

21 MPa compact design hydraulic cylinders with magnetic proximity sensors developed first in the industry

- 21 MPa compact design hydraulic cylinders. Sufficient strength verified by fatigue test and pressure test.
- The adoption of AX/AZ type sensors with high maintainability as standard.
- Switch Set cylinders can be used at up to 100°C depending on the selection of sensors.
- The mounting hole pitch is completely compatible to 100S-1 Series and 160S-1 Series. (The length in the stroke direction is different.)



Standard Specifications

Type	Standard type	Switch Set
Nominal pressure	21 MPa	
Maximum allowable pressure	21 MPa	
Proof test pressure	31.5 MPa	
Minimum operating pressure	0.3 MPa	
Working temperature range (ambient temperature)	-10 to +120°C (No freezing)	AX·AZ type..... -10 to +70°C Note) AX125 and AZ125 sensors can be used at up to +100°C. (No freezing)
Structure of cushioning	None	
Adaptable fluid	Petroleum-based fluid (When using another fluid, refer to the table of fluid adaptability.)	
Tolerance for thread	JIS 6H/6g	
Tolerance of stroke	0 to 0.8mm	
Mounting style	Basic style	
Rod end threads	Female thread and male thread	

Adaptability of Fluid to Seal Material

Seal material	Adaptable fluid				
	Petroleum-based fluid	Water-glycol fluid	Phosphate ester fluid	Water in oil fluid	Oil in water fluid
③ Fluorocarbon	○	×	○	○	○
⑥ HNBR	◎	◎	×	◎	◎

- Notes) 1. ◎: Applicable X: Inapplicable
2. The ◎-marked items are recommended seal materials in case of giving the first priority to abrasion resistance.

Terminologies

Nominal pressure

Pressure given to a cylinder for convenience of naming.
It is not always the same as the working pressure (rated pressure) that guarantees performance under the specified conditions.

Maximum allowable pressure

Maximum allowable pressure generated in a cylinder (surge pressure, etc.).

Proof test pressure

Test pressure against which a cylinder can withstand without unreliable performance at the return to nominal pressure.

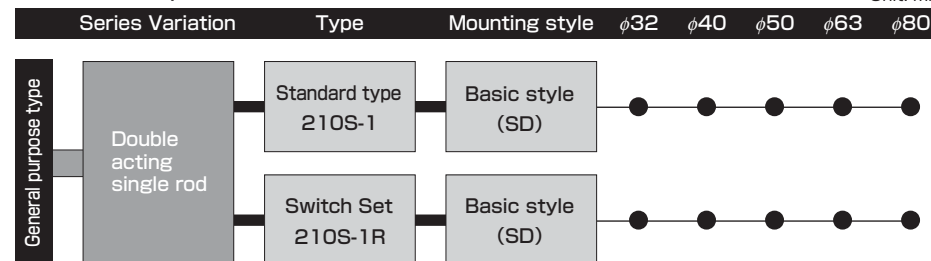
Minimum operating pressure

Minimum pressure at which cylinder installed horizontally operates under no load.

- Notes) ● This series of cylinders does not have air vents.
● Since side load (eccentric load) must not be applied to the piston rod, take care when installing the cylinder.
● The working temperature range depends on the seal material. For details, refer to the selection materials at the beginning of this catalog.
● When the piston hits against the cylinder end face at the stroke end, reduce the speed to less than the minimum speed.

Product Lineup

Unit: mm



- Notes) ● When using a sensor, use a Switch Set Cylinder.
● No sensor can be mounted onto the standard type cylinder.

Double acting single rod



Basic style(210S-1)



Switch Set (210S-1R)

Weight Table

Unit: kg

Bore	Basic style(210S-1)		Switch Set(210S-1R)		Male thread additional weight
	Basic weight	Additional weight per mm of stroke	Basic weight	Additional weight per mm of stroke	
φ32	1.66	0.025	1.43	0.022	0.057
φ40	2.16	0.030	1.94	0.028	0.114
φ50	2.97	0.037	2.66	0.036	0.201
φ63	5.03	0.047	4.57	0.049	0.435
φ80	8.32	0.067	8.00	0.071	0.798

Sensor Additional Weight Table

Unit: kg

AX type		
Cord length 1.5 m	Cord length 5 m	Connector type
0.05	0.13	0.04

[Calculation formula] Cylinder weight(kg)=basic weight+(cylinder stroke(mm)×additional weight per mm of stroke)+(sensor additional weight×sensor quantity)

[Calculation example] 210S-1R, bore φ40, cylinder stroke 30 mm, 2 pcs of AZ101(cord length 1.5 m)
2.16+(30×0.030)+(0.05×2)=3.16kg

Piston Pressurized Area Table

Unit: mm²

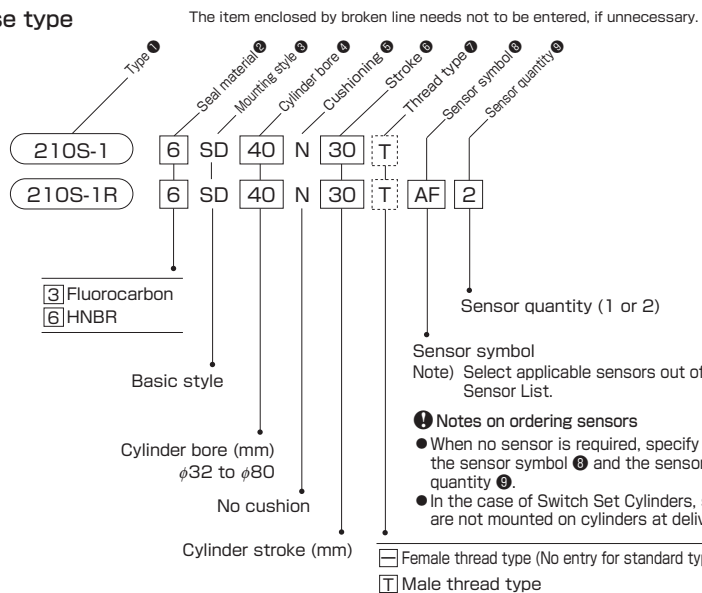
Bore	Rod dia.	Double acting single rod	
		Extension side	Retraction side
φ32	φ18	804	550
φ40	φ22	1257	876
φ50	φ28	1963	1348
φ63	φ36	3117	2100
φ80	φ45	5027	3436

[Calculation formula] $F=A \cdot P \cdot \beta$ (N)
F: Cylinder force (N)
A: Piston pressurized area (mm²)
P: Working pressure (MPa)
β: Load rate

[Calculation example] Double acting single rod, bore φ40, working pressure: 21 MPa
Load rate: 0.8
Cylinder force on extension side (N)
=1257×21×0.8=2117 (N)
Cylinder force on retraction side (N)
=876×21×0.8=14716 (N)

How to order

General purpose type



Standard Stroke Range

Series variations	Type	Mounting style	Bore	Stroke (mm)										Male thread type		
				5	10	15	20	25	30	40	50	60	70		80	
Double acting single rod	Standard type 210S-1	Basic style (SD)	φ32	○	○	○	○	○	○	○	○	○	○	○	○	○
			φ40	○	○	○	○	○	○	○	○	○	○	○		
			φ50	○	○	○	○	○	○	○	○	○	○	○		
			φ63	○	○	○	○	○	○	○	○	○	○	○		
	Switch Set 210S-1R	Basic style (SD)	φ32	○	○	○	○	○	○	○	○	○	○	○		
			φ40	○	○	○	○	○	○	○	○	○	○	○		
			φ50	○	○	○	○	○	○	○	○	○	○	○		
			φ63	○	○	○	○	○	○	○	○	○	○	○		
			φ80	○	○	○	○	○	○	○	○	○	○			

Sensor List

Type	Sensor symbol	Load voltage range	Load current range	Max. switching capacity	Protective circuit	Indicating lamp	Wiring method	Cord length	Applicable load					
Reed sensor	AF AX101CE	DC : 5 to 30V AC : 5 to 120V	DC : 5 to 40mA AC : 5 to 20mA	DC : 1.5W AC : 2VA	None	LED (lights in red when sensing)	0.3mmφ, 2-core, outer dia. φ4mm Rear wiring	1.5m	Small relay, programmable controller					
	AG AX105CE				5m									
	AH AX111CE				1.5m									
	AJ AX115CE				5m									
	AE AX125CE	DC: 30V or less AC: 120V or less	DC: 40mA or less AC: 20mA or less	DC : 1.5W AC : 2VA	None	None	5m							
	AK AX11ACE	AC : 5 to 120V	5 to 20mA		2VA	Provided	LED (lights in red when sensing)	4-pin connector type Rear wiring		0.5m				
	AL AX11BCE	DC : 5 to 30V	5 to 40mA		1.5W	Provided	LED (lights in red when sensing)	4-pin connector type Upper wiring		0.5m				
	AP AZ101CE	DC : 5 to 30V AC : 5 to 120V	DC : 5 to 40mA AC : 5 to 20mA		DC : 1.5W AC : 2VA	None	LED (lights in red when sensing)	0.3mmφ, 2-core, outer dia. φ4mm Upper wiring		1.5m				
	AR AZ105CE			5m										
	AS AZ111CE			1.5m										
	AT AZ115CE			5m										
	AN AZ125CE	DC: 30V or less AC: 120V or less	DC: 40mA or less AC: 20mA or less	DC : 1.5W AC : 2VA	None	None	5m							
	AU AZ11ACE	AC : 5 to 120V	5 to 20mA		2VA	Provided	LED (lights in red when sensing)	4-pin connector type Upper wiring		0.5m				
	AW AZ11BCE	DC : 5 to 30V	5 to 40mA		1.5W	Provided	LED (lights in red when sensing)	4-pin connector type Upper wiring		0.5m				
AM AX135CE	AC/DC : 90 to 240V	5 to 300mA	B contact output		Provided	LED (lights in red when not sensing)	0.3mmφ, 2-core, outer dia. φ4mm Rear wiring 0.3mmφ, 2-core, outer dia. φ4mm Upper wiring	5m						
AY AZ135CE				5m										
BE AX201CE-1				DC : 5 to 30V	5 to 40mA			—	Provided	LED (lights in red when sensing)	0.3mmφ, 2-core, outer dia. φ4mm Rear wiring	1.5m	Small relay, programmable controller	
BF AX205CE-1												5m		
CE AX211CE-1	1.5m													
CF AX215CE-1	5m													
BM AZ201CE-1	1.5m													
BN AZ205CE-1	5m													
CM AZ211CE-1	1.5m													
CN AZ215CE-1	5m													
CT AX211CE-1	DC : 5 to 30V	5 to 40mA	—			Provided	LED (lights in red when sensing)					0.3mmφ, 2-core, outer dia. φ4mm Rear wiring		1.5m
CU AX215CE-1														5m
CV AX21BCE-1														0.5m
CW AZ211CE-1														1.5m
CX AZ215CE-1														5m
CY AZ21BCE-1														0.5m
										LED (two-LED type in red/green)	0.3mmφ, 2-core, outer dia. φ4mm Rear wiring		1.5m	
													0.5m	

Notes) ● For the sensors without a protective circuit, be sure to provide a protective circuit (SK-100) with the load when using any induction load (relay, etc.).
 ● The output logic of AX and AZ135CE is B contact. When the piston is detected, the sensor contact turns off (the lamp turns on).
 ● WR and WS type sensors can be mounted.
 ● For the details of sensors, be sure to read the sensor specifications at the end of this catalog.
 ● We recommend AND Unit (AU series) for multiple sensors connected in series.
 For details, refer to AND Unit at the end of this catalog.



Sensor Mountable Minimum Stroke Unit: mm

Bore	With 1 sensor		With 2 sensors	
	Operating range	Hysteresis	Operating range	Hysteresis
φ32	5	10 *	10 *	10 *
φ40				
φ50				
φ63				
φ80				

Operating Range and Hysteresis Unit: mm

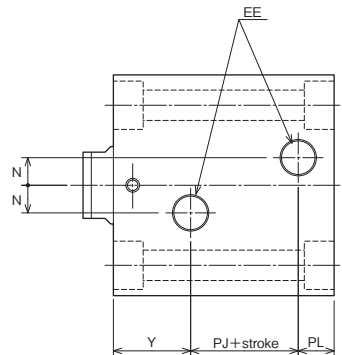
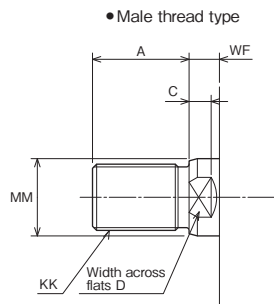
Bore	contact		Non-contact	
	Operating range	Hysteresis	Operating range	Hysteresis
φ32	10 to 17	2 or less	4 to 8	1 or less
φ40				
φ50				
φ63				
φ80				

Notes) ● When two reed sensors are mounted on a 10mm stroke cylinder, adjust their positions because the sensors may interfere with each other.
 * If you want to mount solid state sensors to a 10mm stroke cylinder, use two sensor mounting grooves.

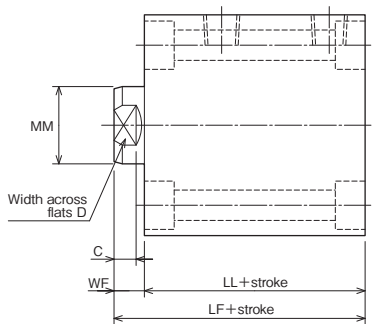
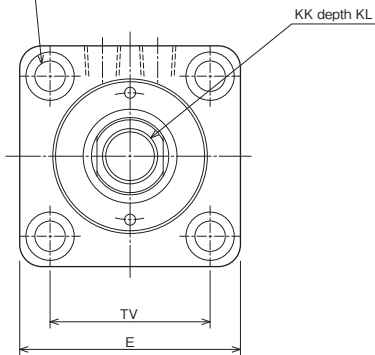
210S-1/THS21 Bore CAD/DATA is available. 

SD Standard type 210S-1 6 SD Bore N Stroke T

None: Female thread type
 : Male thread type



4-FB through
 2x4-spot facing dia. FG depth BT



Dimensional Table



Symbol Bore	A	BT	C	D	E	EE	FB	FG	KK		KL
									Female thread type	Male thread type	
φ32	25	6.5	7	14	□62	Rc1/4	φ6.6	φ11	M12×1.75	M16×1.5	15
φ40	30	8.6	7	19	□70	Rc1/4	φ9	φ14	M16×2	M20×1.5	20
φ50	35	10.8	8	24	□80	Rc1/4	φ11	φ17.5	M20×2.5	M24×1.5	24
φ63	45	13	9	30	□94	Rc1/4	φ14	φ20	M27×3	M30×1.5	33
φ80	60	15.2	14	41	□114	Rc3/8	φ16	φ23	M30×3.5	M39×1.5	36

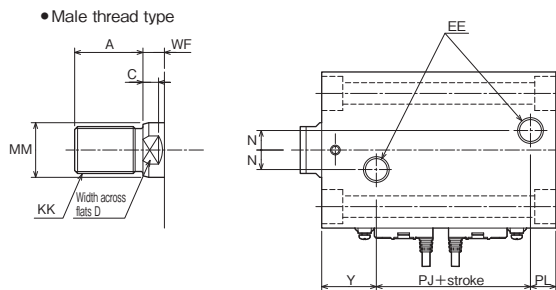
Symbol Bore	LF	LL	MM	N	PJ	PL	TV	WF	Y
φ32	74	64	φ18	10	24	12	□47	10	28
φ40	75	65	φ22	10	26	12	□52	10	27
φ50	81	70	φ28	10	29	13	□58	11	28
φ63	100	87	φ36	10	44	13	□69	13	30
φ80	115	98	φ45	15	45	18	□86	17	35

Note) • The tolerance of MM is f8.

210S-1/THS21 Bore CAD/DATA is available. 

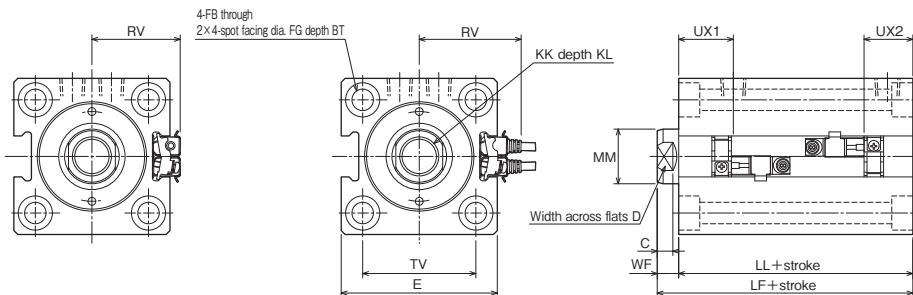
SD Switch Set 210S-1R 6 SD Bore N Stroke T Sensor symbol Sensor quantity

 : Female thread type
 : Male thread type



Rear wiring AX type

Upper wiring AZ type



Dimensional Table

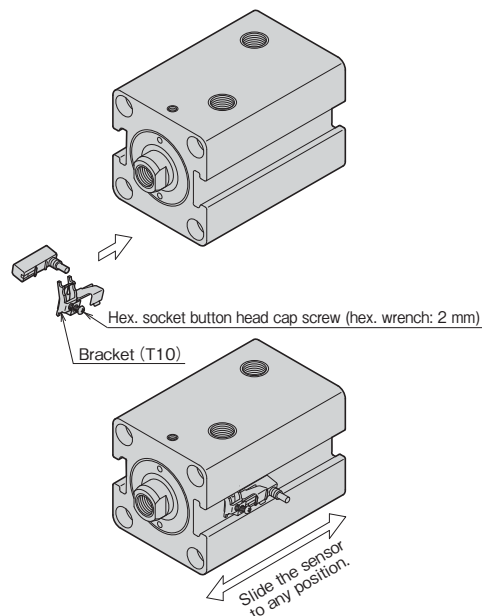
Symbol Bore	A	BT	C	D	E	EE	FB	FG	KK		KL
									Female thread type	Male thread type	
φ32	25	6.5	7	14	□62	Rc1/4	φ6.6	φ11	M12×1.75	M16×1.5	15
φ40	30	8.6	7	19	□70	Rc1/4	φ9	φ14	M16×2	M20×1.5	20
φ50	35	10.8	8	24	□80	Rc1/4	φ11	φ17.5	M20×2.5	M24×1.5	24
φ63	45	13	9	30	□94	Rc1/4	φ14	φ20	M27×3	M30×1.5	33
φ80	60	15.2	14	41	□114	Rc3/8	φ16	φ23	M30×3.5	M39×1.5	36

Symbol Bore	LF	LL	MM	N	PJ	PL	RV		TV	UX1	UX2	WF	Y
							AX type	AZ type					
φ32	74	64	φ18	10	24	12	37	44	□47	24	22	10	28
φ40	75	65	φ22	10	26	12	41	48	□52	25	22	10	27
φ50	81	70	φ28	10	29	13	46	53	□58	27	25	11	28
φ63	100	87	φ36	10	44	13	53	60	□69	34	35	13	30
φ80	115	98	φ45	15	45	18	63	70	□86	40	40	17	35

Note) • The tolerance of MM is f8.

Setting method of sensor detecting position

AX-AZ type bracket screw tightening torque:
Approx. 0.4 N·m



1. Loosen the bracket screw, and fit the bracket in the center of the sensor.
2. Insert the sensor combined with the bracket into the sensor mounting part of the cylinder body.
3. Slide the sensor to any position. Installing in the center of operating range provides the most stable detection.
4. To detect the cylinder stroke end, mount the sensor at dimension UX (optimum setting position).
5. After sliding the sensor to the detecting position, tighten the bracket screw.

Note) If the tightening torque is improper, the sensor may be dislocated, or the sensor body may be damaged.

How to order individual sensors

● AX-AZ type

T10 AZ105CE

Sensor type

Precautions for use

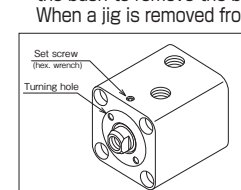
- When using the cylinder with stroke adjuster tighten the screw(s) to the rod end completely so that no load is applied to the piston rod screw section.
- Since side load (eccentric load) must not be applied to the piston rod, take care when installing the cylinder.
- When operating the cylinder for the first time, take air bleeding from the piping. After air bleeding, run the cylinder at a reduced pressure, and gradually increase the pressure to the working pressure.
Note) Since 210S-1 Series has no air vents, take air bleeding from the piping.
- To install the cylinder, use four hex. socket head cap screws (JIS B 1176, strength class 10.9 or more).
- When using mounting bolts, screw the bolts into mounting materials by 80% or more of the screw diameter. The material of the mounting materials must have strength equal to SS400.
- When using nuts to tighten mounting bolts, use steel nuts with a strength class of 6 or more. (However, DO NOT use the type-3 nuts.)
- When using mounting bolts to secure the cylinder body, be sure to tighten them according to the following specified torque.

Cylinder Mounting Bolt Tightening Torque

Bore	Mounting bolt	Tightening torque N·m
φ32	M6×1	8.1
φ40	M8×1.25	20.0
φ50	M10×1.5	40.0
φ63	M12×1.75	67.0
φ80	M14×2	110.0

Notes on disassembly and reassembly

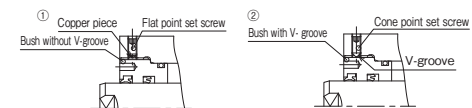
- After removing the set screw, use the turning hole of the bush to remove the bush from the cylinder.



Note) A copper piece may have been set under the set screw.

- When a jig is removed from the rod end screw, burrs may occur on the width across flats of the rod. Remove the burrs with a file, etc. and remove the bush.
- The piston rod and piston cannot be disassembled.
- When reassembling the cylinder, be careful that foreign matters such as dust, fillings, and debris do not enter the inside of the cylinder.

- When a copper piece is equipped under the set screw to protect the bush, remove it before tightening the bush.
- The center height of cylinders of the mounting style LD has been determined before shipment. When reassembling such a cylinder, adjust the center height.
- After tightening the bush;
In case of ①, place the copper piece under the set screw and tighten it.
In case of ②, tighten the set screw without placing the copper piece.



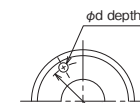
Components Combination List

No.	Screw on bush	Copper piece	Set screw type
①	Without V-groove	Required	Flat point
②	With V-groove	—	Cone point

Seal replacement

- When disassembling the cylinder, renew all seals.
- General purpose types (210S-1 and 210S-1R): The piston seals, rod seals, dust wipers, bush O-rings and back-up rings are replaceable.
- Since the piston and rod have been locked, the piston rod O-ring cannot be replaced.

- Dimensions of bush turning hole



* Bore φ32 to φ80

Unit: mm

Bore	a	d	PCD
φ32	5	4	32
φ40	7	4	38
φ50	8	5	46
φ63	8	5	58
φ80	10	8	70