

HYDRAULIC ACTUATOR

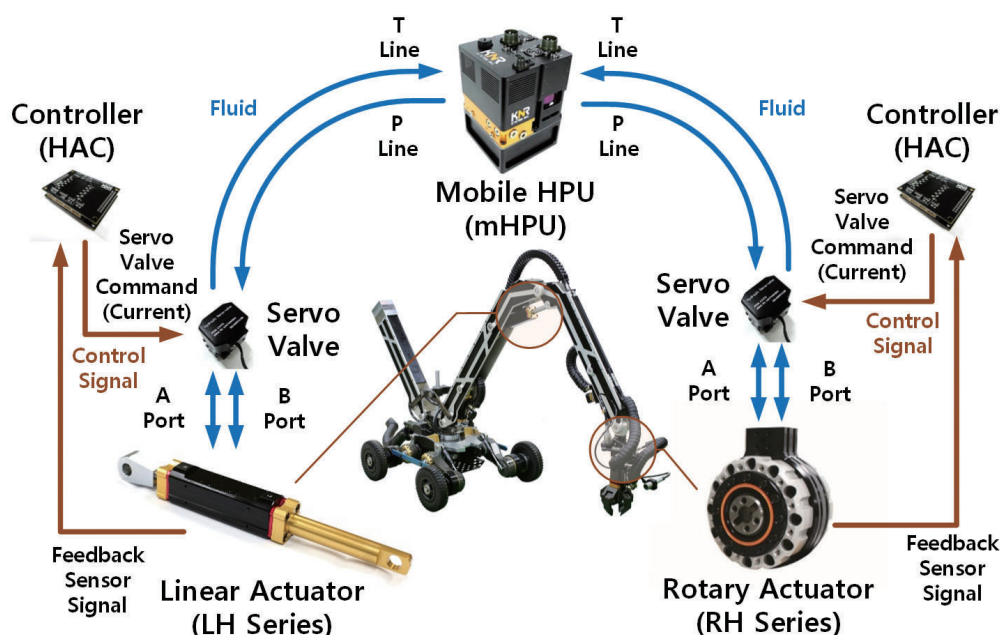


RH/LH Series

KNR Systems Inc. develops high quality hydraulic components consisting of linear and rotary actuators, mobile and stationary hydraulic power units, and servo valves. These hydraulic components are mainly used in the field of robotics, where the components are connected to form a central controller for a robots.



We supply two main categories of hydraulic actuator products: RH (Rotary Hydraulic actuator) and LH (Linear Hydraulic Actuator). The RH Series is a group of rotary actuators that creates rotational joints with high torque without additional parts. The LH Series is a group of linear actuators used to implement prismatic motion or rotational motion using an additional link. The RH/LH Series can perform high precision closed loop feedback control with the use of servo valves and specific sensors; generally, LVDT is used for linear movement control and RVDT or Encoder is used for the rotational control. We provide customization options with the RH/LH Series for the customers with specific purposes.



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HYDRAULIC ACTUATOR

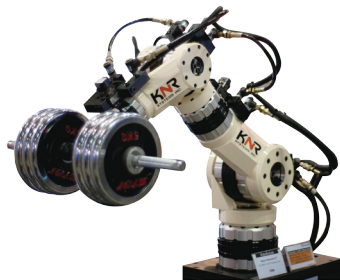


Your Benefit

Heavy load-carrying capacity

KNR's unique design achieves high FWR (Force to Weight Ratio) performance to meet the needs of various applications.

The design supports heavy radial moment and thrust Loads without additional parts to create robust systems with high power density.



Compact design

Tight assemble with several parts permits double or single vane/stroke resulting in high torque/force output from compact configurations. No mechanical part causes power loss.



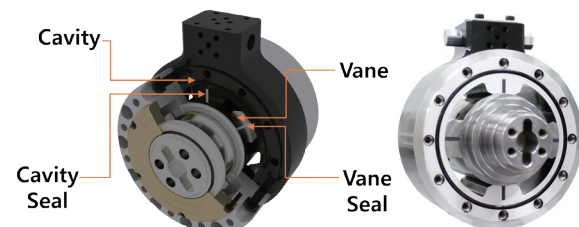
Flexibility

The shaft features a large diameter mounting flange With a drilled and tapped bolt circle. It provides considerable application flexibility with directly connected linkages.



Less leakage

Sealant is applied against accurately manufactured smooth surfaces, effectively eliminating most leakage and enabling selected positions to be held without drift.



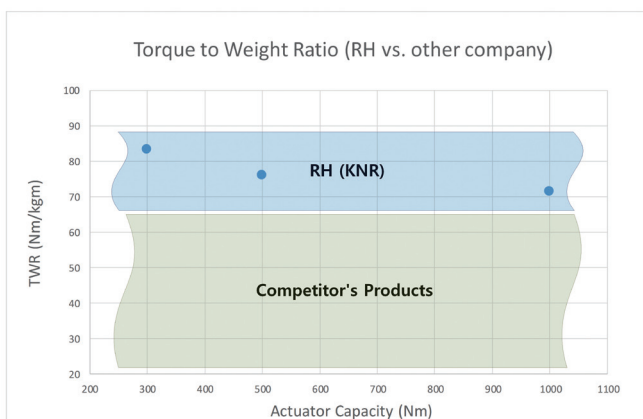
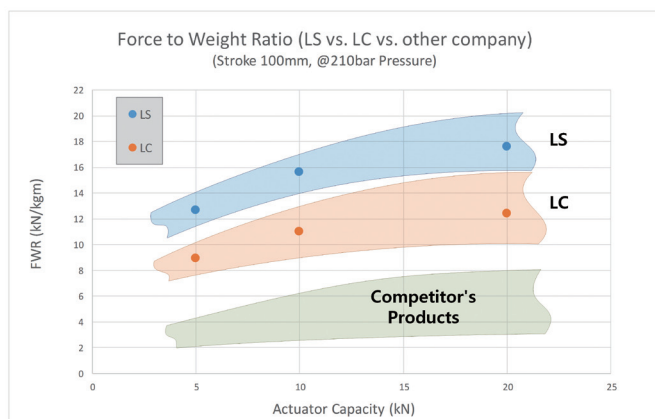
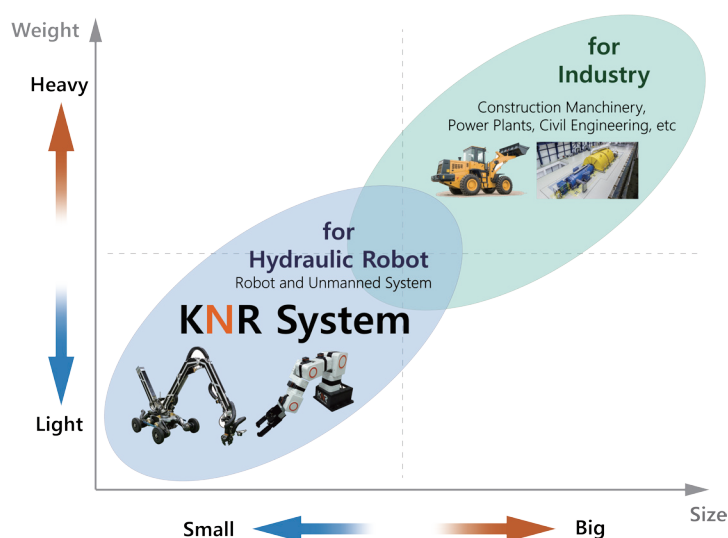
HYDRAULIC ACTUATOR



Heavy load-carrying capacity

KNR System develops actuators that satisfy the in-field needs of robotic and unmanned systems. Our actuators have a higher "Force to weight" ratio compared to the products of competitors. It supports heavy radial moment and thrust loads without additional parts to create robust application systems with high power density.

Area of KNR's Actuator Coverage : fit for the use in small application such as robotics



HYDRAULIC ACTUATOR



Customization Service

Hydraulic Actuators have simple but compact design, making modifications easier for a specific purpose when the standard model is not suitable.

We can customize products to meet your specifications and actuator shapes at an additional cost and using an extended timeframe.

Customized Specification

- ☛ Actuator Stroke
- ☛ Capacity (LH Series : Force / RH Series : Torque)

Customized Shape

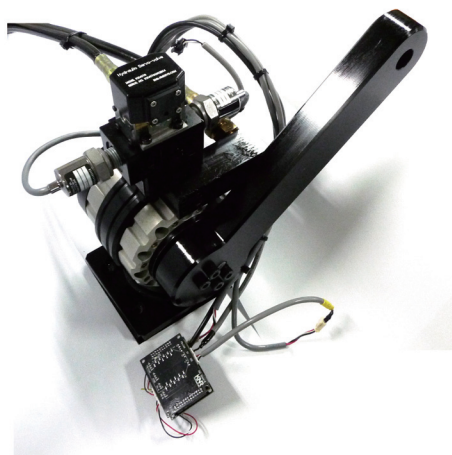
- ☛ Actuator Size & Shape
- ☛ Mounting Type
- ☛ Joint Accessories



HYDRAULIC ACTUATOR



Application



Manipulator



MP3
(KNR's Multi-Purpose Manipulator)

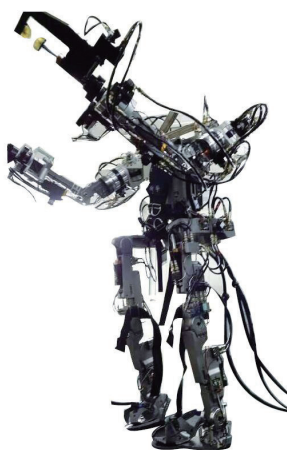


UW2
(KNR's Underwater Manipulator)

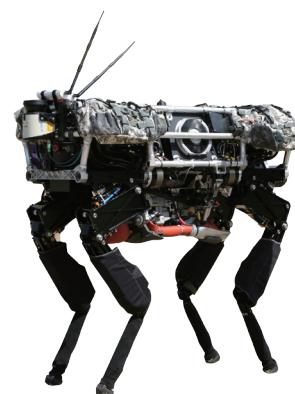
Robot



Gibbon
(KNR's Hydraulic Mobile Robot
in a nuclear power plant)
(Body: 10^5 (Rad/hr),
Grip: 10^6 (Rad/hr))



*Project supported by MOTIE,
"Development of Wearable
Robot for Industrial Labor
Support."*



*Project supported by MKE,
"Development of Quadruped
Legged Robot Platform
Technology"*

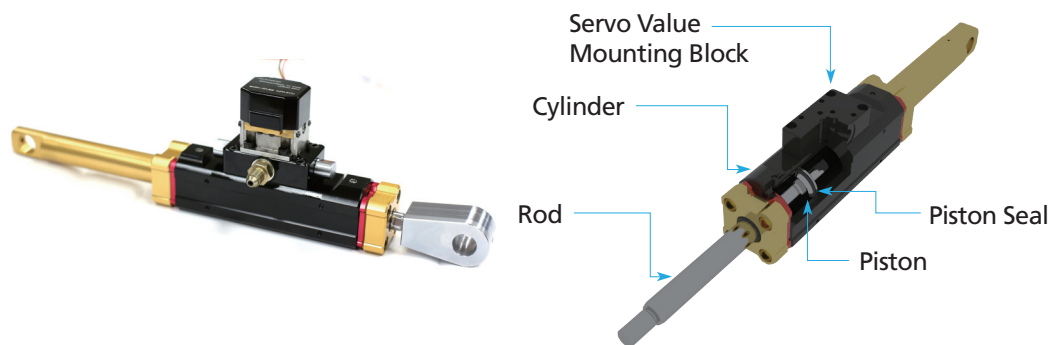
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Linear Hydraulic Actuator (LH Series)

Linear Hydraulic actuators (LH Series) is used to create linear motions. With an additional link, linear actuators can create rotational motion as well. One advantage of linear actuators is that they can be made smaller and narrower than rotary actuators. The standard power of these actuators is from 5 to 20 kN (1122~4489 lbf) at 210 bar (3045 psi), but they can be specially customized for many different purposes.

Compared to rotary actuators, linear actuators can come in smaller sizes. However, more attention is required when using linear actuators, as they apply different levels of torque depending on the angle of the links. Pressure, force, and displacement sensors can be used with the servo valve to provide better feedback and control. Single- and double-rod types are available to accommodate control and range of motion needs.



Technical Data	
OUTPUT Force	5, 10, 20 (kN) (1.12, 2.25, 4.5 (lbf))
Stroke	20 ~ 150 mm (0.79 ~ 5.91in)
Rod Type	Single Rod Type , Double Rod Type
Nominal Pressure	210 (bar)
Min. Operating Pressure	6 (bar)
Cycle Lift	> 10 ⁷ cycles between seal change

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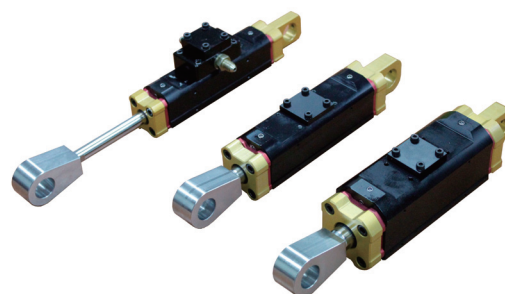
Ordering Code (LS Series)

LS	S	05	0020	I	SV
Model LS : Special Type	Rod Type S : SINGLE ROD D : DOUBLE ROD	Force 1) 05 : 05 (kN) 10 : 10 (kN) 20 : 20 (kN)	Stroke 0020 : 20 (mm) 0050 : 50 (mm) 0060 : 60 (mm) 0070 : 70 (mm) 0080 : 80 (mm) 0090 : 90 (mm) 0100 : 100 (mm) 0120 : 120 (mm) 0150 : 150 (mm)	Hydraulic Mount SV : SERVO VALVE T8 : AB PORT (PT) 1/8" T4 : AB PORT (PT) 1/4" F8 : AB PORT (PF) 1/8" F4 : AB PORT (PF) 1/4"	Mount Type 2) I : HINGE FH : FRONT FLANGE MOUNT HOLE FT : FRONT FLANGE MOUNT TAP RH : REAR FLANGE MOUNT HOLE RT : REAR FLANGE MOUNT TAP BF : BASE FOOT

1) Force : Please refer to Page 9
(Force Specification)

2) Mount Type : Please refer to Page 10
(Mounting Type)

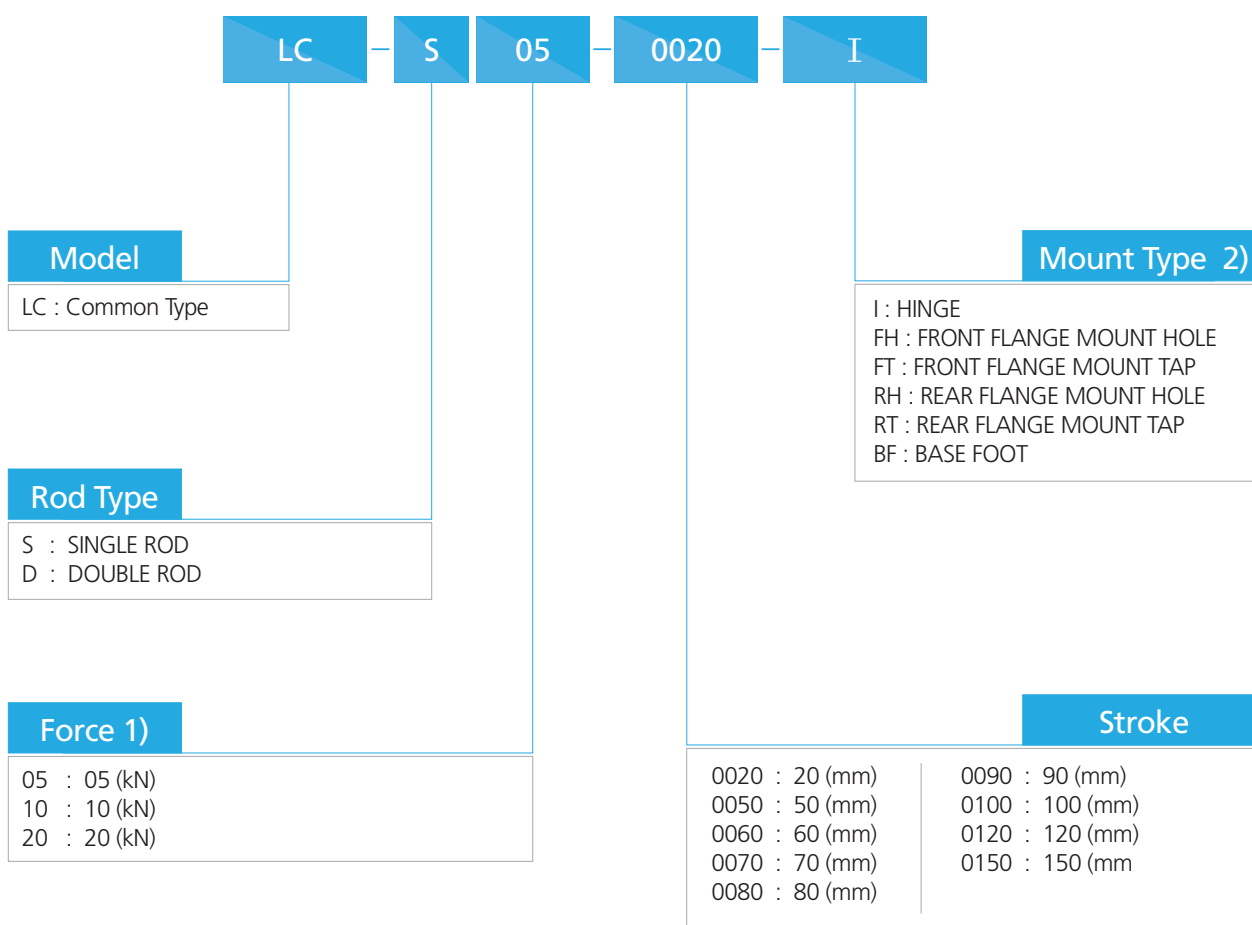
The LHA Series is a product line which has various customizable components to meet the needs of any customer. Servo valves can be assembled directly on an actuator or applied to various hydraulic connectors, using a variety of mounting types.



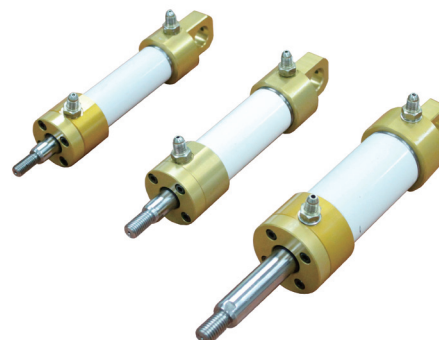
HYDRAULIC ACTUATOR



Ordering Code (LC Series)



- 1) Force : Please refer to Page 9 (Force Specification)
 2) Mount Type : Please refer to Page 10 (Mounting Type)

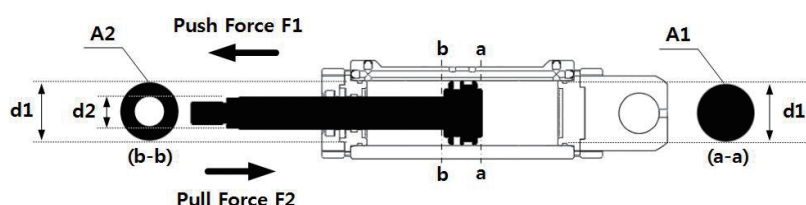


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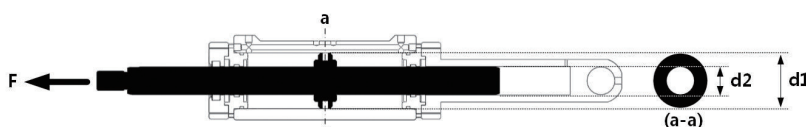
Force Specification

Single Rod Type



Model	Piston ($\varnothing$, mm (in))	Rod ($\varnothing$, mm (in))	A1 (mm ² (in ²))	A2 (mm ² (in ²))	F1 (@210bar, kN(lbf))	F2 (@210bar, kN(lbf))
LSS05	22 (0.87)	12 (0.47)	380 (0.59)	267 (0.41)	7.98 (1794)	5.61 (1261)
LSS10	30 (1.18)	16 (0.63)	707 (1.1)	506 (0.78)	14.84 (3336)	10.62 (2387)
LSS20	40 (1.57)	20 (0.79)	1257 (1.95)	942 (1.46)	26.39 (5932)	19.79 (4449)
LCS06	22 (0.87)	12 (0.47)	380 (0.59)	267 (0.41)	7.98 (1794)	5.61 (1261)
LCS10	30 (1.18)	16 (0.63)	707 (1.1)	506 (0.78)	14.84 (3336)	10.62 (2387)
LCS20	40 (1.57)	20 (0.79)	1257 (1.95)	942 (1.46)	26.39 (5932)	19.79 (4449)

Double Rod Type



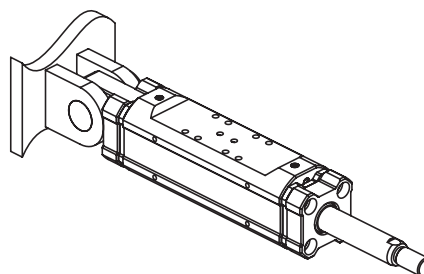
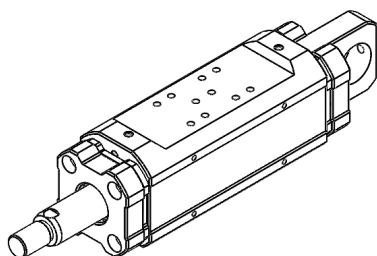
Model	Piston d1 ($\varnothing$, mm(in))	Rod d2 ($\varnothing$, mm(in))	A (mm ² (in ²))	F (@210bar, kN(lbf))
LSD05	22 (0.87)	12 (0.47)	267 (0.41)	5.61 (1261)
LSD10	30 (1.18)	16 (0.63)	506 (0.78)	10.62 (2387)
LSD20	40 (1.57)	20 (0.79)	942 (1.46)	19.79 (4449)
LCD06	22 (0.87)	12 (0.47)	267 (0.41)	5.61 (1261)
LCD10	30 (1.18)	16 (0.63)	506 (0.78)	10.62 (2387)
LCD20	40 (1.57)	20 (0.79)	942 (1.46)	19.79 (4449)

HYDRAULIC ACTUATOR

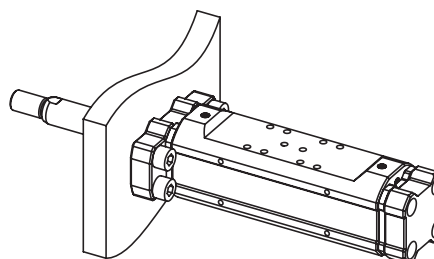
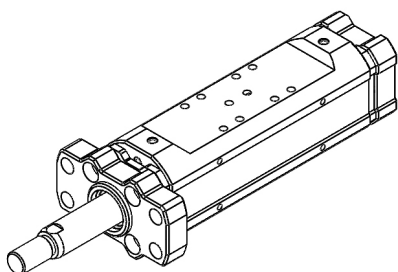


Mounting Type

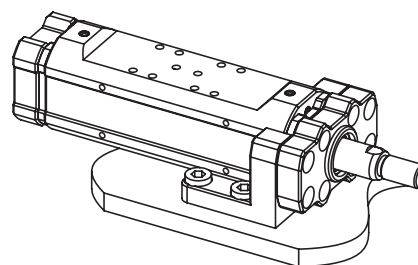
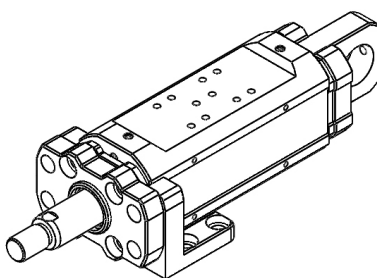
Hinge Type



Flange Type



Base Foot Type

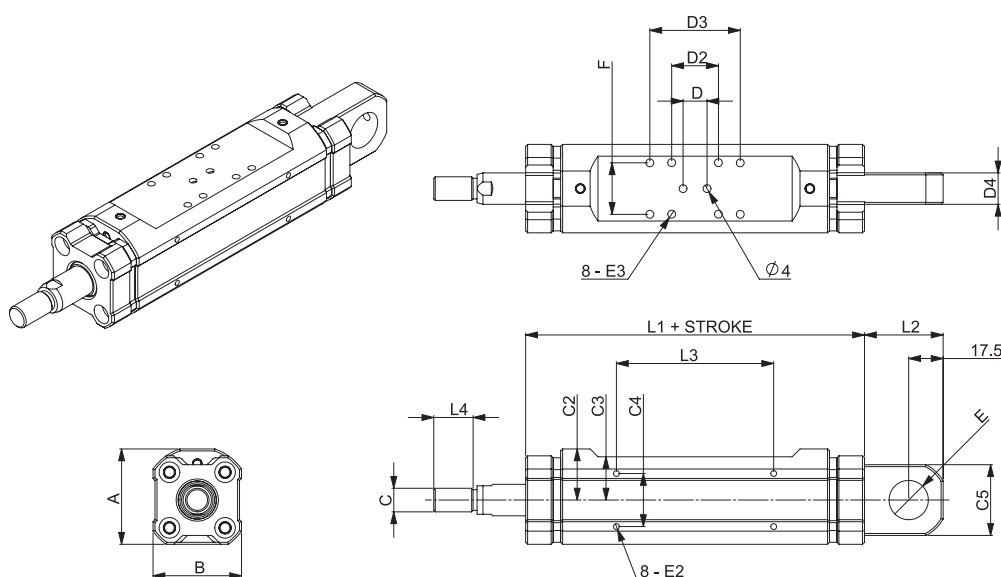


HYDRAULIC ACTUATOR



Dimension

Single Rod - Base Type



(unit : mm (in))

Model	A	B	C	C2	C3	C4	C5	D
LSS05	40.5 (1.59)	37 (1.46)	M8	22 (0.87)	17.5 (0.69)	20 (0.79)	30 (1.18)	12.2 (0.48)
LSS10	48.5 (1.91)	45 (1.77)	M12	26 (1.02)	22 (0.87)	27 (1.06)	36 (1.42)	12.2 (0.48)
LSS20	60.5 (2.38)	55 (2.17)	M14	32.5 (1.28)	28.5 (1.12)	37.6 (1.48)	36 (1.42)	12.2 (0.48)

Model	D2	D3	D4	E (+0.02)	E2	E3	F
LSS05	23.8 (0.94)	46 (1.81)	16 (0.63)	15 (0.59)	3 (0.12)	4 (0.16)	26.2 (1.03)
LSS10	23.8 (0.94)	46 (1.81)	17 (0.67)	20 (0.79)	3(0.12)	4 (0.16)	26.2 (1.03)
LSS20	23.8 (0.94)	46 (1.81)	18 (0.71)	25 (0.98)	3(0.12)	4 (0.16)	26.2 (1.03)

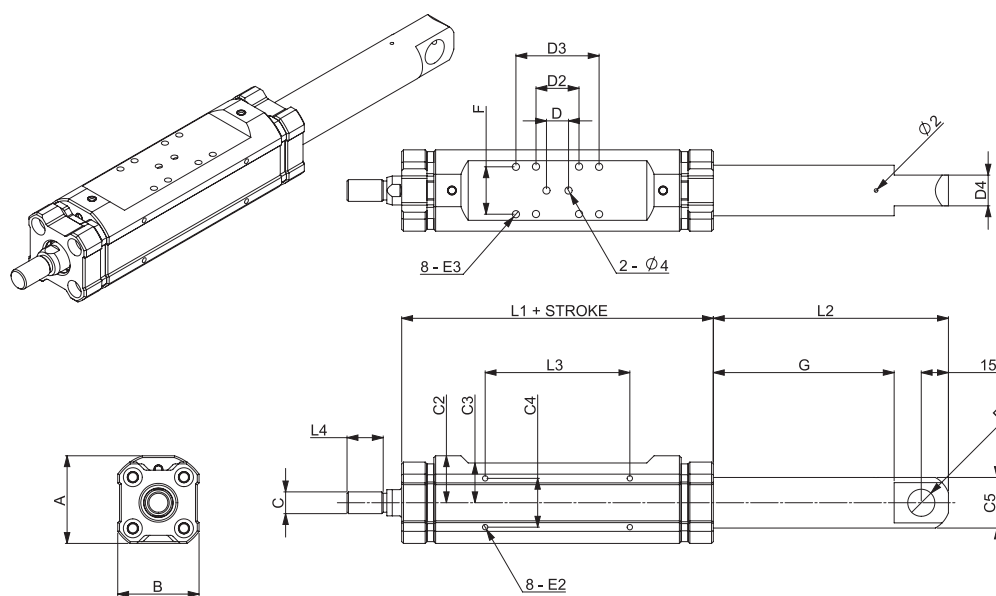
Model	L1 + STROKE	L2	L3	L4
LSS05	72.4 (2.85) + STROKE	40 (1.57)	80 (3.15)	14 (0.55)
LSS10	72.4 (2.85) + STROKE	40 (1.57)	80 (3.15)	20 (0.79)
LSS20	72.4 (2.85) + STROKE	40 (1.57)	82.2 (3.24)	20 (0.79)

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Dimension

Double Rod - Base Type



(unit : mm (in))

Model	A	B	C	C2	C3	C4	C5	D
LSS05	40.5 (1.59)	37 (1.46)	M8	22 (0.87)	17.5 (0.69)	20 (0.79)	21 (0.83)	12.2 (0.48)
LSS10	48.5 (1.91)	45 (1.77)	M12	26 (1.02)	22 (0.87)	27 (1.06)	28 (1.1)	12.2 (0.48)
LSS20	60.5 (2.38)	55 (2.17)	M14	32.5 (1.28)	28.5 (1.12)	37.6 (1.48)	30.5 (1.2)	12.2 (0.48)

Model	D2	D3	D4	E (+0.02)	E2	E3	F
LSS05	23.8 (0.94)	46 (1.81)	10 (0.39)	15 (0.59)	3 (0.12)	4 (0.16)	26.2 (1.03)
LSS10	23.8 (0.94)	46 (1.81)	17 (0.67)	20 (0.79)	3 (0.12)	4 (0.16)	26.2 (1.03)
LSS20	23.8 (0.94)	46 (1.81)	19.5 (0.77)	25 (0.98)	3 (0.12)	4 (0.16)	26.2 (1.03)

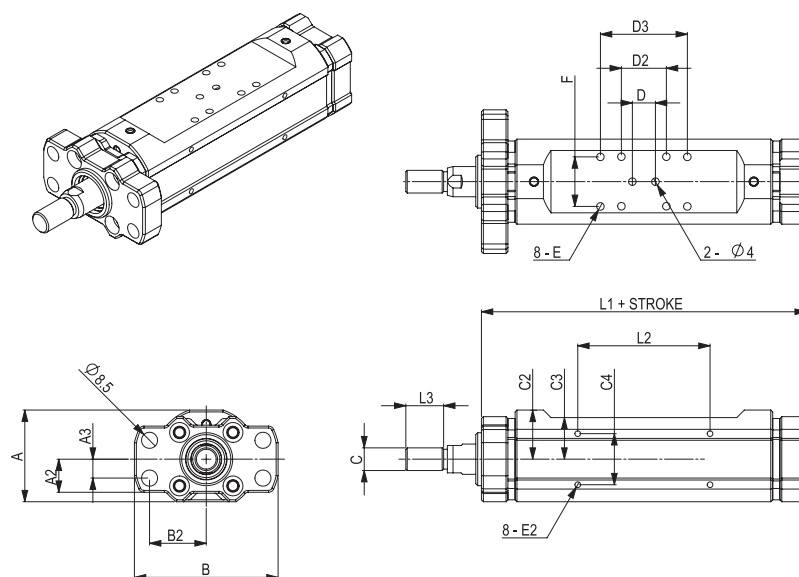
Model	L1 + STROKE	G	L2	L3	L4
LSS05	72.4 (2.85) + STROKE	100 (3.94)	130 (5.12)	80 (3.15)	20 (0.79)
LSS10	72.4 (2.85) + STROKE	100 (3.94)	130 (5.12)	80 (3.15)	20 (0.79)
LSS20	72.4 (2.85) + STROKE	100 (3.94)	130 (5.12)	80 (3.15)	20 (0.79)

HYDRAULIC ACTUATOR



Dimension

Flange Type



(unit : mm (in))

Model	A	A2	A3	B	B2	C	C2	C3
LSS05	40.5 (1.59)	14.5 (0.57)	8 (0.31)	68 (2.68)	27 (1.06)	M8	22 (0.87)	17.5 (0.69)
LSS10	48.5 (1.91)	17.5 (0.69)	10 (0.39)	76 (2.99)	30 (1.18)	M12	26 (1.02)	22 (0.87)
LSS20	60 (2.36)	22.5 (0.89)	12 (0.47)	85 (3.35)	33 (1.3)	M14	32.5 (1.28)	28.5 (1.12)

Model	C4	D	D2	D3	E	F
LSS05	20 (0.79)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	4 (0.16)	26.2 (1.03)
LSS10	27 (1.06)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	4 (0.16)	26.2 (1.03)
LSS20	37.6 (1.48)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	4 (0.16)	26.2 (1.03)

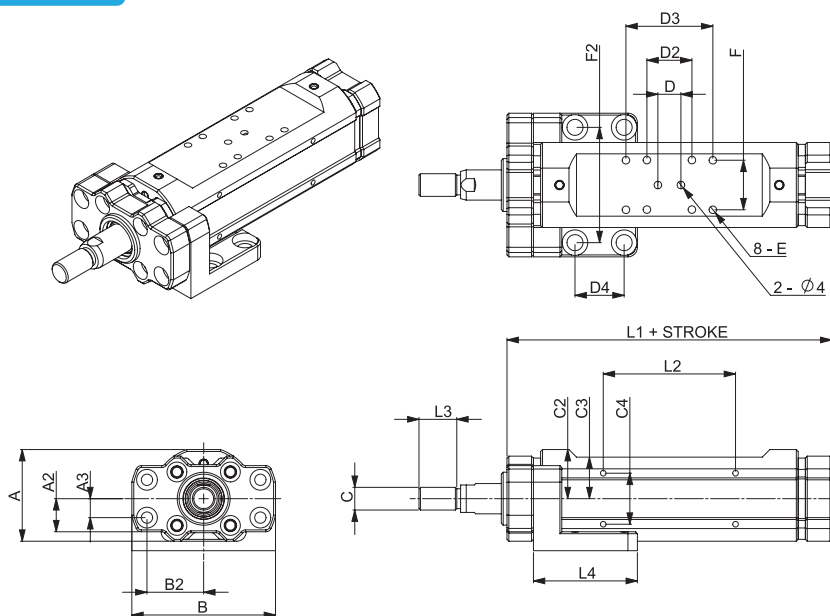
Model	L1 + STROKE	L2	L3
LSS05	72.4 (2.85) + STROKE	70 (2.76)	20 (0.79)
LSS10	72.4 (2.85) + STROKE	70 (2.76)	20 (0.79)
LSS20	72.4 (2.85) + STROKE	70 (2.76)	20 (0.79)

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Dimension

Base Foot Type



(unit : mm (in))

Model	A	A2	A3	B	B2	C	C2	C3
LSS05	40.5 (1.59)	14.5 (0.57)	8 (0.31)	68.5 (2.7)	27 (1.06)	M8	22 (0.87)	17.5 (0.69)
LSS10	48.5 (1.91)	17.5 (0.69)	10 (0.39)	76 (2.99)	30 (1.18)	M12	26 (1.02)	22 (0.87)
LSS20	66 (2.6)	22.5 (0.89)	12 (0.47)	86 (3.39)	33 (1.3)	M14	32.5 (1.28)	28.5 (1.12)

Model	C4	D	D2	D3	D4	E	F	F2
LSS05	20 (0.79)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	26 (1.02)	4 (0.16)	26.2 (1.03)	53 (2.09)
LSS10	27 (1.06)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	26 (1.02)	4 (0.16)	26.2 (1.03)	61 (2.4)
LSS20	37.6 (1.48)	12.2 (0.48)	23.8 (0.94)	46 (1.81)	26 (1.02)	4 (0.16)	26.2 (1.03)	70.8 (2.79)

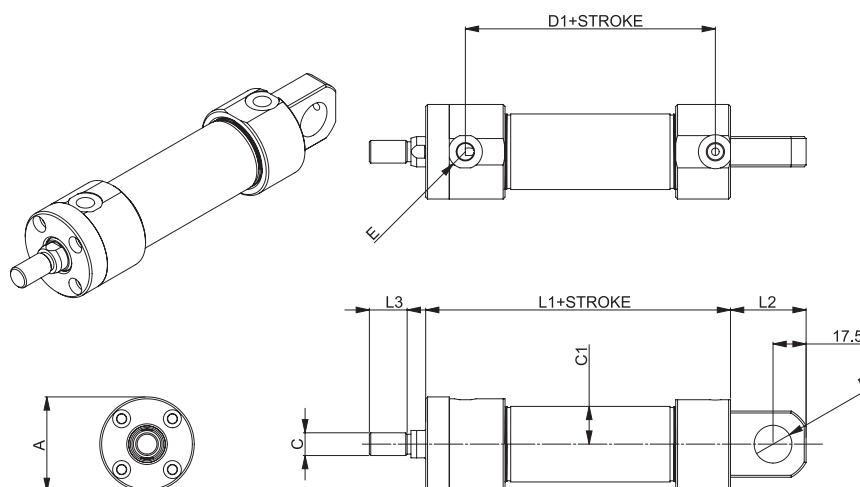
Model	L1 + STROKE	L2	L3	L4
LSS05	72.4 (2.85) + STROKE	70 (2.76)	20 (0.79)	55 (2.17)
LSS10	72 (2.83) + STROKE	70 (2.76)	20 (0.79)	55 (2.17)
LSS20	73.4 (2.89) + STROKE	70 (2.76)	20 (0.79)	55 (2.17)

HYDRAULIC ACTUATOR



Dimension

LC Series



(unit : mm (in))

Model	A	C	C1	D	D1 + STROKE
LCS05	Ø46 (1.81)	M10	17 (0.67)	20 (0.79)	32.3 (1.27) + STROKE
LCS10	Ø50 (1.97)	M12	20 (0.79)	20 (0.79)	32.3 (1.27) + STROKE
LCS20	Ø60 (2.36)	M14	25 (0.98)	20 (0.79)	34.3 (1.35) + STROKE

Model	E	L1 + STROKE	L2	L3
LCS05	G1/8	61.3 (2.41) + STROKE	40 (1.57)	20 (0.79)
LCS10	G1/8	61.3 (2.41) + STROKE	40 (1.57)	20 (0.79)
LCS20	G1/8	63.3 (2.49) + STROKE	40 (1.57)	20 (0.79)

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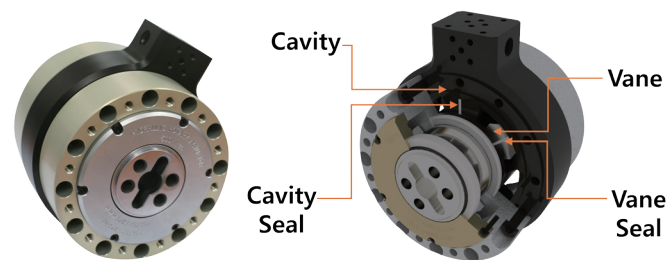
Rotary Hydraulic Actuator (RH Series)

Rotary actuators can be adapted to form different systems, providing high levels of mechanical stiffness and torque. They have compact yet heavy-duty designs.

These kinds of actuators can be implemented to yield a torque-to-weight ratio about 10 times higher than a standard motor and Harmonic Drive configuration.

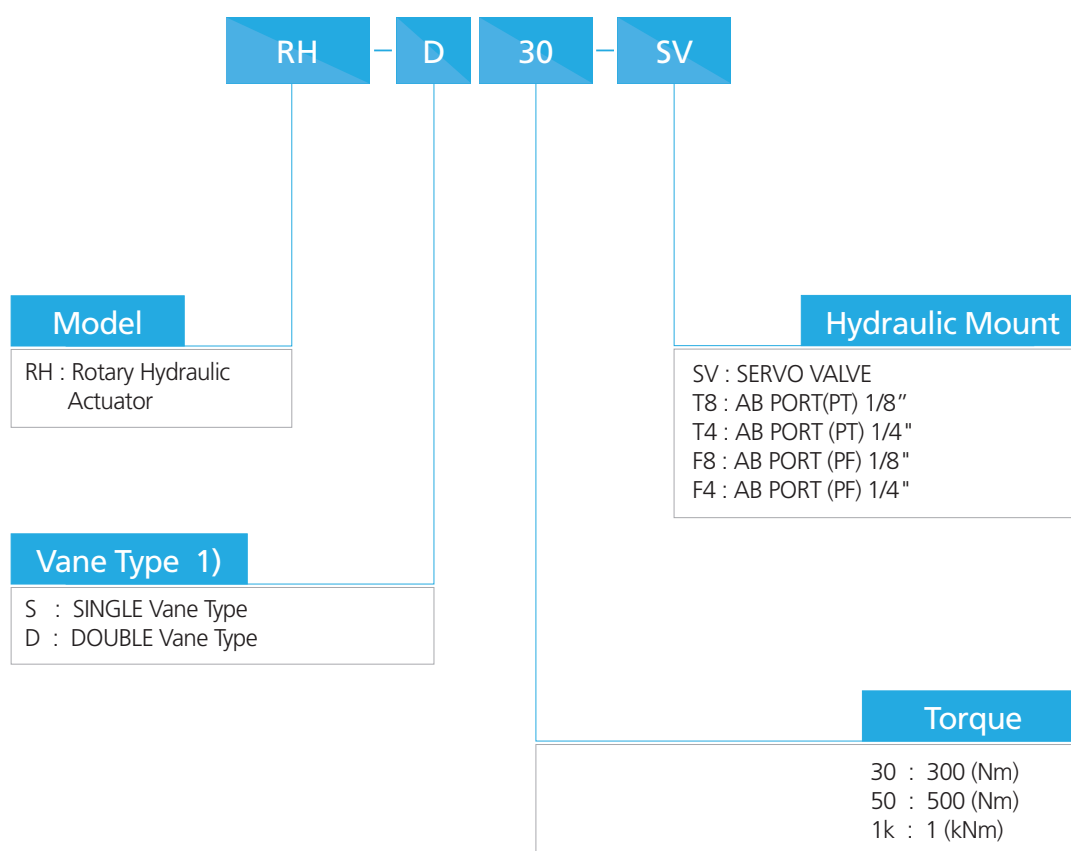
One of the advantages of rotary actuators is that they can be added to a system easily, with a simple insertion between two links. There's no need for extra parts, such as bearings and gearheads, so joints are guaranteed to have precise and powerful movements and links have no need for clearance. Their precision makes them ideal not only for robots, but for other industrial applications and testing.

We consistently research different types of mounts, and can provide actuators with different levels of power from our standard models 300 Nm (2655 in-lbs), 500 Nm (4425 in-lbs), and 1000 Nm (8851 in-lbs) at 210 bar (3045psi). We also have ongoing interest in developing actuators better equipped for harsh environments to better fit applications that require operations in underwater, high temperature, or high dust level environments.



Technical Data	
OUTPUT Torque	300Nm, 500Nm, 1kNm (2655, 4425, 8851 lbf · in)
Rotation	Double Vane Type : 100deg Single Vane Type : 270deg
Vane Type	Single Vane Type , Double Vane Type
Nominal Pressure	210 (bar)

HYDRAULIC ACTUATOR

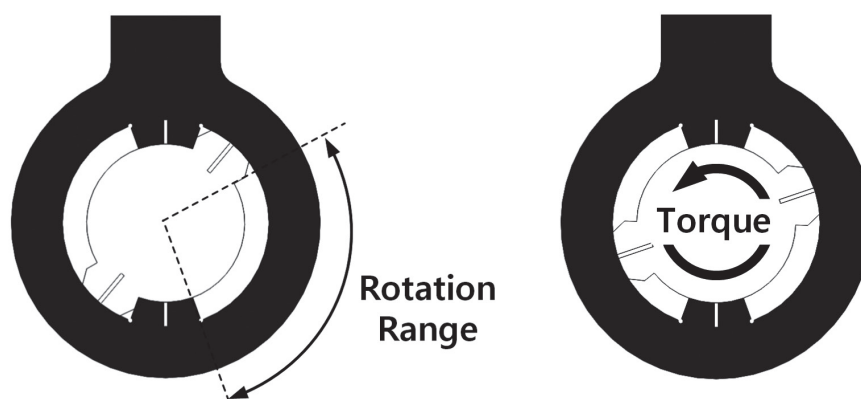


1) Rotary actuators can be designed in two types: single vane or double vane. Single vane allows better range of movements and double vane provides more torque. The two features make rotary actuators suitable for a wide variety of applications.

HYDRAULIC ACTUATOR



Specification



Double Vane Type

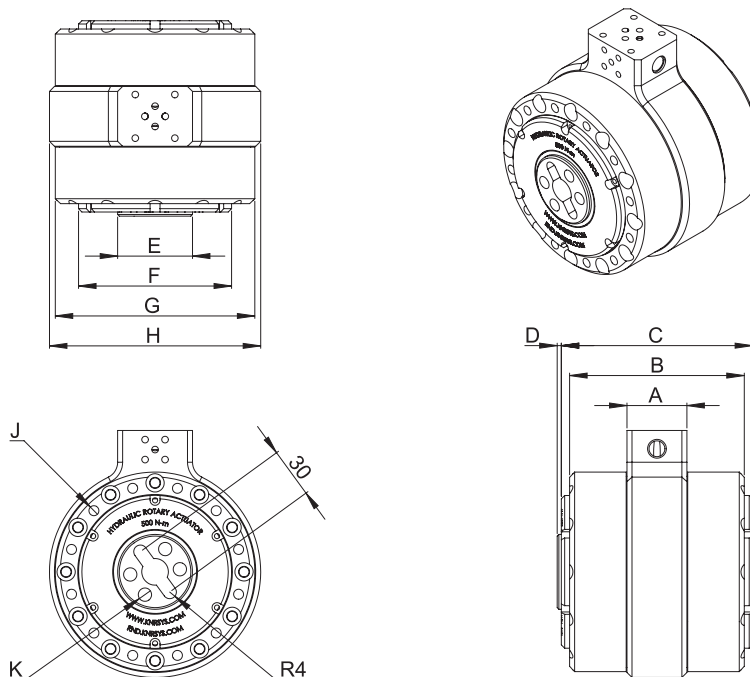
Model	Rotation Range (deg)	Torque (Nm(lbf · in))
RH-D30	100	300 (2655)
RH-D50	100	500 (4425)
RH-D1k	100	1000 (8851)

HYDRAULIC ACTUATOR



Dimension

RH-D



(unit : mm (in))

Model	A	B	C	D	E	F	G	H	J	K
RH-D30	26 (1.02)	84 (3.31)	90 (3.54)	2.5 (0.1)	40 (1.57)	78 (3.07)	110 (4.33)	113 (4.45)	M5 x 10 PCD 94 (PCD 3.7)	M6 x 15 PCD 24 (PCD 0.94)
RH-D50	36 (1.42)	105 (4.13)	115 (4.53)	2.5 (0.1)	45 (1.77)	92 (3.62)	120 (4.72)	127 (5)	M6 x 15 PCD 104 (PCD 4.09)	M8 x 20 PCD 30 (PCD 1.18)
RH-D1k	50 (1.97)	130 (5.12)	136 (5.35)	2.5 (0.1)	70 (2.76)	115 (4.53)	170 (6.69)	182 (7.17)	M8 X 15 PCD 135 (PCD 5.31)	M12 X 20 PCD 46 (PCD 1.81)

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KNR
SYSTEMS INC

HYDRAULIC ACTUATOR

MAY, 2016



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