Hydraulic Cylinder
7MPa Nominal Pressure

Series CHN

ø20, ø25, ø32, ø40

Our Series CHN stainless steel tube hydraulic cylinder comes in four small bore sizes and can handle nominal pressures of up to 7MPa.

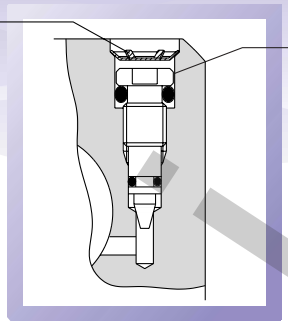
Our stainless steel tube hydraulic cylinder comes in 4 small bore sizes that can accommodate up to 7MPa of nominal pressure.

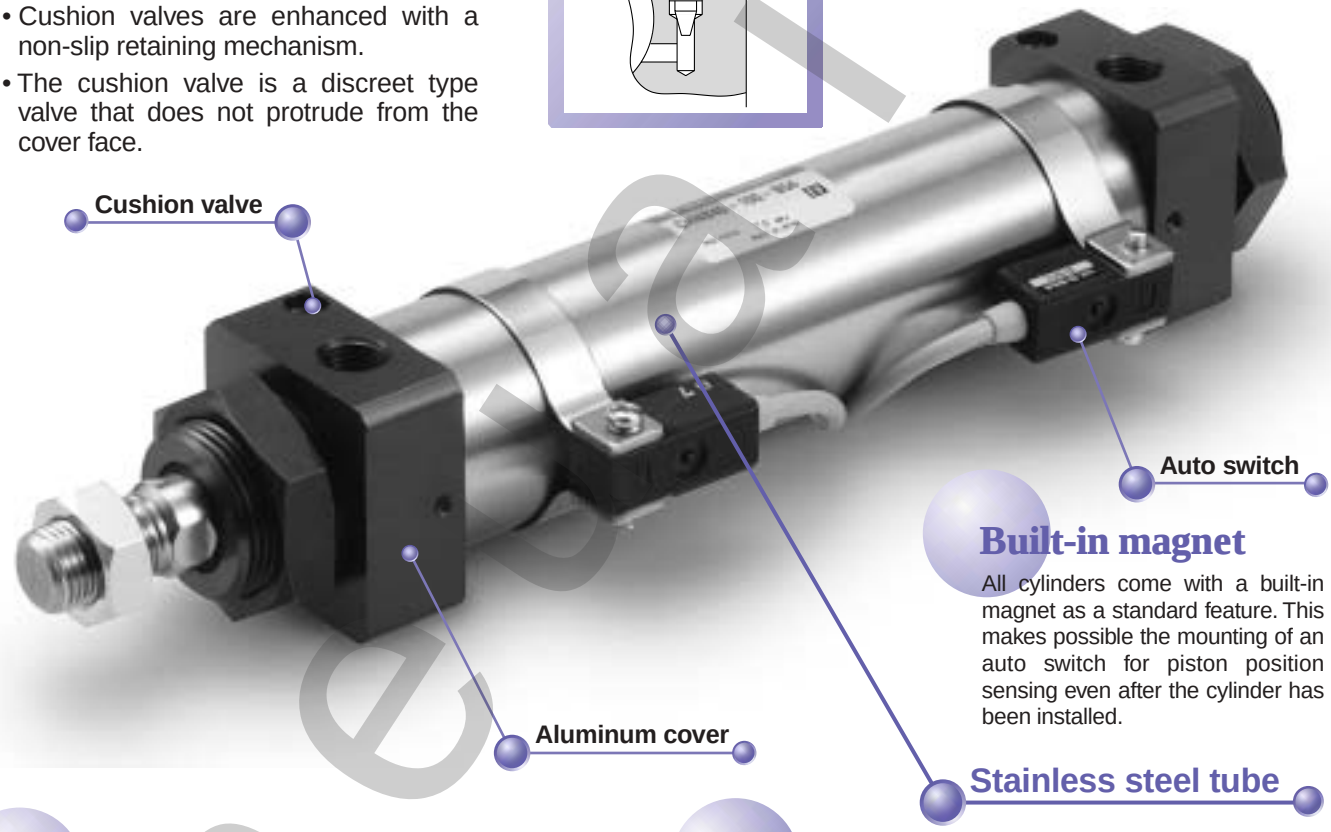
Series CHN

ø20, ø25, ø32, ø40

Equipped with cushion mechanism

- A cushion seal system mechanism is now a standard feature.
- Cushion valves are enhanced with a non-slip retaining mechanism.
- The cushion valve is a discreet type valve that does not protrude from the cover face.



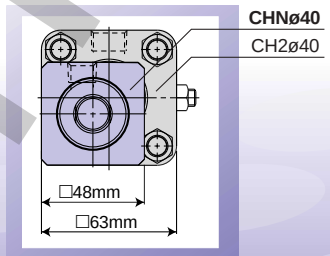


Built-in magnet

All cylinders come with a built-in magnet as a standard feature. This makes possible the mounting of an auto switch for piston position sensing even after the cylinder has been installed.

Reduced cross sectional area

When compared to the same size tie-rod cylinder, the cross sectional area of our Series CHN cylinder projects less than 45%, thereby attaining a better space savings.



Light weight

Using aluminum alloy for both the rod cover and head cover reduces overall weight.

Model	Weight (kg)
CHNB20-100	0.51
CHNB25-100	0.63
CHNB32-100	0.89
CHNB40-100	1.51

Basic type with a 100 mm stroke

Series Variations

Series	Nominal pressure	Bore size (mm)	Mounting bracket	Auto Switch
CHN	7.0MPa	20 25 32 40	Basic type Axial foot type Front flange type Rear flange type Single clevis type	Band mounting type Reed type Solid state type

7MPa

Hydraulic Cylinder
Series CHN
ø20, ø25, ø32, ø40

How to Order

CHN [L] [25] — [100] — [C73] [ ]

Mounting bracket

B	Basic type
L	Axial foot type
F	Front flange type
G	Rear flange type
C	Single clevis type

Bore size

20	20mm
25	25mm
32	32mm
40	40mm

Cylinder stroke (mm)
Refer to the standard stroke table on page 2.

Auto switch type

Nil	Without auto switch

∗ Select applicable auto switches from the table below.

Number of auto switches

Nil	2 pcs.
S	1 pc.
n	"n" pcs.

Applicable auto switches

Type	Special function	Electrical entry	Indicator light	Wiring (output)	Load voltage DC	Load voltage AC	Auto switch model	Lead wire length (m)∗ 0.5 (Nil)	3 (L)	5 (Z)	None (N)	Applicable load	
Reed switch	—	Grommet	Yes	3-wire (NPN equiv.)	5V	—	**C76**	●	●	—	—	IC circuit	—
				2-wire	12V	—	**B53**	●	●	●	—	—	PLC
						200V or less	**B54**	●	●	●	—	—	Relay PLC
			No				**B64**	●	●	—	—		
			Yes			100V	**C73**	●	●	●	—		
			No		5V, 12V	100V or less	**C80**	●	●	—	—	IC circuit	
		Connector	Yes		24V	12V	—	**C73C**	●	●	●	●	—
			No			5V, 12V	24V	**C80C**	●	●	●	●	IC circuit
		Terminal conduit	Yes			12V	—	**A33**	—	—	—	●	—	PLC
		DIN terminal				12V	100V, 200V	**A34**	—	—	—	●	—	Relay PLC
								A44	—	—	—	●	—	
	Diagnostic indication (2-color display)	Grommet				—	—	**B59W**	●	●	—	—	—	
Solid state switch	—	Grommet	Yes	3-wire (NPN)	5V, 12V	—	**H7A1**	●	●	○	—	IC circuit	Relay PLC
				3-wire (PNP)			**H7A2**	●	●	○	—		
				2-wire	12V		**H7B**	●	●	○	—	—	
		Connector					**H7C**	●	●	●	●		
		Terminal conduit		3-wire (NPN)	5V, 12V		**G39**	—	—	—	●	IC circuit	
				2-wire	12V		**K39**	—	—	—	●	—	
	Diagnostic indication (2-color display)	Grommet		3-wire (NPN)	24V 5V, 12V	—	**H7NW**	●	●	○	—	IC circuit	
				3-wire (PNP)			**H7PW**	●	●	○	—		
				2-wire	12V		**H7BW**	●	●	○	—	—	
	Water resistant (2-color display)						**H7BA**	—	●	○	—		
	With timer			3-wire (NPN)	5V, 12V		**G5NT**	—	●	○	—	IC circuit	
	With diagnostic output (2-color display)			4-wire (NPN)			**H7NF**	●	●	○	—		
	Latch type with diagnostic output (2-color display)				—		**H7LF**	●	●	○	—	—	

∗ Lead wire length symbols: 0.5m ..... Nil (example) C73C
3m ..... L (example) C73CL
5m ..... Z (example) C73CZ
None ..... N (example) C73CN

Notes) • Solid state switches marked "○" are produced upon receipt of order.
• You do not need to specify "N" (i.e., without lead wire) for D-A3□, D-A44, D-G39, and D-K39. This is the only standard specification automatically available for these models.

Hydraulic Cylinder: 7MPa *Series CHN*

Specifications

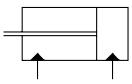
Action	Double acting/Single rod
Fluid	Hydraulic fluid
Nominal pressure	7MPa
Proof pressure	10.5MPa
Maximum allowable pressure	9MPa
Minimum operating pressure	0.3MPa
Ambient and fluid temperature	Without auto switch: –10° to 80°C
	With auto switch: –10° to 60°C
Piston speed	8 to 300mm/s
Cushion	Cushion seal
Rod end thread	Male thread
Thread tolerance	JIS class 2
Stroke length tolerance	to 250mm $^{+1.0}_{0}$ 251 to 800mm $^{+1.4}_{0}$
Mounting types	Basic type, Axial foot type Rear flange type, Front flange type Single clevis type

Note) Refer to page 26 for definitions of terms related to pressure.

Accessories

Mounting types		Basic	Axial foot	Rear flange	Front flange	Single clevis
Standard	**Mounting nut**	● (2 pcs.)	● (2 pcs.)	● (1 pc.)	● (1 pc.)	—
	Rod end nut	●	●	●	●	●
Option	**Clevis pin**	—	—	—	—	—
	Single knuckle joint	●	●	●	●	●
	Double knuckle joint (with pin)	●	●	●	●	●
	Knuckle bracket	●	●	●	●	●

JIS symbol



Standard Strokes: Refer to page 3 for minimum strokes for auto switch mounting.

Bore size (mm)	Standard strokes (mm)	Long stroke
20	25 to 300	800
25	25 to 400	
32	25 to 500	
40		

∗ Standard strokes above have a minimal delivery time. Consult with P/A for the manufacture of strokes other than the above.

Hydraulic Fluid Compatibility

Hydraulic fluid	Compatibility
Standard mineral hydraulic fluid	Compatible
W/O hydraulic fluids	Compatible
O/W hydraulic fluids	Compatible
Water/Glycol hydraulic fluids	∗
Phosphate hydraulic fluids	Not compatible

∗ Consult with Power Aire.

Mounting Brackets: Part Nos.

Bore size (mm)	20	25	32	40
Axial foot∗	CHN-L020	CHN-L025	CHN-L032	CHN-L040
Flange	CHN-F020	CHN-F025	CHN-F032	CHN-F040

∗ When ordering the axial foot type, order 2 pieces for each cylinder.

Auto Switch Mounting Brackets: Part Nos. (incl. band & screws)

Bore size (mm)	Auto switch models		
	D-C7, D-C8 D-H7	D-B5, D-B6 D-G5, D-K5	D-A3, D-A4
20	BMA2-020	BA-01	BD1-01M
25	BHN3-025	BHN2-025	BD1-02M
32	BHN3-032	BGS1-032	BHN1-032
40	BHN3-040	BH2-040	BDS-04M

[Stainless steel mounting screw kits]
The following stainless steel mounting screw kits are available for use depending on the operating environment. (Switch mounting bands are not included and should be ordered separately.)
BBA3: D-B5, D-B6, D-G5, and D-K5
BBA4: D-C7, D-C8, D-H7

∗ When D-H7BAL switches are shipped mounted on a cylinder, the above stainless steel screws are used. Also, when switches are shipped separately, BBA4 is included.

Series CHN

Minimum Strokes for Auto Switch Mounting

(mm)

Auto switch models	No. of auto switches				
	2 pcs.		"n" pcs.		1 pc.
	Different sides	Same side	Different sides	Same side	
D-C7 **D-C8**	15	50	$15 + 45\left(\frac{n-2}{2}\right)$ (n = 2, 4, 6 ···)	50 + 45 (n – 2) (n = 2, 3, 4, 5 ···)	10
D-H7□ **D-H7□W** **D-H7BAL** **D-H7NF**	15	60		60 + 45 (n – 2) (n = 2, 3, 4, 5 ···)	10
D-C73C **D-C80C** **D-H7C**	15	65	$15 + 50\left(\frac{n-2}{2}\right)$ (n = 2, 4, 6 ···)	65 + 50 (n – 2) (n = 2, 3, 4, 5 ···)	10
D-H7LF	20	65	$20 + 50\left(\frac{n-2}{2}\right)$ (n = 2, 4, 6 ···)		10
D-B5 **D-B6**	15	75	$15 + 50\left(\frac{n-2}{2}\right)$ (n = 2, 4, 6 ···)	75 + 55 (n – 2) (n = 2, 3, 4, 5 ···)	10
D-B59W	20	75	$20 + 50\left(\frac{n-2}{2}\right)$ (n = 2, 4, 6 ···)		15
D-A3 **D-G39** **D-K39** **D-A44**	35	100	35 + 30 (n – 2) (n = 2, 3, 4, 5 ···)	100 + 100 (n – 2) (n = 2, 3, 4, 5 ···)	10

n: Number of auto switches

Theoretical Output

Unit (N)

Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm^2)	Operating pressure (MPa)			
				1	**3**	**5**	**7**
20	10	OUT	314	314	942	1570	2198
		IN	235	235	705	1175	1645
25	12	OUT	490	490	1470	2450	3430
		IN	377	377	1131	1885	2639
32	16	OUT	804	804	2412	4020	5628
		IN	603	603	1809	3015	4221
40	18	OUT	1256	1256	3768	6280	8792
		IN	1002	1002	3006	5010	7014

Theoretical output (N) = Pressure (MPa) x Piston area (mm^2)

Weights

(kg)

Bore size (mm)		**20**	**25**	**32**	**40**
Basic weight	**Basic type**	0.27	0.37	0.53	1.05
	Axial foot type	0.51	0.63	0.91	1.59
	Flange type	0.36	0.54	0.72	1.26
	Clevis type	0.25	0.45	0.67	1.00
Additional weight per 50mm		0.12	0.13	0.18	0.23

- Calculation method
  (Example) CHNL20–100
  (Foot type, ø20, 100mm stroke)
- Basic weight ····· 0.51kg
- Additional weight ····· 0.12/50mm
- Cylinder stroke ····· 100mm
  0.51 + 0.12/50 x 100 = 0.75kg

⚠ Specific Product Precautions

Be sure to read before handling. Refer to pages 25 through 31 for safety instructions, hydraulic cylinder precautions and auto switch precautions.

⚠Caution

When operating a cylinder for the first time, make sure to release the air at low pressure. When the air release is complete, operate the cylinder at reduced pressure, gradually increasing it to the normal operating pressure. However, the piston speed at this time should be adjusted to the minimum speed.

Mounting

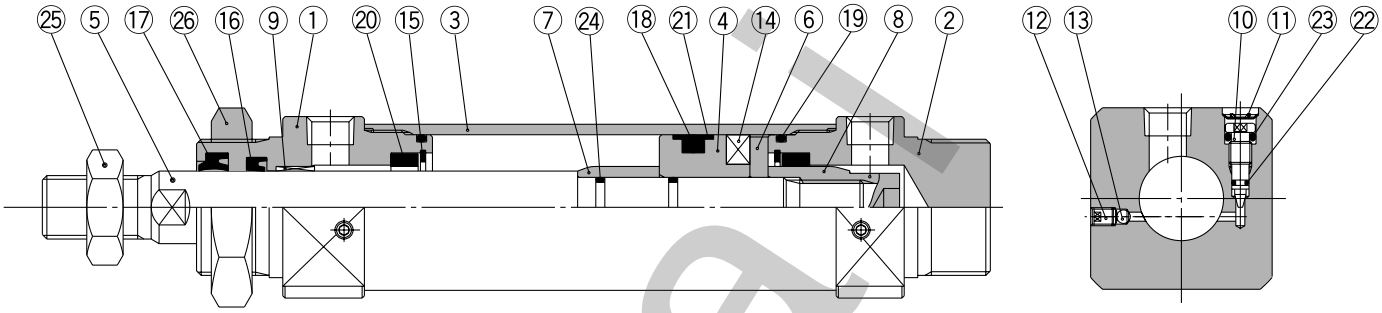
⚠Caution

1. When mounting with bracket mounting nuts, tighten them using the tightening torques in the table below as a guide.

Bore size (mm)	Mounting nut thread	Mounting nut width across flats (mm)	Tightening torque (N·m)
20	M22 x 1.5	26	45
25	M24 x 1.5	32	60
32	M30 x 1.5	38	85
40	M33 x 1.5	41	110

2. When mounted with one side attached and one side unattached (basic type and flange type) and operating at high speed, bending moment acts on the cylinder due to oscillation at the stroke end, which may cause cylinder damage. In this case, install brackets to suppress the oscillation of the cylinder body, or reduce the piston speed enough so that the cylinder body does not oscillate at the stroke end.

Construction



Parts list

No.	Description	Material	Note
1	**Rod cover**	Aluminum alloy	Black anodized
2	**Head cover**	Aluminum alloy	Black anodized
3	**Cylinder tube**	Stainless steel	
4	**Piston**	Stainless steel	
5	**Piston rod**	ø20, 25: Stainless steel ø32, 40: Carbon steel	Hard chromium electro plating
6	**Magnet plate**	Stainless steel	
7	**Cushion ring A**	Carbon steel	
8	**Cushion ring B**	Carbon steel	
9	**Bushing**	Lead bronze	
10	**Cushion valve**	Carbon steel	
11	**Snap ring**	Spring steel	
12	**Air release valve**	Alloy steel	
13	**Check ball**	Bearing steel	

No.	Description	Material	Note
14	**Magnet**	—	
15	**Snap ring**	Spring steel	
16	**Rod seal**	NBR	
17	**Scraper**	NBR	
18	**Piston seal**	NBR	
19	**Tube gasket**	NBR	
20	**Cushion seal**	—	
21	**Back-up ring**	Resin	
22	**Cushion valve seal A**	NBR	
23	**Cushion valve seal B**	NBR	
24	**Piston gasket**	NBR	
25	**Rod end nut**	Carbon steel	
26	**Mounting nut**	Carbon steel	

Replacement parts: Seal kits

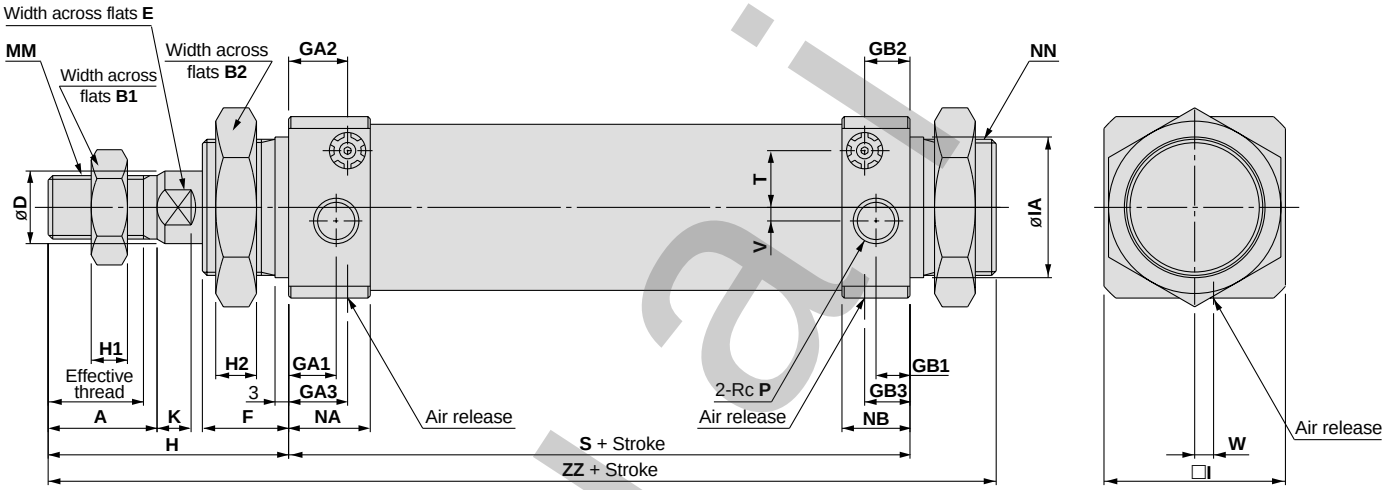
Bore size (mm)	Seal kit no.	Kit components
20	**CHN20-PS**	Nos.16 to 20, and 22 from the chart
25	**CHN25-PS**	
32	**CHN32-PS**	
40	**CHN40-PS**	

∗ Seal kits consist of items 16 to 20, and 22, and can be ordered by using the seal kit number for each bore size.

Series CHN

Dimensions

Basic type: CHNB



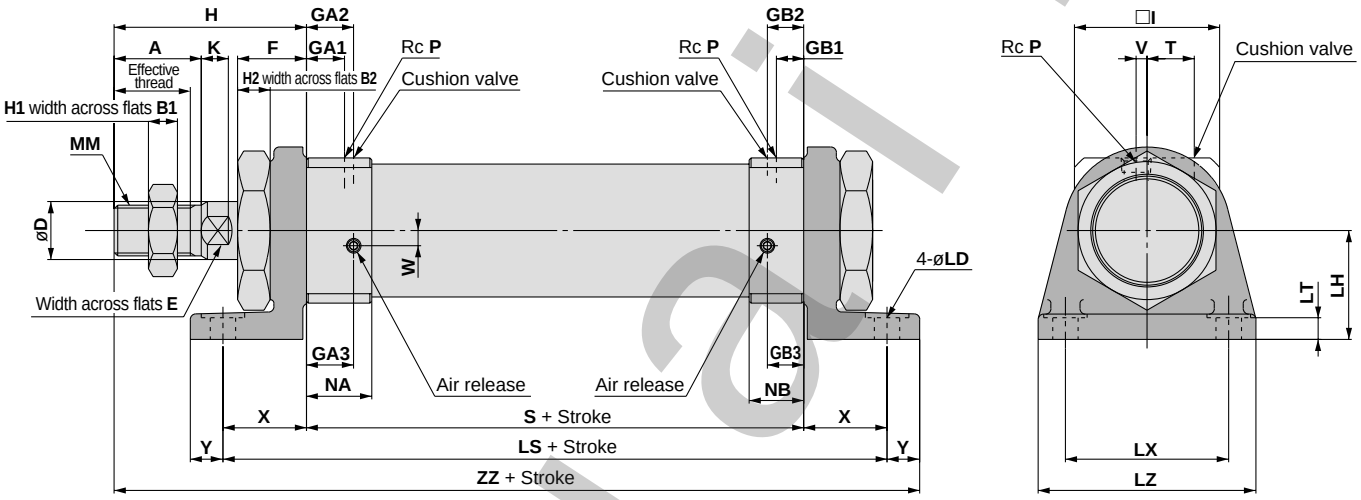
(mm)

Bore size (mm)	Stroke range (mm)	Effective thread length (mm)	A	B1	B2	D	E	F	GA1	GA2	GA3	GB1	GB2	GB3	H	H1	H2	I
20	25 to 300	15.5	18	13	26	10	8	16	10	12	12	8	10	10	41	5	8	31
25	25 to 400	19.5	22	17	32	12	10	16	10	12	12	8	10	10	46	6	8	34
32	25 to 500	21	24	22	38	16	14	19	11	13	13	8	10	10	53	8	9	40
40	25 to 500	21	24	24	41	18	16	21	12	17	17	11	16	16	54	10	11	48

(mm)

Bore size (mm)	IA	K	MM	NA	NB	NN	P	S	T	V	W	ZZ
20	23f8 $^{-0.020}_{-0.053}$	5	M8 x 1.25	17	15	M22 x 1.5	1/8	81	9.5	4.5	6.5	138
25	25f8 $^{-0.020}_{-0.053}$	5.5	M10 x 1.25	17	15	M24 x 1.5	1/8	81	11	3.5	5.5	143
32	31f8 $^{-0.025}_{-0.064}$	7.5	M14 x 1.5	18	15	M30 x 1.5	1/8	87	13	3	4	159
40	34f8 $^{-0.025}_{-0.064}$	7.5	M16 x 1.5	22	21	M33 x 2	1/4	108	16	5	0	183

Axial foot type: CHNL



(mm)

Bore size (mm)	Stroke range (mm)	Effective thread length (mm)	A	B1	B2	D	E	F	GA1	GA2	GA3	GB1	GB2	GB3	H	H1	H2	I	K
20	25 to 300	15.5	18	13	26	10	8	16	10	12	12	8	10	10	41	5	8	31	5
25	25 to 400	19.5	22	17	32	12	10	16	10	12	12	8	10	10	46	6	8	34	5.5
32	25 to 500	21	24	22	38	16	14	19	11	13	13	8	10	10	53	8	9	40	7.5
40	25 to 500	21	24	24	41	18	16	21	12	17	17	11	16	16	54	10	11	48	7.5

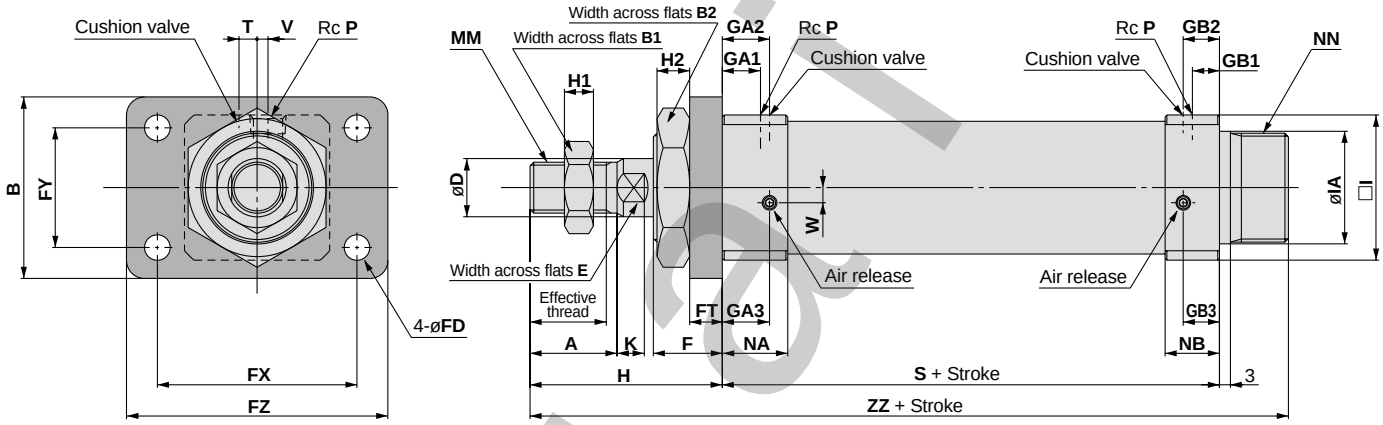
(mm)

Bore size (mm)	LD	LH	LS	LT	LX	LZ	MM	NA	NB	P	S	T	V	W	X	Y	ZZ
20	7	25	121	5.5	40	55	M8 x 1.25	17	15	1/8	81	9.5	4.5	6.5	20	9	151
25	7	28	121	5.5	40	55	M10 x 1.25	17	15	1/8	81	11	3.5	5.5	20	9	156
32	7	30	133	6	45	60	M14 x 1.5	18	15	1/8	87	13	3	4	23	9	172
40	9	35	158	6	55	75	M16 x 1.5	22	21	1/4	108	16	5	0	25	11	198

Series CHN

Dimensions

Front flange type: CHNF



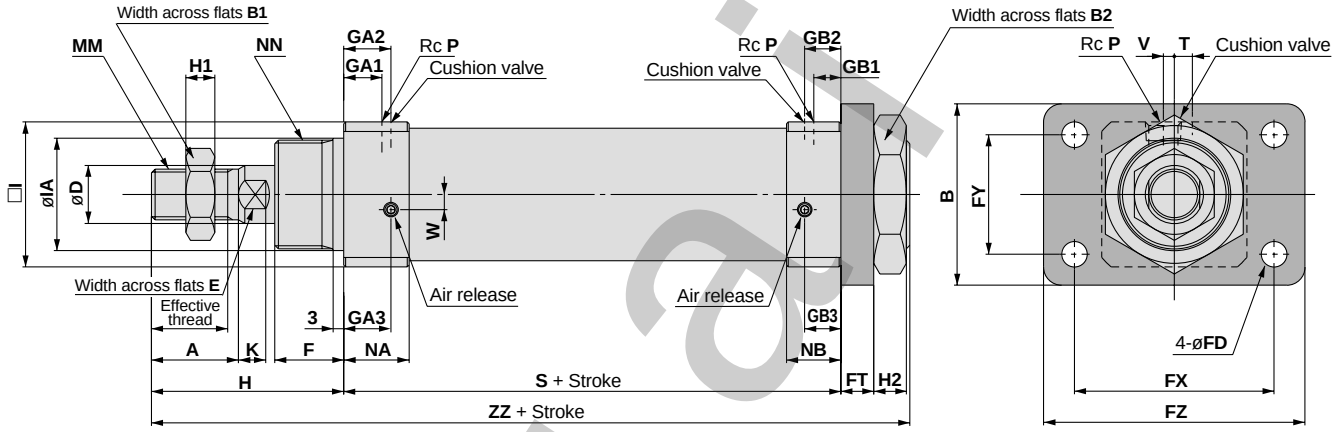
(mm)

Bore size (mm)	Stroke range (mm)	Effective thread length (mm)	A	B	B1	B2	D	E	F	FD	FT	FX	FY	FZ	GA1	GA2	GA3	GB1	GB2
20	25 to 300	15.5	18	38	13	26	10	8	16	7	6	51	21	68	10	12	12	8	10
25	25 to 400	19.5	22	44	17	32	12	10	16	7	9	53	27	70	10	12	12	8	10
32	25 to 500	21	24	50	22	38	16	14	19	7	9	55	33	72	11	13	13	8	10
40	25 to 500	21	24	60	24	41	18	16	21	9	9	66	36	84	12	17	17	11	16

(mm)

Bore size (mm)	GB3	H	H1	H2	I	IA	K	MM	NA	NB	NN	P	S	T	V	W	ZZ
20	10	41	5	8	31	23f8 $^{-0.020}_{-0.053}$	5	M8 x 1.25	17	15	M22 x 1.5	1/8	81	9.5	4.5	6.5	138
25	10	46	6	8	34	25f8 $^{-0.020}_{-0.053}$	5.5	M10 x 1.25	17	15	M24 x 1.5	1/8	81	11	3.5	5.5	143
32	10	53	8	9	40	31f8 $^{-0.025}_{-0.064}$	7.5	M14 x 1.5	18	15	M30 x 1.5	1/8	87	13	3	4	159
40	16	54	10	11	48	34f8 $^{-0.025}_{-0.064}$	7.5	M16 x 1.5	22	21	M33 x 2	1/4	108	16	5	0	183

Rear flange type: CHNG



(mm)

Bore size (mm)	Stroke range (mm)	Effective thread length (mm)	A	B	B1	B2	D	E	F	FD	FT	FX	FY	FZ	GA1	GA2	GA3	GB1	GB2
20	25 to 300	15.5	18	38	13	26	10	8	16	7	6	51	21	68	10	12	12	8	10
25	25 to 400	19.5	22	44	17	32	12	10	16	7	9	53	27	70	10	12	12	8	10
32	25 to 500	21	24	50	22	38	16	14	19	7	9	55	33	72	11	13	13	8	10
40	25 to 500	21	24	60	24	41	18	16	21	9	9	66	36	84	12	17	17	11	16

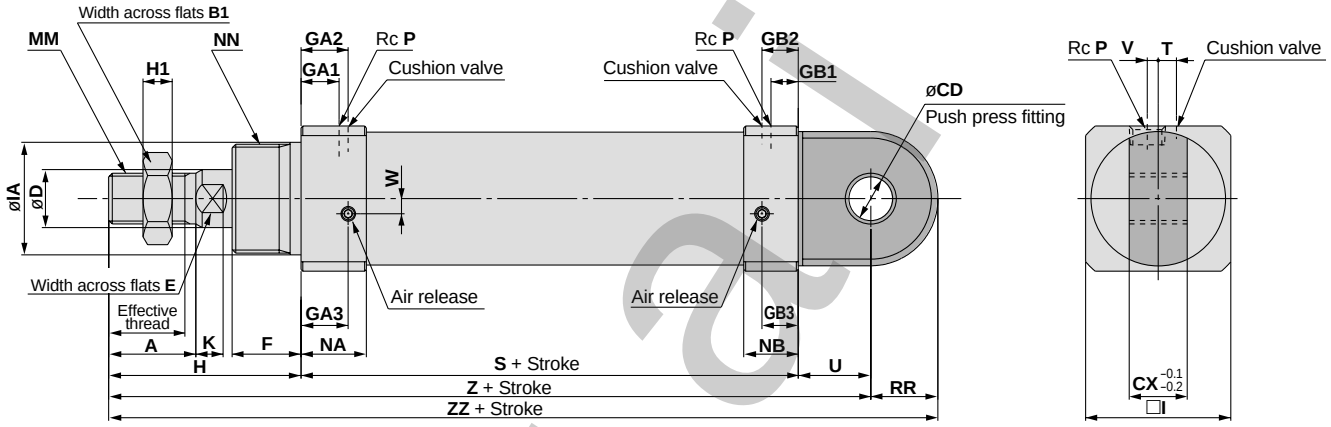
(mm)

Bore size (mm)	GB3	H	H1	H2	I	IA	K	MM	NA	NB	NN	P	S	T	V	W	ZZ
20	10	41	5	8	31	23f8 $^{-0.020}_{-0.053}$	5	M8 x 1.25	17	15	M22 x 1.5	1/8	81	9.5	4.5	6.5	138
25	10	46	6	8	34	25f8 $^{-0.020}_{-0.053}$	5.5	M10 x 1.25	17	15	M24 x 1.5	1/8	81	11	3.5	5.5	143
32	10	53	8	9	40	31f8 $^{-0.025}_{-0.064}$	7.5	M14 x 1.5	18	15	M30 x 1.5	1/8	87	13	3	4	159
40	16	54	10	11	48	34f8 $^{-0.025}_{-0.064}$	7.5	M16 x 1.5	22	21	M33 x 2	1/4	108	16	5	0	183

Series CHN

Dimensions

Single clevis type: CHNC



(mm)

Bore size (mm)	Stroke range (mm)	Effective thread length (mm)	A	B1	CD	CX	D	E	F	GA1	GA2	GA3	GB1	GB2	GB3	H	H1	I
20	25 to 300	15.5	18	13	10 $^{+0.109}_{0}$	16	10	8	16	10	12	12	8	10	10	41	5	31
25	25 to 400	19.5	22	17	10 $^{+0.109}_{0}$	16	12	10	16	10	12	12	8	10	10	46	6	34
32	25 to 500	21	24	22	12 $^{+0.109}_{0}$	16	16	14	19	11	13	13	8	10	10	53	8	40
40	25 to 500	21	24	24	16 $^{+0.034}_{-0.015}$	24	18	16	21	12	17	17	11	16	16	54	10	48

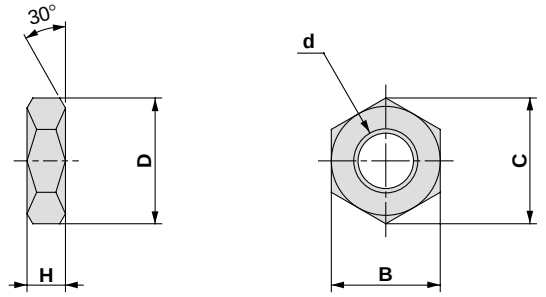
(mm)

Bore size (mm)	IA	K	MM	NA	NB	NN	P	RR	S	T	U	V	W	Z	ZZ
20	23f8 $^{-0.020}_{-0.053}$	5	M8 x 1.25	17	15	M22 x 1.5	1/8	13.5	81	9.5	14	4.5	6.5	136	150
25	25f8 $^{-0.020}_{-0.053}$	5.5	M10 x 1.25	17	15	M24 x 1.5	1/8	14.5	81	11	15	3.5	5.5	142	157
32	31f8 $^{-0.025}_{-0.064}$	7.5	M14 x 1.5	18	15	M30 x 1.5	1/8	18.5	87	13	20	3	4	160	179
40	34f8 $^{-0.025}_{-0.064}$	7.5	M16 x 1.5	22	21	M33 x 2	1/4	22.5	108	16	20	5	0	182	205

Accessories (Standard)

Rod end nut

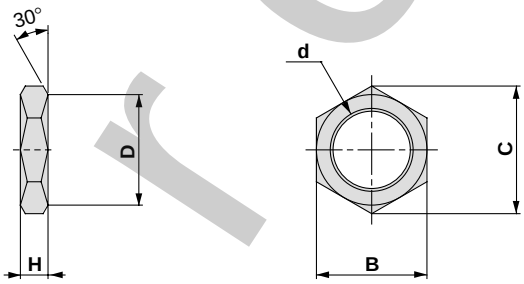
Material: Carbon steel



Part no.	Applicable bore size (mm)	d	H	B	C	D
NT-02	20	M8 x 1.25	5	13	15.0	12.5
NT-03	25	M10 x 1.25	6	17	19.6	16.5
NT-04	32	M14 x 1.5	8	22	25.4	21.0
AC-NI-50	40	M16 x 1.5	10	24	27.7	23

Mounting nut

Material: Carbon steel



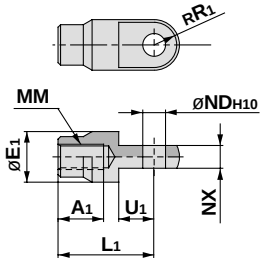
Part no.	Applicable bore size (mm)	d	H	B	C	D
SO-02	20	M22 x 1.5	8	26	30	26
SO-03	25	M24 x 1.5	8	32	36.9	32
SO-04	32	M30 x 1.5	9	38	43.9	38
SO-05	40	M33 x 2.0	11	41	47.3	41

Series CHN

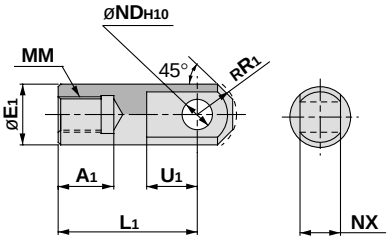
Accessory Brackets (Optional)

I-shaped single knuckle joint

ø20: I-02
ø25: I-03
Material: Rolled steel plate



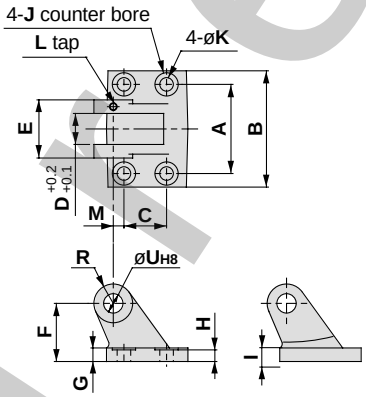
ø32: I-04
ø40: IHN-04
Material: Rolled steel plate



Part no.	Applicable bore size (mm)	A1	E1	L1	MM	R1	U1	NDH10	NX
I-02	20	16	20	36	M8 x 1.25	10	14	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$
I-03	25	18	20	38	M10 x 1.25	10	14	$9^{+0.058}_{0}$	$9^{-0.1}_{-0.2}$
I-04	32	22	24	55	M14 x 1.5	15.5	20	$12^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$
IHN-04	40	22	24	55	M16 x 1.5	15.5	20	$15^{+0.070}_{0}$	$16^{-0.1}_{-0.3}$

Bracket for clevis type

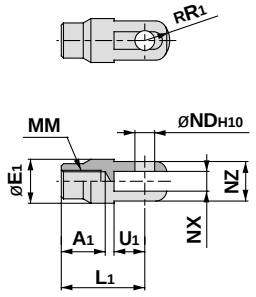
Material: Cast iron



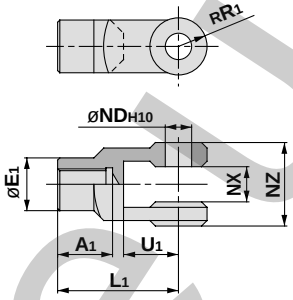
Part no.	Applicable bore size (mm)	A	B	C	D	UH8	E	F	G	H	I	J	K	L	M	R
AD-FI-20	20	46	60	22	16	$10^{+0.027}_{0}$	30	28	6.5	5.5	10	12	7	M4	5.5	10
AD-FI-25	25	46	60	22	16	$10^{+0.027}_{0}$	30	30	6.5	5.5	10	12	7	M4	5.5	10
AD-FI-32	32	56	80	30	16	$12^{+0.027}_{0}$	36	40	10	9	13	12	7	M5	7	12
AD-CHN-40	40	64	88	30	24	$16^{+0.027}_{0}$	44	43	10	9	13	16	9	M5	10	12

Y-shaped double knuckle joint

ø20: Y-02
ø25: Y-03
Material: Rolled steel plate



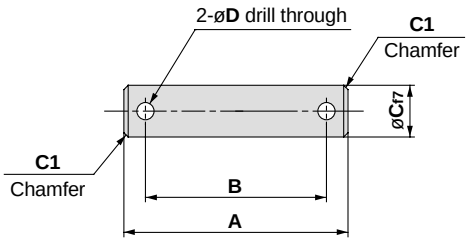
ø32: Y-04C
ø40: YHN-04
Material: Cast iron



Part no.	Applicable bore size (mm)	A1	E1	L1	MM	R1	U1	NDH10	NX	NZ
Y-02	20	16	20	36	M8 x 1.25	12	14	$9^{+0.058}_{0}$	$9^{+0.2}_{+0.1}$	18
Y-03	25	18	20	38	M10 x 1.25	12	14	$9^{+0.058}_{0}$	$9^{+0.2}_{+0.1}$	18
Y-04C	32	22	24	55	M14 x 1.5	13	25	$12^{+0.070}_{0}$	$16^{+0.3}_{+0.1}$	38
YHN-04	40	22	24	55	M16 x 1.5	13	25	$15^{+0.070}_{0}$	$16^{+0.3}_{+0.1}$	38

Bracket pin

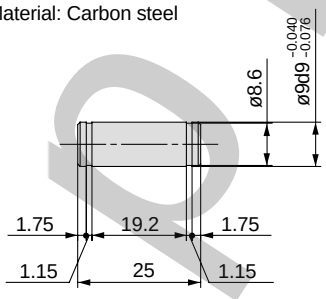
Material: Carbon steel



Part no.	Bore size (mm)	A	B	Cf7	D	Cotter pin
AD-EI-20	20	45.5	35.5	$10^{-0.016}_{-0.034}$	3.2	ø3.2 x 16l
AD-EI-25	25	45.5	35.5	$10^{-0.016}_{-0.034}$	3.2	
AD-EI-32	32	52	42	$12^{-0.016}_{-0.034}$	4	ø4 x 20l
AD-CHN-40	40	60	50	$16^{-0.016}_{-0.034}$	4	

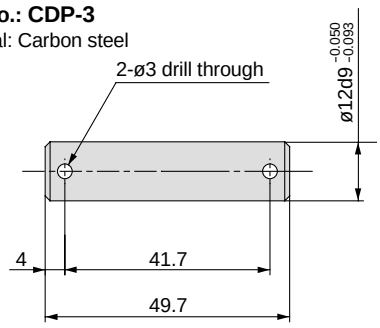
Knuckle pin

ø20, ø25
Part no.: CDP-1
Material: Carbon steel



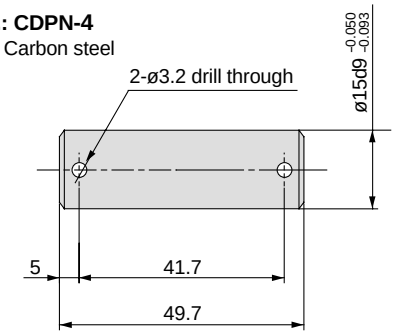
Snap ring: C type 9 for shaft

ø32
Part no.: CDP-3
Material: Carbon steel



Cotter pin: ø3 x 18l

ø40
Part no.: CDPN-4
Material: Carbon steel

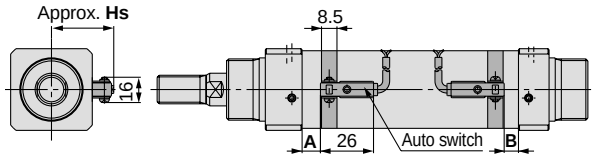


Cotter pin: ø3.2 x 20l

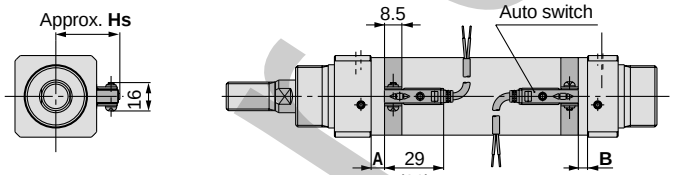
Series CHN
Auto Switch Specifications

Auto Switches: Proper Mounting Positions and Mounting Heights for Stroke End Detection

D-C7, D-C8

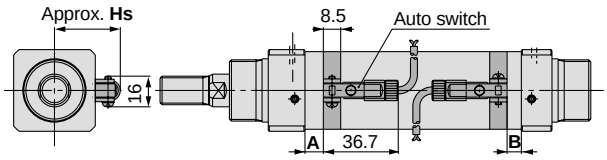


D-H7□, D-H7□W, D-H7□F, D-H7BAL

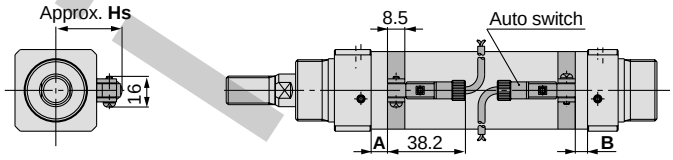


∗ Dimensions inside ( ) are for D-H7LF.

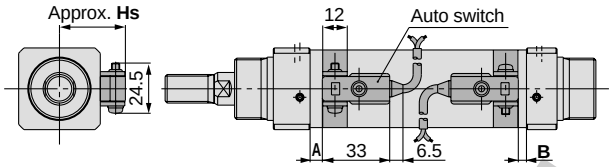
D-C73C, D-C80C



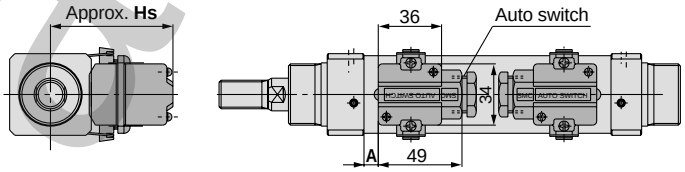
D-H7C



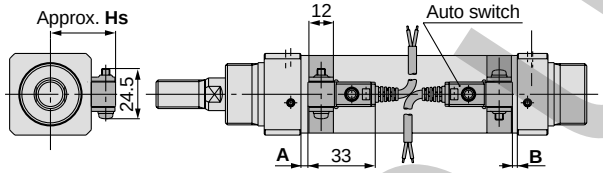
D-B5, D-B6, D-B59W



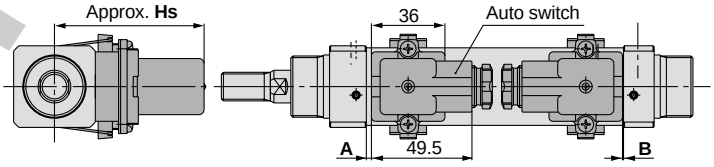
D-A3, D-G3, D-K3



D-G5, D-K5, D-G5□W, D-G5BA, D-K9W, D-G59F, D-G5NT



D-A44



Proper auto switch mounting positions

(mm)

Bore size (mm)	D-C7□ D-C80 D-C73C D-C80C		D-B5□ D-B64		D-H7□ D-H7C D-H7□W D-H7BAL		D-G5NTL		D-H7□F		D-B59W		D-G39 D-K39 D-A3□ D-A44	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
20	19	11	12.5	4.5	17.5	9.5	14	6	16	8	15.5	7.5	12	4
25	20.5	10.5	14	4	19	9	15.5	5.5	17.5	7.5	17	7	13.5	3.5
32	23.5	12.5	17	6	22	11	18.5	7.5	20.5	9.5	20	9	16.5	5.5
40	28.5	18.5	22	12	27	17	23.5	13.5	25.5	15.5	25	15	21.5	11.5

Auto switch mounting heights

(mm)

Bore size (mm)	D-C7 D-C8 D-H7 D-H7□W D-H7□F D-H7BAL	D-B5 D-B6 D-B59W D-G5NTL	D-C73C D-C80C D-H7C	D-G39 D-K39 D-A33 D-A34	D-A44
	HS	HS	HS	HS	HS
20	25	28	27.5	62	72
25	27	30	29.5	64	74
32	30.5	33.5	32.5	66	76
40	34.5	37.5	37.0	70.5	80.5

Contact Protection Boxes: CD-P11, CD-P12

1

<Applicable switch models>

D-C7, D-C8, D-C73C, D-C80C

The above auto switches do not have built-in contact protection circuits.

1. The operating load is an induction load.

2. The length of wiring to the load is 5m or more

3. The load voltage is 100VAC or 200VAC.

A contact protection box should be used in any of the above conditions. Otherwise, the life of the contacts may be reduced. (They may stay on continuously.)

2

Furthermore, even in the case of a type having an internal contact protection circuit (D-A34, D-A44, D-B54, D-B64, D-B59W), **if the length of the wiring to the load is extremely long (30m or more) and a PLC having a large rush current is used, consult with P/A as a contact protection box may be necessary.**

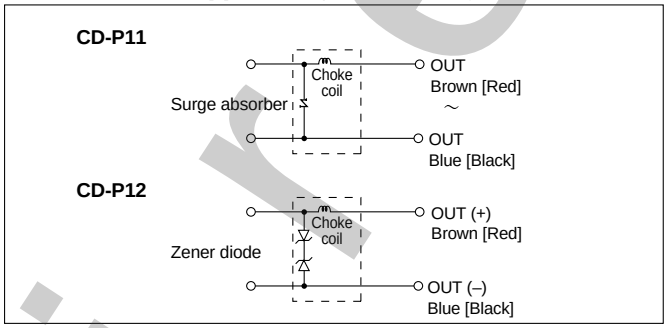
Contact protection box specifications

Part no.	CD-P11		CD-P12
Load voltage	100VAC	200VAC	24VDC
Maximum load current	25mA	12.5mA	50mA

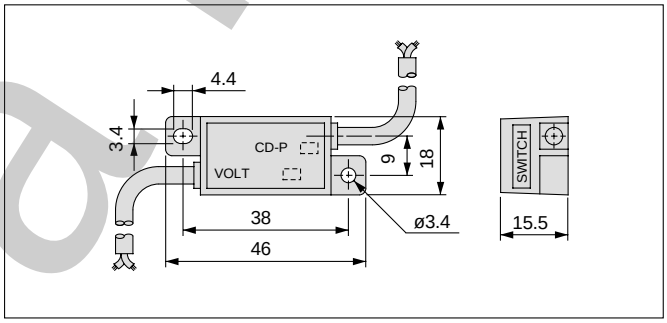
∗ Lead wire length —— Switch connection side: 0.5m
Load connection side: 0.5m

Internal circuits

Lead wire colors inside [ ] are those prior to conformity with IEC standards.



Dimensions



Connection

To connect a switch unit to a contact protection box, connect the lead wire from the side of the contact protection box marked SWITCH to the lead wire coming out of the switch unit.

The length of the lead wires between the switch unit and contact protection box should be no more than 1m, and they should be placed as close together as possible.

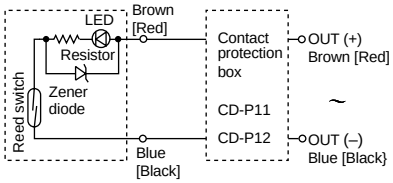
Hydraulic Cylinder
Auto Switch Specifications

Auto Switch Internal Circuits

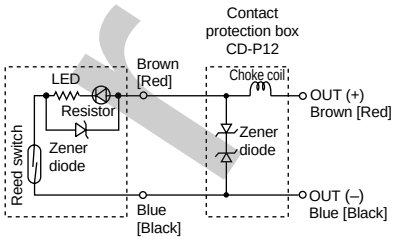
Lead wire colors inside [ ] are those prior to conformity with IEC standards.

Reed switches

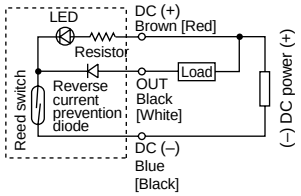
D-C73



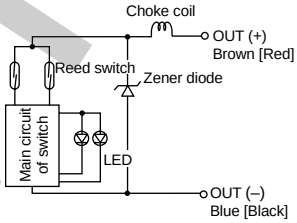
D-C73C



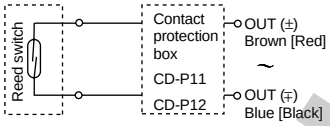
D-C76



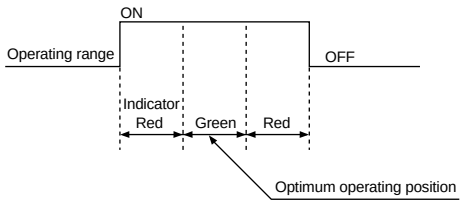
D-B59W



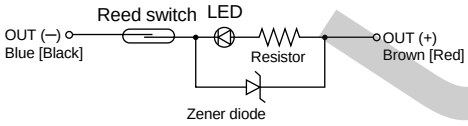
D-C80, D-C80C



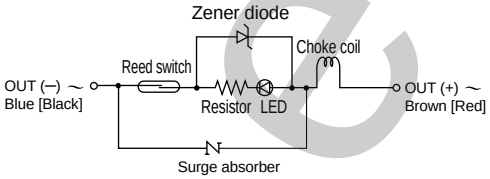
Indicator light: Display method



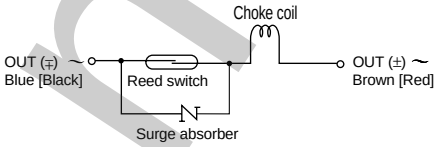
D-B53



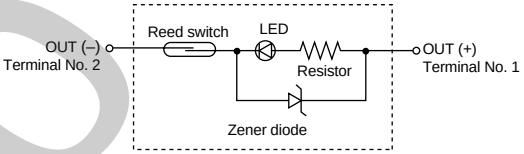
D-B54



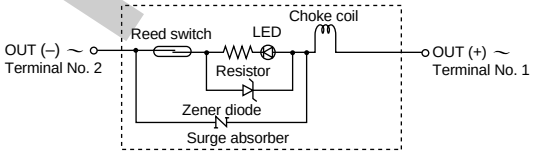
D-B64



D-A33



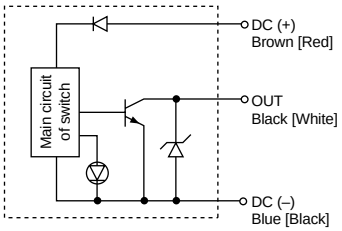
D-A34, D-A44



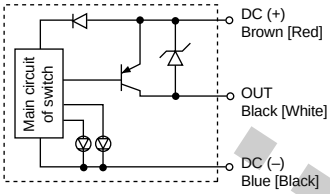
Lead wire colors inside [ ] are those prior to conformity with IEC standards.

Solid state switches

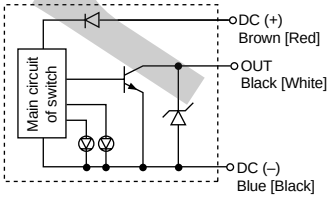
D-H7A1



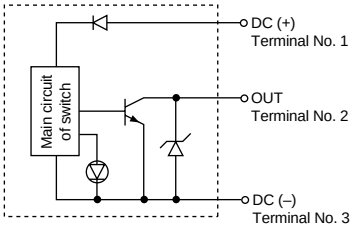
D-H7PW



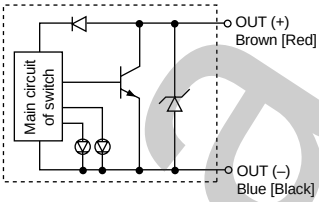
D-H7NW



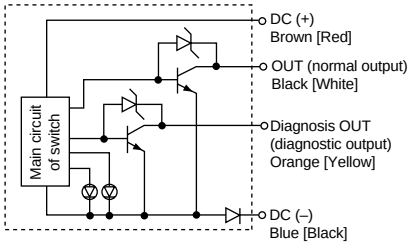
D-G39, D-G39C



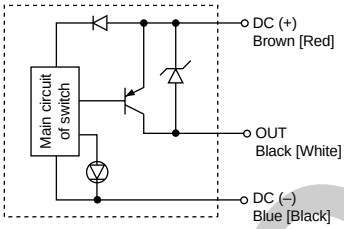
D-H7BAL, D-H7BW



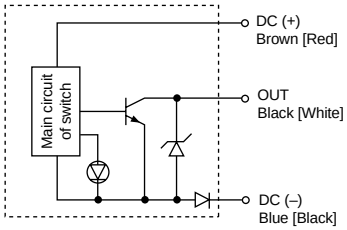
D-H7NF



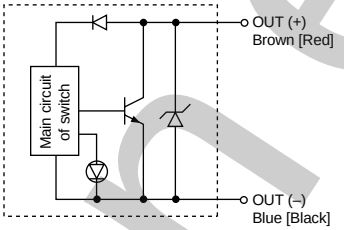
D-H7A2



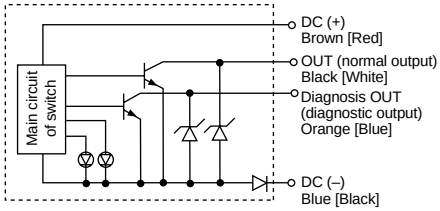
D-G5NTL



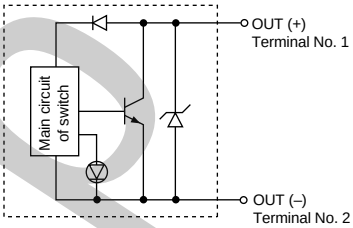
D-H7B, D-H7C



D-H7LF



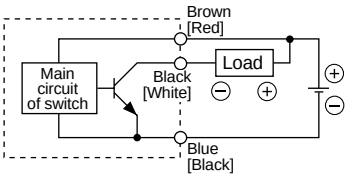
D-K39, D-K39C



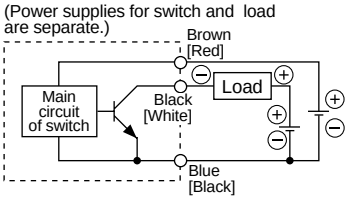
Hydraulic Cylinder
Auto Switch Connections and Examples

Basic Wiring

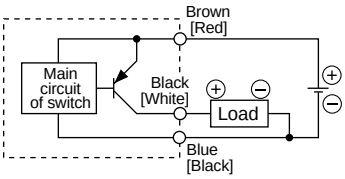
Solid state 3-wire, NPN



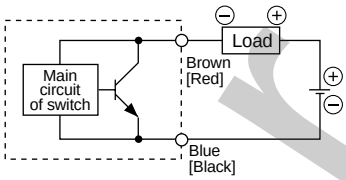
(Power supplies for switch and load are separate.)

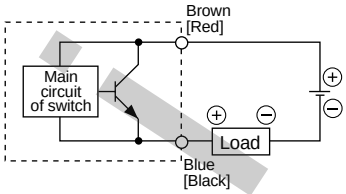


Solid state 3-wire, PNP

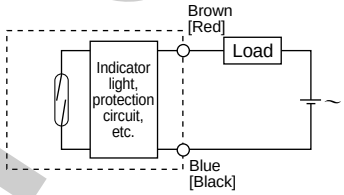


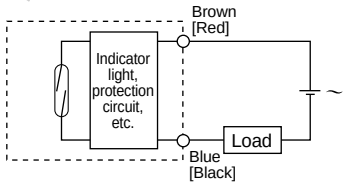
Solid state 2-wire





Reed switch 2-wire

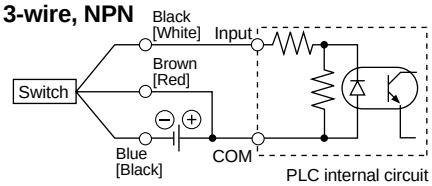




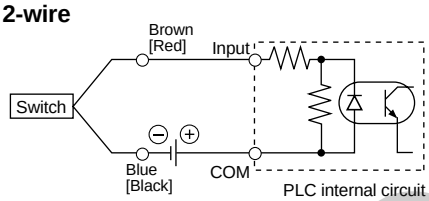
Examples of Connection to PLC

Sink input specifications

3-wire, NPN

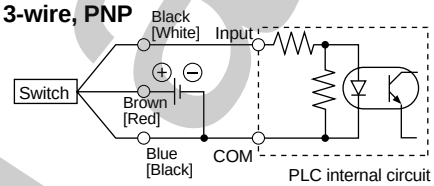


2-wire

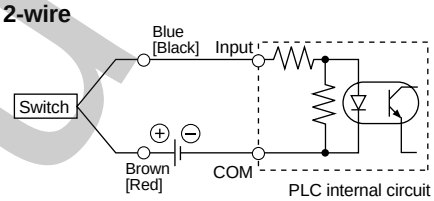


Source input specifications

3-wire, PNP



2-wire

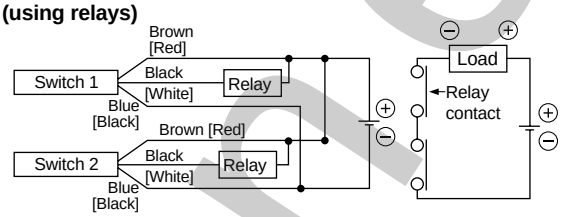


The connection method will vary depending on the PLC input specifications. Connect accordingly.

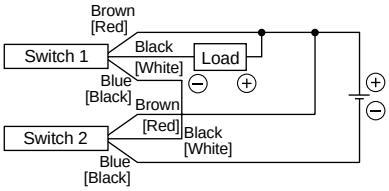
Connection Examples for AND (Series) and OR (Parallel)

3-wire

AND connection for NPN output (using relays)

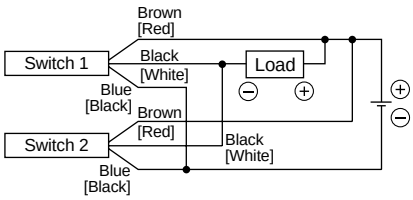


AND connection for NPN output (performed with switches only)

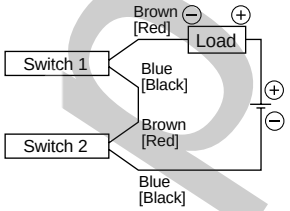


The indicator lights will light up when both switches are turned ON.

OR connection for NPN output



2-wire with 2-switch AND connection

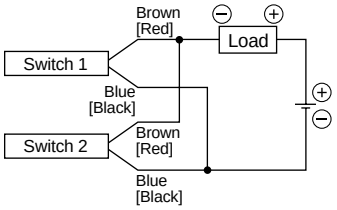


When 2 switches are connected in series, the load may malfunction because the load voltage will decline when in the ON state.
The indicator lights will light up when both of the switches are in the ON state.

Load voltage at ON = Power supply voltage − Residual voltage × 2 pcs.
= 24V − 4V × 2 pcs.
= 16V

Example: Power supply is 24VDC.
Internal voltage drop in switch is 4V.

2-wire with 2-switch OR connection



<Solid state>
When 2 switches are connected in parallel, malfunction may occur because the load voltage will increase when in the OFF state.

Load voltage at OFF = Leakage current × 2 pcs. × Load impedance
= 1mA × 2 pcs. × 3kΩ
= 6V

Example: Load impedance is 3kΩ.
Leakage current from switch is 1mA.

<Reed switch>
Because there is no current leakage, the load voltage will not increase when turned OFF. However, depending on the number of switches in the ON state, the indicator lights may sometimes grow dim or not light up because of the dispersion and reduction of current flowing to the switches.

Series CHN
Technical Data 1

Bore Size Selection

Relationship among generated force, bore size and pressure

A cylinder's generated force will be lower than the theoretical output due to the following factors.

(1) Sliding resistance on the cylinder bearings, seals, etc.
(2) Pressure loss in hydraulic equipment and piping
(3) Frictional resistance in moving parts of machinery

It is necessary to select bore sizes considering these factors.
When a cylinder is nearly at rest, the relation of generated force, bore size and pressure can be expressed with the following formulas.

$Fp_1 = \mu_1 \times Ff_1$ ····· Formula (1)
$Fp_2 = \mu_2 \times Ff_2$ ····· Formula (2)
$Ff_1 = \frac{\pi}{4} D^2 \times P$ ····· Formula (3)
$Ff_2 = \frac{\pi}{4} (D^2 - d^2) \times P$ ··· Formula (4)

Fp_1: Generated extension force of cylinder (N)
Fp_2: Generated retraction force of cylinder (N)
Ff_1: Theoretical extension output (N)
Ff_2: Theoretical retraction output (N)
P: Operating pressure (MPa)
D: Bore size (mm)
d: Piston rod diameter (mm)
μ_1: Cylinder extension load pressure coefficient 0.9
μ_2: Cylinder retraction load pressure coefficient 0.9

Selection standards

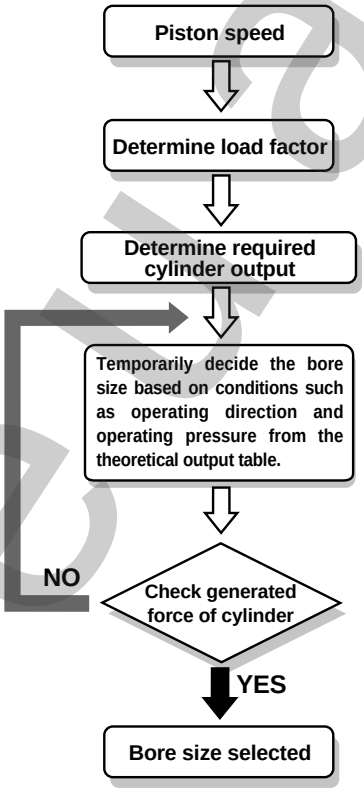
The ratio of the load to the theoretical output is the load factor. It is imperative to understand the relationship between this load factor and the piston speed in order to make the proper bore size selection. Use the table below as a guide for understanding the correlation between load factor and piston speed.

Piston speed (mm/s)	Maximum load factor
8 to 100	70%
101 to 200	30%
201 to 300	10%

Example

To find the cylinder bore size that is required to operate:

- On a load weight of 1000N.
- With operating pressure of 5MPa, and
- The operating piston speed when the cylinder is extended at 150mm/s.



150mm/s (initial condition)

30% (from the table above)

Load weight: 1000N, Load factor: 30%
Required cylinder output: F = 1000/0.3 = 3333(N)

According to the theoretical output table, the bore size that satisfies the required cylinder output F with operating pressure 5MPa when the operating direction is OUT is ø32.

Formula (1) $Fp_1 = \mu_1 \times Ff_1 = 0.9 \times 4020$
$= 3618(N) > F(3333N)$

Series CHN Theoretical Output

Unit: N

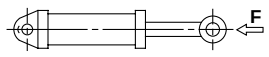
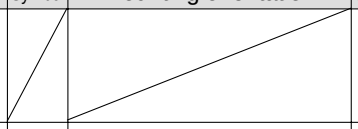
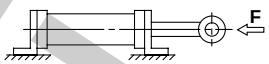
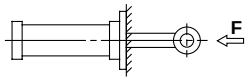
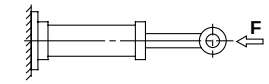
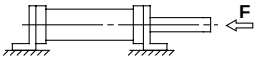
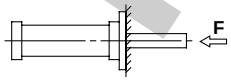
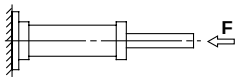
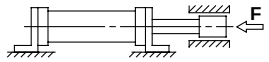
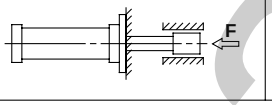
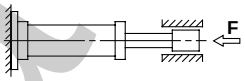
Bore size (mm)	Rod size (mm)	Operating direction	Piston area (mm^2)	Operating pressure (MPa)			
				1	3	5	7
20	10	OUT	314	314	942	1570	2198
		IN	235	235	705	1175	1645
25	12	OUT	490	490	1470	2450	3430
		IN	377	377	1131	1885	2639
32	16	OUT	804	804	2412	4020	5628
		IN	603	603	1809	3015	4221
40	18	OUT	1256	1256	3768	6280	8792
		IN	1002	1002	3006	5010	7014

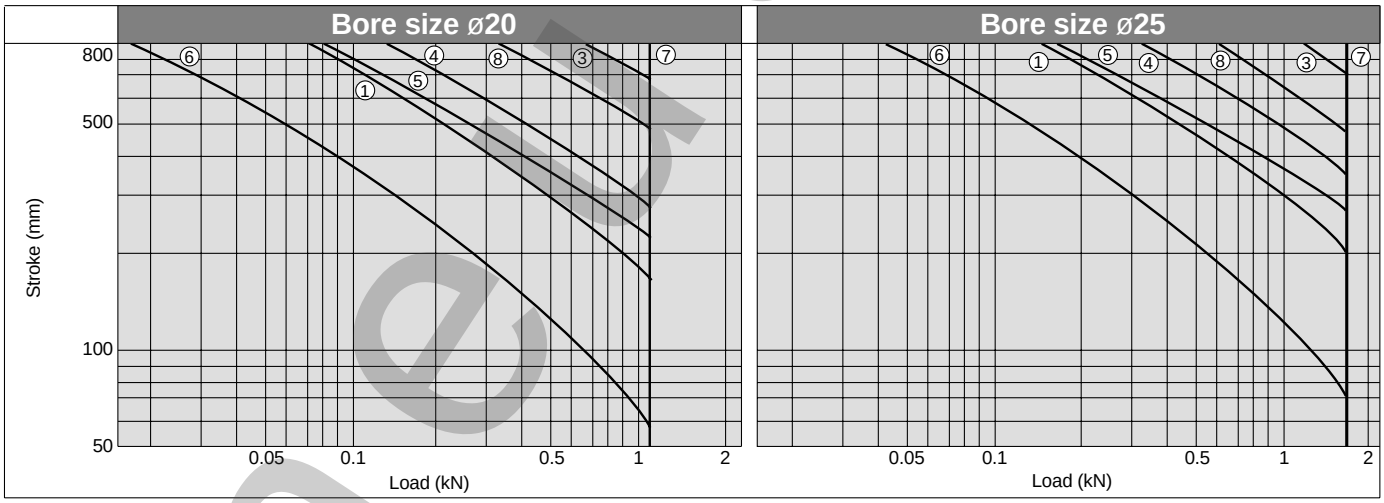
Series CHN
Technical Data 2

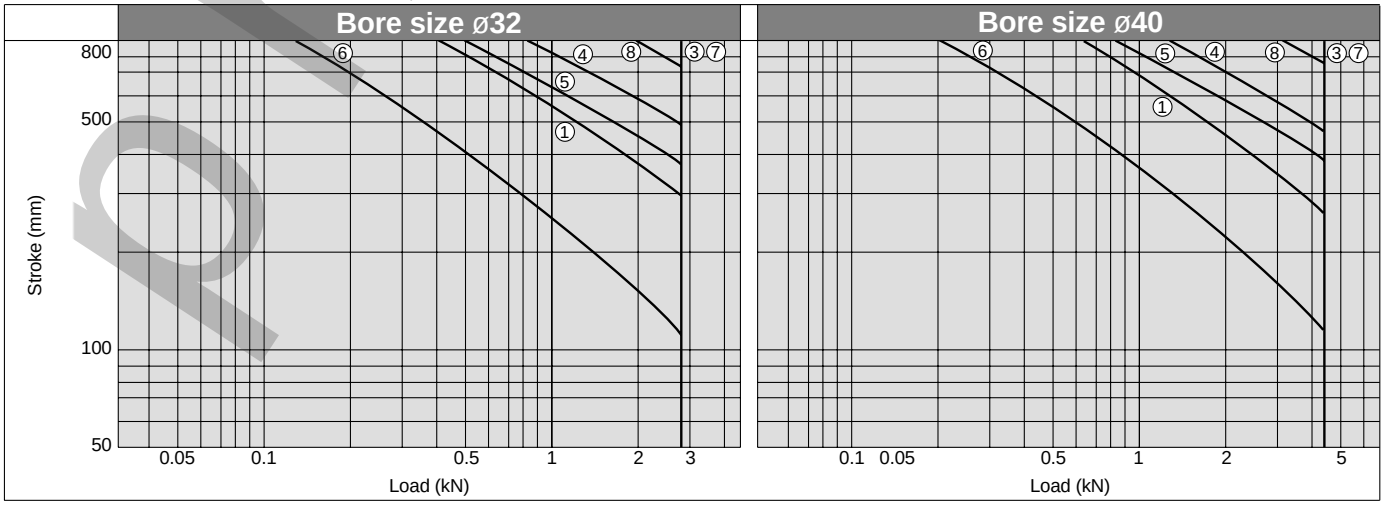
Stroke Selection (Maximum Usable Stroke Based on Buckling Strength)

Refer to stroke range limit charts regarding rod buckling due to load weight.
The values in these tables indicate the maximum stroke that can be used in a situation when air is being supplied while the cylinder is stopped in an intermediate position by a) an external force acting on the piston rod and/or b) by an external stopper.
Since the maximum usable stroke varies depending on the diameter of the piston rod and operating conditions, verify the applicability using the stroke range limit charts.

Series CHN Stroke range limit charts: Bore size ø20, ø25, ø32, ø40

Symbol	Mounting orientation	Symbol	Mounting orientation	Symbol	Mounting orientation	Symbol	Mounting orientation
①				③		③	
④		⑤		⑤		⑥	
⑦		⑦		⑧			





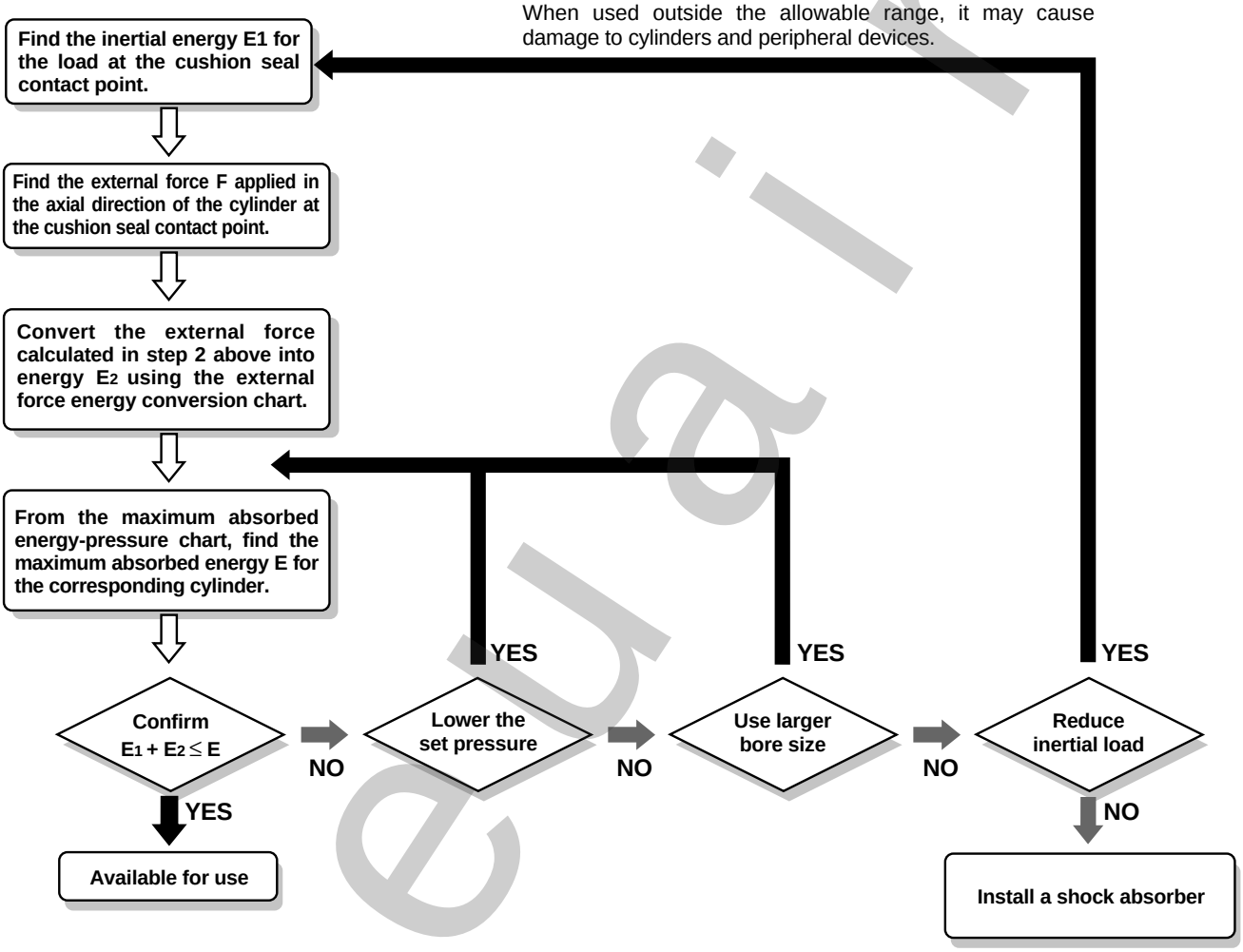
Series CHN
Technical Data 3-1

Cylinder Cushion Selection

Procedure

⚠Caution

Use a cylinder cushion within the maximum absorbed energy range.
When used outside the allowable range, it may cause damage to cylinders and peripheral devices.

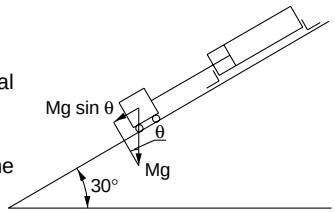


Calculation Example

<Design conditions>
Cylinder: CHN25
Set pressure P_1: 5MPa
Load weight M: 50kg
Piston speed V: 0.3m/s (at the cushion seal contact point)
Load transfer direction: Downward θ: 30°
(External force applied to the cylinder is gravity only).
Operating direction: Out
Gravitational acceleration g: 9.8m/s²

<Calculation>

1. Load inertial energy E_1 at the cushion seal contact point
   $E_1 = MV^2/2 = 50 \times 0.3^2/2 = 2.25J$
2. External force F applied in axial direction of the cylinder at the cushion seal contact point
   $F = Mg \sin \theta = 50 \times 9.8 \times \sin 30° = 245N$



3. Convert the external force calculated in step 2 into energy E_2.
   In the "External force and energy conversion chart" on page 22, draw a vertical line from the value of F (= 245N). The point where this line intersects with the diagonal line (0.27J) is the energy caused by external force.
   $E_2 = 0.27J$
4. Find the maximum absorbed energy E for a cylinder.
   In the "Maximum absorbed energy and pressure chart" on page 22, draw a vertical line from the set pressure 5MPa. The point where this line intersects with the line for ø25 (3.7J) is the maximum absorbed energy.
   $E = 3.7J$
5. Confirm that $E_1 + E_2 \leq E$
   $E_1 + E_2 = 2.25 + 0.27 = 2.52J$
   Since $E = 3.7J$, $E_1 + E_2 \leq E$
   Therefore, the cylinder cushion is available for use.

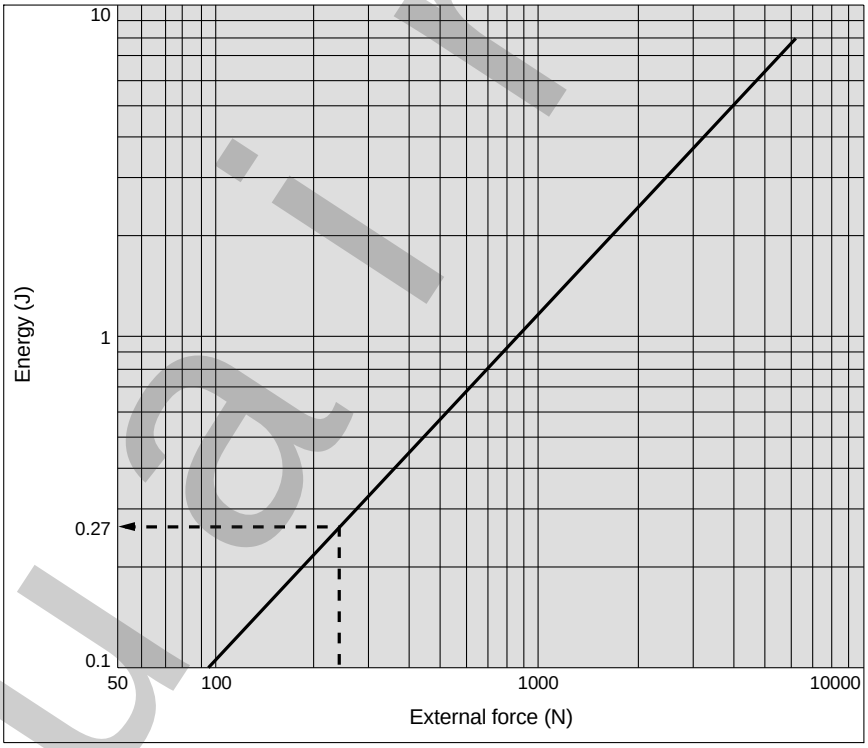
Series CHN
Technical Data 3-2

Maximum Absorbed Energy Chart & External Force and Energy Conversion Chart at Cushion Seal Contact Point

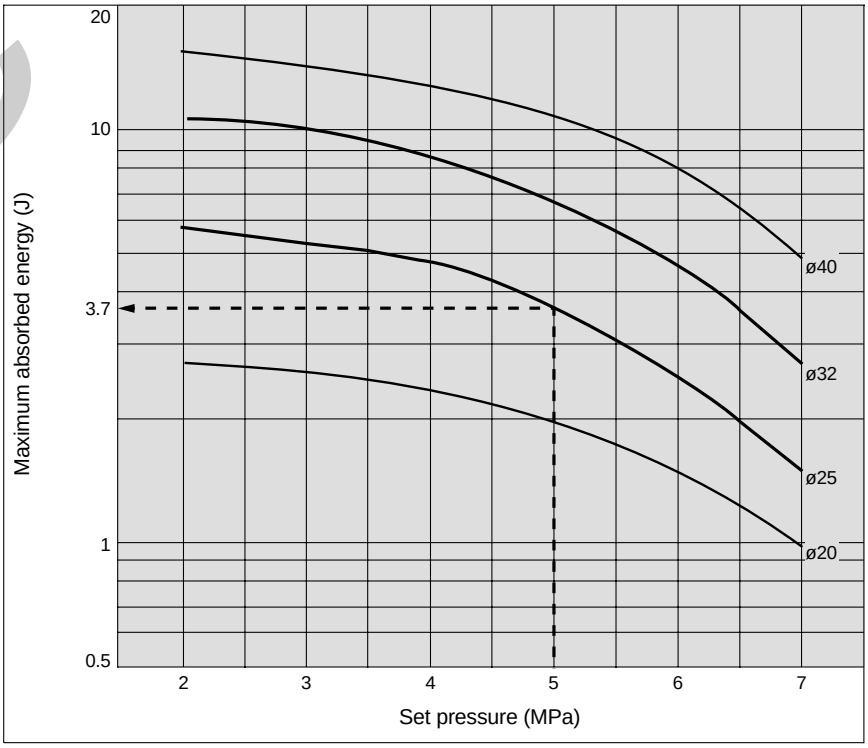
Maximum absorbed energy pressure and chart in terms of cushion performance characteristics

Be sure to keep the combined values of kinetic energy of the load operated by the cylinder and the energy generated by the external force within the values that are shown in the bottom chart.

External force and energy conversion chart at cushion seal contact point



Maximum absorbed energy and pressure chart



Series CHN
Technical Data 4

Piston Speed, Required Fluid Volume, and Piping Size Selection

This information is intended to help you find the required fluid volume and piping size to operate a cylinder at a specified speed.

Relationship between piston speed and fluid volume

$$Q_1 = \frac{\pi}{4} D^2 \cdot \upsilon \cdot \frac{6}{1000} \quad \text{..... Formula (1)}$$

$$Q_2 = \frac{\pi}{4} (D^2 - d^2) \cdot \upsilon \cdot \frac{6}{1000} \quad \text{..... Formula (2)}$$

Q_1 : Required fluid volume for extension (ℓ/min)
Q_2 : Required fluid volume for retraction (ℓ/min)
D : Bore size (cm)
d : Piston rod diameter (cm)
υ : Piston speed (mm/s)

Effective inside diameter of piping

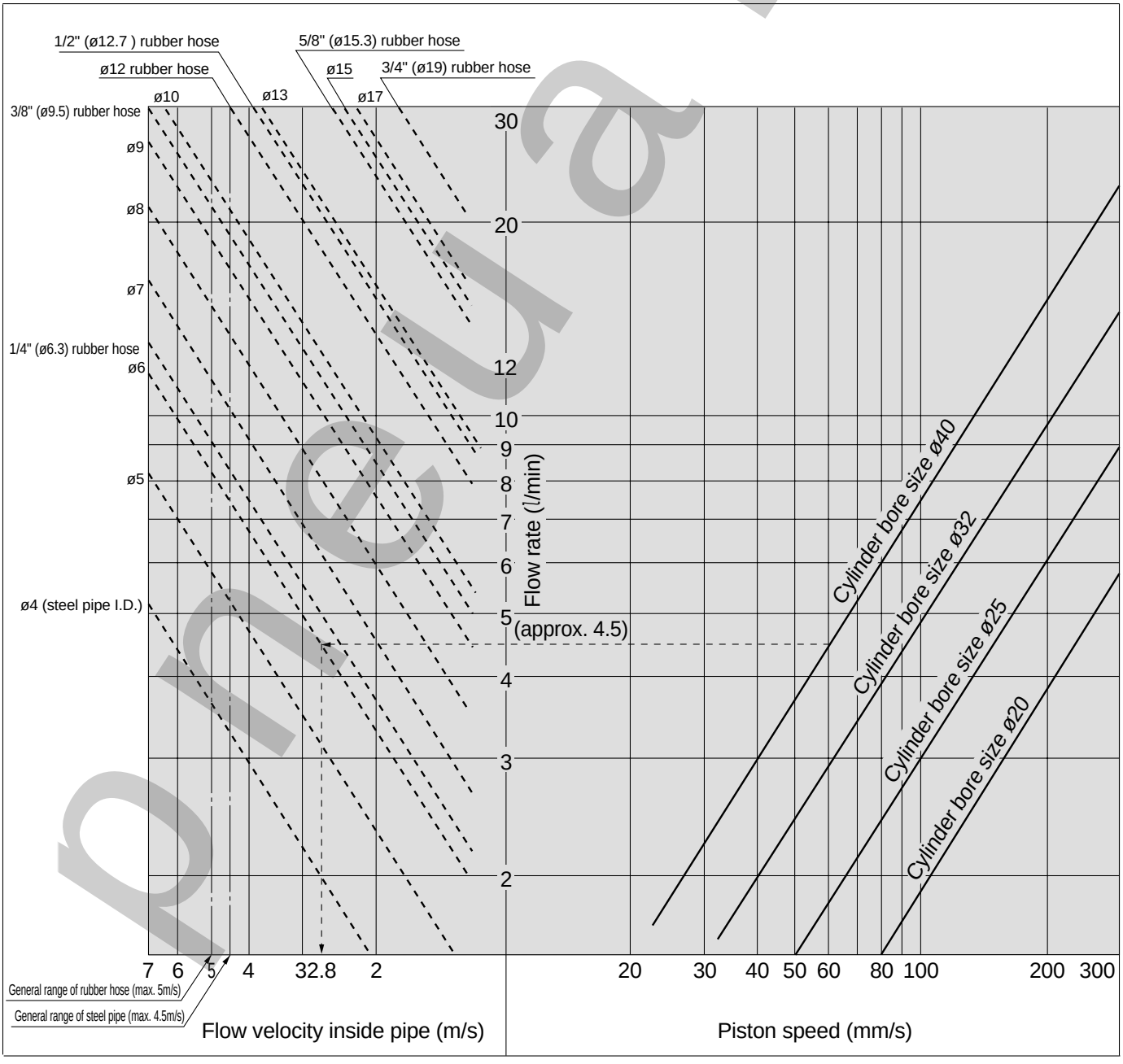
$$V = \frac{Q}{\frac{\pi}{4} din^2 \times 10^{-3}} \cdot \frac{1}{60} \quad \text{..... Formula (3)}$$

V : Fluid flow velocity (m/s)
Q : Fluid volume (ℓ/min)
din: Effective inside diameter of piping (mm)

In general, it is necessary to select a piping diameter that will not allow the fluid flow velocity to exceed the values shown in the chart below.
If the fluid flow velocity exceeds this value, turbulent flow and overheating may occur in conjunction with pressure loss.

Fluid flow velocity

Rubber hose	5m/s
Steel piping	4.5m/s



How to read the chart:
Example) The required flow rate to operate a ø40 cylinder at a speed of 60mm/s is approximately 4.5ℓ/min.
When a ø6 (I.D.) steel pipe is used for piping, the flow velocity in the piping will be approximately 2.7m/s.