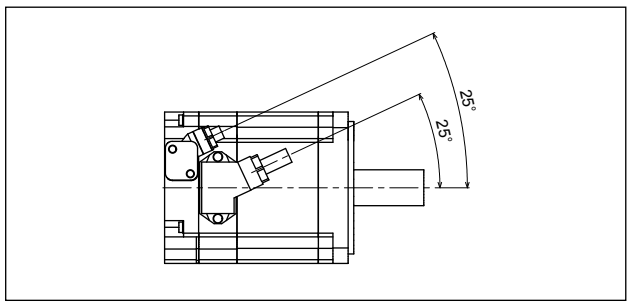
Rear **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW80-R3R	KES-M4754-30
5m	GXCC-UVW80-R5R	KES-M4754-50
10m	GXCC-UVW80-R10R	KES-M4754-A0



Front **Extraction specifications**

Cable length	Product model	Part No.
3m	GXCC-UVW80-R3F	KES-M4758-30
5m	GXCC-UVW80-R5F	KES-M4758-50
10m	GXCC-UVW80-R10F	KES-M4758-A0



Robot cable table

TS-S/TS-S2/TS-SD cable

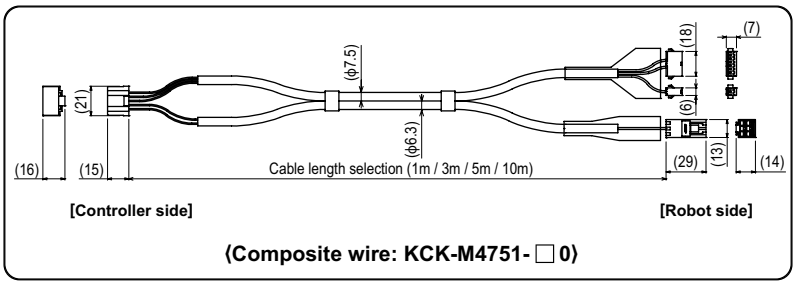
[Flexible cable]

Connected robot ▷ **TRANSERVO**

Set	Single item	
-	Composite wire	KCK-M4751- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
1	1m
3	3m
5	5m
A	10m



⟨Composite wire: KCK-M4751- □ 0⟩

TS-S2S cable

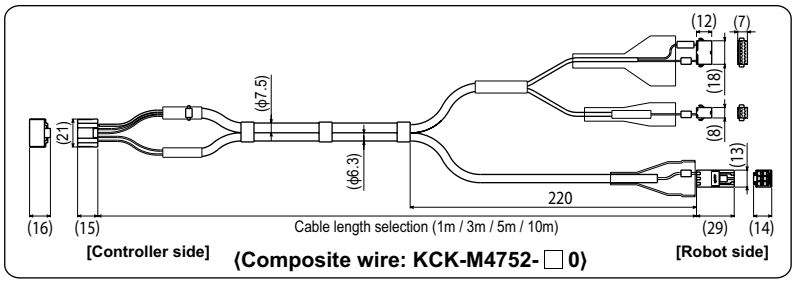
[Flexible cable]

Connected robot ▷ **TRANSERVO**
(RF Type Sensor specification)

Set	Single item	
-	Composite wire	KCK-M4752-□ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
1	1m
3	3m
5	5m
A	10m



⟨Composite wire: KCK-M4752- □ 0⟩

TS-X cable

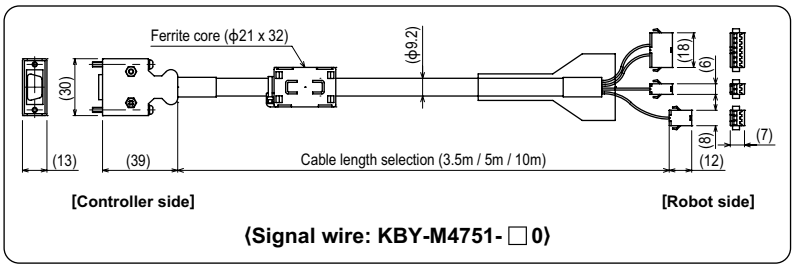
[Standard cable]

Connected robot ▷ **FLIP-X**

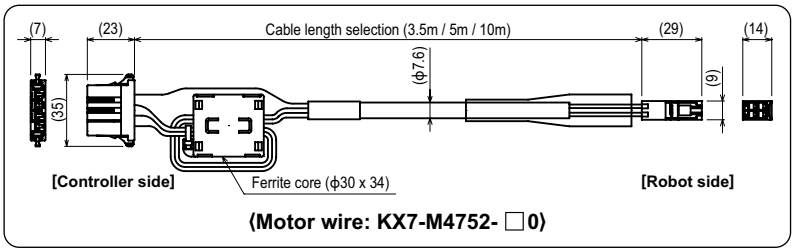
Set	Single item	
KBY-M4710- □ 0	Signal wire	KBY-M4751- □ 0
	Motor wire	KX7-M4752- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨Signal wire: KBY-M4751- □ 0⟩



⟨Motor wire: KX7-M4752- □ 0⟩

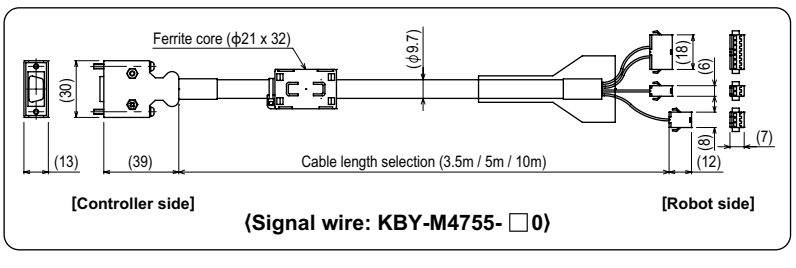
[Flexible cable]

Connected robot ▷ **FLIP-X**

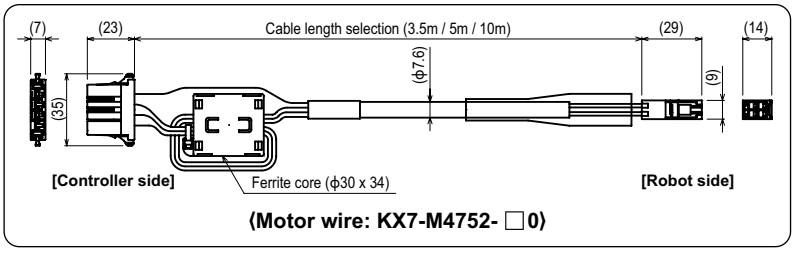
Set	Single item	
KBY-M4720- □ 0	Signal wire	KBY-M4755- □ 0
	Motor wire	KX7-M4752- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨Signal wire: KBY-M4755- □ 0⟩



⟨Motor wire: KX7-M4752- □ 0⟩

TS-P cable

[Standard cable]

Connected robot ▷ **PHASER**

Set	Single item	
KBS-M4710- ☐ 0	Signal wire	KBS-M4751- ☐ 1
	Motor wire	KAU-M4752- ☐ 1

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

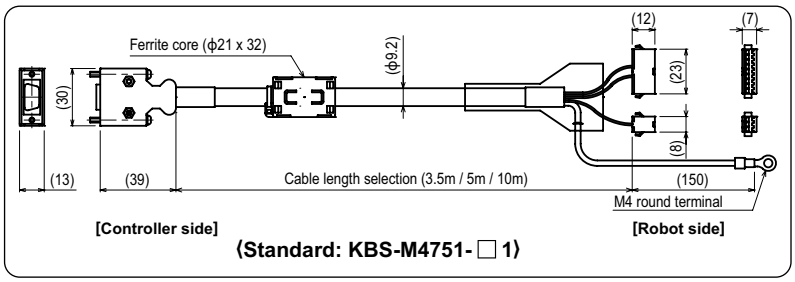
Connected robot ▷ **PHASER**

Set	Single item	
KBS-M4720- ☐ 0	Signal wire	KBS-M4755- ☐ 1
	Motor wire	KAU-M4752- ☐ 1

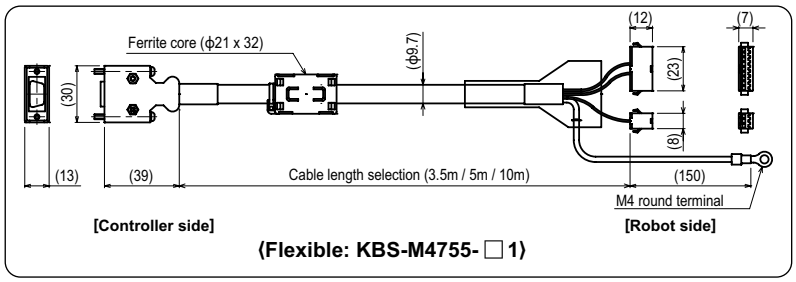
Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Signal wire]

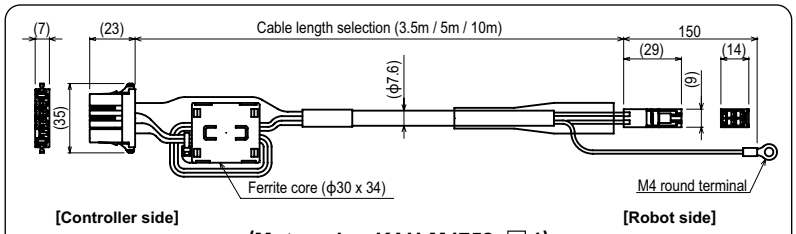


⟨Standard: KBS-M4751- ☐ 1⟩



⟨Flexible: KBS-M4755- ☐ 1⟩

[Motor wire]



⟨Motor wire: KAU-M4752- ☐ 1⟩

RDV-X cable (No-brake specifications)

[Standard cable]

Connected robot ▷ **FLIP-X**

Set	Single item	
KEF-M4710- ☐ 0	Signal wire	KBH-M4751- ☐ 0
	Motor wire	KEF-M4752- ☐ 0
	I/O connector	KBH-M4420-00

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

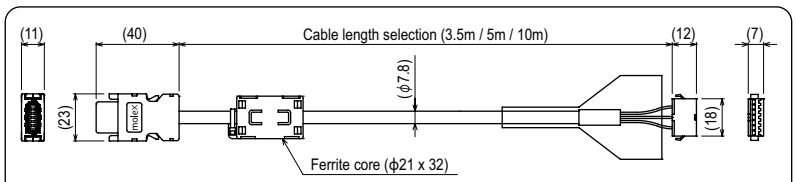
Connected robot ▷ **FLIP-X**

Set	Single item	
KEF-M4730- ☐ 0	Signal wire	KBH-M4756- ☐ 0
	Motor wire	KEF-M4752- ☐ 0
	I/O connector	KBH-M4420-00

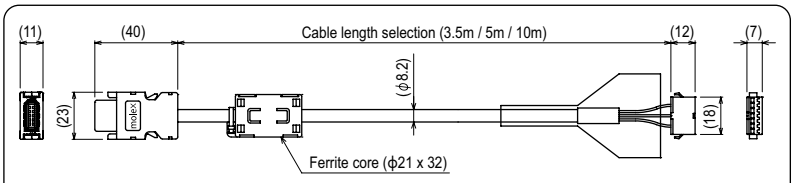
Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Signal wire]

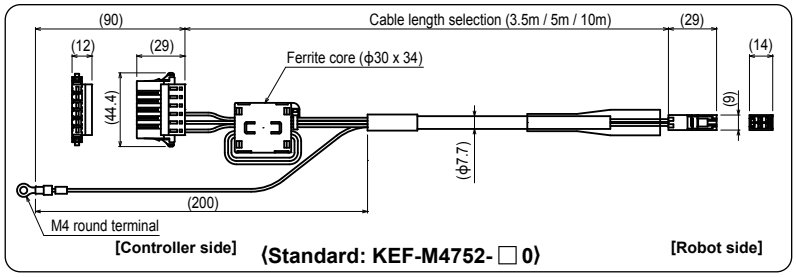


⟨Standard: KBH-M4751- ☐ 0⟩



⟨Flexible: KBH-M4756- ☐ 0⟩

[Motor wire]



⟨Standard: KEF-M4752- ☐ 0⟩

Robot cable table

RDV-X cable (models with brake and sensor)

[Standard cable]

Connected robot ▷ **FLIP-X**

Set	Single item	
KEF-M4720-☐0	Signal wire	KBH-M4753-☐0
	Motor wire	KEF-M4752-☐0
	ORG, BK wires	KBH-M4421-00

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

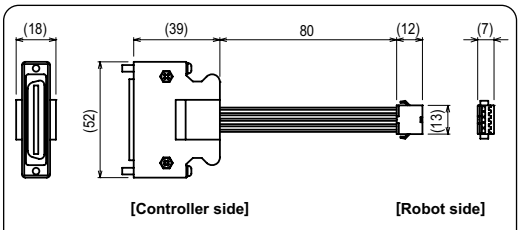
Connected robot ▷ **FLIP-X**

Set	Single item	
KEF-M4740-☐0	Signal wire	KBH-M4757-☐0
	Motor wire	KEF-M4752-☐0
	ORG, BK wires	KBH-M4421-00

Note. Notation within slot in model types is as shown at right.

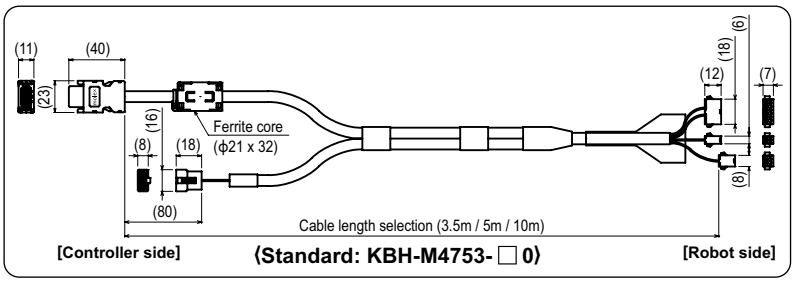
Within ☐	Cable length
3	3.5m
5	5m
A	10m

[ORG, BK wires]

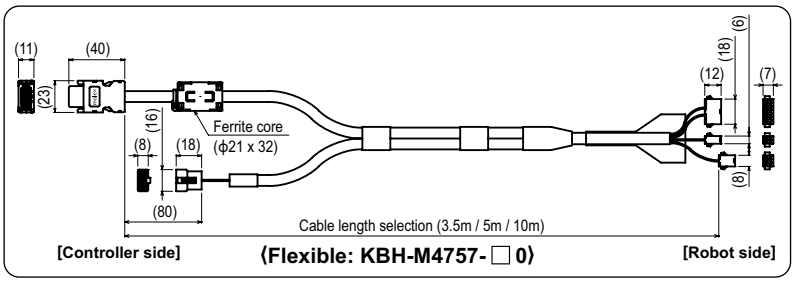


⟨ORG, BK wires: KBH-M4421-00⟩

[Signal wire]

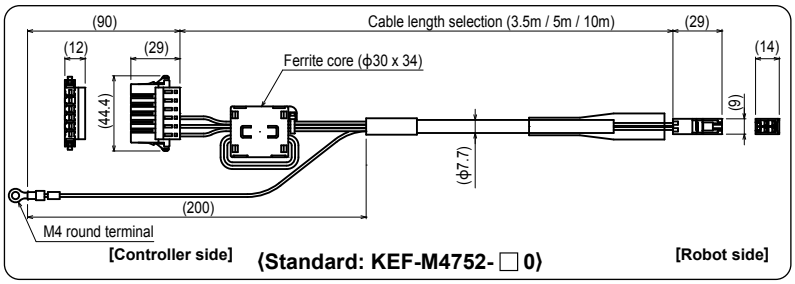


⟨Standard: KBH-M4753-☐0⟩



⟨Flexible: KBH-M4757-☐0⟩

[Motor wire]



⟨Standard: KEF-M4752-☐0⟩

RDV-P cable

[Standard cable]

Connected robot ▷ **PHASER**

Set	Single item	
KEF-M4711-☐0	Signal wire	KBH-M4754-☐1
	Motor wire	KEF-M4755-☐0
	I/O connector	KBH-M4420-00

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

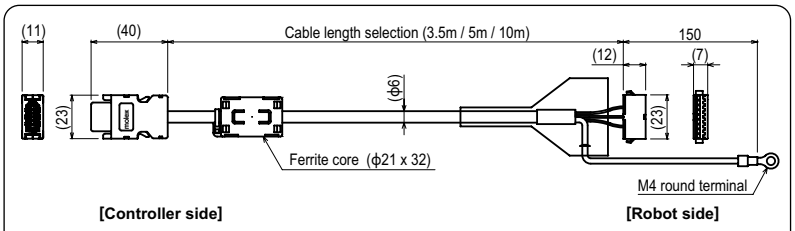
Connected robot ▷ **PHASER**

Set	Single item	
KEF-M4712-☐0	Signal wire	KBH-M4758-☐0
	Motor wire	KEF-M4755-☐0
	I/O connector	KBH-M4420-00

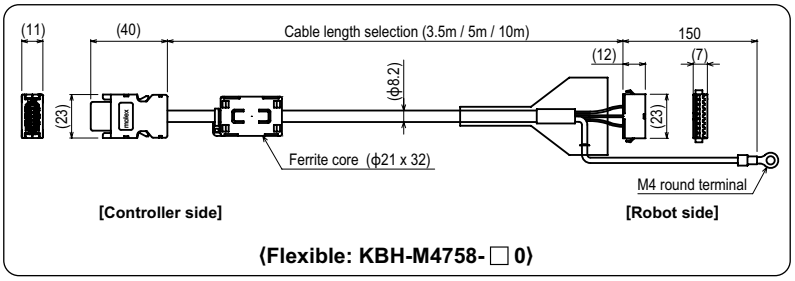
Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Signal wire]

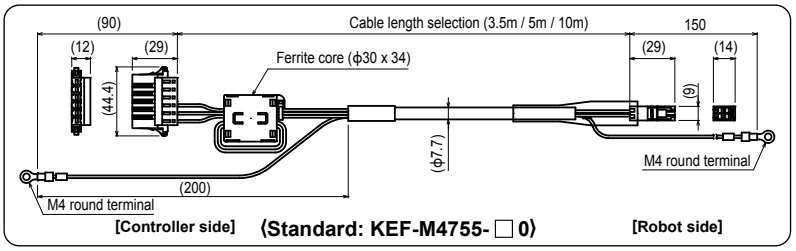


⟨Standard: KBH-M4754-☐1⟩



⟨Flexible: KBH-M4758-☐0⟩

[Motor wire]



⟨Standard: KEF-M4755-☐0⟩

SR1-X cable

[Standard cable]

Connected robot ▷ **FLIP-X**

Set	Single item	
KX7-M4710- ☐ 0	Signal wire	KX7-M4751- ☐ 1
	Motor wire	KX7-M4752- ☐ 0

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

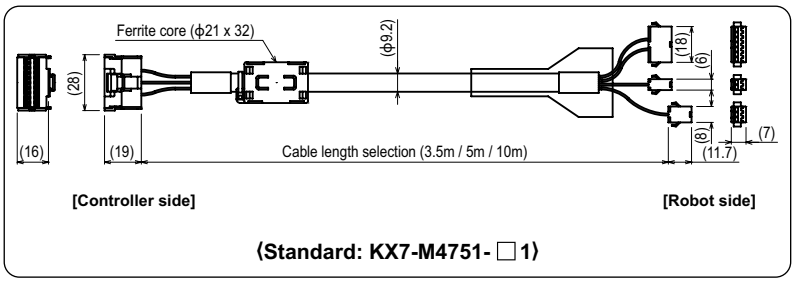
Connected robot ▷ **FLIP-X**

Set	Single item	
KX7-M4720- ☐ 0	Signal wire	KX7-M4755- ☐ 0
	Motor wire	KX7-M4752- ☐ 0

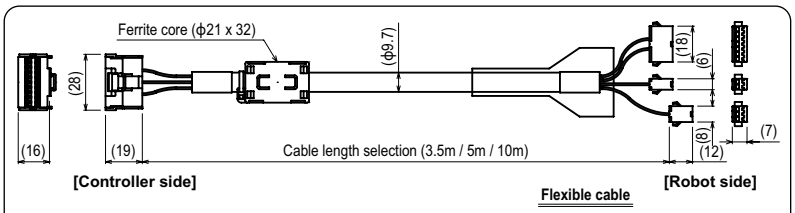
Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Signal wire]

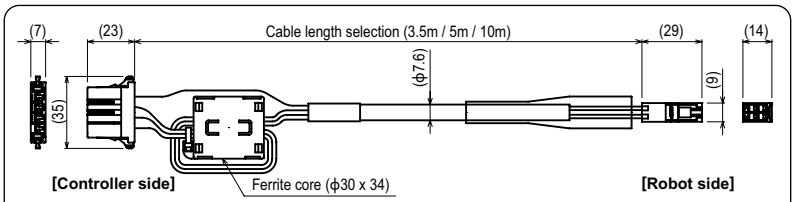


⟨Standard: KX7-M4751- ☐1⟩



⟨Flexible: KX7-M4755- ☐0⟩

[Motor wire]



⟨Motor wire: KX7-M4752- ☐0⟩

SR1-P cable

[Standard cable]

Connected robot ▷ **PHASER**

Set	Single item	
KAU-M4710- ☐ 0	Signal wire	KAU-M4751- ☐ 4
	Motor wire	KAU-M4752- ☐ 1

Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Flexible cable]

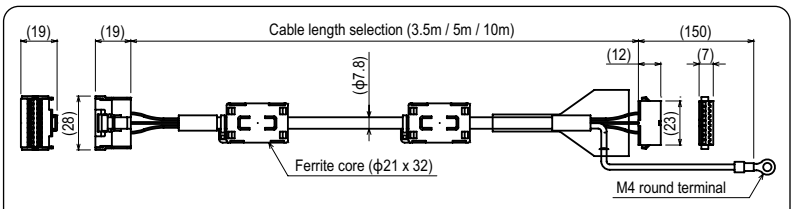
Connected robot ▷ **PHASER**

Set	Single item	
KAU-M4720- ☐ 0	Signal wire	KAU-M4755- ☐ 0
	Motor wire	KAU-M4752- ☐ 1

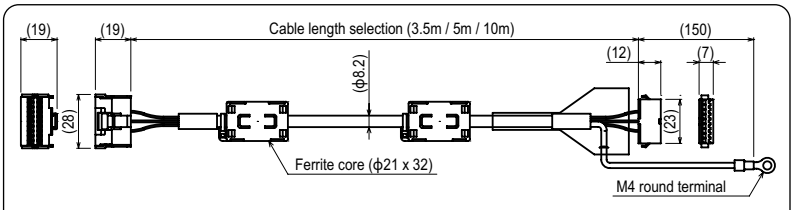
Note. Notation within slot in model types is as shown at right.

Within ☐	Cable length
3	3.5m
5	5m
A	10m

[Signal wire]

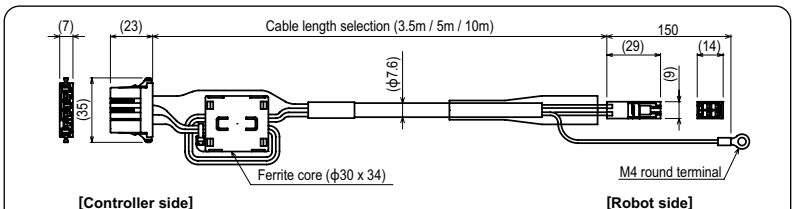


⟨Standard: KAU-M4751- ☐4⟩



⟨Flexible: KAU-M4755- ☐0⟩

[Motor wire]



⟨Motor wire: KAU-M4752- ☐1⟩

Robot cable table

ERCD / ERCX cable

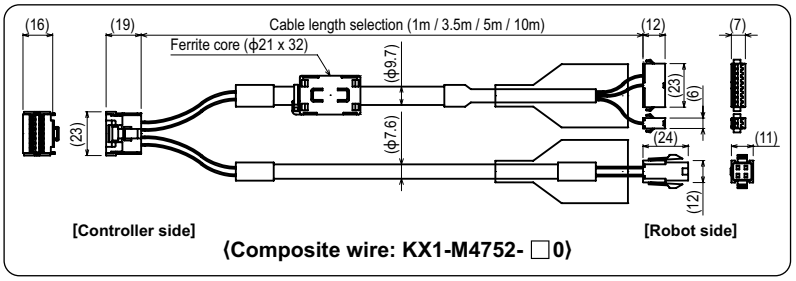
[Flexible cable]

Connected robot ▷ **FLIP-X**

Set	Single item	
-	Composite wire	KX1-M4752- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
1	1m
3	3.5m
5	5m
A	10m



⟨Composite wire: KX1-M4752- □0⟩

Multi-robot cable

Single axis multi-robot cable

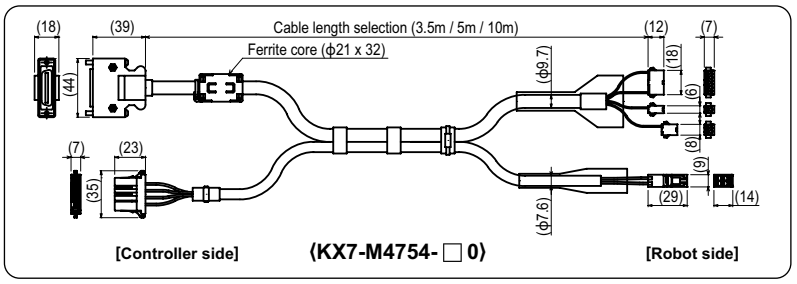
[Flexible cable]

Connected controller ▷ **RCX240**

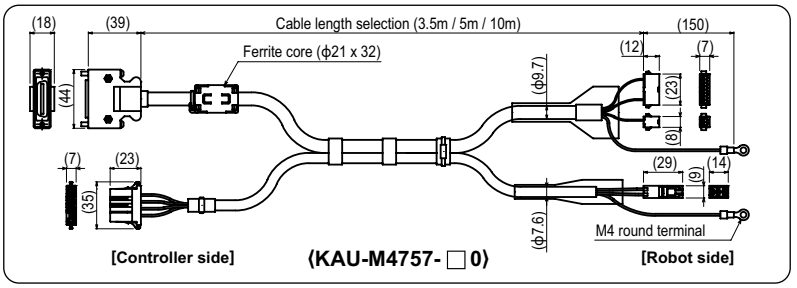
Robot	Cable type
FLIP-X	KX7-M4754- □ 0
PHASER	KAU-M4757- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KX7-M4754- □ 0⟩



⟨KAU-M4757- □ 0⟩

2-axes multi-robot cable

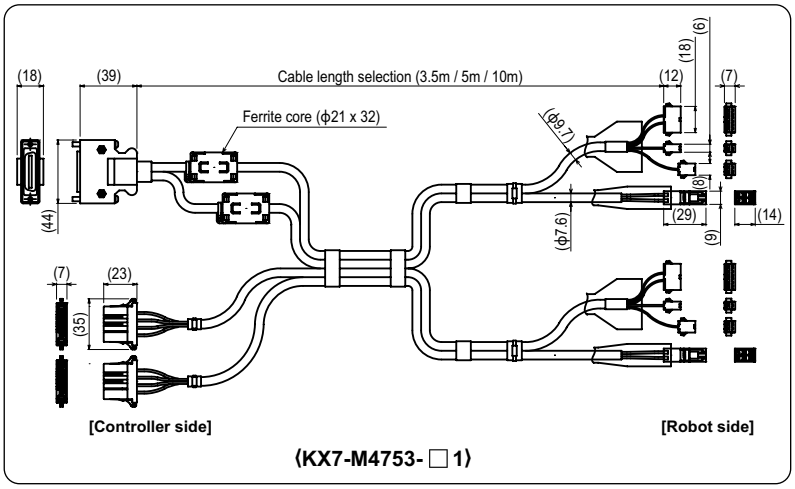
[Flexible cable]

Connected controller ▷ • **RCX221 / RCX222**
• **RCX240 / RCX320 / RCX340**
• **DRCX**

Robot combinations		Cable type
First axis	Second axis	
FLIP-X	FLIP-X	KX7-M4753- □ 1

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KX7-M4753- □ 1⟩

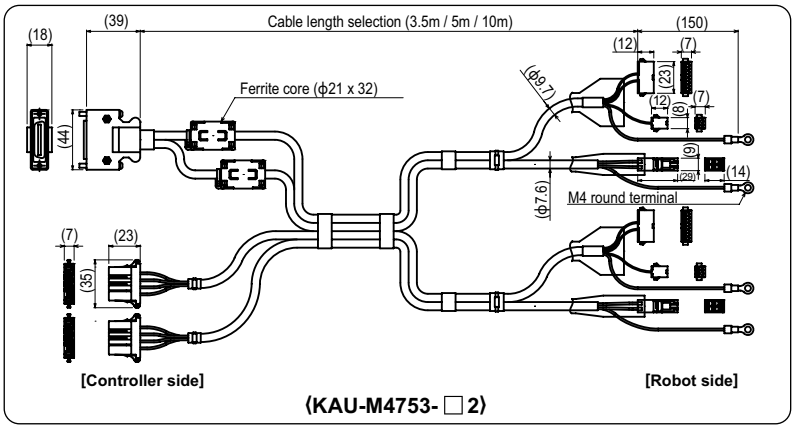
[Flexible cable]

Connected controller ▷ **RCX221 / RCX240**

Robot combinations		Cable type
First axis	Second axis	
PHASER	PHASER	KAU-M4753- □ 2

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KAU-M4753- □ 2⟩

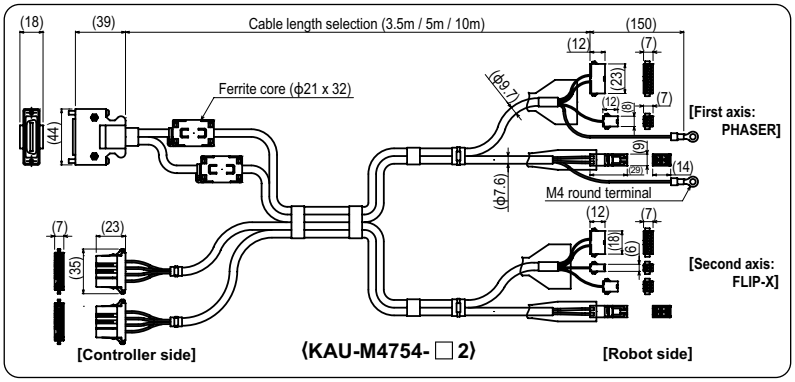
[Flexible cable]

Connected controller ▷ **RCX221 / RCX240**

Robot combinations		Cable type
First axis	Second axis	
PHASER	FLIP-X	KAU-M4754- □ 2

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KAU-M4754- □ 2⟩

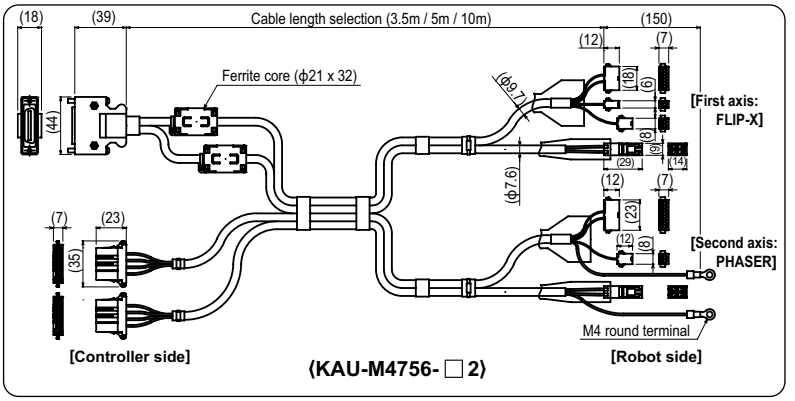
[Flexible cable]

Connected controller ▷ **RCX221 / RCX240**

Robot combinations		Cable type
First axis	Second axis	
FLIP-X	PHASER	KAU-M4756- □ 2

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KAU-M4756- □ 2⟩

Cartesian robot cable

Cartesian 2-axes cable

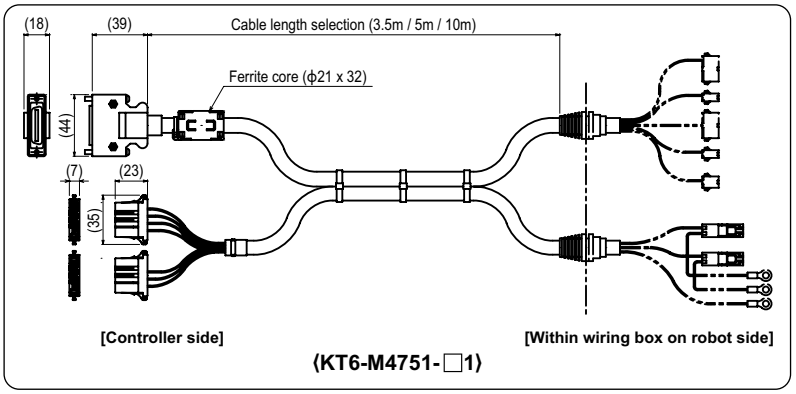
[Standard cable]

Connected controller ▷ **DRCX / RCX222 / RCX320 / RCX340**

Type	KT6-M4751- □ 1

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KT6-M4751-□1⟩

Cartesian 3-axes cable

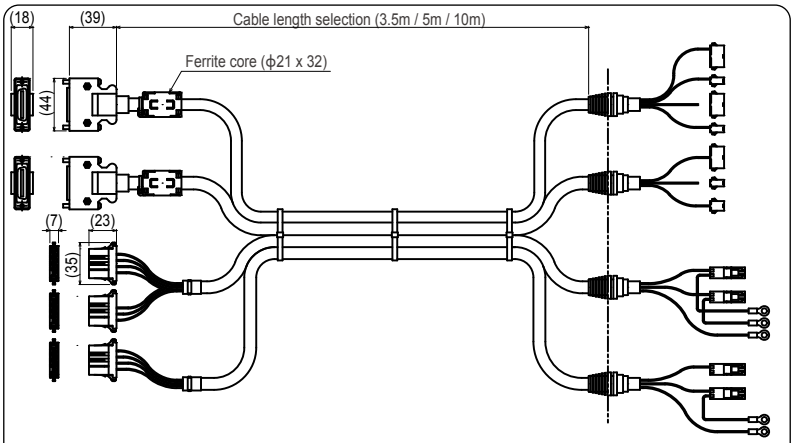
[Standard cable]

Connected controller ▷ **RCX142 / RCX240 / RCX340**

Type	KT6-M4755- □ 0

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KT6-M4755- □ 0⟩

Cartesian 4-axes cable

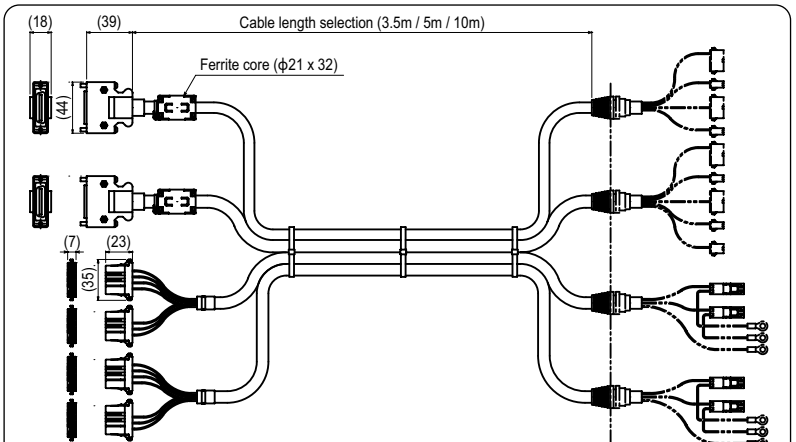
[Standard cable]

Connected controller ▷ **RCX142 / RCX240 / RCX340**

Type	KT6-M4752- □ 1

Note. Notation within slot in model types is as shown at right.

Within □	Cable length
3	3.5m
5	5m
A	10m



⟨KT6-M4752-□1⟩

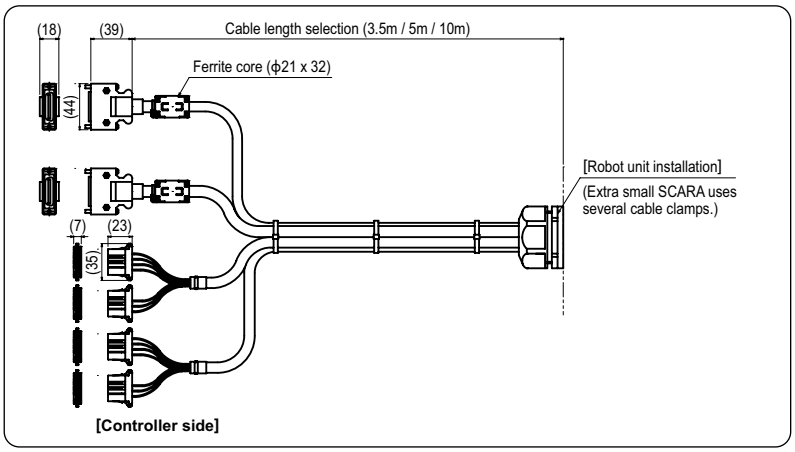
SCARA robot cable

Note. SCARA robot cables all use the same size connectors but different models use different cables.

[Standard cable]

Connected robot ▷ • **YK-XG (No including YK120XG / YK150XG / YK180XG)**
• **YK-XGS**
• **YK-TW**
• **YK400XR / YK-XE**

Cable length	Type
3.5m	KBF-M6211-00
5m	KBF-M6211-10
10m	KBF-M6211-20



Connected robot ▷ • **YK120XG**
• **YK150XG**
• **YK180XG**

Cable length	Type
2m	KCB-M6211-31
3.5m	KCB-M6211-01
5m	KCB-M6211-11
10m	KCB-M6211-21

Connected robot ▷ • **YK-XGP**
• **YK-XGC**

Cable length	Type
3.5m	KDP-M6211-00
5m	KDP-M6211-10
10m	KDP-M6211-20

Connected robot ▷ • **YK-XC (Large type)**
• **YK-XS**
• **YK-XP**

Cable length	Type
3.5m	KN3-M6211-00
5m	KN3-M6211-10
10m	KN3-M6211-20

Connected robot ▷ • **YK1200X**

Cable length	Type
3.5m	KN6-M6211-00
5m	KN6-M6211-10
10m	KN6-M6211-20

Connected robot ▷ • **YK180X**
• **YK220X**
• **YK180XC**
• **YK220XC**

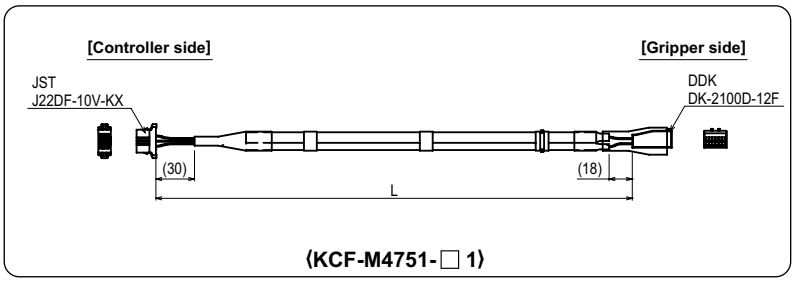
Cable length	Type
3.5m	KBE-M6211-00
5m	KBE-M6211-10
10m	KBE-M6211-20

Gripper cable

Note. Be sure to adjust the total length of the robot (for gripper) cable and relay cable to 14m or less.

● **Robot cable**
[Flexible cable]

Cable length	Type
3.5m	KCF-M4751-31
5m	KCF-M4751-51
10m	KCF-M4751-A1

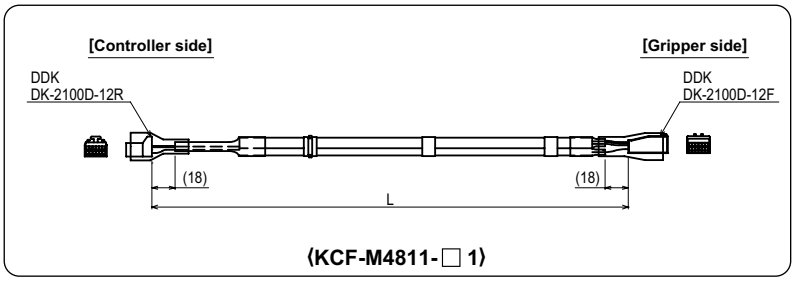


〈KCF-M4751-□ 1〉

● **Relay cable**
[Flexible cable]

Type	KCF-M4811-□ 1

Within □	1	2	3	4	5	6	7	8
Length (mm)	0.5	1	1.5	2	2.5	3	3.5	4



〈KCF-M4811-□ 1〉

Cable terminal table

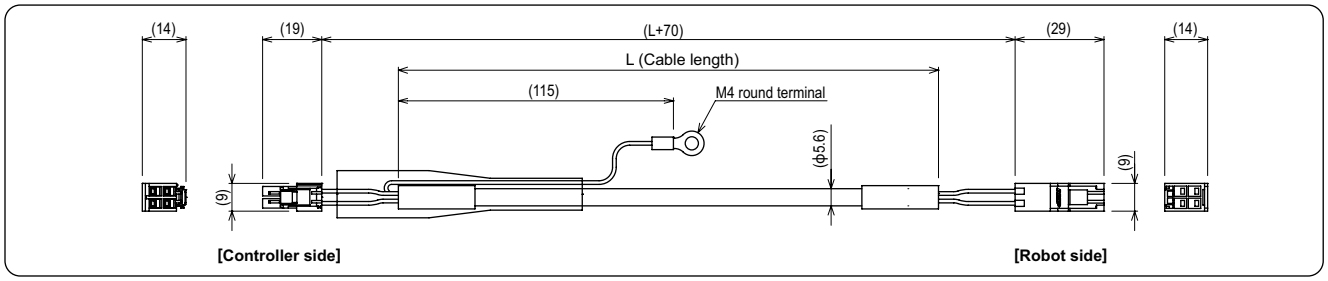
This is a relay cable used between the robot body and the robot cable such cable carrier wiring, etc.

PHASER relay cable

Motor wire (350mm to 1450mm) Note. Common to MR types and MF types

Type	KAU-M4813-☐0

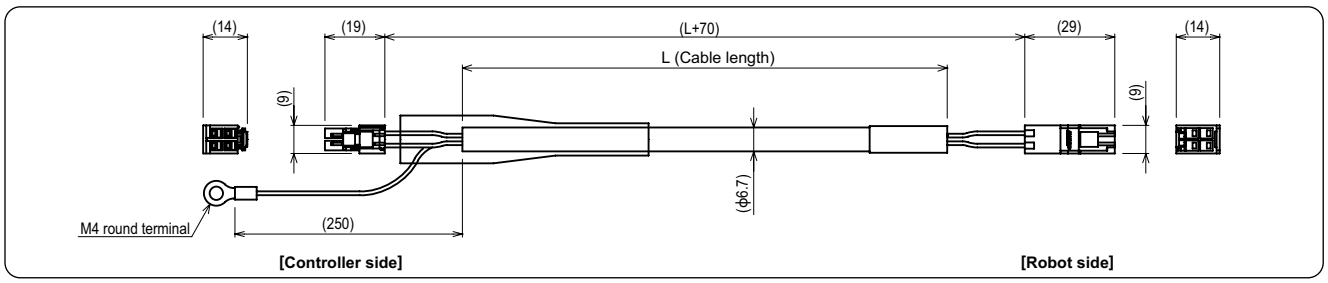
Within ☐	1	2	3	4	5	6	7	8	9	A	B	C
Length (mm)	350	450	550	650	750	850	950	1050	1150	1250	1350	1450



Motor wire (1500mm to 2600mm) Note. Not usable on MR type

Type	KBD-M4813-☐0

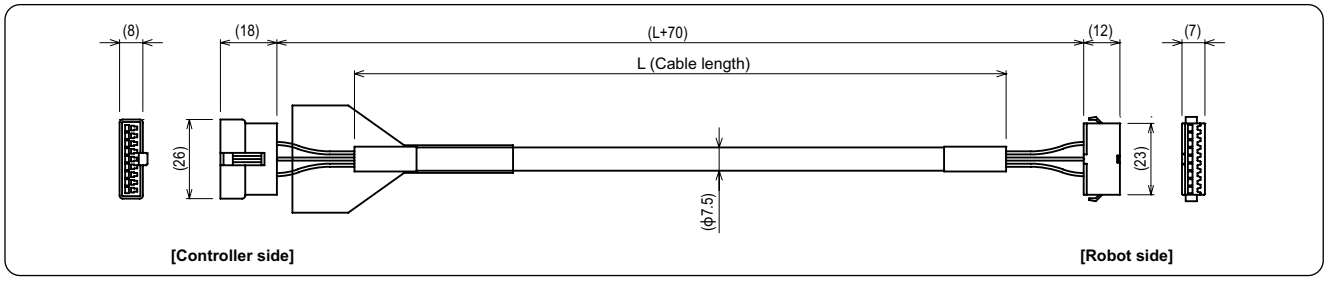
Within ☐	6	7	8	9	A	B	C	D	E	F	G	M
Length (mm)	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600



Signal cable (350mm to 1450mm) Note. Common to MR types and MF types

Type	KAU-M4812-☐1

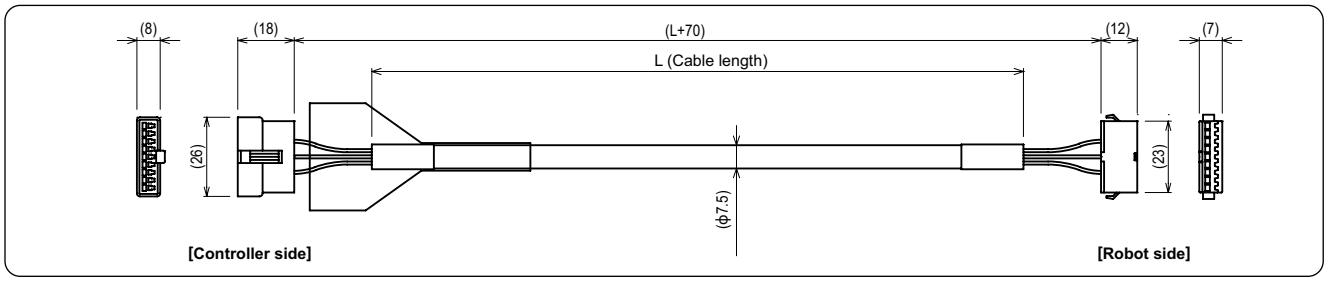
Within ☐	1	2	3	4	5	6	7	8	9	A	B	C
Length (mm)	350	450	550	650	750	850	950	1050	1150	1250	1350	1450



Signal cable (1500mm to 2600mm) Note. Common to MR types and MF types

Type	KBD-M4812-☐1

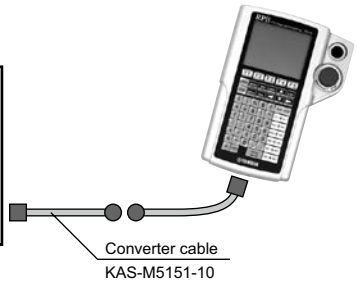
Within ☐	6	7	8	9	A	B	C	D	E	F	G	J
Length (mm)	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600

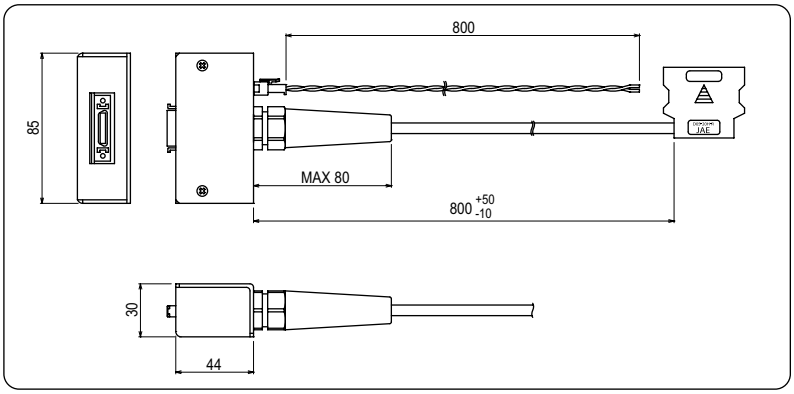


Connector converter cable

Programming box converter cable

RCX40
RCX141
RCX142

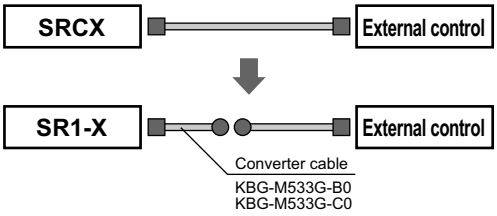




Converter cable for operating the RCX40, RCX141, RCX142 by RPB.

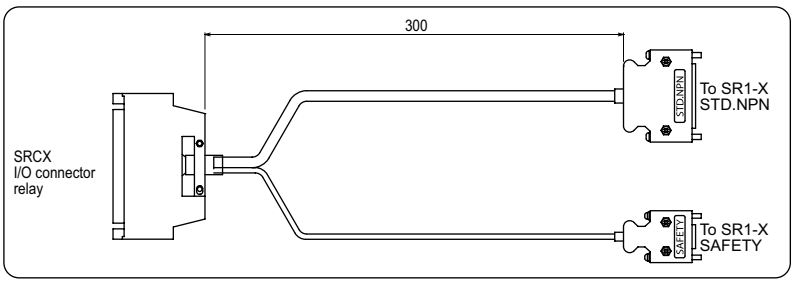
Type	KAS-M5151-10

I/O control converter cable



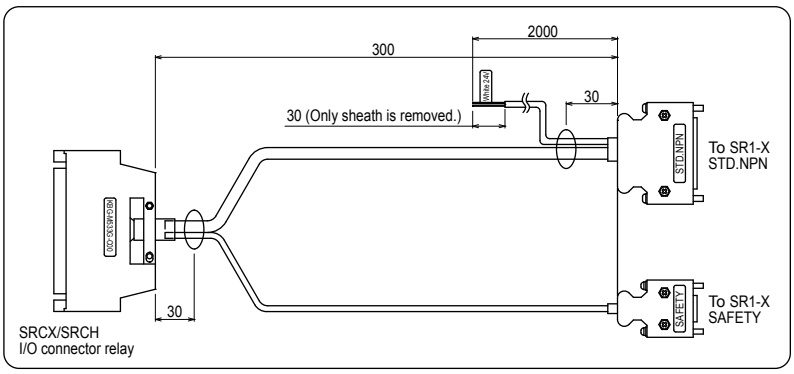
Converter cable allows connecting to the SRCX connector when system using the SRCX was changed to the SR1-X.

External power supply is used for the I/O power supply.



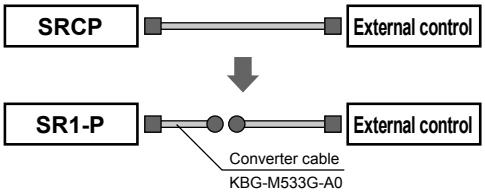
Type	KBG-M533G-B0

Internal power supply of the SRCX is used for the I/O power supply.

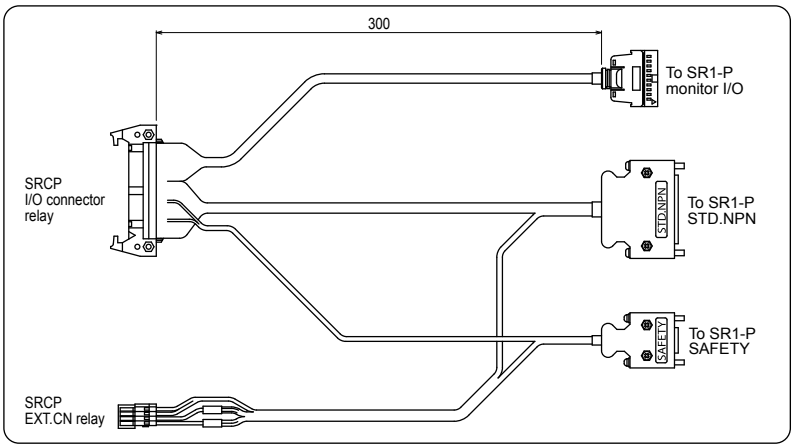


Note. It is necessary to input the 24V-power supply from the outside.

Type	KBG-M533G-C0



Converter cable allows connecting to the SRCP connector when system using the SRCP was changed to the SR1-P.

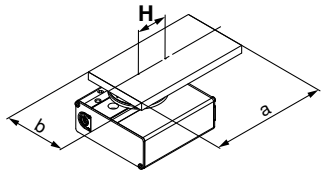


Type	KBG-M533G-A0

TRANSERVO RF type model selection

Selecting a model

Operating conditions



Rotary type: RF03
Installation posture: Horizontal
Kind of load: Inertial load Ta
Shape of load: 150 mm x 80 mm (rectangular plate)
Oscillating angle θ: 180°
Acceleration/deceleration $\dot{\omega}$: 1,000 °/sec^2
Speed ω: 420 °/sec
Load mass m: 2.0 kg
Distance between shaft and center of gravity H: 40 mm

Step 1 Moment of inertia Acceleration/deceleration

1 Calculating the moment of inertia.

2 Checking the moment of inertia vs. acceleration/deceleration.
Select an appropriate model from the moment of inertia vs. acceleration/deceleration while referring to the moment of inertia vs. acceleration/deceleration graph.

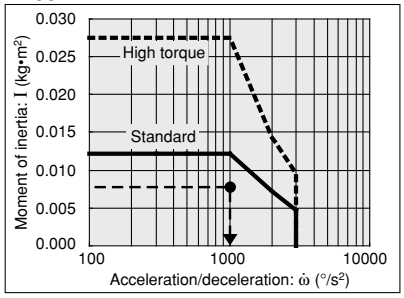
Calculation formula

$I=m\times(a^2+b^2)/12+m\times H^2$

Selection example

$I=2.0\times(0.15^2+0.08^2)/12+2.0\times0.04^2$
$=0.00802kg\cdot m^2$

RF03



Step 2 Selecting a torque

1 Kinds of loads
- Static load: Ts
- Resistance load: Tf
- Inertial load: Ta

2 Checking the effective torque
Check that the speed can be controlled by the effective torque by the speed while referring to the effective torque vs. speed graph.

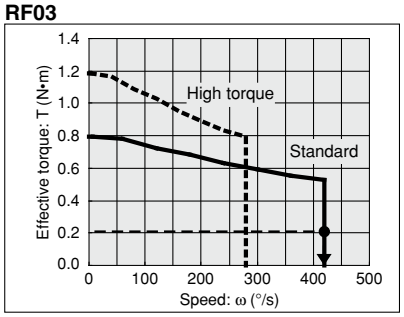
Calculation formula

Effective torque≥Ts
Effective torque≥Tf x 1.5
Effective torque≥Ta x 1.5

Selection example

Inertial load: Ta
$Ta\times1.5=I\times\dot{\omega}\times2\pi/360\times1.5$
$=0.00802\times1,000\times0.0175\times1.5$
$=0.21N\cdot m$

RF03



Step 3 Allowable load

1 Checking the allowable load
- Radial load
- Thrust load
- Moment

Calculation formula

Allowable thrust load≥m×9.8
Allowable moment≥m×9.8×H

Selection example

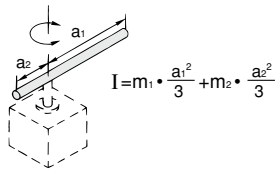
Thrust load
2.0×9.8=19.6N<Allowable load OK
Allowable moment
2.0×9.8×0.04
=0.784N•m<Allowable moment OK

List of moment of inertia calculation formulas (Calculation of moment of inertia I)

I: Moment of inertia m: Load mass

1 Thin rod

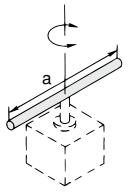
Position of rotation axis:
Passes through one end perpendicularly to the rod.



$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot \frac{a_2^2}{3}$

2 Thin rod

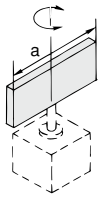
Position of rotation axis:
Passes through the center of gravity of the rod.



$I = m \cdot \frac{a^2}{12}$

3 Thin rectangular plate (rectangular parallelepiped)

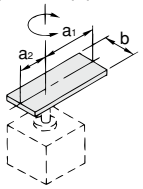
Position of rotation axis:
Passes through the center of gravity of the rod.



$I = m \cdot \frac{a^2}{12}$

4 Thin rectangular plate (rectangular parallelepiped)

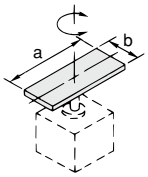
Position of rotation axis:
Passes through one end perpendicularly to the plate.
(Same position for the rectangular parallelepiped with the plate thickened.)



$I = m_1 \cdot \frac{4a_1^2 + b^2}{12}$
$+ m_2 \cdot \frac{4a_2^2 + b^2}{12}$

5 Thin rectangular plate (rectangular parallelepiped)

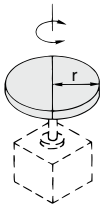
Position of rotation axis:
Passes through one end perpendicularly to the plate.
(Same position for the rectangular parallelepiped with the plate thickened.)



$I = m \cdot \frac{a^2 + b^2}{12}$

6 Cylinder (including thin disc)

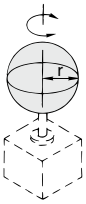
Position of rotation axis:
Central axis



$I = m \cdot \frac{r^2}{2}$

7 Solid ball

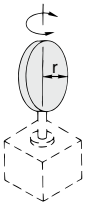
Position of rotation axis:
Diameter



$I = m \cdot \frac{2r^2}{5}$

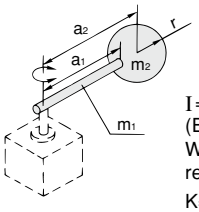
8 Thin disc

Position of rotation axis:
Diameter



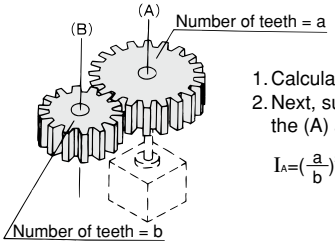
$I = m \cdot \frac{r^2}{4}$

9 Load at lever tip



$I = m_1 \cdot \frac{a_1^2}{3} + m_2 \cdot a_2^2 + K$
(Example)
When the shape of m_2 is a ball, refer to [7] to obtain the following.
$K = m_2 \cdot \frac{2r^2}{5}$

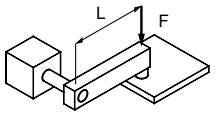
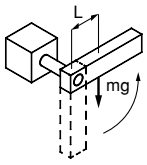
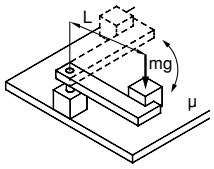
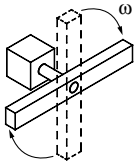
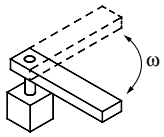
10 Gear transmission



1. Calculate the moment of inertia I_B around the (B) axis.
2. Next, substitute I_B for the moment of inertia around the (A) axis to calculate I_A as follows.

$I_A = (\frac{a}{b})^2 \cdot I_B$

Kinds of loads

Kinds of loads		
Static load: Ts	**Resistance load: Tf**	**Inertial load: Ta**
Only push force is needed (clamp, etc.).	Gravity or friction force applies in the rotation direction.	Load with inertia needs to be rotated.
	<Gravity applies.>  <Friction force applies.> 	<Rotation center matches to the gravity of the load.>  <Rotation axis is in the vertical direction.> 
Ts = F•L Ts : Static load (N•m) F : Clamp force (N) L : Distance from oscillating center to clamp position (m)	Gravity applies in the rotation direction. Tf = m•g•L Friction force applies in the rotation direction. Tf = μ•m•g•L Tf : Resistance load (N•m) m : Mass of load (kg) g : Gravity acceleration 9.8 (m/s²) L : Distance from oscillating center to gravity or friction force action point (m) μ : Friction coefficient	Ta = I • $\dot{\omega}$ • 2 π / 360 (Ta = I • $\dot{\omega}$ • 0.0175) Ta: Inertial load (N•m) I : Moment of inertia (kg•m²) $\dot{\omega}$: Acceleration/deceleration (°/sec²) ω : Speed (°/sec)
Required torque T = Ts	Required torque T = Tf × 1.5 Note 1)	Required torque T = Ta × 1.5 Note 1)

- **Load becomes the resistance load.**
  Gravity or friction force applies in the rotation direction.
  Example 1) The rotation center of the rotation axis does not match to the center of gravity of the load in the horizontal direction.
  Example 2) The load slips on the floor to move it.
  The required torque is the total of the resistance load and inertial load.
  T = (Tf + Ta) × 1.5

- **Load does not become the resistance load.**
  Gravity or friction force does not apply in the rotation direction.
  Example 1) The rotation axis is vertical.
  Example 2) The rotation center of the rotation axis does not match to the center of gravity of the load in the horizontal direction.
  The required torque is only the inertial load.
  T = Ta × 1.5

Note 1) An allowance is required for Tf and Ta to make the speed adjustment.

R-axis tolerable moment of inertia and acceleration coefficient

How to find the inertia moment

The tool and work are not usually a simple shape so calculating the inertia moment is not easy.
As a method, the load is replaced with several factors that resemble a simple form for which the moment of inertia can be calculated. The total of the moment of inertia for these factors is then obtained. The objects and equations often used for the calculation of the moment of inertia are shown below. Incidentally, there is the following relation: J (kgfcmsec^2) =I (kgm^2) x 10.2

[1] Moment of inertia for material particle

The equation for the moment of inertia for a material particle that has a rotation center such as shown in Fig. ① is as follows: This is used as an approximate equation when x is larger than the object size.

$$I = mx^2 \ (kgm^2)$$

$$J = \frac{Wx^2}{g} \ (kgfcmsec^2) \quad \text{... (3.1)}$$

g : Gravitational acceleration (cm/sec^2)
m : Mass of material particle (kg)
W : Weight of material particle (kgf)

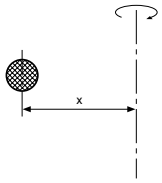


Fig.①

[2] Moment of inertia for cylinder (part 1)

The equation for the moment of inertia for a cylinder that has a rotation center such as shown in Fig. ② is given below.

$$I = \frac{\rho \pi D^4 h}{32} = \frac{mD^2}{8} \ (kgm^2)$$

$$J = \frac{\rho \pi D^4 h}{32g} = \frac{WD^2}{8g} \ (kgfcmsec^2) \quad \text{... (3.2)}$$

ρ : Density (kg/m^3, kg/cm^3)
g : Gravitational acceleration (cm/sec^2)
m : Mass of cylinder (kg)
W : Weight of cylinder (kgf)

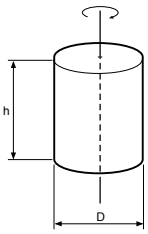


Fig.②

[3] Moment of inertia for cylinder (part 2)

The equation for the moment of inertia for a cylinder that has a rotation center such as shown in Fig. ③ is given below.

$$I = \frac{\rho \pi D^2 h}{16}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) = \frac{m}{4}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) \ (kgm^2)$$

$$J = \frac{\rho \pi D^2 h}{16g}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) = \frac{W}{4g}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) \ (kgfcmsec^2) \quad \text{... (3.3)}$$

ρ : Density (kg/m^3, kg/cm^3)
g : Gravitational acceleration (cm/sec2)
m : Mass of cylinder (kg)
W : Weight of cylinder (kgf)

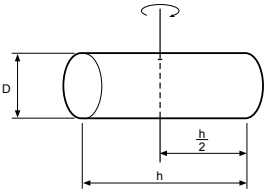


Fig.③

[4] Moment of inertia for prism

The equation for the moment of inertia for a prism that has a rotation center as shown in Fig. ④ is given as follows.

$$I = \frac{\rho abc\,(a^2 + b^2)}{12} = \frac{m\,(a^2 + b^2)}{12} \ (kgm^2)$$

$$J = \frac{\rho abc\,(a^2 + b^2)}{12g} = \frac{W\,(a^2 + b^2)}{12g} \ (kgfcmsec^2) \quad \text{... (3.4)}$$

ρ : Density (kg/m^3, kg/cm^3)
g : Gravitational acceleration (cm/sec^2)
m : Mass of prism (kg)
W : Weight of prism (kgf)

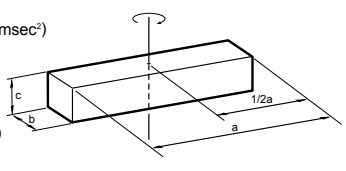


Fig.④

[5] When the object's center line is offset from the rotation center

The equation for the moment of inertia, when the center of the cylinder is offset by the distance "x" from the rotation center as shown in Fig.⑤, is given as follows.

$$I = \frac{\rho \pi D^4 h}{32} + \frac{\rho \pi D^2 h x^2}{4} = \frac{mD^2}{8} + mx^2 \ (kgm^2)$$

$$J = \frac{\rho \pi D^4 h}{32g} + \frac{\rho \pi D^2 h x^2}{4g} = \frac{WD^2}{8g} + \frac{Wx^2}{g} \ (kgfcmsec^2) \quad \text{... (3.5)}$$

ρ : Density (kg/m^3, kg/cm^3)
g : Gravitational acceleration (cm/sec^2)
m : Mass of cylinder (kg)
W : Weight of cylinder (kgf)

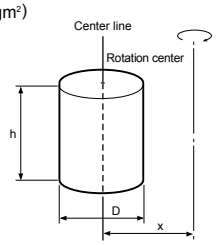


Fig.⑤

In the same manner, the moment of inertia of a cylinder as shown in Fig. ⑥ is given by

$$I = \frac{\rho \pi D^2 h}{16}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) + \frac{\rho \pi D^2 h x^2}{4} = \frac{m}{4}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) + mx^2 \ (kgm^2)$$

$$J = \frac{\rho \pi D^2 h}{16g}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) + \frac{\rho \pi D^2 h x^2}{4g} = \frac{W}{4g}\left(\frac{D^2}{4} + \frac{h^2}{3}\right) + \frac{Wx^2}{g} \ (kgfcmsec^2) \quad \text{... (3.6)}$$

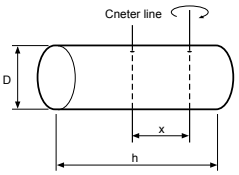


Fig.⑥

In the same manner, the moment of inertia of a prism as shown in Fig. ⑦ is given by

$$I = \frac{\rho abc\,(a^2 + b^2)}{12} + \rho abcx^2 = \frac{m\,(a^2 + b^2)}{12} + mx^2 \ (kgm^2)$$

$$J = \frac{\rho abc\,(a^2 + b^2)}{12g} + \frac{\rho abcx^2}{g} = \frac{W\,(a^2 + b^2)}{12g} + \frac{Wx^2}{g} \ (kgfcmsec^2) \quad \text{... (3.7)}$$

m : Mass of prism (kg)
W : Weight of prism (kgf)

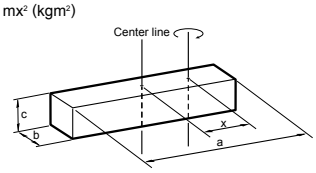


Fig.⑦

Example of moment of inertia calculation

Let's discuss an example in which the chuck and workpiece are at a position offset by 10cm from the R-axis by a stay, as shown in Fig. ⑧. The moment of inertia is calculated with the following three factors, assuming that the load material is steel and its density ρ is 0.0078kg/cm^3.

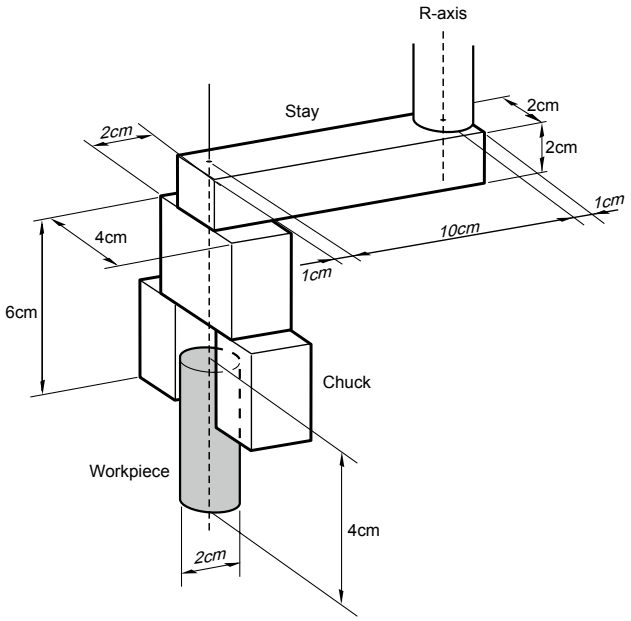


Fig. ⑧

[1] Moment of inertia of the stay

From Fig. ⑨, the weight of the stay (Ws) is given as follows :

Ws = ρabc=0.0078 x 12 x 2 x 2
= 0.37 (kgf)

The moment of inertia of the stay (Js) is then calculated from Eq. 3-7.

$$Js = \frac{0.37 \times (12^2 + 2^2)}{12 \times 980} + \frac{0.37 \times 5^2}{980} = 0.014 \ (kgfcmsec^2)$$

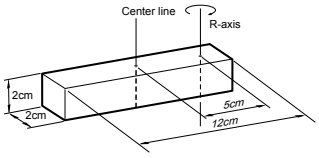


Fig. ⑨

[2] Moment of inertia of the chuck

When the chuck form resembles that shown in Fig. ⑩, the weight of the chuck (Wc) is

Wc =0.0078 x 2 x 4 x 6
=0.37 (kgf)

The moment of inertia of the chuck (Jc) is then calculated from Eq. 3-7.

$$Jc = \frac{0.37 \times (2^2 + 4^2)}{12 \times 980} + \frac{0.37 \times 10^2}{980} = 0.038 \ (kgfcmsec^2)$$

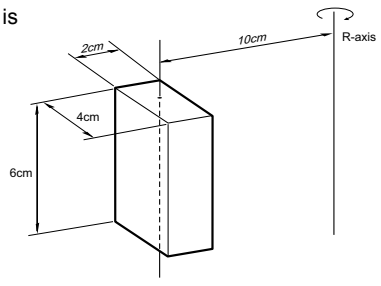


Fig. ⑩

[3] Moment of inertia of workpiece

When the workpiece form resembles that shown in Fig. ⑪, the weight of the workpiece (Ww) is

$$Ww = \frac{\rho \pi D^2 h}{4} = \frac{0.0078 \pi \times 2^2 \times 4}{4} = 0.098 \ (kgf)$$

The moment of inertia of the workpiece (Jw) is then calculated from Eq. 3-5.

$$Jw = \frac{0.097 \times 2^2}{8 \times 980} + \frac{0.097 \times 10^2}{980} = 0.010 \ (kgfcmsec^2)$$

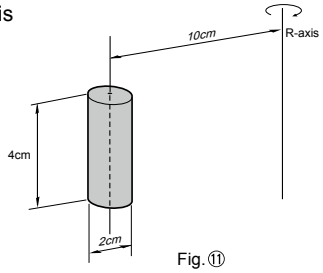


Fig. ⑪

[4] Total weight

W = Ws + Wc + Ww = 0.84 (kgf)

[5] Total moment of inertia

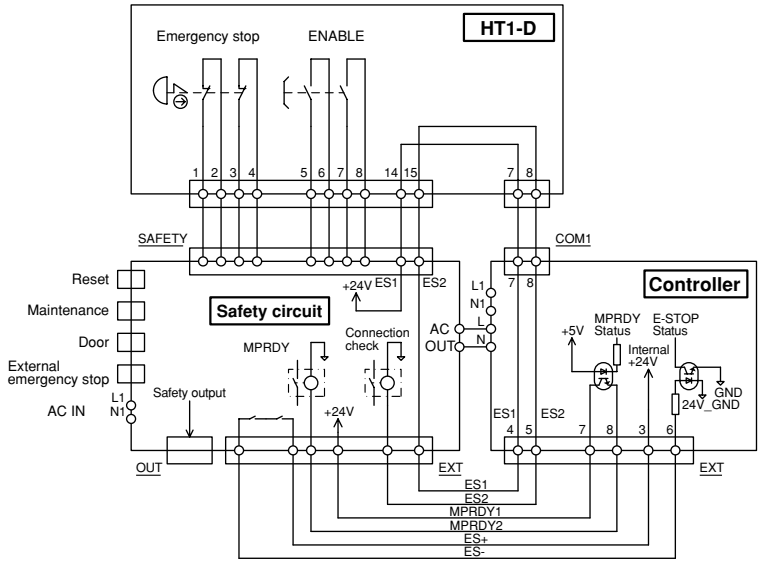
J = Js + Jc + Jw = 0.062 (kgfcmsec^2)

External safety circuit examples

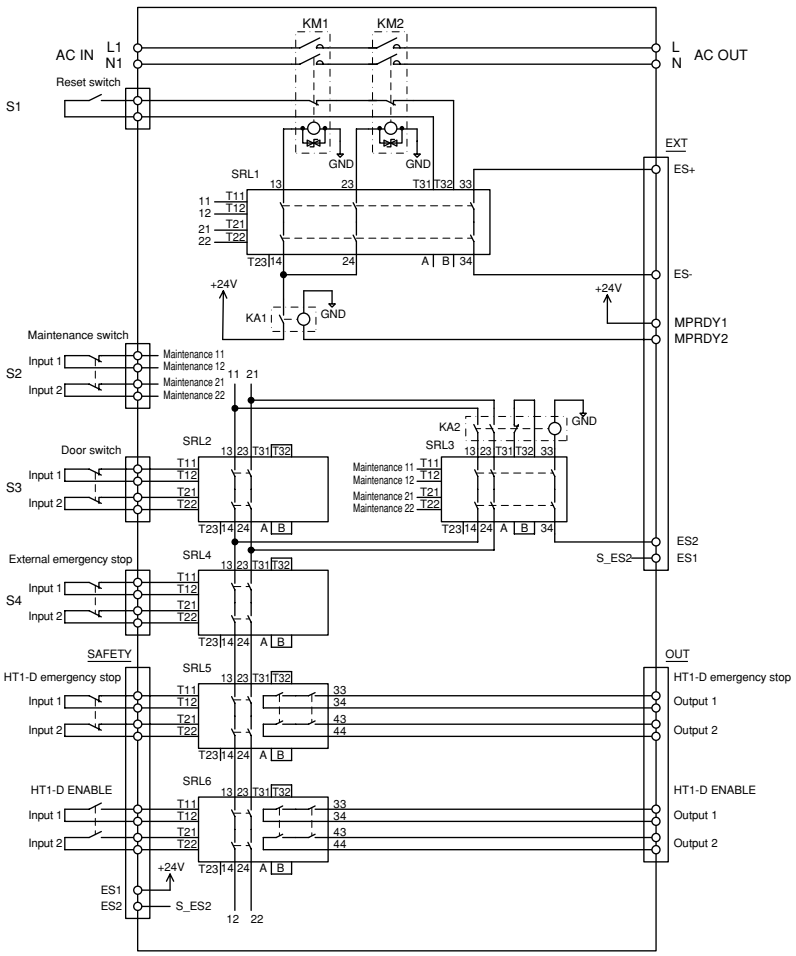
To ensure safe use of the robot, we request the customers make a risk assessment of their end equipment to decide what performance level is needed from safety circuits at the point. Customer should then install a safety circuit at the required performance level.
Here we show examples of category 4 circuits for the TS-X/TS-P, SR1 and RCX240 controllers using a programming box with an enable switch.
Safety circuits for other categories are described in the user's manuals, so download them from our website if needed.

Circuit configuration examples (TS-X/TS-P)

General connection diagram

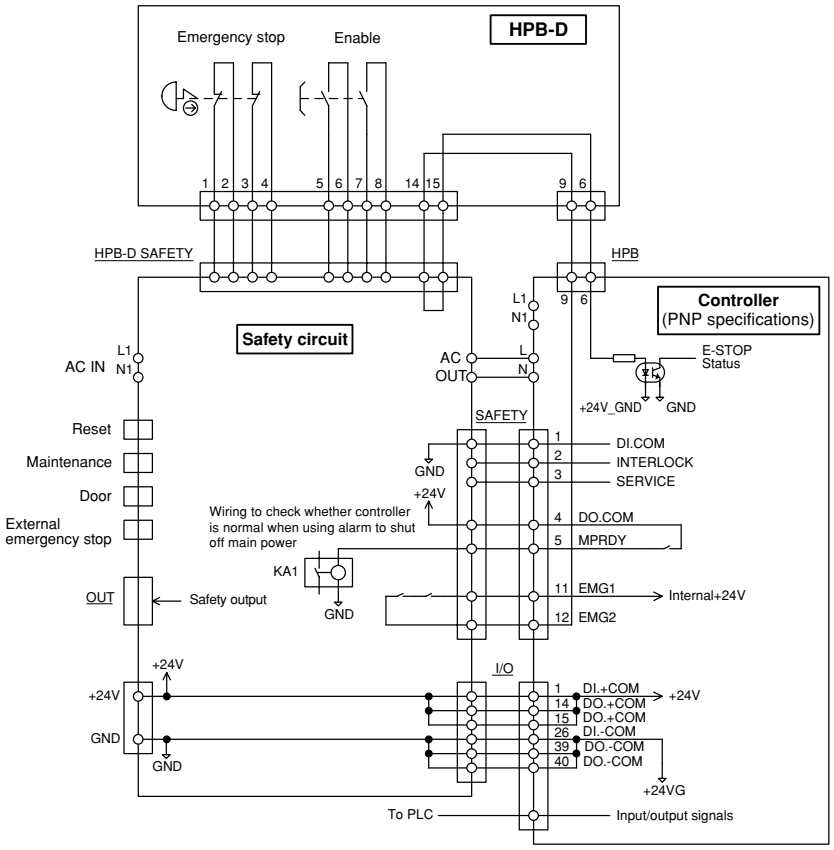


Category 4

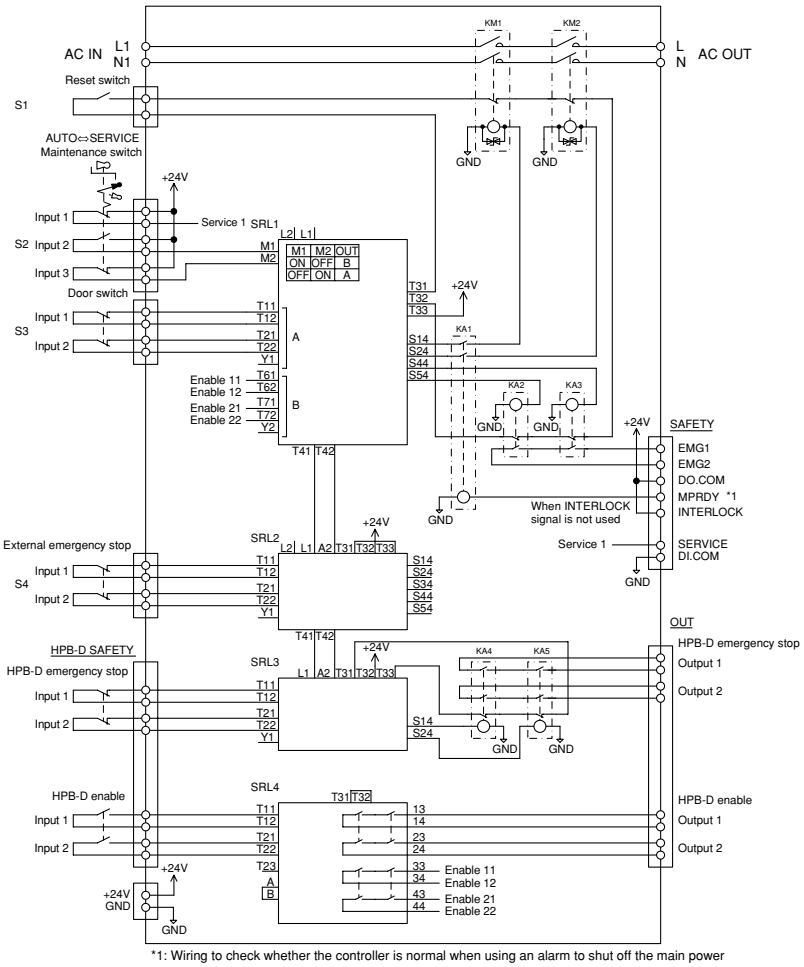


Circuit configuration examples (SR1)

General connection diagram



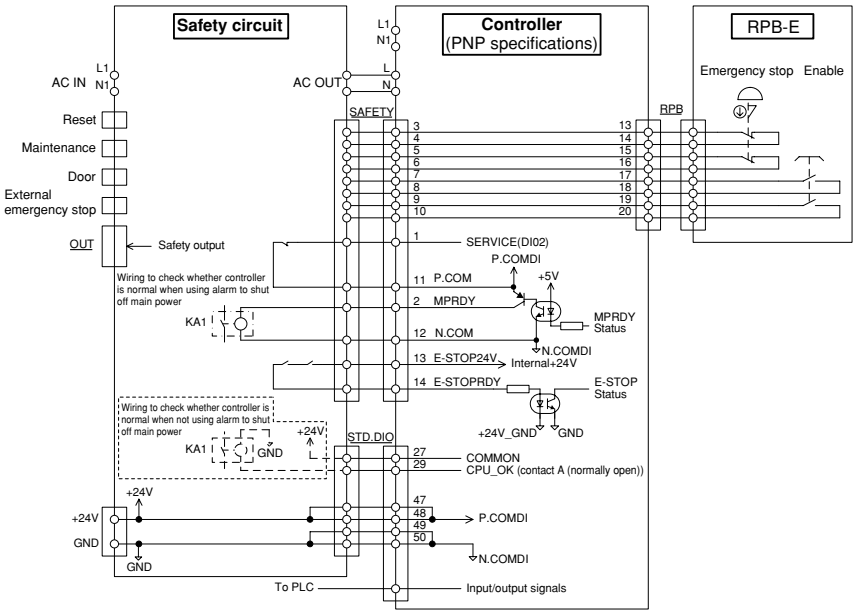
Category 4



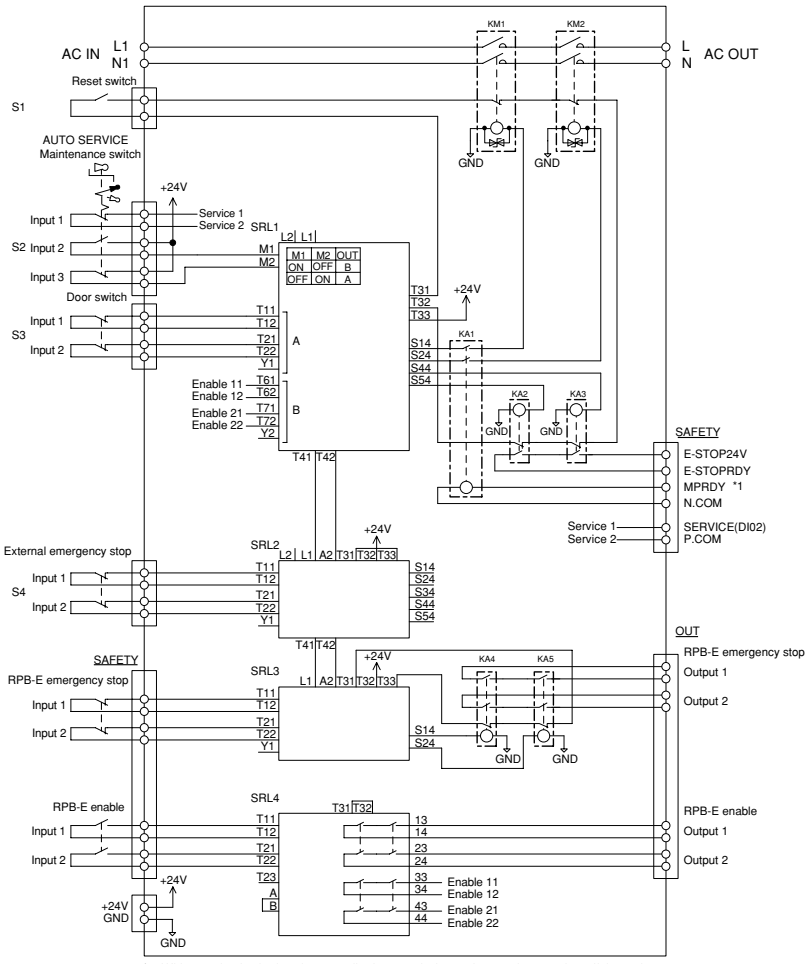
*1: Wiring to check whether the controller is normal when using an alarm to shut off the main power

Circuit configuration examples (RCX240)

General connection diagram



Category 4



*1: Wiring to check whether the controller is normal when using an alarm to shut off the main power

Parts Table

Circuit No.	Part Name	Circuit No.	Part Name
S1	Reset switch	KM1, 2	Contactor (mirror contact)
S2	Key-selector switch	KA1 to 5 *1	Safety relay
S3	Safety door switch	SRL1 to 4	Safety relay unit
S4	Emergency stop switch	SRL5, 6 *2	Safety relay unit

*1. TS-X and TS-P are KA1 to 2.
*2. Only TS-X and TS-P.

Cautions regarding CE specifications

* Check the latest information at the website shown below.
https://global.yamaha-motor.com/business/robot/support/ce/

CE marking

The YAMAHA robot (robot and controller) is one component that is incorporated into the customer's system (built-in equipment), and we declare that the YAMAHA robots conform to the EC Directives only within the scope of built-in equipment (semi-finished product). So, no CE marks are affixed to the YAMAHA robot products.

Cautions regarding compliance with EC Directives

The YAMAHA robot (robot and controller) is not, in itself, a robot system. The YAMAHA robot-series product is one component that is incorporated into the customer's system (built-in equipment), and we declare that the YAMAHA robots conform to the EC Directives only within the scope of built-in equipment. Just incorporating the YAMAHA robot does not guarantee that the customer's system conforms to the EC Directives. However, combining the YAMAHA robot that is a semi-finished product with other device or circuit that is designed and manufactured appropriately makes it possible to conform the finished system to the EC Directives. The customer who incorporates YAMAHA robot products into the customer's final system, which will be shipped to or used in European region, should verify that the overall system conforms to the EC Directives.

Installation of external safety circuits

To comply with EC directives, customers using YAMAHA robots must always build and install their own external safety circuits after selecting product components (safety relays, etc.) according to performance levels and safety categories required by the customer equipment.
For details about examples of external safety circuits, the user's manual should be referred to.

Compliance with EMC Directives

In order to conform to the EMC Directives, the customer should evaluate the final system (overall system) and take necessary countermeasures. As examples of EMC countermeasures for single YAMAHA robot product are described in the user's manual, these descriptions should be referred to.

Cautions regarding official language of EU countries

Only English which is the official language of the EU is utilized in the manuals, warning labels, operating screens, and the Declaration of Incorporation for this product.
If warning text appears on the warning label, then Japanese may also sometimes be listed along with the English.

Cautions on KCs (Korean Certificate Safety) specifications

About KCs

* Check the latest information at the website shown below.
https://global.yamaha-motor.com/business/robot/support/korea/

KCs is a system that conforms to Korean Industrial Safety and Health Act and self-regulatory safety confirmation declaration of hazardous machines and devices. For machines specified in this system, the KCs mark needs to be indicated after conducting the forced certification or self-regulatory safety confirmation declaration. Industrial robots that have manipulators with 3 or more axes are specified as machines needing the self-regulatory safety confirmation declaration in South Korea's Ministry of Employment and Labor Notification No. 1201-46. Its safety standards are defined in separate table 2 of this notification.

About measures for KCs

For some YAMAHA robot models, this self-regulatory safety confirmation declaration is conducted to register these models. Additionally, the KCs mark is indicated on the robots that have been declared. When you investigate to purchase a robot to be used in South Korea, check whether or not this robot conforms to KCs and order it with the KCs specifications specified.

The YAMAHA robot is a unit that is incorporated into the customer's system. Therefore, when the customer incorporates the robot into the customer's system, additional safety measures need to be taken. For details, see "Safety standards application guide reference manual".

List of robots subject to KCs

Robot products may not be applicable to KCs depending on the customer's applications, operating conditions, or environments. Consult YAMAHA before purchasing a product.
Since a self-regulatory safety declaration has not been made for inapplicable models, these models cannot be used in Korea. Special-order robots are also unavailable. For details, please contact YAMAHA.

As of July, 2020
○ : subject to KCs
– : not subject to KCs

Product	Type	Model name	KCs registration	
			RCX240 (S)	RCX340
Cartesian robot	FXYx	3 axes	○	○
	SXYx	3 axes	○	○
		4 axes		
	SXYBx	3 axes	○	○
		4 axes		
	MXYx	3 axes	○	○
		4 axes		
	HXYx	3 axes	○	○
		4 axes		
	NXY	3 axes	–	–
		4 axes		
		6 axes		
	SXYxC	3 axes	–	–
		4 axes		
Pick & place robot	YP Series	3 axes	–	–
		4 axes		
SCARA robot	YK400XE-4		–	○
	YK510XE-10			
	YK610XE-10			
	YK710XE-10			
	YK180X		–	–
	YK220X			
	YK120XG			
	YK150XG			
	YK180XG			
	YK250XG		○	○
	YK350XG			
	YK400XG			
	YK400XR		–	○
	YK500XGL		○	○
	YK600XGL			
	YK700XGL		–	○
	YK500XG		○	○
	YK600XG			
	YK600XGH			
	YK700XG			
	YK800XG			
	YK900XG			
	YK1000XG			
	YK1200X		–	–

▶ Continues to the next page.

Product	Type	Model name	KCs registration	
			RCX240 (S)	RCX340
SCARA robot	YK180XC		–	–
	YK220XC			
	YK250XGC		○	–
	YK350XGC			
	YK400XGC			
	YK500XGLC			
	YK600XGLC			
	YK500XC		–	–
	YK600XC			
	YK700XC			
	YK800XC			
	YK1000XC			
	YK300XGS		–	○
	YK400XGS			
	YK500XGS		○	○
	YK600XGS			
	YK700XGS			
	YK800XGS			
	YK900XGS			
	YK1000XGS			
	YK250XGP		○	–
	YK350XGP			
	YK400XGP			
	YK500XGLP			
	YK600XGLP			
	YK500XGP			
	YK600XGP			
	YK600XGHP			
	YK700XGP			
	YK800XGP			
	YK900XGP			
	YK1000XGP			
	YK350TW		–	○
	YK500TW		○	○

Cautions on Korean EMC specifications

* Check the latest information at the website shown below.
https://global.yamaha-motor.com/business/robot/support/korea_emc/

About Korean KC

KC is a system based on the radio regulations of Korea. Devices specified by this system must certify compliance or register compliance, and indicate compliance. Applicable devices are defined by public announcement from the Korean National Radio Research Agency (NRRA).

About Korean KC compliance

Some models of YAMAHA robot (robots and controllers) are registered with the Korean National Radio Research Agency (NRRA) by self-test compliance registration. YAMAHA robots that have already been registered display the KC mark.
If you are considering the purchase of robots to be used in Korea, please check the table below for compliance before ordering the applicable product.

YAMAHA robots are devices for inclusion in a system; therefore, if you, the customer, build a complete system that includes robots, and ship that system as a final product to Korea or use it within Korea, you yourself must verify EMC compliance.
For TS series and TS-SD units, check "Examples of EMC countermeasures" within the user's manual; for other controllers, check this section within the "Safety standards application guide reference manual".

List of KC compliant robots

* Please consult with YAMAHA before purchase, since compliance might not be possible depending on your application, conditions of use, and environment.
* In the case of 3-axis or greater Cartesian robots and SCARA robots, the robot must be compliant with both KC and KCs. In conjunction with this table, refer also to the list of KCs compliant robots.

As of December, 2020

Product	Model name	Registration No.
Controller	ERCD	MSIP-REM-Y3M-ERCD
	TS-S2	MSIP-REM-Y3M-TSS
	TS-SD	MSIP-REM-Y3M-TSSD
	TS-SH	MSIP-REM-Y3M-TSSH
	TS-X	MSIP-REM-Y3M-TSX
	TS-P	MSIP-REM-Y3M-TSP
	RDV-X	MSIP-REM-Y3M-RDVX
	RDV-P	MSIP-REM-Y3M-RDVP
	SR1-X	MSIP-REM-Y3M-SR1X
	SR1-P	MSIP-REM-Y3M-SR1P
	RCX221	MSIP-REM-Y3M-X221
	RCX222	MSIP-REM-Y3M-X222
	RCX240/RCX240S	MSIP-REM-Y3M-X240
	RCX320	R-R-GYM-RCX320
	RCX340	MSIP-REM-Y3M-X340
	LCC140	MSIP-REM-Y3M-C140
	YHX-HCU	R-R-GYM-YHXHCU
	YHX-DPU	R-R-GYM-YHXDPU
	YHX-A30/YHX-A10	R-R-GYM-YHXA30A10
	EP-01-A30 / EP-01-A10	R-R-GYM-EP-01
Linear conveyor	LCM100	MSIP-REM-Y3M-M100
	LCMR200	R-R-GYM-LCMR200
	JGX series	R-R-GYM-JGX
Single-axis robot	TRANSERVO series	MSIP-REM-Y3M-TR
	FLIP-X series	MSIP-REM-Y3M-FX
	FLIP-X (24V) series	MSIP-REM-Y3M-FXL
	PHASER series	MSIP-REM-Y3M-PH
	GX series	R-R-GYM-GX
	Robonity series *	R-R-GYM-ROBONITY
Cartesian robot	XY-X series	MSIP-REM-Y3M-XY
SCARA robot	YK series	MSIP-REM-Y3M-YK
	YK-XE series	R-R-GYM-YK710XE-10

* Robonity_Motorless is not included as it is not subject to KC.

About non-compliant models

The following robots are subject to the KC system; however, since self-test compliance registration has not been done at the present time, they cannot be used in Korea. Additionally, special-order robots are also not compliant with the KC system.
Even for the various series listed in the table, some new models might not have been registered. (Contact YAMAHA for details.)

Pick and place robots: YP-X series

Approach to complying with EU RoHS Directive

Our approach to complying with EU RoHS Directive is explained below.

* Check the latest information at the website shown below.
https://global.yamaha-motor.com/business/robot/support/rohs/

In June, 2015, Commission Delegated Directive (EU) 2015/863 was published, and four kinds of phthalates were newly added to the specified hazardous substances (lead, hexavalent chromium, mercury, cadmium, PBB and PBDE) of EU RoHS Directive 2011/65/EU.
Our products are industrial instruments listed in Category 9 “Monitoring and control instruments including industrial monitoring and control instruments” and must comply with this directive if they are launched in Europe after the directive is put into operation.
We will take measures to comply with this directive by the appointed time.

EU RoHS Directive 2011/65/EU

1. Product categories concerned (from Annex I)

* Our products are industrial instruments listed in Category 9 “Monitoring and control instruments.” Categories

1	Large household appliances.
2	Small household appliances.
3	IT and telecommunications equipment.
4	Consumer equipment.
5	Lighting equipment.
6	Electrical and electronic tools.
7	Toys, leisure and sports equipment.
8	Medical devices.
9	Monitoring and control instruments including industrial monitoring and control instruments.
10	Automatic dispensers.
11	Other EEE not covered by any of the categories above.

2. Regulated substances and state of compliance with regulations

* All our products comply with EU RoHS Directive 2011/65/EU.

	Substance name	Max. allowable concentration
1	Lead	1000 ppm
2	Mercury	1000 ppm
3	Cadmium	100 ppm
4	Hexavalent chromium	1000 ppm
5	PBB (polybrominated biphenyls)	1000 ppm
6	PBDE (polybrominated diphenyl ethers)	1000 ppm

Addition of restricted substances to regulated substances

Commission Delegated Directive (EU) 2015/863 (notice through official gazettes in June, 2015) added the following four kinds of restricted substances to the substances regulated by EU RoHS Directive.

	Substance name	Max. allowable concentration	Effective date	
			Categories 1 to 7, 10 and 11	Categories 8 and 9
1	Bis (2-Ethylhexyl) phthalate (DEHP)	1000 ppm	July 22, 2019	July 22, 2021
2	Benzyl butyl phthalate (BBP)	1000 ppm		
3	Dibutyl phthalate (DBP)	1000 ppm		
4	Diisobutyl phthalate (DIBP)	1000 ppm		

Warranty

For information on the warranty period and terms, please contact our distributor where you purchased the product.

This warranty does not cover any failure caused by:

1. Installation, wiring, connection to other control devices, operating methods, inspection or maintenance that does not comply with industry standards or instructions specified in the YAMAHA manual;
2. Usage that exceeded the specifications or standard performance shown in the YAMAHA manual;
3. Product usage other than intended by YAMAHA;
4. Storage, operating conditions and utilities that are outside the range specified in the manual;
5. Damage due to improper shipping or shipping methods;
6. Accident or collision damage;
7. Installation of other than genuine YAMAHA parts and/or accessories;
8. Modification to original parts or modifications not conforming to standard specifications designated by YAMAHA, including customizing performed by YAMAHA in compliance with distributor or customer requests;
9. Pollution, salt damage, condensation;
10. Fires or natural disasters such as earthquakes, tsunamis, lightning strikes, wind and flood damage, etc;
11. Breakdown due to causes other than the above that are not the fault or responsibility of YAMAHA;

The following cases are not covered under the warranty:

1. Products whose serial number or production date (month & year) cannot be verified.
2. Changes in software or internal data such as programs or points that were created or changed by the customer.
3. Products whose trouble cannot be reproduced or identified by YAMAHA.
4. Products utilized, for example, in radiological equipment, biological test equipment applications or for other purposes whose warranty repairs are judged as hazardous by YAMAHA.

THE WARRANTY STATED HEREIN PROVIDED BY YAMAHA ONLY COVERS DEFECTS IN PRODUCTS AND PARTS SOLD BY YAMAHA TO DISTRIBUTORS UNDER THIS AGREEMENT. ANY AND ALL OTHER WARRANTIES OR LIABILITIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY EXPRESSLY DISCLAIMED BY YAMAHA. MOREOVER, YAMAHA SHALL NOT BE HELD RESPONSIBLE FOR CONSEQUENT OR INDIRECT DAMAGES IN ANY MANNER RELATING TO THE PRODUCT.

Ver.1.01_201209

Repeatability positioning accuracy

The “repeatability positioning accuracy” cannot be guaranteed for the accuracy conditions listed below.

(1) Factors involving absolute accuracy

- Under conditions requiring accuracy between the robot controller internal coordinate position (command position) and real space position (movement position).

(2) Operating pattern factors

- Under conditions including a motion approaching close to a teaching point (position) from different directions during repeating operation.
- Under conditions where power was turned off or operation was stopped, even when approaching a teaching position from same direction.
- Under conditions where movement to a teaching position uses a hand system (left-handed or right-handed system) different from that during teaching. (SCARA robots)

(3) Temperature factors

- Under conditions subject to drastic changes in ambient temperature.
- Under conditions where temperature of robot unit fluctuates.

(4) Fluctuating load factors

- Under conditions where load conditions fluctuate during operation (load fluctuates due to workpiece or no workpiece).

Discontinued sales models and repair coverage limits

MR12/MR12D

● Can be used for wall-mount

Sales end date	End of December 2019
Repair coverage	End of December 2026

Ordering method

Single carriage model

MR12 – [ ] – [ ] – [ ] – [ ] – [ ] – [ ] – **TSP** – [ ] – [ ] – [ ]

Model	Cable carrier entry location	Optional cable carrier for users	Origin position change	Grease type	Stroke	Cable length Note 2
MR12: Incremental MR12A: Semi-absolute Note 1	RH: Horizontal, right LH: Horizontal, left RW: Wall mounted, right LW: Wall mounted, left	No entry: None S: S type M: M type	Horizontal: No entry: L side (Standard), Z: R side Wall: No entry: R side (Standard), Z: L side	No entry: Standard GC: Clean	50 to 1050 (100mm pitch)	3L: 3.5m 5L: 5m 10L: 10m 3K/5K/10K (Flexible cable) Note 3

Positioner Note 4	Driver: Power-supply voltage / Power capacity	LCD monitor	I/O selection
TS-P	105: 100V/100W or less 205: 200V/100W or less	No entry: None L: With LCD	NP: NPN PN: PNP CC: CC-Link DN: DeviceNet™ EP: EtherNet/IP™ GW: No I/O board Note 5

SR1-P – **05** – [ ] – [ ]

Controller	Driver: Power capacity	Usable for CE	I/O selection
SR1-P	05: 100W or less	No entry: Standard E: CE marking	N: NPN P: PNP CC: CC-Link DN: DeviceNet™ PB: PROFIBUS

RDV-P – **2** – **05**

Driver	Power-supply voltage	Driver: Power capacity
RDV-P	2: AC200V	05: 100W or less

Note 1. For the details of the semi-absolute model, please refer to P.67. RDV-P has an incremental model only.
Note 2. The robot cable is standard cable (3L/5L/10L), but can be changed to flexible cable. See P.732 for details on robot cable.
Note 3. If a flexible cable is needed for the SR1-P, TS-P, or RDV-P, then select 3K/5K/10K. On the RCX221, the standard cable is a flexible cable, so enter 3L/5L/10L when ordering.
Note 4. These controllers can be mounted on DIN rails. See P.634 for details.
Note 5. Select this selection when using the gateway function. For details, see P.96.
Note. It is possible to provide the model without a cable carrier. To find information on wiring (cable terminals) within the cable carrier see P.742.

Double carriage model

MR12D – [ ] – [ ] – [ ] – [ ] – [ ] – **RCX221** – [ ] – [ ] – [ ]

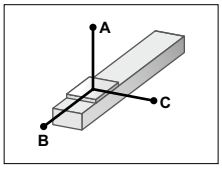
Model	Installing direction	Optional cable carrier for users	Grease type	Stroke	Cable length	Controller	Usable for CE	I/O selection 1	I/O selection 2
MR12D: Incremental MR12AD: Semi-absolute Note 1	H: Horizontal installation W: Wall mounted installation	No entry: None S: S type M: M type	No entry: Standard GC: Clean	50 to 1050 (100mm pitch)	3L: 3.5m 5L: 5m 10L: 10m 3K/5K/10K (Flexible cable) Note 3	RCX221 SR1-P (2 units) TS-P (2 units) RDV-P (2 units)	No entry: Standard E: CE marking	N: NPN P: PNP CC: CC-Link DN: DeviceNet™ PB: PROFIBUS EN: Ethernet	No entry: None N1: OP.DIO24/16 (NPN) P1: OP.DIO24/17 (PNP) EN: Ethernet

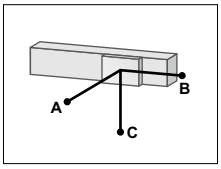
Specifications Note

Model	MR12	MR12D
Driving method / Shaft diameter	Shaft motor / ϕ12	
Repeatability (μm)	+/-5 or less	
Scale (μm)	Magnetic type: resolution of 1	
Maximum speed Note 1 (mm/sec)	2500	
Rated thrust (N)	18	
Maximum payload Note 2 (kg)	5	
Stroke (mm)	50 to 1050 (50mm pitch)	
Linear guide	4 rows of circular arc grooves × 2 rail	
Maximum cross-section outside dimensions (mm)	W60 × H90 (except the cable carrier section)	
Total length (mm)	Stroke+288	Stroke+488
Cable length (m)	Standard: 3.5 / Option: 5,10	

Note. A vertical model (with brake) is not available with the PHASER series.
Note. The basic specifications of semi-absolute model are the same as those of the incremental model.
Note 1. Maximum speed may not be obtained depending on operating conditions.
Note 2. Maximum payload per carriage.

Allowable overhang Note





Horizontal installation (Unit: mm)

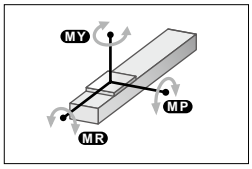
	A	B	C
1kg	600	600	600
2kg	1200	1200	598
3kg	1800	1800	406
5kg	3000	1561	241

Wall installation (Unit: mm)

	A	B	C
1kg	600	600	600
2kg	529	1200	1200
3kg	323	1450	1800
5kg	162	589	3000

Note. Distance from center of slider top to center of gravity of object being carried at a guide service life of 10,000 km.

Static loading moment



(Unit: N·m)

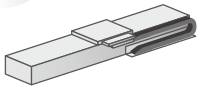
MY	MP	MR
107	107	89

Controller

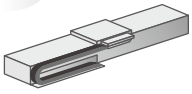
Controller	Operating method
SR1-P05	Programming / I/O point trace / Remote command / Operation using RS-232C communication
RCX221 RCX240/340	
TS-P105 TS-P205	I/O point trace / Remote command
RDV-P205	Pulse train control

Cable carrier entry location

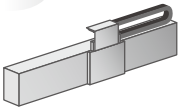
RH Horizontal, right



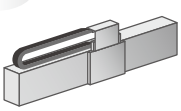
LH Horizontal, left



RW Wall mounted, right



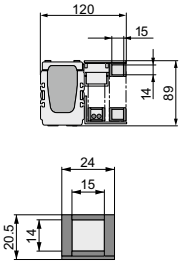
LW Wall mounted, left



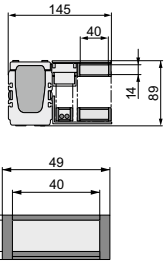
Note. Be sure to install in the direction as specified (in cable carrier take-out direction drawing and various specification drawings) individually. Installation in any other way will cause a failure. For requirement of installation in any way other than the above standard installation, please consult YAMAHA as special arrangement will be available.

Optional cable carrier for users

S type



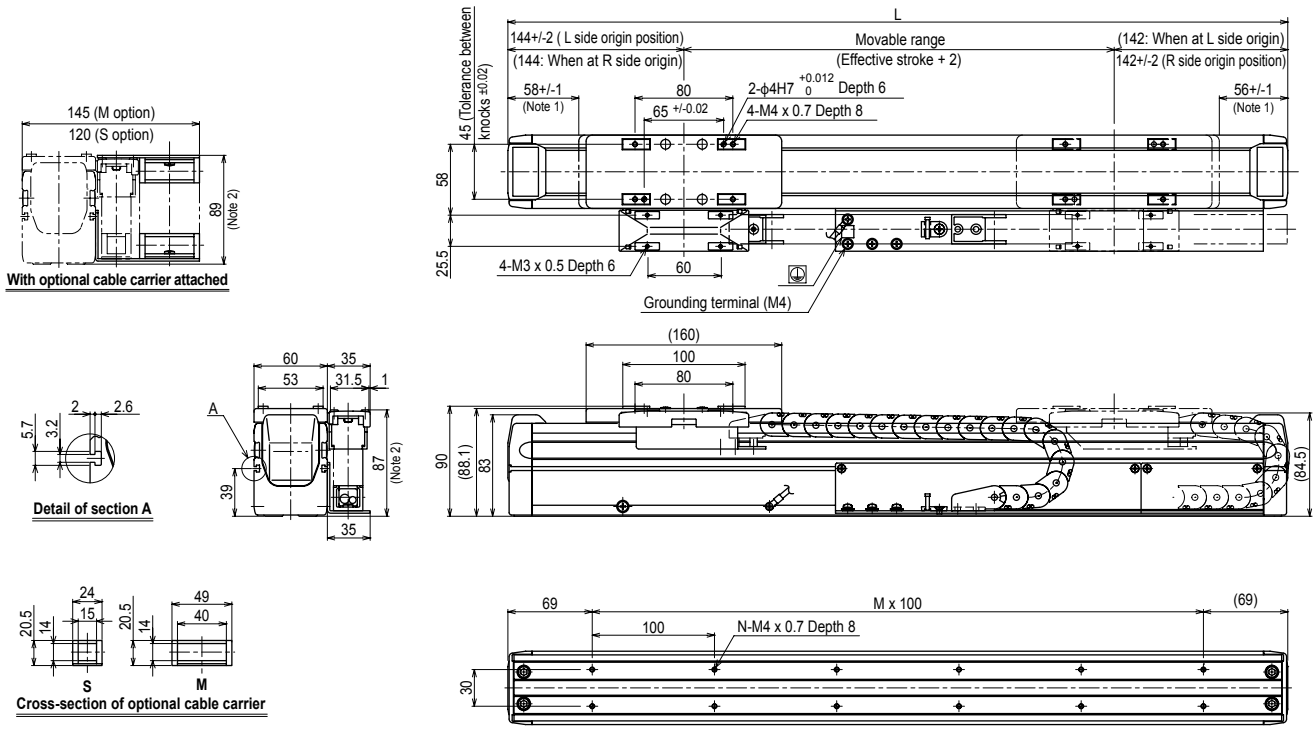
M type



Space for optional cable for users

Note. The cable and air hoses should take up less than 30% of the space when storing them inside the cable carrier. Lay out the cables and air hoses in rows inside the cable carrier so they do not cross each other.

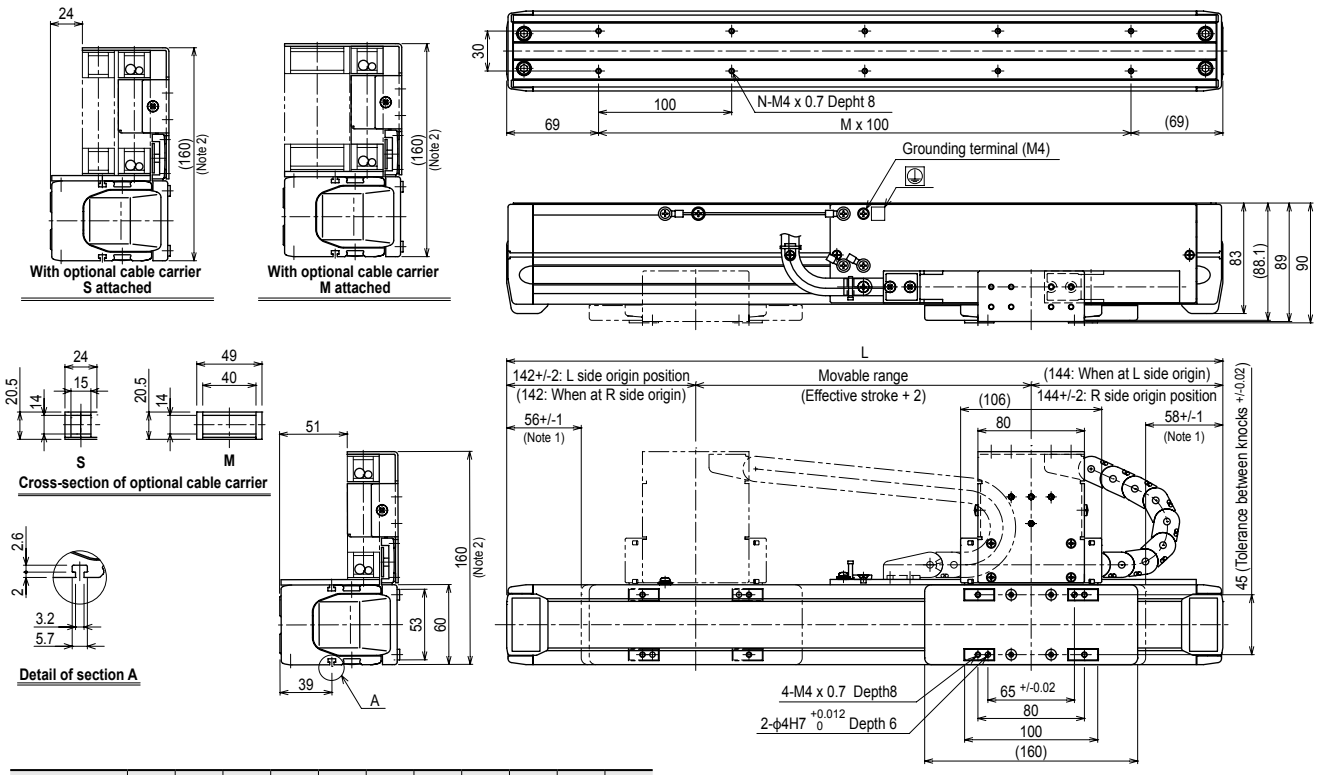
MR12 single carriage horizontal mount model RH



Effective stroke	50	150	250	350	450	550	650	750	850	950	1050
L	338	438	538	638	738	838	938	1038	1138	1238	1338
M	2	3	4	5	6	7	8	9	10	11	12
N	6	8	10	12	14	16	18	20	22	24	26
Weight (kg)	3.9	4.4	5.0	5.6	6.1	6.7	7.3	7.9	8.4	9.0	9.5

Note 1. Stop positions are determined by the mechanical stoppers at both ends.
Note 2. Depending on the stroke and the operating conditions, the cable carrier bending radius might be larger, making it higher than the dimensions shown in the diagram.
Note. The origin is set on the L side at the time of shipment. It can be changed to the R side by parameter setting.

MR12 single carriage wall mount model RW



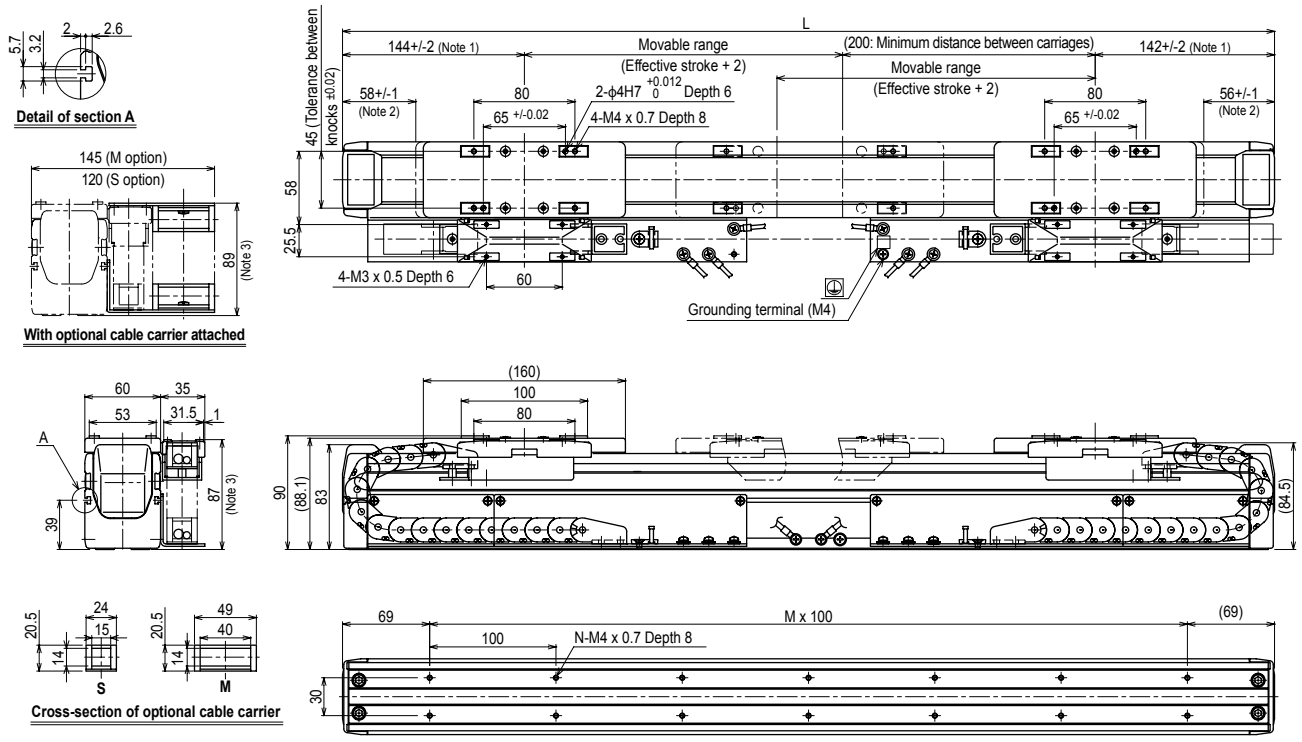
Effective stroke	50	150	250	350	450	550	650	750	850	950	1050
L	338	438	538	638	738	838	938	1038	1138	1238	1338
M	2	3	4	5	6	7	8	9	10	11	12
N	6	8	10	12	14	16	18	20	22	24	26
Weight (kg)	3.9	4.4	5.0	5.6	6.1	6.7	7.3	7.9	8.4	9.0	9.5

Note 1. Stop positions are determined by the mechanical stoppers at both ends.
Note 2. Depending on the stroke and the operating conditions, the cable carrier bending radius might be larger, making it higher than the dimensions shown in the diagram.
Note. The origin is set on the R side at the time of shipment. It can be changed to the L side by parameter setting.

Controller SR1-P ▶ 652 | RCX221 ▶ 670 | TS-P ▶ 626 | RDV-P ▶ 640

MR12/MR12D

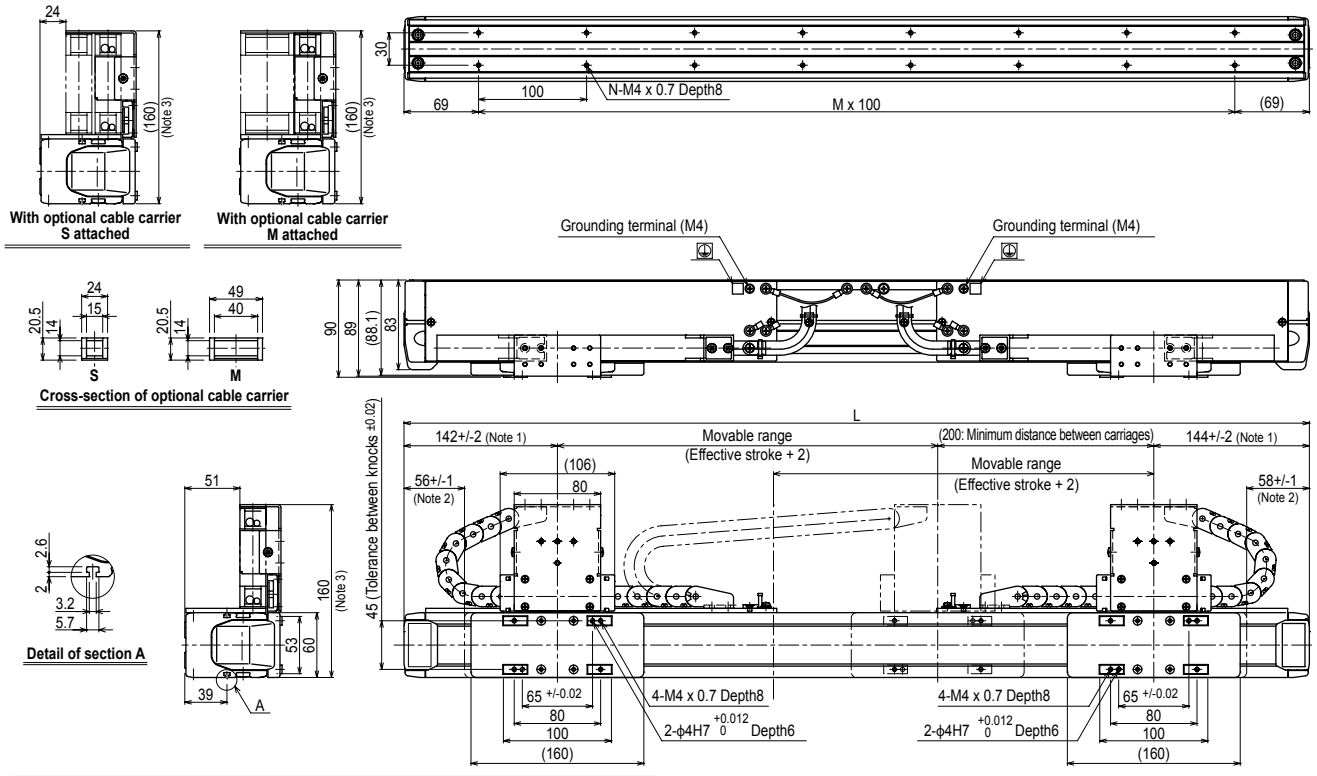
MR12D double carriage horizontal mount model H



Effective stroke	50	150	250	350	450	550	650	750	850	950	1050
L	538	638	738	838	938	1038	1138	1238	1338	1438	1538
M	4	5	6	7	8	9	10	11	12	13	14
N	10	12	14	16	18	20	22	24	26	28	30
Weight (kg)	5.7	6.3	6.8	7.3	8.0	8.6	9.1	9.7	10.2	10.8	11.3

Note 1. Position of the table slider when returned to the origin.
Note 2. Stop positions are determined by the mechanical stoppers at both ends.
Note 3. Depending on the stroke and the operating conditions, the cable carrier bending radius might be larger, making it higher than the dimensions shown in the diagram.

MR12D double carriage wall mount model W



Effective stroke	50	150	250	350	450	550	650	750	850	950	1050
L	538	638	738	838	938	1038	1138	1238	1338	1438	1538
M	4	5	6	7	8	9	10	11	12	13	14
N	10	12	14	16	18	20	22	24	26	28	30
Weight (kg)	5.7	6.3	6.8	7.3	8.0	8.6	9.1	9.7	10.2	10.8	11.3

Note 1. Position of the table slider when returned to the origin.
Note 2. Stop positions are determined by the mechanical stoppers at both ends.
Note 3. Depending on the stroke and the operating conditions, the cable carrier bending radius might be larger, making it higher than the dimensions shown in the diagram.

YK400XR

Standard type: Small type

LOW COST HIGH PERFORMANCE MODEL

Sales end date	End of June 2020
Repair coverage	End of June 2027

Arm length 400mm **Maximum payload 3kg**

Ordering method

YK400XR - [ ] - **150** - [ ] - [ ] - **RCX340-4** - [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Model	Return-to-origin method	Z axis stroke	Hollow shaft	Cable	Controller / Number of controllable axes	Safety standard	Option A (OP.A)	Option B (OP.B)	Option C (OP.C)	Option D (OP.D)	Option E (OP.E)	Absolute battery
YK400XR	S: Sensor T: Stroke end	150	No entry: None S: With hollow shaft	3L: 3.5m 5L: 5m 10L: 10m	RCX340-4							

Specify various controller setting items. RCX340 ▶ P.678

Specifications

			X-axis	Y-axis	Z-axis	R-axis
Axis specifications	Arm length		225 mm	175 mm	150 mm	-
	Rotation angle		+/-132 °	+/-150 °	-	+/-360 °
AC servo motor output			200 W	100 W	100 W	100 W
Deceleration mechanism	Transmission method	Motor to speed reducer	Direct-coupled		Timing belt	
		Speed reducer to output	Direct-coupled			Timing belt
Repeatability Note 1			+/-0.01 mm		+/-0.01 mm	+/-0.01 °
Maximum speed			6 m/sec		1.1 m/sec	2600 °/sec
Maximum payload			3 kg (Standard specification), 2 kg (Option specifications Note 4)			
Standard cycle time: with 2kg payload Note 2			0.45 sec			
R-axis tolerable moment of inertia Note 3			0.05 kgm^2 (0.5 kgfcms^2)			
User wiring			0.2 sq × 10 wires			
User tubing (Outer diameter)			ϕ 4 × 3			
Travel limit			1.Soft limit 2.Mechanical stopper (X,Y,Z axis)			
Robot cable length			Standard: 3.5 m Option: 5 m, 10 m			
Weight			17 kg			

Note 1. This is the value at a constant ambient temperature. (X,Y axes)
Note 2. When reciprocating 300mm in horizontal and 25mm in vertical directions and performing the coarse positioning arch operation.
Note 3. It is necessary to input the moment of inertia in the actual operating environment.
Note 4. Maximum payload of option specifications (with user wiring/tubing through spline type) is 2kg.

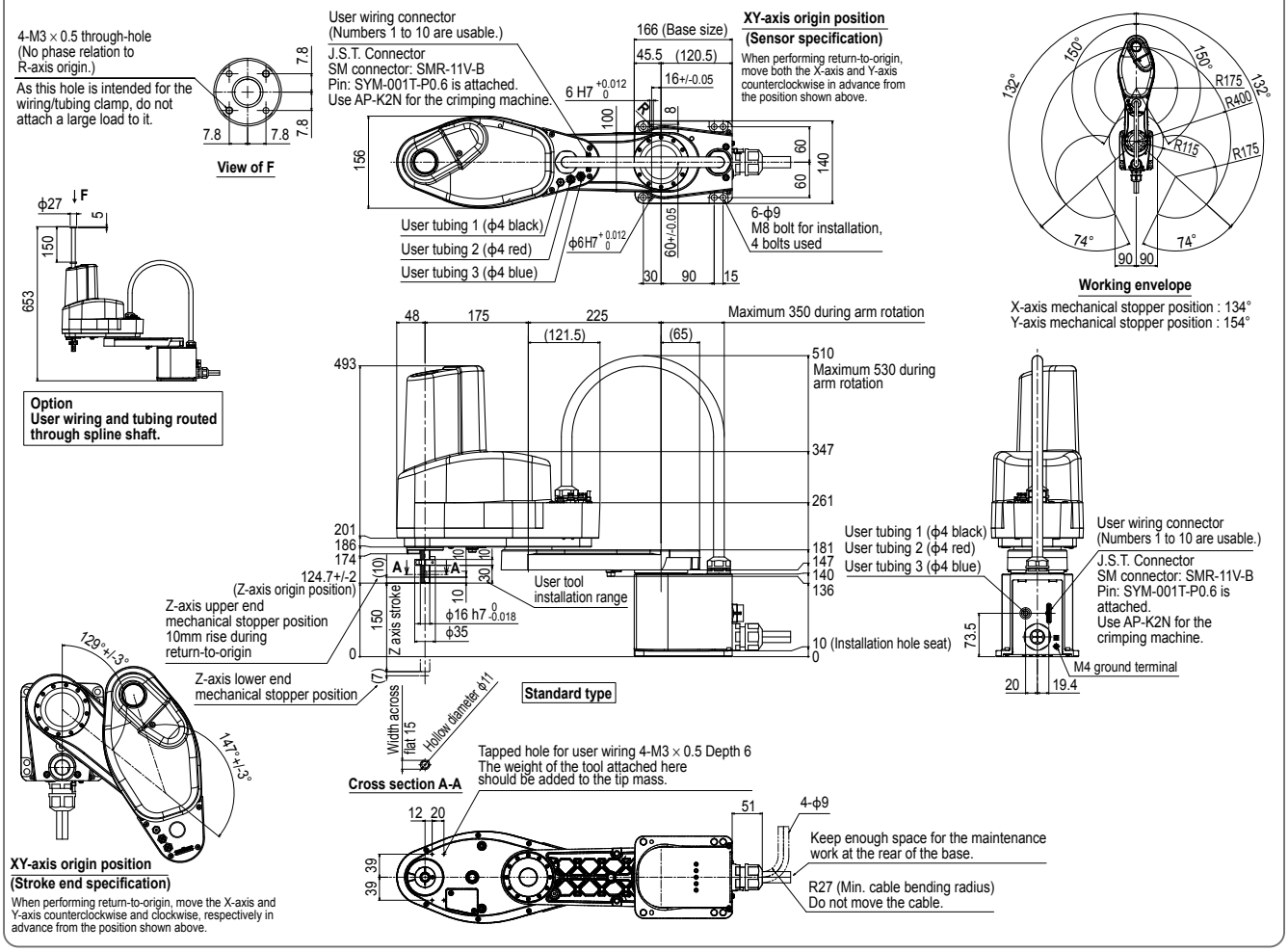
Controller

Controller	Power capacity (VA)	Operation method
RCX340	1000	Programming / Remote command / Operation using RS-232C communication

Note. The movement range can be restricted by adding the X- and Y-axis mechanical stoppers. (The maximum movement range was set at shipment.)
See our robot manuals (installation manuals) for detailed information.
Note. To set the standard coordinates with high accuracy, use a standard coordinate setting jig (option). Refer to the user's manual (installation manual) for more details.

Our robot manuals (installation manuals) can be downloaded from our website at the address below:
https://global.yamaha-motor.com/business/robot/

YK400XR



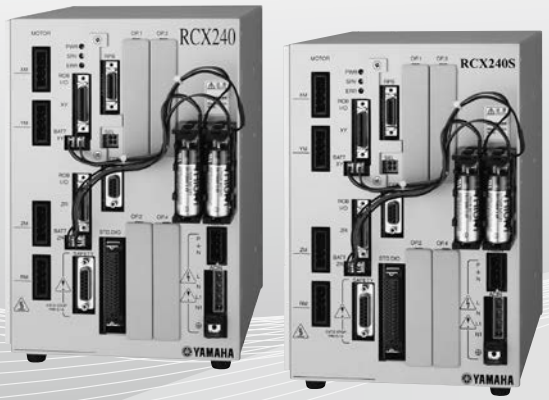
Controller RCX340 ▶ 678

RCX240/RCX240S

Sales end date	End of December 2019
Repair coverage	End of December 2026

● Robot controller with advanced functions

An advanced multi-axial controller newly developed based on long years of actual results! Along with a full range of functions, great engineering also makes it extremely easy to use.



RCX240

RCX240S

Programming box
▶ **RPB/RPB-E**
P.700

Support software for PC
▶ **VIP+**
P.692

■ Basic specifications

	Item	Model	RCX240 / RCX240S
Basic specifications	Number of controllable axes		4 axes maximum (Control simultaneously: 4 axes)
	Controllable robots		Single-axis robot FLIP-X, Linear motor single-axis robot PHASER, Cartesian robot XY-X, SCARA robot YK-XG, Pick & place robot YP-X
	Maximum power consumption		2500VA (RCX240) / 1500VA (RCX240S)
	Capacity of the connected motor		1600W (RCX240) /800W (RCX240S)
	Dimensions		W180 × H250 × D235mm
	Weight		6.5kg
	Input power supply	Control power supply	Single phase AC200 to 230V +/-10% maximum (50/60Hz)
		Motor power supply	Single phase AC200 to 230V +/-10% maximum (50/60Hz)
Axis control	Drive method		AC full-digital software servo
	Position detection method		Multi-turn resolver with data backup function, Magnetic linear scale
	Operating method		PTP (Point to Point), Linear interpolation, Circular interpolation, ARCH
	Coordinate system		Joint coordinates, Cartesian coordinates
	Position indication units		Pulses, mm (millimeters), deg (degrees)
	Speed setting		1% to 100% (In units of 1%. However speed is in units of 0.01% during single-axis operation by DRIVE statement.)
	Acceleration setting		1. Automatic acceleration setting based on robot model type and end mass parameter 2. Setting based on acceleration and deceleration parameter (Setting by 1% unit)
	Origin search method		Incremental, Absolute, Semi-absolute
Program	Program language		YAMAHA BASIC (Conforming to JIS B8439 SLIM Language)
	Multitasks		8 tasks maximum
	Sequence program		1 program
	Point-data input method		Manual data input (coordinate value input), Direct teaching, Teaching playback
Memory	Memory capacity		364KB (total capacity of program and points) (available program capacity during use of maximum number of points is 84KB)
	Programs		100 program (Max.) 9,999: maximum lines per program 98KB: maximum capacity per program
	Points		10,000 points: maximum numbers of points
	Memory Backup battery		Lithium metallic battery (service life 4 years at 0°C to 40°C)
	Internal flash memory		512KB (ALL data only)

Controllable robot	XY-X P.363	YK-X P.491	FLIP-X P.295	PHASER P.341	YP-X P.553
CE marking	◯	Field networks	CC-Link DeviceNet EtherNet/IP Ethernet PROFIBUS		

Model Overview

Name	RCX240/RCX240S
Controllable robot Note	Cartesian robot XY-X / SCARA robot YK-X / Single-axis robot FLIP-X / Linear motor single-axis robot PHASER / Pick & place robot YP-X
Input power	Single phase : AC200V to 230V +/-10% maximum (50/60Hz)
Operating method	Programming / Remote command / Operation using RS-232C communication
Maximum number of controllable axes	4 axes maximum
Origin search method	Incremental/Absolute

Note. For details, please refer to the controller model selection table on the next page.

Ordering method

RCX240
RCX240S

Controller Note1	Usable for CE	Regenerative unit Note2	Option I/O	Network Option	iVY System Option board	Light/Tracking	Gripper	Battery
RCX240: Standard model RCX240S: Low capacity model	No entry: Standard E: CE marking K: KCs	No entry: None R: RGU-2 R3: RGU-3 Note3	N, P: Standard I/O 16/8 N1, P1: 40/24 points N2, P2: 64/40 points N3, P3: 88/56 points N4, P4: 112/72 points	No entry: None CC: CC-Link DN: DeviceNet™ PB: PROFIBUS EN: Ethernet EP: EtherNet/IP™ YC: YC-Link Note5	No entry: None VY: iVY (VISION)	No entry: None TR: Light+Tracking LC: Light	No entry: None GR: Gripper	No entry: None Note6 B: 2pcs Note7 BB: 4pcs Note8

Note 1.The RCX240S controller is limited to use with robots that handles 200W or lower on each axis. Check the following controller selection table to find the matching model.
Note 2.The regenerative unit (option) is required when operating a model designated by YAMAHA or a load with a large inertia. Please refer to the following regenerative unit selection table.
Note 3.YK500XG to YK1000XG are for RGU-3.
Note 4.Use N to N4 when NPN is selected on the I/O board, and P to P4 when PNP is selected.
Note 5.Available only for the master. (The YC-Link system controls an SR1 series single-axis controller in accordance with communications received from an RCX series multi-axis controller. Using the YC-Link system allows control of up to 8 axes (or up to 6 axes with synchronous control)).
Note 6.Use battery-less model if connecting to all-axis linear motor, or to incremental models.
Note 7.If any or Single-axis among the XY axes are absolute specifications then 2 batteries are required.
Note 8.If any or Single-axis among the ZR axes are absolute specifications then 2 batteries are required.

☆ Please note that:

The current sensor on the RCX240S cannot be set to 20A.
As a controller stocked for maintenance, please order an RCX240 that can be set to any of 05A, 10A and 20A.

	Item		Model	RCX240 / RCX240S	
External input/output	STD.DIO	I/O input		Dedicated input 10 points, General input 16 points (NPN / PNP specifications selectable)	
		I/O output		Dedicated output 11 points, General output 8 points	
	SAFETY			Emergency stop input (Relay contact), Service mode input (NPN/PNP specification is set according to STD. DIO setting), Enabling switch input (Enabled only when the RPB-E is used.)	
	Brake output			Relay contact	
	Origin sensor input			Connectable to DC 24V normally-closed contact sensor	
	External communications			RS-232C: 1CH D-SUB9 (female) RS-422: 1CH (Dedicated RPB)	
	Regenerative unit connection			RGEN connector	
	Options	Slots		4	
		Type		Optional input/output (NPN/PNP)	General input 24 points, General output 16 points
				CC-Link	Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points (4 nodes occupied)
				DeviceNet™	Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points
				PROFIBUS	Dedicated input 16 points, Dedicated Output 16 points, General input 96 points, General output 96 points
				Ethernet	IEEE802.3 10Mbps (10BASE-T)
				EtherNet/IP™	Dedicated input 16 points, dedicated output 16 points, General-purpose input 96 points, general-purpose output 96 points Conforms to Ethernet (IEEE 802.3) 10Mbps/100Mbps.
				iVY	Camera input (2ch), camera trigger input, PC connection input
				Tracking	AB phase input, lighting trigger input, lighting power supply input/output
				Lighting control	Lighting trigger input, lighting power supply input/output
				Gripper control	No. of axes: 1 axis, Position detection method: Optical rotary encoder, Min. setting distance: 0.01mm
Options	Programming box			RPB, RPB-E (with enable switch)	
	Support software for PC			VIP+	
	Regenerative unit			RGU-2, RGU-3	
General specifications	Operating temperature			0°C to 40°C	
	Storage temperature			-10°C to 65°C	
	Operating humidity			35% to 85%RH (non-condensing)	
	Absolute backup battery			Lithium metallic battery 3.6V 5400mAH (2700mAH × 2)	
	Absolute data backup period			1 year (in state with no power applied)	
	Noise immunity			IEC61000-4-4 Level 3	
	Protective structure			IP10	

RCX240/RCX240S

Controller model selection table

The RCX240S controller is limited to use with robots that handles 200W or lower on each axis and is partly modified such as for optimizing the IPM, but it is fully compatible with RCX240 operation and functions, and peripheral equipment can be used by both models.

	XY-X								
	PXYX	FXYX	FXYBX	SXYX	SXYBX	NXY	MXYX	HXYX	HXYLX
RCX240						●	●	●	●
RCX240S	●	●	●	●	●				

	YK-X																		
	YK500TW	YK120XG	YK150XG	YK180X/XG	YK220X	YK250XG	YK350XG	YK400XG	YK500XGL	YK500XG	YK600XGL	YK600XG	YK700XG	YK800XG	YK900XG	YK1000XG	YK1200X	YK300XGS	YK400XGS
RCX240	●									●		●	●	●	●	●	●		
RCX240S		●	●	●	●	●	●	●	●		●							●	●

	YK-X																	
	YK500XGS	YK600XGS	YK700XGS	YK800XGS	YK900XGS	YK1000XGS	YK250XGP	YK350XGP	YK400XGP	YK500XGLP	YK500XGP	YK600XGLP	YK600XGP	YK600XGHP	YK700XGP	YK800XGP	YK900XGP	YK1000XGP
RCX240	●	●	●	●	●	●					●		●	●	●	●	●	●
RCX240S							●	●	●	●		●						

	CLEAN											
	YK180XGC	YK220XC	YK250XGC	YK350XGC	YK400XGC	YK500XGLC	YK500XC	YK600XGLC	YK600XC	YK700XC	YK800XC	YK1000XC
RCX240							●		●	●	●	●
RCX240S	●	●	●	●	●	●		●				

Multi-robot: Driver list for each model

For “multi-robots” that are used in combination with one or more single-axis robots, the RCX240S can be used unless the divers for the combined models include a 20A model.

		FLIP-X																				PHASER					
		T4LH	T5LH	T6L	T9	T9H	F8/F8L/F8LH	F10	F14	F14H	GF14XL	F17/F17L	GF17XL	F20/F20N	N15	N18	B10	B14/B14H	R5	R10	R20	MR12	MF7	MF15	MF20	MF30	MF75
Driver	05A	●	●	●	●		●	●	●								●	●	●	●		●					
	10A					●				●	●										●		●	●	●		
	20A											●	●	●	●	●										●	●

Regenerative unit selection table

	XY-X					
	FXYx	SXYx	NXY	NXY	MXYx	HXYx
	3 axes	3,4 axes	3,4 axes	6 axes	3,4 axes	3,4 axes
No entry (None)	●	○				
R (RGU-2)		○	●	●	●	●
R3						

	YK-XG																		
	YK120XG	YK150XG	YK180XG	YK180X	YK220X	YK250XG	YK350XG	YK400XG	YK500XGL	YK500XG	YK600XGL	YK600XG	YK600XGH	YK700XG	YK800XG	YK900XG	YK1000XG	YK1200X	YK300XGS
No entry (None)	●	●	●	●	●	●	●	●	●		●								●
R (RGU-2)																		●	
R3										●		●	●	●	●	●	●		

	YK-XG																		
	YK400XGS	YK500XGS	YK600XGS	YK700XGS	YK800XGS	YK900XGS	YK1000XGS	YK250XGP	YK350XGP	YK400XGP	YK500XGLP	YK500XGP	YK600XGLP	YK600XGP	YK600XGHP	YK700XGP	YK800XGP	YK900XGP	YK1000XGP
No entry (None)	●							●	●	●	●		●						
R (RGU-2)																			
R3		●	●	●	●	●	●					●		●	●	●	●	●	●

	Clean											
	SXYxC	SXYxC	YK180XC	YK220XC	YK250XCH	YK350XCH	YK400XCH	YK500XC	YK600XC	YK700XC	YK800XC	YK1000XC
	3 axes	4 axes										
No entry (None)	●	●	●	●	●	●	●					
R (RGU-2)								●	●	●	●	●
R3												

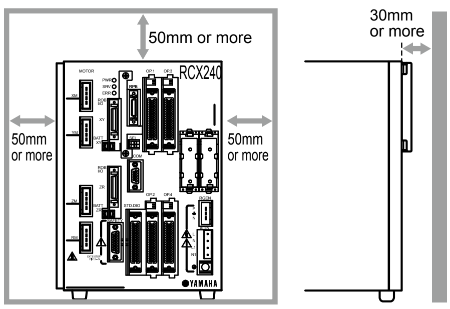
● : Required ○ : If Z axis is 200W specifications then regenerative unit RGU-2 is required.

Conditions where regenerative unit is needed on multi robots

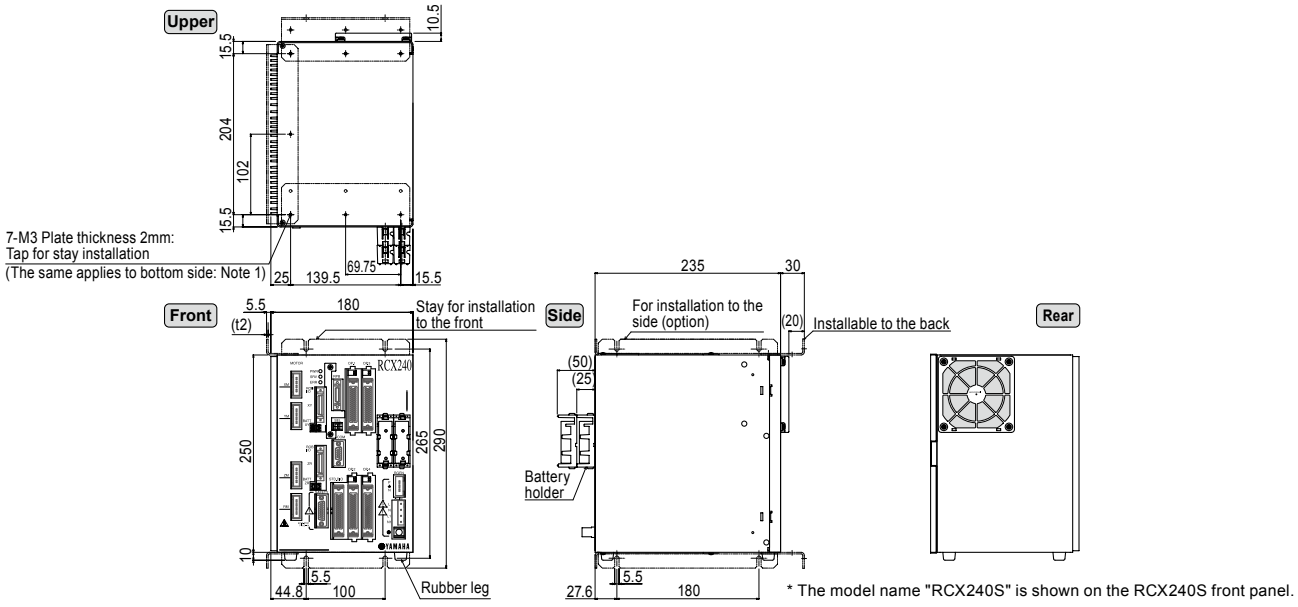
- Motor capacity exceeds a total of 450W.
- Motor capacity for perpendicular axis exceeds a total of 240W.
- B14H which maximum speed exceeds 1250mm per second.
- The following conditions apply when perpendicular axis capacity is 240W or less.
  - perpendicular axis is 200W.
  - perpendicular axis is 100W and stroke is 700mm or more.
  - there are 2 perpendicular axes at 100W, and includes leads of 5mm.

Installation conditions

- Install the RCX240/RCX240S inside the control panel.
- Install the RCX240/RCX240S on a flat, level surface.
- Install the RCX240/RCX240S in a well ventilated location, with space on all sides of the RCX240/RCX240S (See fig. at right.).
- Do not block the heat-sink on the side panel.
- Do not block the fan on the bottom of the controller.
- Ambient temperature : 0 to 40˚C
- Ambient humidity : 35 to 85% RH (no condensation)



Dimensions



* The model name "RCX240S" is shown on the RCX240S front panel.

Power supply capacity and heat emission

The required power supply capacity and heat emission will vary depending on the robot type and number of axes.
Using the following table as a general guide consider the required power supply preparation and control panel size, controller installation, and cooling method.

(1) When connected to SCARA robot

Robot type					Power capacity (VA)	Generated heat amount (W)
Standard type	Clean type	Dust-proof & drip-proof type	Wall-mount / Ceiling-mount / inverse type	Orbit type		
YK180X, 220X	–	–	–	–	500	63
YK250XG, 350XG, 400XG, 500XGL, 600XGL	YK250XGC, 350XGC, 400XGC, 500XGLC, 600XGLC	YK250XGP, 350XGP, 400XGP, 500XGLP, 600XGLP	YK300XGS, 400XGS	–	1000	75
–	YK500XC, 600XC	–	–	–	1500	88
YK550X, 500XG, 600XG	–	YK500XGP, 600XGP	YK500XGS, 600XGS	–	1700	93
–	YK700XC, 800XC, 1000XC	–	–	–	2000	100
YK600XGH, 700XG, 800XG, 900XG, 1000XG, 1200X	–	YK600XGHP, 700XGP, 800XGP, 900XGP, 1000XGP	YK700XGS, 800XGS, 900XGS, 1000XGS	YK350TW, YK500TW	2500	113

(2) When connected to 2 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note		Power capacity (VA)	Generated heat amount (W)
X axis	Y axis		
05	05	600	65
10	05	800	70
10	10	1000	75
20	05	1100	78
20	10	1300	83
20	20	1700	93

(3) When connected to 3 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note			Power capacity (VA)	Generated heat amount (W)
X axis	Y axis	Z axis		
05	05	05	700	68
10	05	05	900	73
10	10	05	1000	75
10	10	10	1200	80
20	05	05	1200	80
20	10	05	1300	83
20	10	10	1500	88
20	20	05	1600	90
20	20	10	1800	95
20	20	20	2000	95

(4) When connected to 4 axis (Cartesian robot and/or multi-axis robot)

Axial current sensor value Note				Power capacity (VA)	Generated heat amount (W)
X axis	Y axis	Z axis	R axis		
05	05	05	05	800	70
10	05	05	05	1000	75
10	10	05	05	1100	78
10	10	10	05	1300	83
10	10	10	10	1400	85
20	05	05	05	1200	80
20	10	05	05	1400	85
20	10	10	05	1500	88
20	10	10	10	1700	93
20	20	05	05	1600	90
20	20	10	05	1800	95
20	20	10	10	2000	100
20	20	20	05	2100	103
20	20	20	10	2200	105
20	20	20	20	2500	113

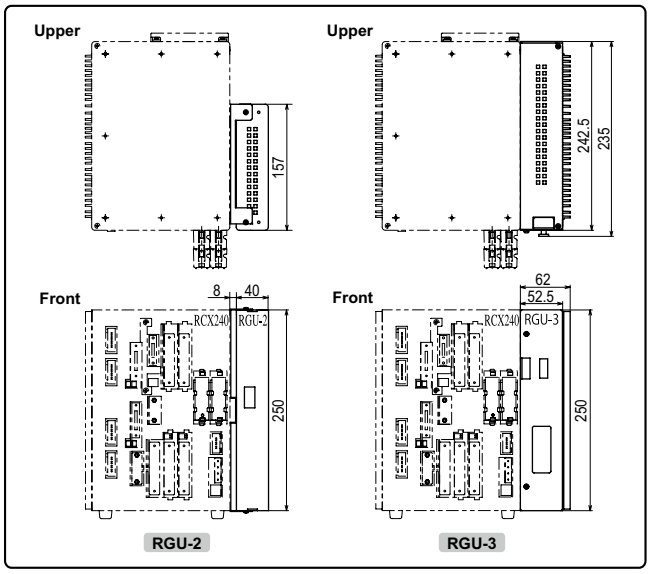
Note. Even if axial current sensor values for each axis are interchanged no problem will occur.

Note. Motor capacity vs. current sensor table

Connected motor capacity	Current sensor
100W or less	05
200W	10
400W or more	20

Note. Motor output of the B14H is 200W but the current sensor is 05.

Regenerative unit



RGU-2 basic specifications

Item	RGU-2
Model	KX0-M4107-20 (including cable supplied with unit)
Dimensions	W40 × H250 × D157mm
Weight	0.9kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

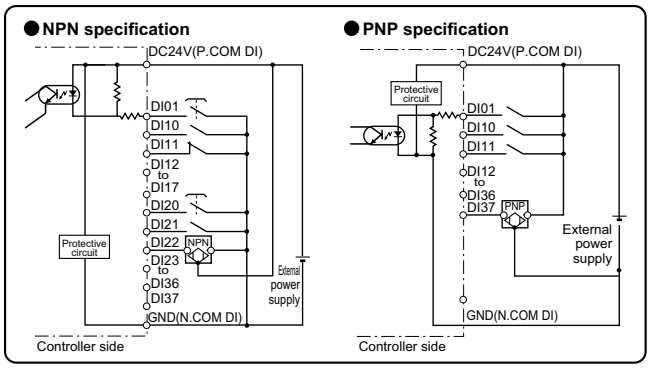
Note. Always leave an empty space (gap of about 20mm) between this unit and the adjacent controller. Also, always use the dedicated cable when connecting the controller.

RGU-3 basic specifications

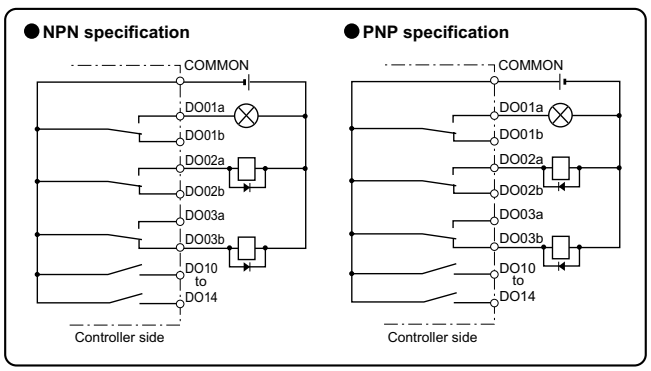
Item	RGU-3
Model	KX0-M4107-30 (including cable supplied with unit)
Dimensions	W62 × H250 × D242.5mm
Weight	3.7kg
Regenerative voltage	Approx. 380V or more
Regenerative stop voltage	Approx. 360V or less
Accessory	Cable for connection with controller (300mm)

Note. Cannot be installed as a separate unit.

Example of input signal connection

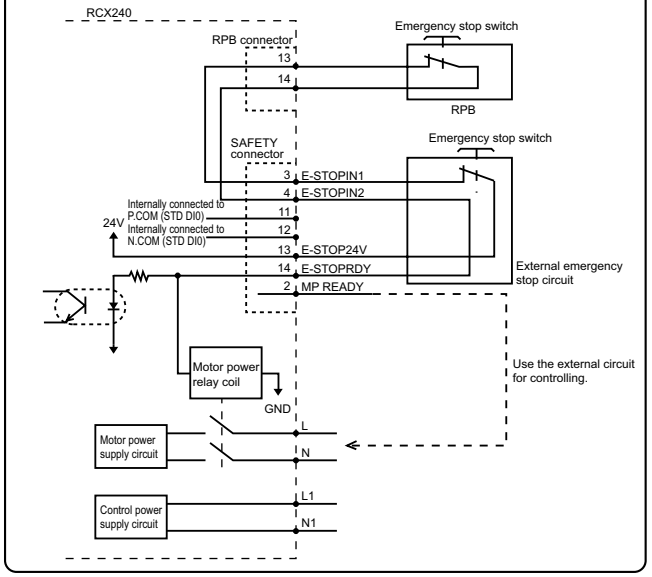


Example of output signal connection



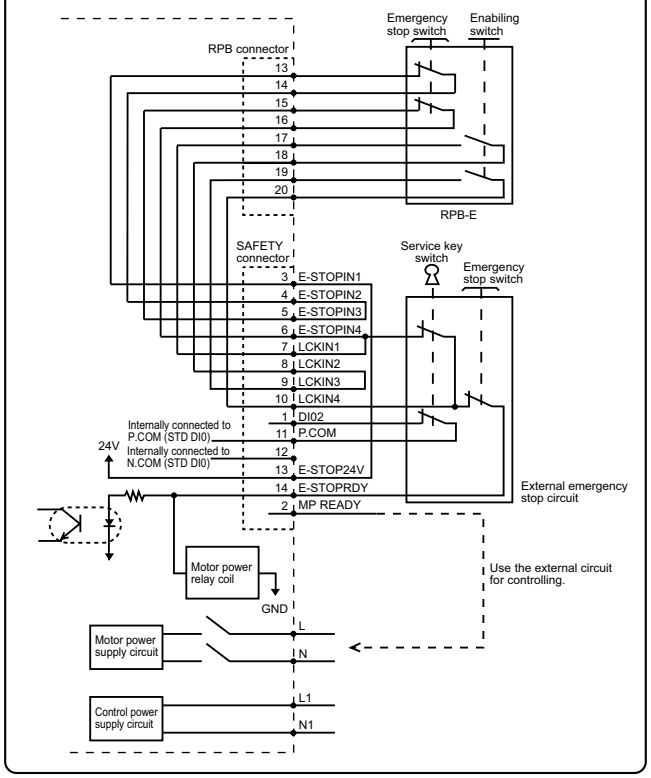
Emergency input signal connections

Connection when using the standard RPB with an external emergency stop circuit.



Installing an external safety circuit will satisfy safety category class 4 standards. See P.750 for more information.

Connections using the RPB-E enabling switch compatible programming unit with external emergency stop circuit (PNP specification)



Connector input / output signals

PIN	I/O No.	Name	Note
1	DI05	I/O command execution trigger input	Common terminal : P.COMDI N.COMDI (Photo-coupler input) NPN specification : Source type PNP specification : Sink type
2	DI01	Servo ON input	
3	DI10	Sequence control	
4	DI11	Interlock	
5	DI12	Program start	
6	DI13	AUTO mode input	
7	DI14	Return-to-origin	
8	DI15	Program reset	
9	DI16	MANUAL mode input	
10	DI17	Absolute reset / Return-to-origin	
11	DI20	General input 20	
12	DI21	General input 21	
13	DI22	General input 22	
14	DI23	General input 23	
15	DI24	General input 24	
16	DI25	General input 25	
17	DI26	General input 26	
18	DI27	General input 27	
19	DI30	General input 30	
20	DI31	General input 31	
21	DI32	General input 32	
22	DI33	General input 33	
23	DI34	General input 34	
24	DI35	General input 35	
25	DI36	General input 36	
26	DI37	General input 37	

PIN	I/O No.	Name	Note
27	COMMON	Relay common	(Relay output) Maximum capacity of each terminal (resistance load) : DC 24V 0.5A Common terminal : COMMON
28	DO01b	CPU_OK (B contact)	
29	DO01a	CPU_OK (A contact)	
30	DO02b	Servo ON output (B contact)	
31	DO02a	Servo ON output (A contact)	
32	DO03b	Alarm (B contact)	
33	DO03a	Alarm (A contact)	
34	DO10	AUTO mode output	
35	DO11	Return-to-origin complete	
36	DO12	Sequence program in-progress	
37	DO13	Robot program in-progress	
38	DO14	Program reset	
39	DO20	General output 20	(Transistor output) NPN specification or PNP specification Maximum capacity of each terminal (resistance load) : 0.1A +Common terminal : DC+24V - Common terminal : GND
40	DO21	General output 21	
41	DO22	General output 22	
42	DO23	General output 23	
43	DO24	General output 24	
44	DO25	General output 25	
45	DO26	General output 26	
46	DO27	General output 27	
47	DC24V	DC+24V (P.COMDI)	External power supply input
48			
49	GND	GND (N.COMDI)	
50			

Note. When using the CC-Link, DeviceNetTM, EtherNet/IPTM, or PROFIBUS, the dedicated inputs other than the interlock signal (DI11) of the STD.DIO that are provided on the RCX240 controller are disabled.
Additionally, when the external 24V monitor control of the system parameters is set disabled, the interlock signal (D11) becomes disabled.

SAFETY connector signals

Terminal number	RPB connected		RPB-E connected	
	I/O No.	Name	I/O No.	Name
1	DI02	SERVICE mode	DI02	SERVICE mode
2	MP READY	Motor power ready signal	MP READY	Motor power ready signal
3	E-STOPIN 1	Emergency stop input 1	E-STOPIN 1	Emergency stop input 1
4	E-STOPIN 2	Emergency stop input 2	E-STOPIN 2	Emergency stop input 2
5	NC	NC	E-STOPIN 3	Emergency stop input 3
6	NC	NC	E-STOPIN 4	Emergency stop input 4
7	NC	NC	LCKIN 1	Enabling switch input 1
8	NC	NC	LCKIN 2	Enabling switch input 2
9	NC	NC	LCKIN 3	Enabling switch input 3
10	NC	NC	LCKIN 4	Enabling switch input 4
11	P.COM	DC+24V (P.COM DI)	P.COM	DC+24V (P.COM DI)
12	N.COM	GND (N.COM DI)	N.COM	GND (N.COM DI)
13	E-STOP 24V	Emergency stop input supply	E-STOP 24V	Emergency stop input supply
14	E-STOPRDY	Emergency stop READY signal	E-STOPRDY	Emergency stop READY signal
15	NC	NC	NC	NC

Standard functions of the controller

Function	Description
Operation mode	Automatic mode (main task: execution of program, execution of step), Program mode (main task: creation of program), Manual mode (main task: jog movement, point teaching), System mode (main task: parameter editing, data initialization), Utility mode (main task: operation of motor power source)
Command	Array declarator command (DIM statement), Assignment command (numeric value assignment statement, character string assignment statement, point definition statement), Movement related command (MOVE statement, DRIVE statement, PMOVE statement), Condition branching command (IF statement, FOR statement, WHILE statement), External output command (DO statement, MO statement, LO statement, TO statement, SO statement), Parameter command (ACCEL statement, OUTPOS statement, TOLE statement), Task related command (START statement, SUSPEND statement, CUT statement), Condition wait command (WAIT statement), etc.
Function	Arithmetic function (SIN function, COS function, TAN function), Character string function (STR$ function, LEFT$ function, MID$ function, RIGHT$ function), Point function (WHERE function, JTOXY function, XYTOJ function), Parameter function (ACCEL statement, OUTPOS statement, TOLE statement), etc.
Variable	Simple variable (integer type variable, real number type variable, character string type variable), Array variable (integer type variable, real number type variable, character string type variable), Point variable, Shift variable, Element variable (point element variable, shift element variable), Input/output variable, etc.
Operator	Arithmetic operator (+, -, ∗, /, MOD), Logical operator (AND, OR, XOR), Comparison operator (=, <, >, <>, <=, >=)
Monitor	Monitor of input/output (200ms interval)
On-line command	Key operation command (AUTO, RUN, RESET, STEP), Data handling command (READ, WRITE, ?VER, ?CONFIG), Utility command (COPY, ERA, INIT), Robot language command (independently executable command)
Data file	Program, Point, Parameter, Shift, Hand, All, Error history, etc.
Internal timer	10ms interval
Program break point	4 points at maximum

Robot Language Table

General commands

Language	Function
DECLARE	Declares that a label or sub-procedure is in an external program.
DEF FN	Defines a function that is available to the user.
DIM	Declares the name of an array variable and the number of elements.
EXIT FOR	Terminates a FOR statement to NEXT statement loop.
FOR to NEXT	Controls repetitive operations
GOSUB to RETURN	Jumps to a subroutine with the label specified by a GOSUB statement and executes the subroutine.
GOTO	Unconditionally jumps to the line specified by a label.
HALT	Stops a program and resets it.
HOLD	Pauses a program.
IF	Allows control flow to branch according to conditions.
LET	Executes a specified assignment statement.
ON to GOSU	Jumps to a subroutine with each label specified by a GOSUB statement according to conditions and executes the subroutine.
ON to GOTO	Jumps to each line specified by a label according to conditions.
REM	All characters that follow REM or an apostrophe (') are viewed as comments.
SELECT CASE to END SELECT	Allows control flow to branch according to conditions.
SWI	Switches the currently executed program to a specified program, and executes from the first line after compiling.
WHILE to WEND	Controls repetitive operations.
Label statement	Defines "labels" in program lines.

Robot operation

Language	Function
ABSRST	Performs return-to-origin along robot absolute motor axes.
DRIVE	Performs an absolute movement of each axis in the main group.
DRIVEI	Performs a relative movement of each axis in the main group.
MOVE	Performs an absolute movement of the main robot axes.
MOVEI	Performs a relative movement of the main robot axes.
ORIGIN	Performs return-to-origin on an incremental mode axis or absolute search on a semi-absolute mode axis.
PMOVE	Performs a pallet movement of the main robot axes.
SERVO	Controls the servo ON/OFF of the specified axes in the main group or all axes (in main group and sub group).

I/O control

Language	Function
DELAY	Waits for the specified length of time (ms).
DO	Outputs the specified value to the DO ports.
LO	Outputs the specified value to the LO port to prohibit axis movement or permit axis movement.
MO	Outputs the specified value to the MO ports.
OUT	Turns ON the bits of the specified output ports and the command statement ends.
RESET	Turns OFF the bits of the specified output ports.
SET	Turns ON the bits of the specified output ports
SO	Outputs the specified value to the SO port.
TO	Outputs the specified value to the TO port.
WAIT	1. Waits until the condition in DI/DO conditional expression are met. 2. Waits until positioning on the robot axes is complete (within the tolerance range).

Coordinate control

Language	Function
CHANGE	Switches the hand of the main robot.
HAND	Defines the hand of the main robot.
RIGHTY / LEFTY	Selects whether the main robot will be "right-handed" or "left-handed" when moving to a point specified on a Cartesian coordinate system.
SHIFT	Sets the shift coordinates for the main robot by using the shift data specified by a shift variable.

Condition change

Language	Function
ACCEL	Changes the acceleration coefficient parameter of the main group.
ARCH	Changes the arch position parameter of the main group.
ASPEED	Changes the automatic movement speed of the main group.
AXWGHT	Changes the axis tip weight parameter of the main group.
DECEL	Changes the deceleration rate parameter of the main group.
ORGORD	Sets the axis sequence parameter to perform return-to-origin and absolute search in the main group.
OUTPOS	Changes the OUT position parameter of the main group.
PDEF	Defines the pallet used to execute a pallet movement command.
SPEED	Changes the program speed for the main group.
TOLE	Changes the tolerance parameter of the main group.
WEIGHT	Changes the tip weight parameter of the main robot.

Communication control

Language	Function
ONLINE / OFFLINE	Changes communication mode and initialize the communication port.
SEND	Sends the read file data into a write file.

Screen control

Language	Function
PRINT	Displays the value of specified variable on the MPB/RPB screen.

Key control

Language	Function
INPUT	Assigns a value to the variable specified from the MPB/RPB.

Procedure

Language	Function
CALL	Calls up sub-procedures defined by the SUB and END SUB statements.
EXIT SUB	Terminates the sub-procedure defined by the SUB and END SUB statements.
SHARED	Does not permit variables declared with a program written outside a subprocedure (SUB to END SUB) to be passed on as dummy arguments, but allows them to be referred to with a sub-procedure.
SUB to END SUB	Defines a sub-procedure.

Task control

Language	Function
CHGPRI	Changes the priority of the specified task.
CUT	Terminates a task currently being executed or temporarily stopped.
EXIT TASK	Terminates its own task currently being executed.
RESTART	Restarts a task that is temporarily stopped.
START	Sets the task number and priority of the specified task and starts that task.
SUSPEND	Temporarily stops another task being executed.

Error control

Language	Function
ON ERROR GOTO	If an error occurs during program execution, this command allows the program to jump to the error processing routine specified by the label without stopping the program, or stops the program and displays the error message.
RESUME	Resumes the program execution after recovery from an error. This command is used in the error processing routine.
ERL	Gives the line number where an error occurred.
ERR	Gives the error code number when an error occurred.

PATH control

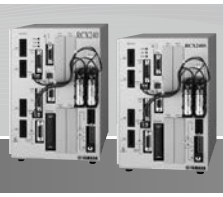
Language	Function
PATH	Sets the PATH motion on the main robot axis.
PATH END	Terminates the path setting for PATH motion.
PATH SET	Starts the path setting for PATH motion.
PATH START	Starts the PATH motion.

Torque control

Language	Function
DRIVE (with torque limit option)	Executes an absolute movement command on each axis in the main group.
TORQUE	Changes the maximum torque instruction for the specified main group axis.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.
TRQTIME	Sets the current limit time-out period on the specified main group axis when using a torque limit setting option in the DRIVE statement.

Accessories and part options

RCX240/RCX240S



Standard accessories

● Power connector + wiring connection lever

Model	KAS-M5382-00

LCC140 TS-X TS-P SR1-X SR1-P RCX221 RCX222 RCX240/S RCX340

● Safety connector

Model	KX0-M5163-00

RCX240/S

● RPB terminator (dummy connector)

Attach this to the RPB connector during operation with the programming box RPB removed.

Model	KAS-M5163-30

RCX221 RCX222 RCX240/S

● Standard I/O (STD.DIO) connector

Model	KX0-M533G-00

RCX240/S

● L type stay (for installing front side, rear side.)

Use to install the controller.

Model	KX0-M410H-00

Note. Model No. is for a single bracket (L type stay). (Two are required to install one controller.)

RCX240/S

● Absolute battery

Battery for absolute data back-up.

● Basic specifications

Item	Absolute battery
Battery type	Lithium metallic battery
Battery capacity	3.6V/2,750mAh
Data holding time	About 1 year Note1 (in state with no power applied)
Dimensions	ϕ17 × L53mm
Weight Note2	22g

Model	KAS-M53G0-11

Note 1.When using two batteries for each two axes.
Note 2.Weight of battery itself.
Note. The absolute battery is subject to wear and requires replacement.
If trouble occurs with the memory then remaining battery life is low so replace the absolute battery. The battery replacement period depends on usage conditions. But generally you should replace the battery after about 1 year counting the total time after connecting to the controller and left without turning on the power.

SR1-X RCX222 RCX240/S

Important **Absolute battery installation conditions**

1 to 2 batteries are required for each 2 axes.
- 1 battery……Data storage time of approximately 6 months (with no power applied)
- 2 batteries…Data storage time of approximately 1 year (with no power applied)

Note. Absolute battery is not required for either of the 2 axes if using incremental or semi-absolute specifications.

● Battery case

This is the absolute battery holder.

Model	KBG-M5395-00

SR1-X RCX222 RCX240/S

See next page for optional parts

Options

L type stay (for side surface installation)

Use to install the controller.

Model	KX0-M410H-10

Note. Model No. is for a single bracket (L type stay).

RCX240/S

Programming box RPB/RPB-E

P.700

This device can perform all operations such as manual robot operation, program entry and edit, teaching and parameter settings.

	RPB	RPB-E
Model	KBK-M5110-10	KBK-M5110-00
Enable switch	–	3-position
CE marking	Not supported	Applicable

RCX221
RCX222
RCX240/S

Support software for PC VIP+

P.692

VIP+ is a simple to use application software that makes tasks such as robot operation, writing-editing programs, and point teaching easy to visually understand.

VIP+ software model	KX0-M4966-00

RCX221
RCX222
RCX240/S

Environment

OS	Windows 2000, XP (32bit), Vista, 7, 10 (Supported version: V.2.8.4 or later)
CPU	Processor that meets or exceeds the suggested requirements for the OS being used.
Memory	Suggested amount of memory or more for the OS being used.
Hard disk	40MB of available space required on installation drive.
Communication method	RS-232C, Ethernet Note. For Ethernet communication, Ethernet unit for RCX series controller is required.
Applicable robot controllers	RCX14x / 22x / 240

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.
Note. ADOBE and ADOBE READER are registered trademarks of Adobe Systems Incorporated.
Note. Ethernet is a registered trademark of Xerox Corporation.

Data cables

Communication cable for VIP+.
Select from USB cable or D-sub cable.

Model	USB type (5m)	KBG-M538F-00
	D-Sub type 9pin-9pin (5m)	KAS-M538F-10

Note. This USB cable supports Windows 2000/XP or later.
Note. Data cable jointly used for POPCOM+, VIP+, RCX-Studio Pro.
Note. USB driver for communication cable can also be downloaded from our website.

LCC140
ERCD
SR1-X
SR1-P
RCX221
RCX222
RCX240/S
RCX340

YC-Link board

Model	KX0-M4400-A1

RCX240/S