

CKD



The best of 2 worlds



Air & Electric



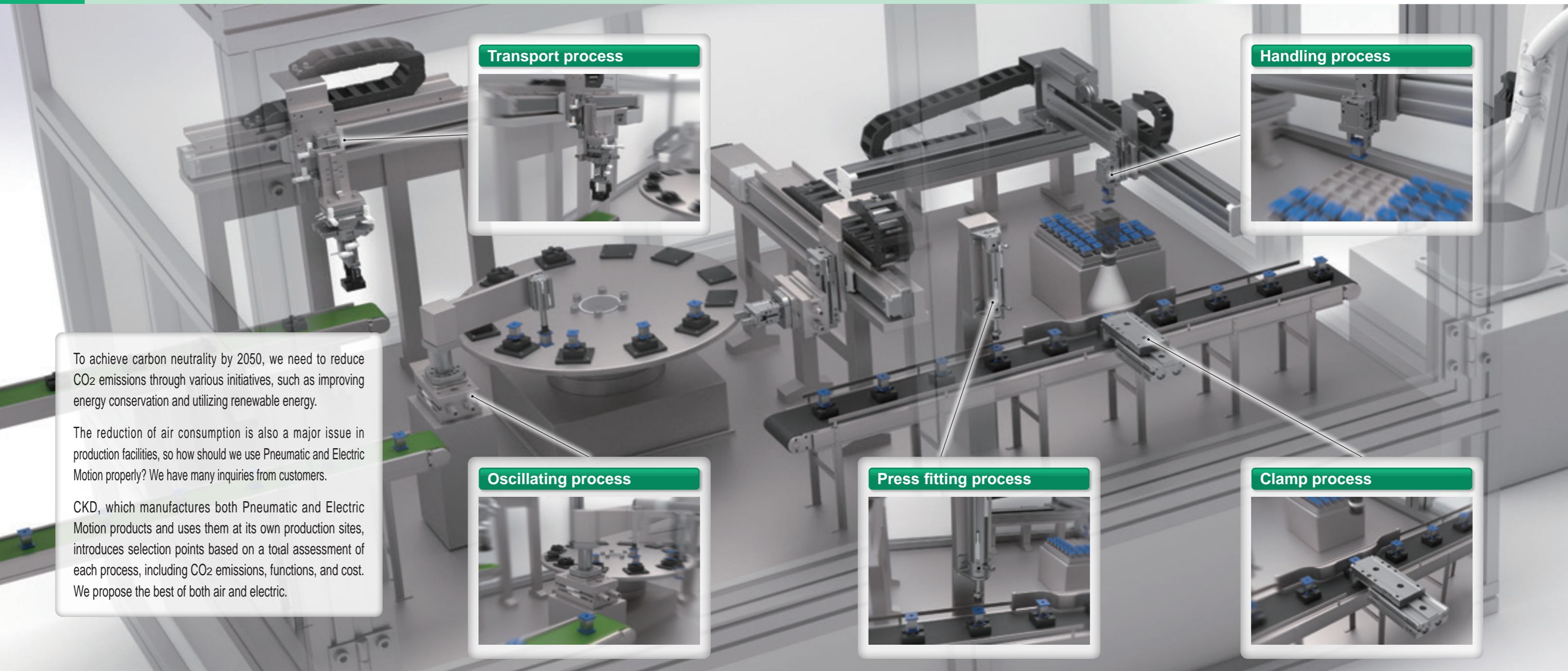
CKD solutions



CKD Corporation

CC-1446A **1**

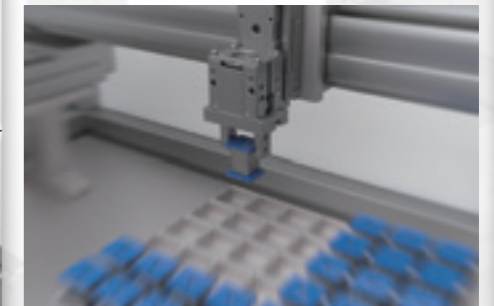
With the 2 pillars of Air and Electric, optimal solutions are proposed.



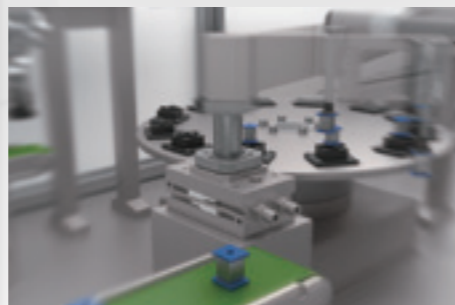
Transport process



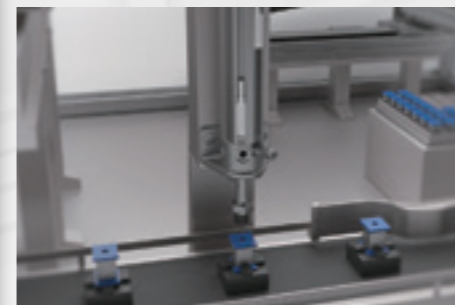
Handling process



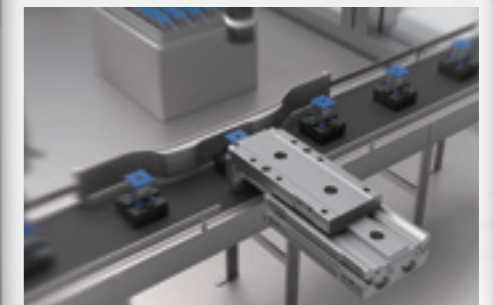
Oscillating process



Press fitting process



Clamp process



To achieve carbon neutrality by 2050, we need to reduce CO₂ emissions through various initiatives, such as improving energy conservation and utilizing renewable energy.

The reduction of air consumption is also a major issue in production facilities, so how should we use Pneumatic and Electric Motion properly? We have many inquiries from customers.

CKD, which manufactures both Pneumatic and Electric Motion products and uses them at its own production sites, introduces selection points based on a total assessment of each process, including CO₂ emissions, functions, and cost. We propose the best of both air and electric.

Calculation conditions

Total cost:

Initial product price, product price or part price upon replacement, combined with electricity cost during operation.
 Power cost during operation, calculated by 22 yen per 1kwh.
 Air consumption is converted to electric power and calculated together with the power consumption of the solenoid valve and cylinder switch.
 Labor charge for maintenance is not included.
 * The replacement time is calculated based on test data obtained from CKD specified conditions, and is not guaranteed.

CO₂ Emissions:

[Conditions] Annual Operating Days: 250 days Operating Hours: 8 hours/day
 Air pressure: 0.5MPa (clamp: 0.4MPa, transport: 0.25MPa)
 CO₂ discharge converted from annual power consumption (kg-CO₂/Year)
 Annual power consumption (kWh) × 0.000406* × 1000*
 * CO₂ Emission Factors: Ministry of the Environment Published by Electricity Utilities Emission Factors R2 Fiscal track record Chubu Electric Power Midget CO₂ Emission Factors * 1000:kg Conversion
 Air consumption is converted to electric power and calculated together with the power consumption of the solenoid valve and cylinder switch.

comparative item

Cost	Dimensions	Positioning time	CO ₂ Emissions
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Air Suggested Points

- Space saving and lightweight
- Move between 2 points
- High thrust



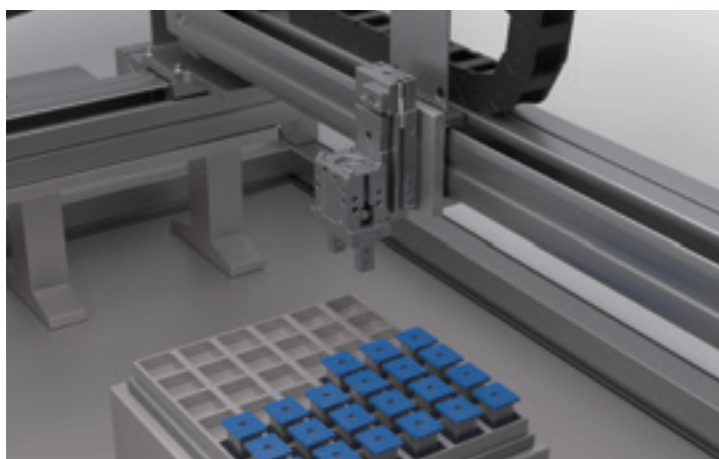
Electric Suggested Points

- Multi-point positioning
- Smooth operation
- IoT



Handling process

Pneumatic and Electric Motion key points: "Lightweight," and "Soft handling"



Air
Linear Slide Hand
LSH-HP1 Series
HP
HIGH PRODUCTIVITY



Electric
2-Finger Gripper
FLSH Series
ROBODEX



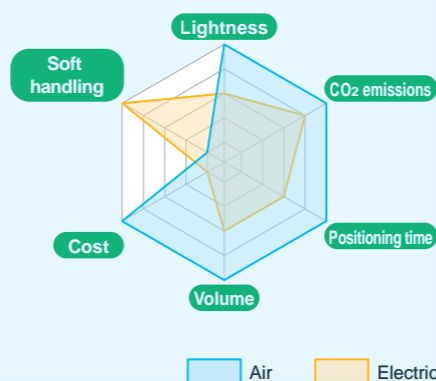
Recommendations from CKD

Air is recommended for handling

The lighter the hand, the better. If it is light, it can reduce the load on the actuator and robot for conveyance and size can be reduced.

For example, air: LSH-A20-HP1 295g
Electric: FLSH-20G 380g

For the same gripping force, we recommend the air type with lighter weight.



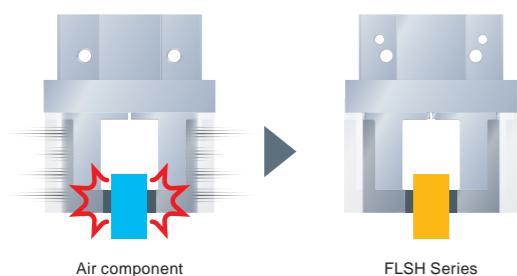
- Thin parallel hand
- Wide parallel hand
- 3-way chuck



Introduction to the benefits of electric motion

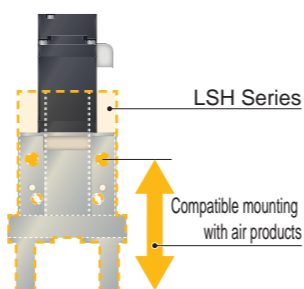
Soft handling

For fragile workpieces, it is recommended to use an electric gripper with variable speeds to avoid impact and variable gripping force to suit the workpiece.



With FLSH...Expanded selection

Compatible with air LSH-HP1 mounting, and easy to replace. The long stroke enables handling of a wide variety of workpieces with multi-point stopping.

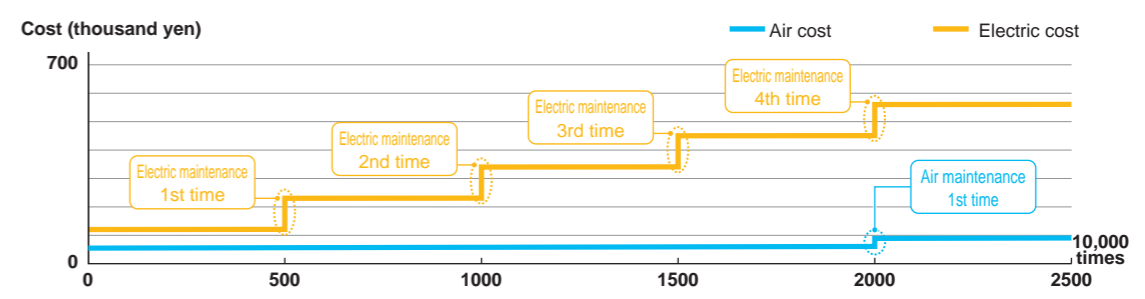


Equipment Operation conditions	Cycle time: 10 sec (6 cycles/min) (Closing operation 0.08 sec. → Grip 4.92 sec. → Opening operation 0.08 sec. → Standby 4.92 sec.)	CO₂ Emissions: Calculated by power consumption during operation in cycle time shown at left Air: 1 cycle 16.25Ws Electric: 1 cycle 18.89Ws
	Replacement time (reference value based on CKD specified conditions): Air 20 million cycles Electric 5 million cycles	

Model No. **Air** LSH-A20D1N-F2H-D-HP1 **Electric** FLSH-20G-H110NCN-FS03

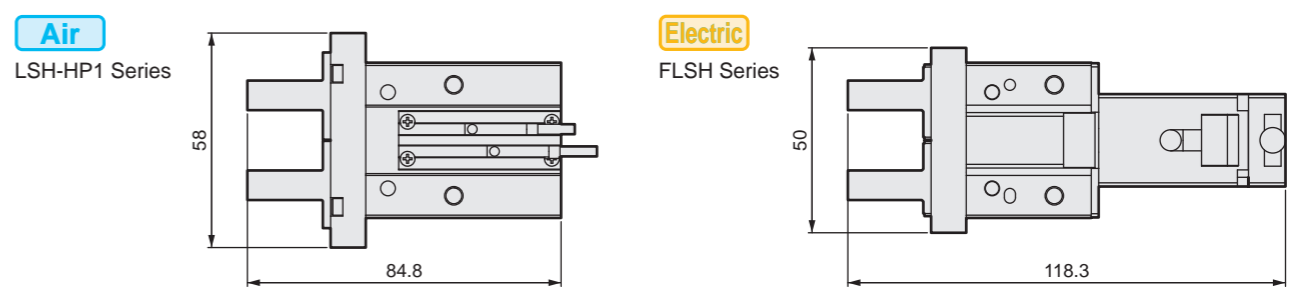
Compare by cost

Air products can be replaced less frequently and costs can be reduced by using the High-durability component LSH-HP1 Series.



Comparison by actuator dimensions

Air is more compact.



Positioning time comparison

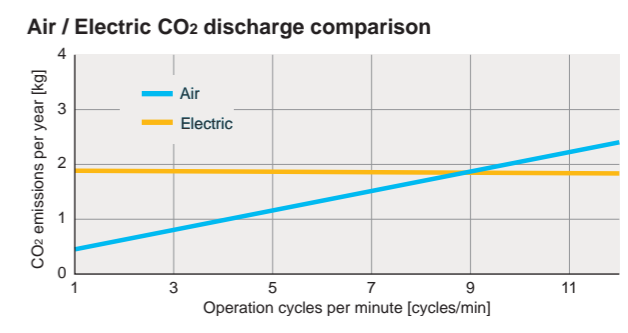
The difference in travel time is small, but the air LSH-HP1 Series is faster when pressing judgment time is factored in.

	Air	Electric
Model No.	LSH-HP1	FLSH
Travel time [s]	0.16	0.08
Pressing travel time (pressing speed) [s]	-	0.07
Pressing judgment time [s]	-	0.2
Positioning time [s]	0.16	0.35

Comparison by CO₂ emissions

If the operating frequency is less than 9 cycles/min, CO₂ emissions with air components are reduced.

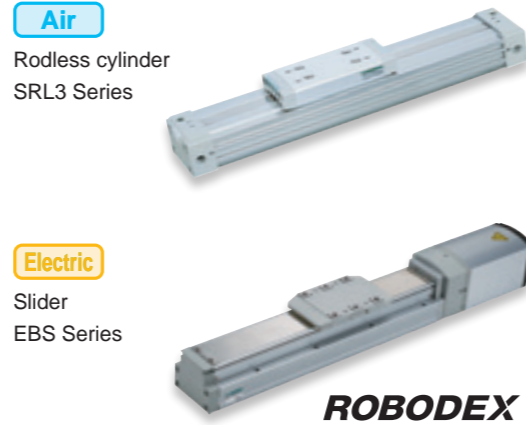
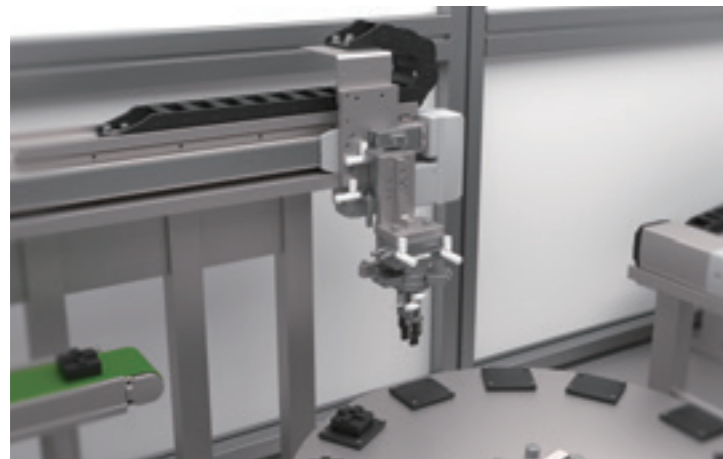
Air LSH-HP1 Series	Electric FLSH Series
CO₂ Emissions	CO₂ Emissions
1.32 kg-CO ₂ /Year	1.84 kg-CO ₂ /Year



*CO₂ emissions vary depending on the frequency of operation per minute.
*The longer the gripping time for electric components, the more power consumption and CO₂ emissions will increase.

Transport process

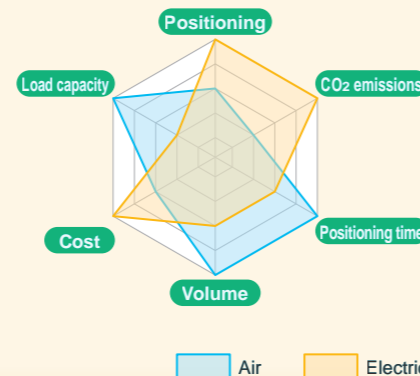
The key points for using air and electric components are "Positioning" and "Payload".



Recommendations from CKD

Electric is recommended for transport

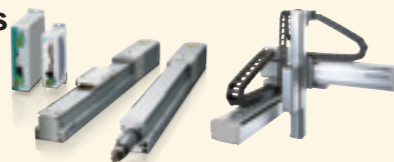
For transport, it is better to have easy positioning. Motorized products enable high-precision positioning according to the program settings and easy multi-point positioning. Acceleration/deceleration and effective speed can also be set, enabling transport and shock absorbing at stable speeds.



Extensive control methods

- Actuator
 - With stepping motor
 - With servo motor
 - Motorless

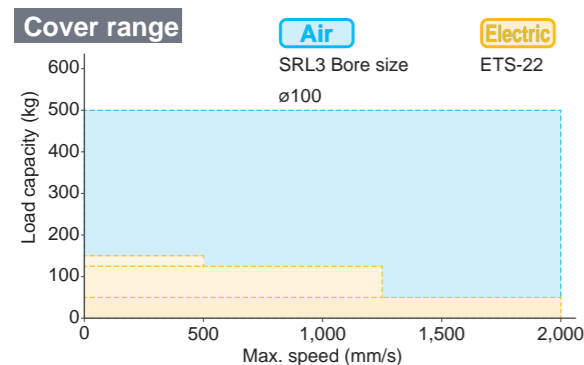
- Network
 - IO-Link
 - CC-Link
 - MECHATROLINK
 - EtherCAT
 - EtherNet/IP
 - DeviceNet



Introduction to the benefits of air

Payload coverage

When moving heavy objects quickly, air is recommended.



Air is useful in these situations

Air is well suited for long, high-speed travel and vertical transport. Load capacity is the same even for vertical transport.

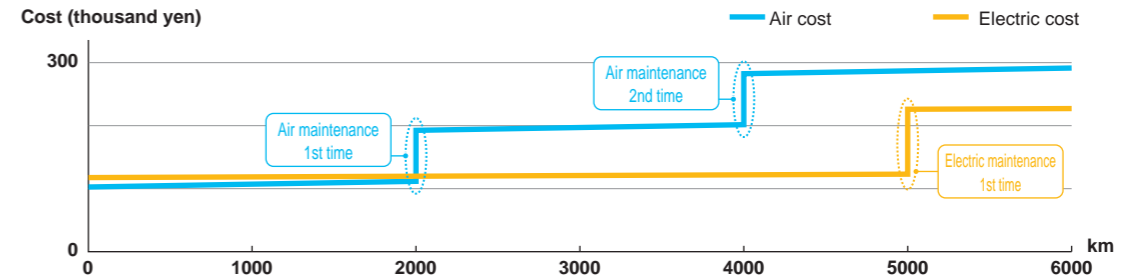


Equipment Operation conditions	Cycle time: 10 sec (6 cycles/min) (Forward travel 1.17 sec → Standby 3.83 sec → Return travel 1.17 sec → Standby 3.83 sec)	CO2 Emissions: Calculated by power consumption during operation in cycle time shown at left Air: 1 cycle 565.48Ws Electric: 1 cycle 88.98Ws
	Replacement time (reference value based on CKD specified conditions): Air 2,000km Electric 5,000km	

Model No. **Air** SRL3-00-20B-500-M2H-D-A **Electric** EBS-08GE-200500NBN-CS03

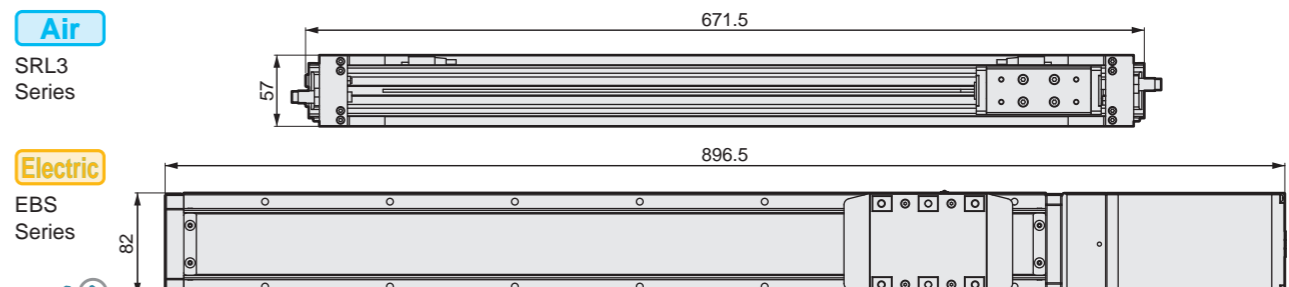
Compare by cost

Since the operating life of the Electric EBS Series is long, replacement frequency can be reduced.



Comparison by actuator dimensions

The air type is compact, but an external guide is sometimes required. The electric type has an outer rail guide built in.



Positioning time comparison

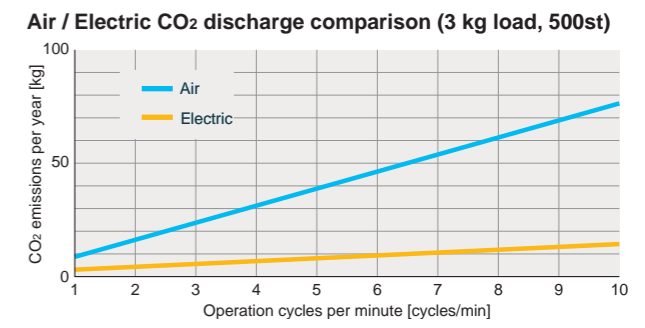
When shifting between two points, the air SRL3 Series is advantageous.

	Air	Electric
Model No.	SRL3	EBS
Travel time [s]	1.1	1.37

Comparison by CO2 emissions

Even though the number of operations per minute increases, CO2 emissions for the electric type are kept low.

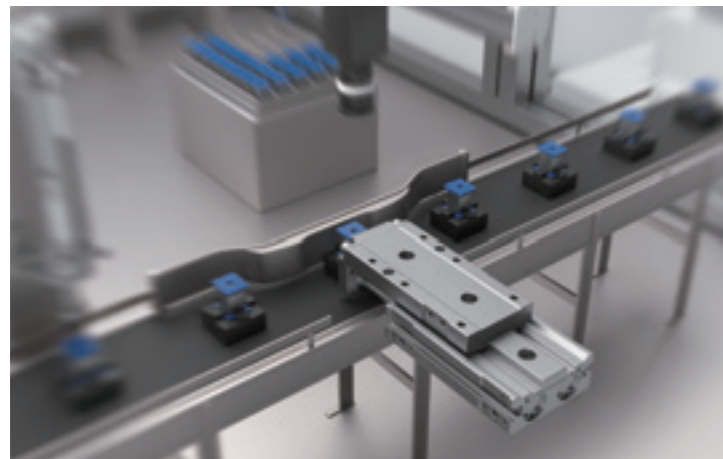
Air SRL3 Series	Electric EBS Series
CO2 Emissions	CO2 Emissions
45.92 kg-CO2/Year	8.67 kg-CO2/Year



* CO2 emissions vary depending on the stroke.

Clamp process

The key points for air and electric motion use are "Speed" and "Shockless".



Air

Cylinder with linear guide
LCR-HP1 Series



Electric

Table
FLCR Series



Cycle time: 10 sec (6 cycles/min)

Equipment Operation conditions
(Clamp operation 0.48 sec. → Clamp 5 sec. → Unclamp operation 0.48 sec. → Standby 4.04 sec.)

Replacement time (reference value based on CKD specified conditions):
Air 20 million cycles (Replace the shock absorber every 5 million cycles) Electric 5 million cycles

CO₂ Emissions:

Calculated by power consumption during operation in cycle time shown at left

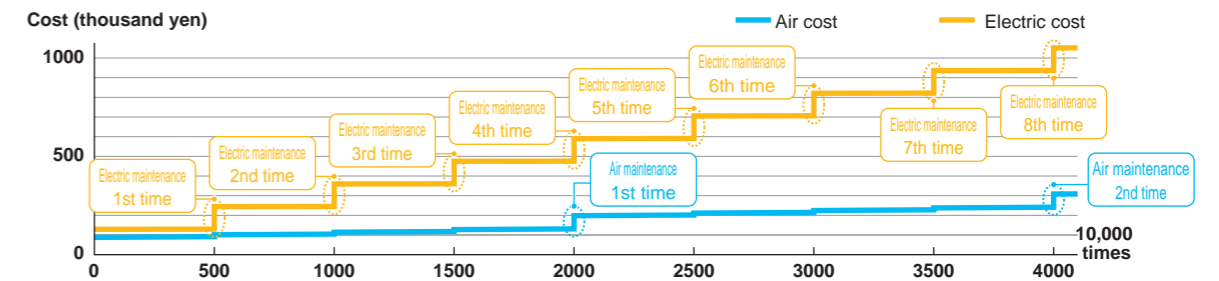
Air: 1 cycle 119.65Ws
Electric: 1 cycle 27.51Ws

Model No. **Air** LCR16-50-T2H-D-A5-HP1

Electric FLCR-20G02050NCN-RS03

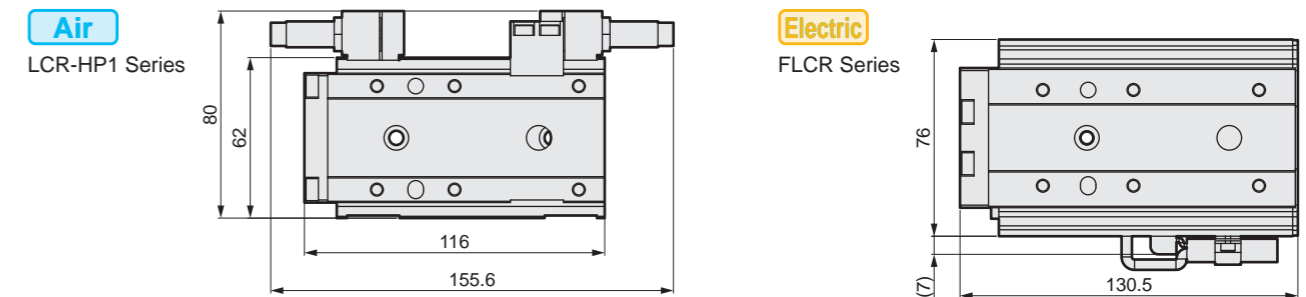
Compare by cost

The High-durability Component LCR-HP1 Series reduces the number of times that the air type is replaced and reduces costs.



Comparison by actuator dimensions

The body of the air type is compact, but when the shock absorber is attached, the dimensions are almost the same.



Positioning time comparison

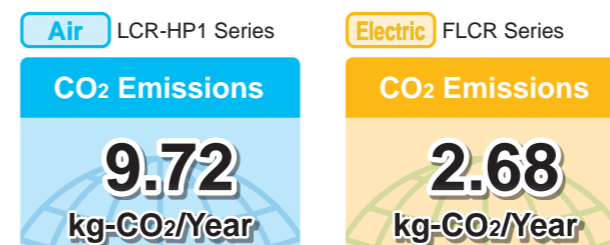
The air LCR-HP1 Series is faster for point-to-point operation.

	Air	Electric
Model No.	LCR-HP1	FLCR
Clamp travel time [s]	0.14	0.48
Pressing travel time (pressing speed) [s]	-	0.01
Pressing judgment time [s]	-	0.2
Positioning time* [s]	0.14	0.69

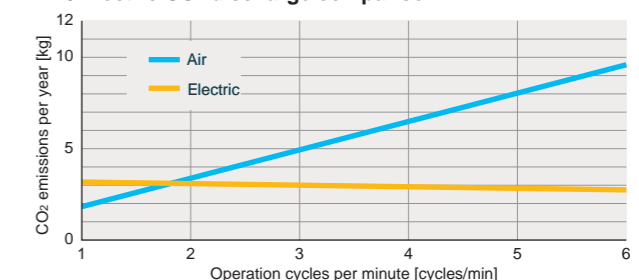
* Shortest time to position

Comparison by CO₂ emissions

Even if the number of operations per minute increases, the CO₂ emissions of the electric type does not fluctuate much.



Air / Electric CO₂ discharge comparison

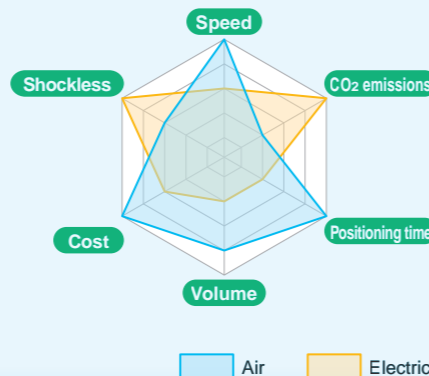


* CO₂ emissions vary with the frequency of operation per minute.
* The longer the clamping time, the more electricity is consumed and the more CO₂ emissions are generated.

Recommendations from CKD

Air is recommended for clamping

You want the clamp to work quickly for the next process, right? Operation time is short with air, contributing to reducing equipment tact time. Since clamping force is high, compact and inexpensive, air is recommended. Furthermore, energy is saved because the power consumption does not increase even when the clamp time is longer.



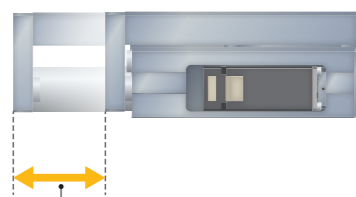
Select from various shapes



Introduction to the benefits of electric motion

Soft pressing

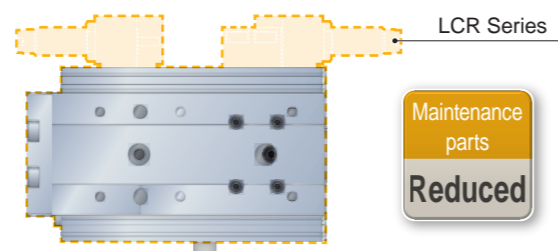
The acceleration/deceleration can be adjusted arbitrarily, enabling shock absorbing clamps.



Acceleration/deceleration can be adjusted

Fewer maintenance parts with the FLCR Series

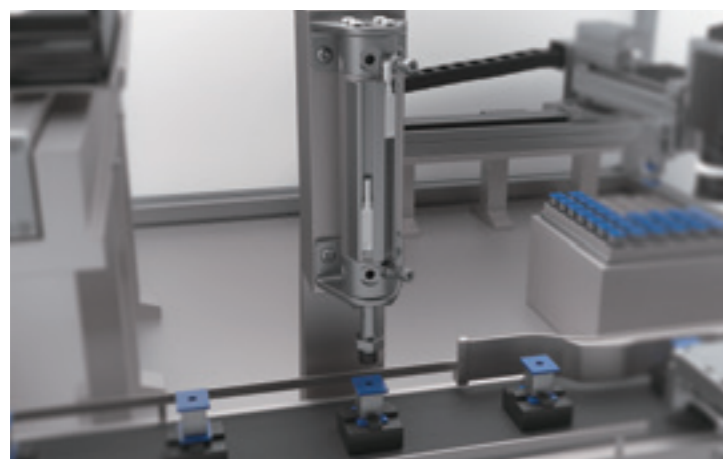
The compact design with the built-in motor enables arbitrary adjustment of acceleration/deceleration, rendering shock absorbers unnecessary and reducing maintenance parts.



4

Press fitting process

The key points to use air and electric are "Pressing force" and "Press fit control".



Equipment Operation conditions

Cycle time: 10 sec (6 cycles/min)
(lowering operation 0.29 sec. → press fitting 2 sec. → rising operation 0.29 sec. → standby 7.42 sec.)

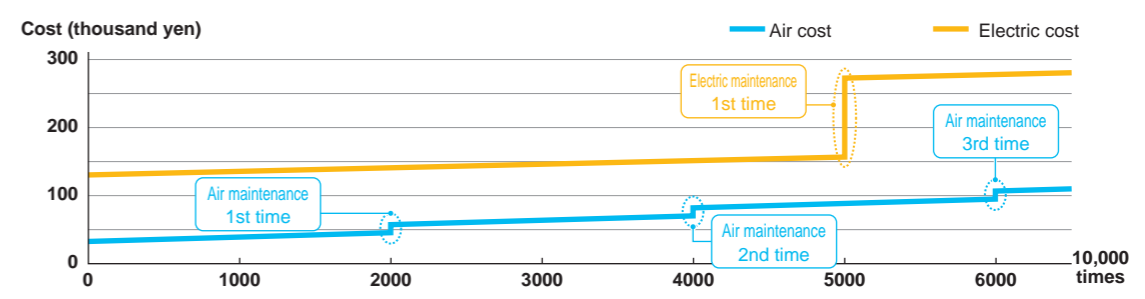
Replacement time (reference value based on CKD specified conditions):
Air 20 million cycles Electric 50 million cycles

CO₂ Emissions:
Calculated by power consumption during operation in cycle time shown at left
Air: 1 cycle 109.30Ws
Electric: 1 cycle 86.0Ws

Model No. **Air** SCM-00-20D-50-T2H-D-HP1 **Electric** EBR-04GR-00-060050BCN-CS03

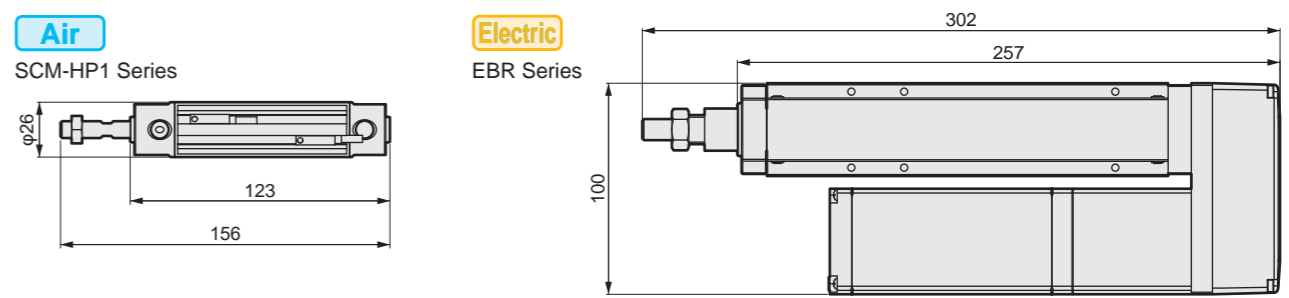
Compare by cost

The electric EBR Series has a long running life, but the initial cost for air is low.



Comparison by actuator dimensions

Air is more compact.



Positioning time comparison

Air SCM-HP1 Series is faster since it operates between two points.

	Air	Electric
Model No.	SCM-HP1	EBR
Lowering time [s]	0.12	0.29
Press fit travel time [s]	0.10 *1	1
Pressing judgment time [s]	-	0.2
Positioning time [s]	0.22	1.49

*1 Since the press fitting travel time varies depending on the resistance during press fitting, it is tentatively assumed to be 0.1.
* Shortest time to position

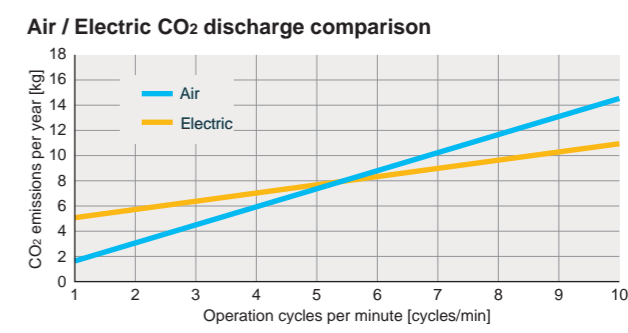
Comparison by CO₂ emissions

If the number of operations per minute is low, CO₂ emissions can be reduced even with the air type.

Air SCM-HP1 Series **Electric** EBR Series

CO₂ Emissions
8.88 kg-CO₂/Year

CO₂ Emissions
8.38 kg-CO₂/Year

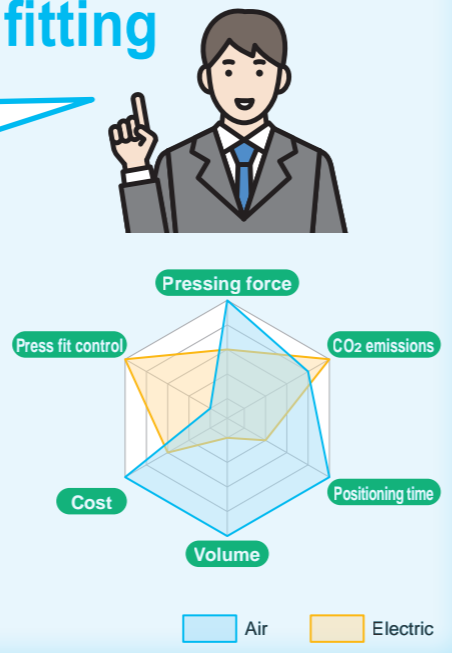


* CO₂ discharge varies with the operating frequency per minute.

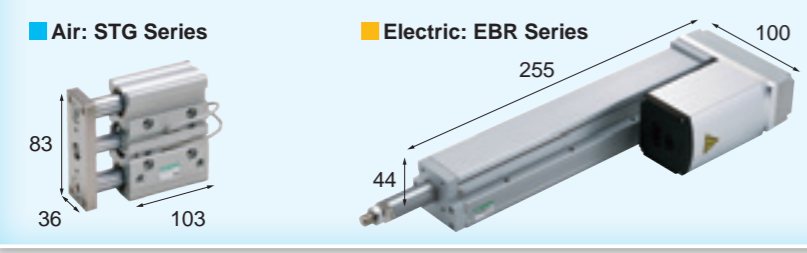
Recommendations from CKD

Air is recommended for press fitting

For press fitting, the smaller the size and the higher the pressing force, the better. With air types, they are small, have high pressing force, and are inexpensive. They are also easy to connect with external guides and can be easily reinforced.



replaced with a guided cylinder.

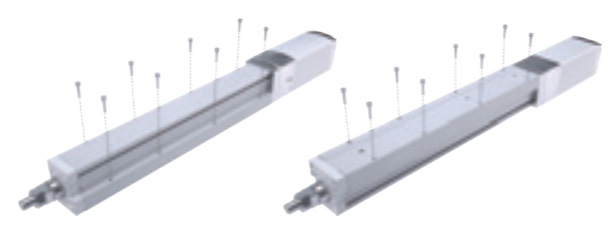


Introduction to the benefits of electric motion

Press fit control
Press-in time, speed, and force can be set to suit the workpiece. A position detection function allows confirmation of press-in errors.

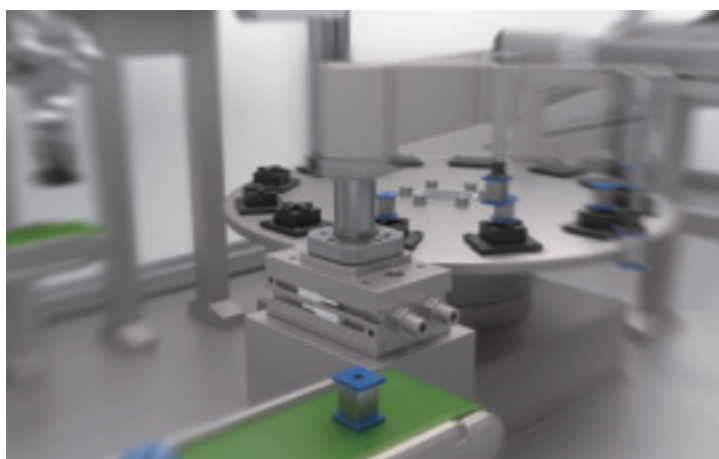


Shorter with EBR Series
Mounting holes are provided on top and bottom of the product to enable direct installation without disassembly. Installation is easy, especially from the top.



Oscillating process

The key points for using Air and Electric types are "Speed" and "Multi-point positioning"



Air

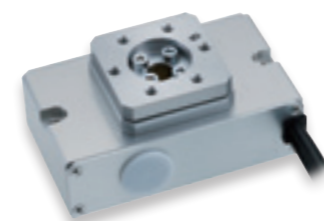
Table Rotary Actuator GRC Series



Electric

Rotary FGRC Series

ROBODEX



Recommendations from CKD

Air is recommended for oscillations

Oscillation transport should be able to move at high speeds. Air can move at high speeds even with 180° rotation. Air is recommended because of its low initial cost.



Wide range of shapes and size variations

Torque size: 0.12 to 206 (N / m)

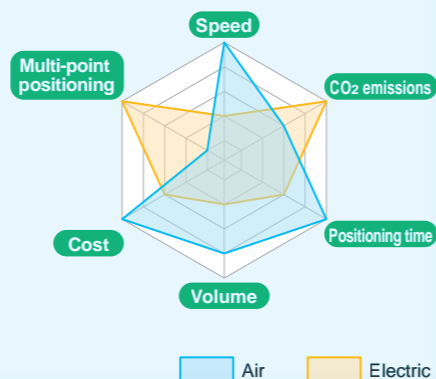
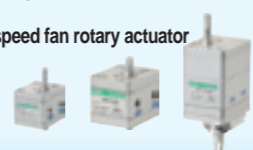
■ Rack and pinion



■ Rotary vane mechanism



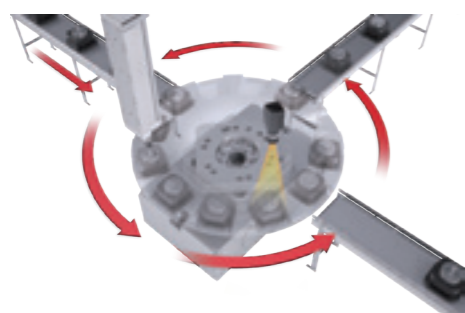
■ Fine speed fan rotary actuator



Introduction to the benefits of electric motion

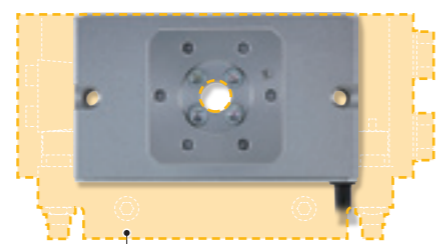
Multi-point positioning

Stopping at multiple points allows for use in oscillations or indexing of two or more points. Excellent stabilization enables easy positioning adjustment for each point.



Fewer maintenance parts with the FGRC Series

The ability to adjust acceleration and deceleration at any desired speed eliminates the need for shock absorbers and reduces the number of maintenance parts. This also reduces installation space.



Maintenance parts Reduced

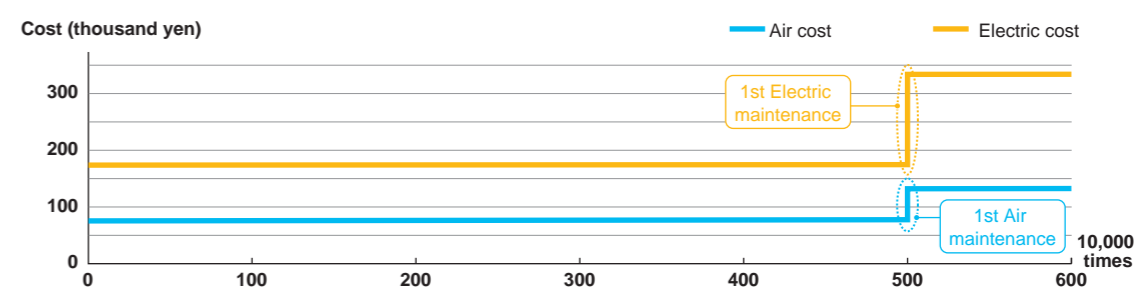
GRC Series

Equipment Operation conditions	Cycle time: 10 sec (6 cycles/min) (Forward travel 1.06 sec → Standby 3.94 sec → Return travel 1.06 sec → Standby 3.94 sec)	CO₂ Emissions: Calculated by power consumption during operation in cycle time shown at left
	Replacement time (reference value based on CKD specified conditions):	Air: 1 cycle 68.72Ws
	Air 5 million cycles Electric 5 million cycles	Electric: 1 cycle 27.51Ws

Model No. **Air** GRC-10-180-T2H-D-A1 **Electric** FGRC-30G360NCN-FS03

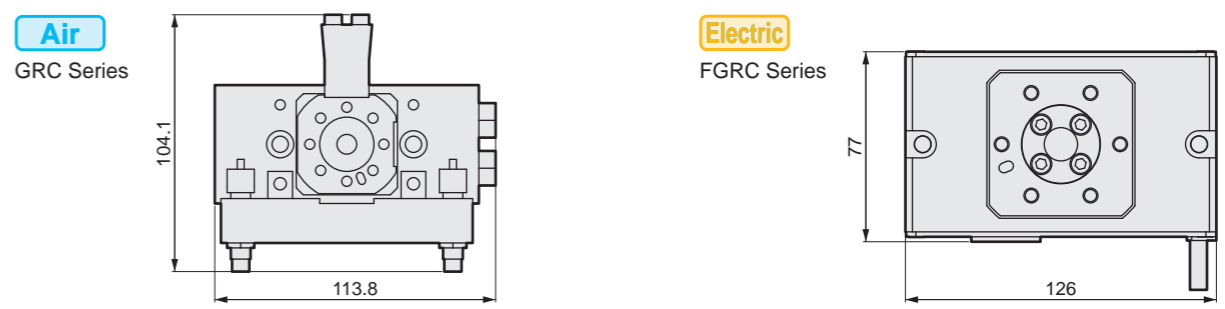
Compare by cost

With the same service life, air with low initial cost can suppress the total cost.



Comparison by actuator dimensions

The body of the air type is compact, but when the shock absorber is attached, the dimensions are almost the same.



Positioning time comparison

The air type is fast because electric types cannot increase the acceleration/deceleration rate higher than the allowable inertia.

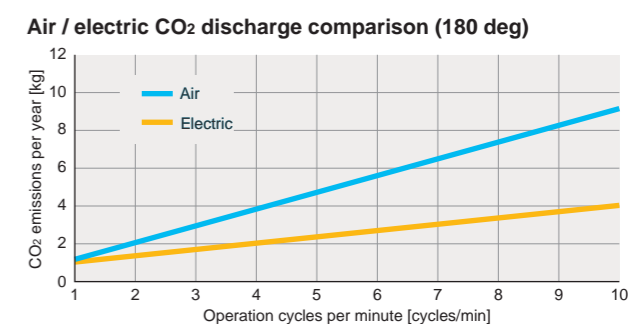
	Air	Electric
Model No.	GRC	FGRC
Travel time [s]	0.45	1.26

* No load operation
* Select a comparison model based on angular speed and output torque

Comparison by CO₂ emissions

Even though the number of operations per minute increases, CO₂ emissions for the electric type are kept low.

Air GRC Series	Electric FGRC Series
CO₂ Emissions	CO₂ Emissions
5.58 kg-CO ₂ /Year	2.68 kg-CO ₂ /Year



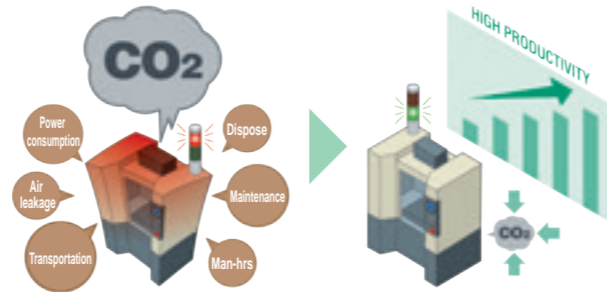
* CO₂ emissions vary with the frequency of operation per minute.

Solution proposal

This is a proposal to solve the problems we often receive inquiries about.

CASE 1 Realize carbon removal without major changes to existing equipment

Towards carbon neutrality, we must reduce the air consumption of equipment and reduce wasteful power consumption of the entire plant. However, it is not easy to review the entire facility, because it will incur time, man-hours, and considerable costs. It is necessary to review the components used in existing equipment and take actions to reduce CO₂ emissions.



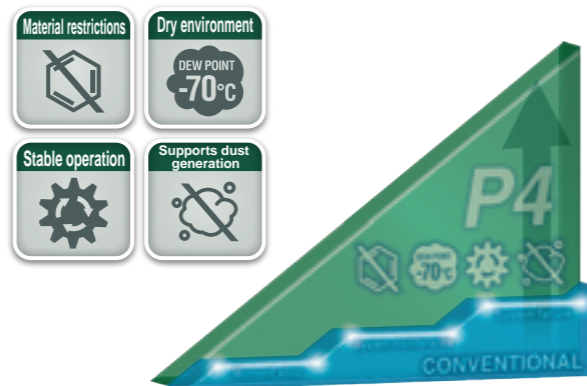
This will solve it

CKD recommends pneumatic and fluid control components with high energy-saving effect. The Eco-Friendly Component Guide introduces pneumatic and fluid control components in terms of CO₂ emissions reduction rates from the viewpoints of air leakage, air consumption, and power consumption. Without major changes in equipment, your components can reduce CO₂ emissions.



CASE 2 Long-term use is desired even in harsh environments such as ultra dry air and dry environments

In the manufacturing process of rechargeable batteries, ultra dry air is used to manufacture batteries in a dry environment. Therefore, the components used must have special functions such as ultra-low dew point environment compatible materials and grease. In addition, to protect the quality of rechargeable battery products, strict material restrictions are imposed on manufacturing processes and inappropriate materials (copper-based materials, etc.) are restricted. Durability that enables stable long-term operation under such severe conditions is essential.



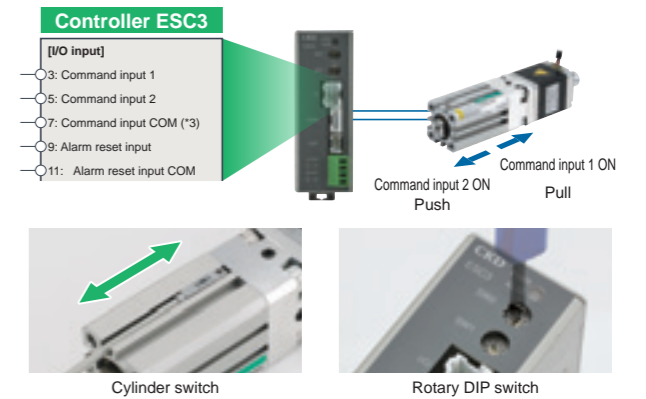
This will solve it

CKD, a manufacturer of winding machines for rechargeable batteries, offers components that can be used for a long time in harsh manufacturing environments. The P4-HP Series is a fusion of the P4 Series, which is a rechargeable battery-compatible device, and the HP Series, a highly durable device that uses sliding technology to ensure stable, long-term operation. In the electric motion sector, the EBS-G P4/EBR-G P4 Series of rechargeable battery-compatible electric actuators contribute to the electrification of production facilities.



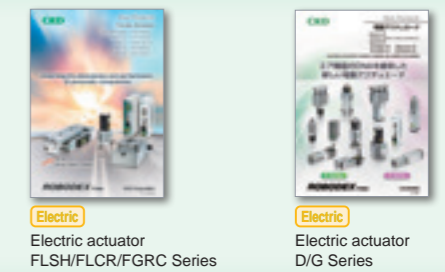
CASE 3 We would like to convert to electric from air cylinders, but design changes are a cause for worry.

When motorizing the air cylinder, the size generally becomes larger and the thrust becomes weaker comparatively. Obtaining the same thrust requires a larger electric actuator, which requires a larger design change. In some cases, electric actuators are difficult to program or have various functions that make them difficult to use, making the conversion to electric operation a hurdle to overcome.



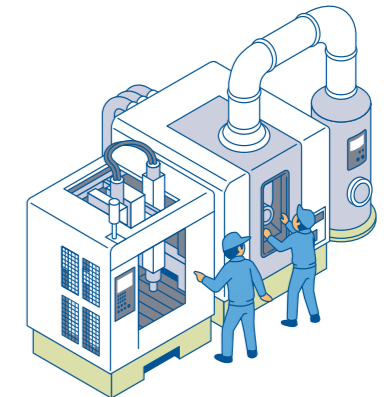
This will solve it

CKD electric motion components have the F Series electric actuators that are compatible with Air Components and are of the same level in size and thrust. The D Series electric actuator specialized for positioning between two points and clamp / gripping is easily set without the need for a dedicated tool, and can be operated with signals with 3 input points, allowing easy use without major design changes.



CASE 4 Easy periodic maintenance

Machine part breakdowns occur suddenly, day or night. Regular maintenance is necessary in order to prevent breakdowns, but there are various problems such as insufficient work space, poor workability, large number of target components, and the ability to work only by specified workers. By making your component last longer and changing it to one that is easy to maintain, you can work easily and effortlessly.

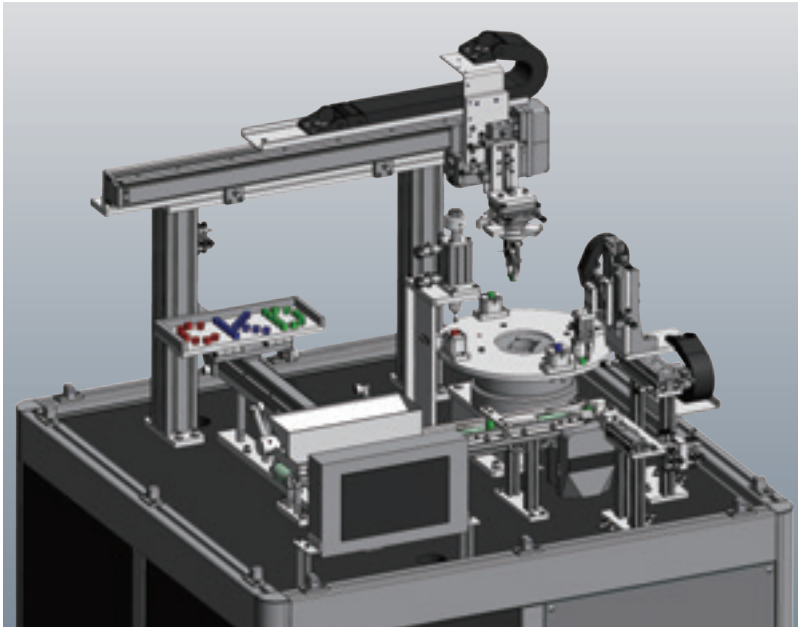


This will solve it

For CKD electric actuators, the slider side is equipped with a grease lubrication port through which external grease can be directly supplied. Since it does not need to be disassembled, it has excellent maintainability without trouble. In addition, the high-durability Air Component "HP Series" uses grease that supports high frequency usage and proprietary sliding technology, enabling the component itself to be highly durable and last longer. Pneumatic and Electric Motion Component contribute to the reduction of maintenance burden and the stable operation of equipment.



Introducing the Best Mix Air & Electric demo machine



Five processes, including the handling introduced in this catalog, have been reproduced, and a demo machine has been prepared so that you can actually see the Pneumatic and Electric Motion usage proposals. Please feel free to contact us if we can be of any assistance in your activities.



HP

HIGH PRODUCTIVITY

The HP Series of air products achieves high durability equipment that never stops and has a long service life, contributing to carbon neutrality

ROBODEX

The electric ROBODEX Series contributes to carbon neutrality by the use of electric power based on the concept of "easy handling and simplicity."

If the goods and/or their replicas, the technology and/or software found in this catalog are to be exported from Japan, Japanese laws require the exporter makes sure that they will never be used for the development and/or manufacture of weapons for mass destruction.

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