Theoretical force output :

$$OUT: A = \frac{\pi D^2}{4}$$

$$IN: A = \frac{\pi}{4}(D^2 - d^2)$$

$$F_{th} = A \times P$$

A:Compressoed area cm2

D:Bore mm

d:Piston rod dia. mm

Fth:Theoretical force outputkg

P:Operating Pressure kg/cm2

Normal force output:

Single action cylinder $F_n = A \times P - (R_{RZ} + R_F)$

Double action cylinder

$$OUT: F_n = \frac{\pi D^2}{4} \times P - R_{RZ}$$

$$IN: F_n = \frac{\pi}{4}(D^2 - d^2) \times P - R_{RZ}$$

Fn:Normal force output kg

RRZ:Friction resistance is about 10–20% to Fth

RF:Spring resiatance is about 3–20%o Fth

Specification:

boremm	piston rod dia.mm	action way	compressed area (cm^2)	air pressure (kgf/cm^2)								
				2	3	4	5	6	7	8	9	10
6	3	OUT	0.283	0.57	0.85	1.13	1.41	1.70	1.98	–	–	–
		IN	0.212	0.42	0.64	0.85	1.06	1.27	1.48	–	–	–
10	4	OUT	0.785	1.57	2.36	3.14	3.93	4.71	5.50	–	–	–
		IN	0.660	1.32	1.98	2.64	3.30	3.96	4.62	–	–	–
12	6	OUT	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11
		IN	0.8	1.6	2.4	3.2	4	4.8	5.6	6.4	7.2	8
16	6	OUT	2.0	2.4	6	8	10	12	14	16	18	20
		IN	1.73	3.46	5.19	6.92	8.65	10.38	12.11	13.84	15.57	17.3
20	8	OUT	3.14	6.28	9.42	12.57	15.71	18.80	22.0	25.1	28.3	31.4
		IN	2.63	5.28	7.92	10.56	13.19	15.83	18.4	21.1	23.7	26.3
	10	IN	2.36	4.71	7.07	9.42	11.78	14.14	16.49	18.85	21.2	23.6
25	10	OUT	4.91	9.82	14.73	19.63	24.5	29.4	34.4	29.3	44.2	49.1
		IN	4.12	8.25	12.37	16.49	20.62	24.7	28.8	32.9	37.1	41.2
	12	IN	3.78	7.56	11.33	15.11	18.89	22.7	26.4	30.2	34.0	37.8
32	12	OUT	8.0	16.1	24.1	32.2	40.2	48.2	56.3	64.3	72	80.4
		IN	6.9	13.8	20.7	27.6	34.5	41.4	48.4	55.3	62.1	69.1
40	16	OUT	12.57	25.1	37.7	50.3	62.8	75.4	88.0	101	113.4	120.2
		IN	10.56	21.1	31.7	42	52.8	63.3	73.9	84.4	95.0	105.6
50	20	OUT	19.63	39.3	58.9	78.5	98.2	117.8	137.4	157.1	176.7	196.3
		IN	16.49	33.0	49.5	66.0	82.5	99.0	115.5	131.9	148.4	164.9
63	20	OUT	31.2	62.3	93.5	124.7	155.9	187.0	218	249	281	312
		IN	28.0	56.1	84.1	112.1	140.2	168.2	196.2	224	252	280
80	25	OUT	50.3	100.5	150.8	201	251	302	352	402	452	503
		IN	45.4	90.7	136.1	181.4	227	272	317	363	408	454
100	25	OUT	78.5	157.1	236	314	393	471	550	628	707	780
		IN	73.6	147.1	220.8	294.4	368	441.6	515.2	588.8	662.4	736
125	35	OUT	122.7	245	368	491	615	736	859	982	1104	1227
		IN	112.5	225	338	450	563	675	788	900	1013	1125
160	45	OUT	201	402	603	804	1005	1206	1407	1341.5	1810	2011
		IN	185.1	370.2	555.3	740.4	925.5	1110.6	1295.7	1608	1665.9	1851
200	45	OUT	314	628	942	1257	1571	1885	2199	2513	2827	3142
		IN	298.1	596.2	894.3	1192.4	1490.5	1788.6	2086.7	2384.8	2682.9	2918
250	50	OUT	491	982	1473	1963	2454	2945	3436	3927	4418	4909
		IN	471.3	942.6	1413.9	1885.2	2356.5	2827.8	3301.2	3770.4	4242	4713

Attentions:

1.Laden direction is in accordance with piston movement incase of distortion.

2.Use F–R–L to adjust the air quality and prolong the life time.

3.Choose more force output cylinder than real load in case that lack pressure can make danger.

4.Pay attention to the operating temp.,restrict the range in–5℃~60℃ between the piston ring and seal part.When the temp.is high,please use Si or Fl rubber which has better temp.resistance.

5In corrosive air environment ,use materialPTFE between the piston ring and seal part.

Air–flow capacity,air capacity consuned

Air–flow capacity $Q_1 = \frac{\pi D^2}{4} \times L \times \frac{60}{t} \times \frac{P+1.03}{1.03} \times 10^{-6})$

air capacity consuned $Q_1 = \frac{\pi D^2}{4} \times L \times 2 \times n \times \frac{P+1.03}{1.03} \times 10^{-6})$

Q_1:Air–flow capacity needed	l/min
Q_2:Air capacity sonsumed	l/min
D:Bore	mm
L: Stroke	mm
t:Time needed per stroke	s
n:to –and–fro times in one minute	times/min
p:Operating pressure	kgf/cm^2

Specification:

boremm	air pressure（kgf/cm^2）								
	1	2	3	4	5	6	7	8	9
12	0.045	0.665	0.885	1.104	1.324	1.543	1.763	–	–
16	0.792	1.182	1.573	1.963	2.352	2.743	3.133	–	–
20	1.24	1.86	2.45	3.07	3.68	4.29	4.90	5.51	6.13
25	1.94	2.89	3.83	4.79	5.75	6.71	7.67	8.61	9.57
30	2.78	4.15	5.53	6.90	8.27	9.64	11.02	12.39	13.76
32	3.18	4.73	6.28	7.85	9.41	10.98	12.55	14.10	15.66
40	4.95	7.40	9.83	12.26	14.69	17.16	19.60	22.04	24.47
50	7.73	11.55	15.35	19.15	22.95	26.80	30.63	34.42	38.24
63	12.27	18.34	24.37	30.41	36.44	42.55	48.62	54.65	60.71
80	19.78	29.57	29.30	49.03	58.76	68.61	78.40	88.13	97.86
100	30.9	46.2	61.4	76.6	91.8	107.2	122.5	137.7	152.9
125	48.3	72.2	96.0	119.7	143.5	167.5	191.4	215.2	238.9
150	69.5	103.9	138.2	172.5	206.9	241.2	275.5	309.8	344.1
160	79.1	118.3	157.2	196.1	235.0	274.4	313.6	352.6	391.5
180	100.1	149.7	199.0	248.2	297.5	347.4	369.9	446.2	495.4
200	123.6	184.8	184.8	306.4	367.2	428.8	490.0	550.8	611.6

In the form said above,it shows aie flow capacity needed in each one mm stroke andone come–and–go,normal consuption refers to the following example.

Air flow capacity（under the circustance of F.R.L and its optional combination）

Example 1. bore 40mm speed 300mm/s,air pressure $5kgf/cm^2$, work out its flow capacity

$Q1=14.69 \times 1/2 \times 300 \times 60 \times 10^{-3}=132.21$ l/min

Air capacity consumed（under the circustance of air compressed）

Example 2. bore40mm, stroke 100mm,operating pressure $5kgf/cm^2$, 10 action times (one minute,to –and–fro), work out its cosumption capacity:

$Q2=14.69 \times 100 \times 10 \times 10^{-3}=14.69$ l/min

Air capacity consumed and needed

(1) capacity consumed (Double cylinder)

Formulate

$$Qcc=(A1+A2)\times L\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

$$Qcp=2\times a\times \ell\times\frac{P}{0.1013}\times 10^{-6}$$

$$Qc=Qcc+Qcp$$

Qcc=Air capacity consumed 〔ℓ(ANR)〕
Qcp=Cylinder and pipe air capacity consumed 〔ℓ(ANR)〕
A1=Push side compressed area 〔mm^2〕
A2=Draw–in side compressed area 〔mm^2〕
L=Pressure stroke 〔mm〕
P=Operating pressure 〔MPa〕
ℓ=Pipe length 〔mm〕
a =Pipe inner section area 〔mm^2〕
Qc=Air capacity needed in one to–and–fro 〔ℓ(ANR)〕

When having chosen the compressed air,for the air drivers' consuption,you should use more size parts to it.Because much consumption happened in air leak together with valves' consumption.Besides,volum becomes smalled when the temp. down

Formulate

Qc´ =Qc × n × cylinder's qty × safe ratio

Qc =Air compressor capaciti output 〔ℓ/min(ANR)〕

n=To –and–fro time per minute

Hose,copper tube inner section area

name	outer dia. (mm)	inner dia. (mm)	area $a(mm^2)$
T□0425	4	2.5	4.9
T□0604	6	4	12.6
T□0805	8	5	19.6
T□0806	8	6	28.3
1/8B	–	6.5	33.2
T□1075	10	7.5	44.2
T□1208	12	8	50.3
T□1209	12	9	63.6
1/4B	–	9.2	66.5
TS1612	16	12	113
3/8B	–	12.7	127
T□1613	16	13	133
1/2B	–	16.1	204
3/4B	–	21.6	366
1B	–	27.6	598

(2)Capacity needed

Formulate

$$Qr1=60\times A1\times V\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

$$Qr2=60\times A2\times V\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

Qr1=Push side Air capacity needed 〔ℓ(ANR)〕
Qr2=Draw–in side Air capacity needed 〔ℓ(ANR)〕
A1=Push side compressed area 〔mm^2〕
A2=Draw–in side compressed area 〔mm^2〕
V=Max.piston speed 〔mm/s〕
P=Operating pressure 〔MPa〕

Doublecylinder,adopt Max.Qr1, Qr2

push single acting :Qr1draw–in single acting :Qr2。

(3)Air capacity(single acting push cylinder)

Formulate

$$Qcc=A1\times L\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

$$Qcp=a\times \ell\times\frac{P}{0.1013}\times 10^{-6}$$

$$Qc=Qcc+Qcp$$

(4)Air capacity needed(single acting push cylinder)

Formulate

$$Qr=60\times A1\times V\times\frac{P+0.1013}{0.1013}\times 10^{-6}$$

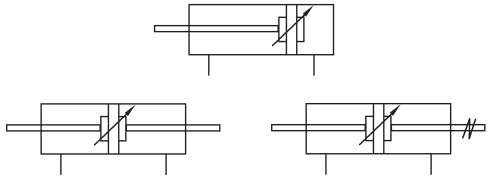
Standard Cylinder

ISO International Standard Aluminum Alloy Cylinder

- Front and rear caps are finished by aluminum alloy die–casting, CNC mechanically processed with high precision.
- Aluminum tube is imported ,stainless forever with friction & corrosion resistance.
- Adopt imported none lubrication.
- Unique cushion technique makes smooth action.
- May add the sensor equipment to easiky control.
- In terms of DNGU series ,pull–rod is hidden inside.

Specification:

Mode	32	40	50	63	80	100	125	160	200
Acting type	Double acting								
Series	SC, SCD, SCJ, SU								
Fluit	air								
Operating pressure Mpa	0.1~1								
Operating speed mm/sec	50~500								
Ambient temperature ℃	–10~70℃								
Cushion	adjustable cushion at both ends								
Oil	provided or not								
Port size	1/8”	1/4”		3/8”		1/2”			



How to order:

SC	50	×	100	FA	S	2
series	bore		stroke	mounting type	with magnet	sensors

SC standard cylinder
SC double axial cylinder
SCJ stroke adjustable cylinder
SU pull–rod hidden cylinder

ϕ 32	ϕ 100
ϕ 40	ϕ 125
ϕ 50	ϕ 160
ϕ 63	ϕ 200
ϕ 80	

blank(standard)	
FA	CB
FB	LB
CA	TC

S:with magnet
blank: without magnet

1:1
2:2

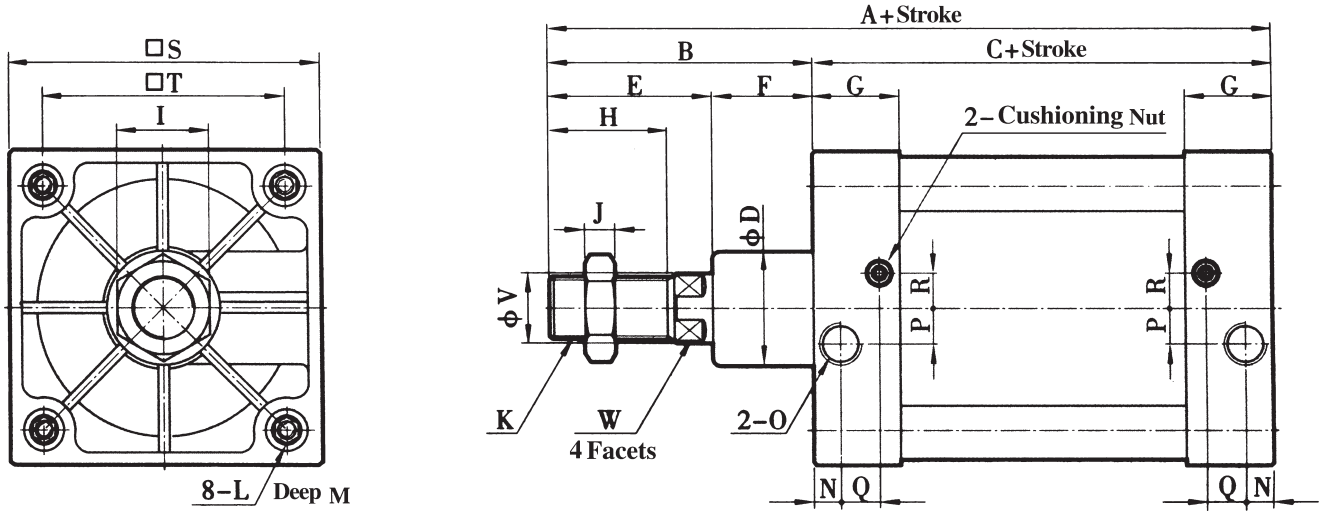
Stroke:

bore \ stroke	25	50	75	100	125	150	175	200	250	300	350	400	450	500	Max.stroke
32	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1000
40	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1200
50	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1200
63	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500
80	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500
100	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500
125	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500
160	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500
200	●	●	●	●	●	●	●	●	●	●	●	●	●	●	1500

Standard Cylinder

Dimension:

■ ϕ 32~ ϕ 200



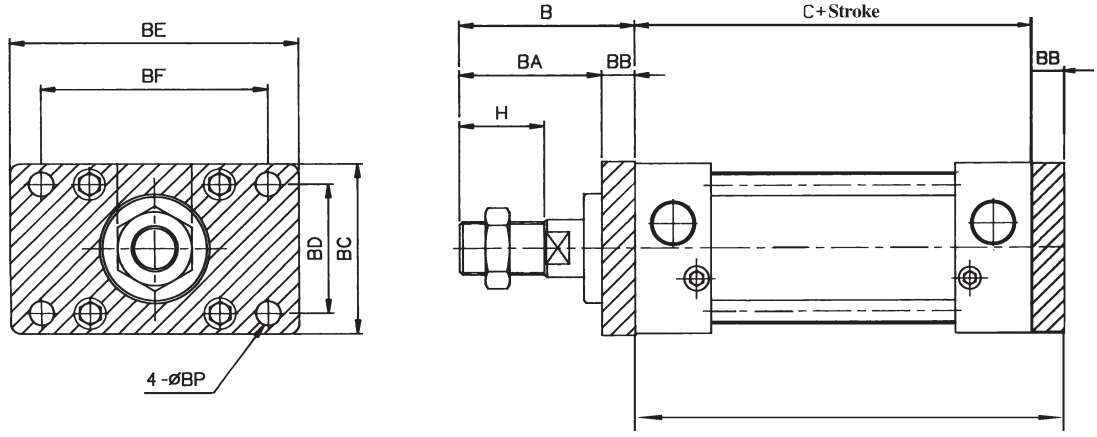
bore/symbol	A	B	C	D	E	F	G	H	I	J	K	L
32	140	47	93	28	32	15	27.5	22	17	6	M10 × 1.25	M6
40	142	49	93	32	34	15	27.5	24	17	7	M12 × 1.25	M6
50	150	57	93	38	41	16	27.5	32	23	8	M16 × 1.5	M6
63	153	57	96	38	41	16	27.5	32	23	8	M16 × 1.5	M8
80	183	75	108	43	54	21	33	40	26	10	M20 × 1.5	M10
100	189	75	110	43	54	21	33	40	26	10	M20 × 1.5	M10
125	216	92	124	56	60	32	32	45	38	11	M27 × 2	M12
160	241	97	145	64	65	32	40	50	50	13	M36 × 2	M16
200	262	114	148	66	80	34	42.5	60	50	13	M36 × 2	M16

bore/symbol	M	N	O	P	Q	R	S	T	V	W
32	9.5	13.2	G1/8”	6	7.7	6	45	33	12	10
40	9.5	12.5	G1/4”	6	7.7	7	50	37	16	14
50	9.5	12.25	G1/4”	7	8.2	8	62	47	20	17
63	9.5	14	G3/8”	7	6.45	8.5	75	56	20	17
80	11.5	16.5	G3/8”	10	9.5	14	94	70	25	22
100	11.5	16.5	G1/2”	11	9.5	14	112	84	25	22
125	26	17	G1/2”	11	7	11	140	110	32	29
160	32	23	G1/2”	12	7	12	178	140	40	37
200	32	25	G1/2”	15	8	15	220	175	40	37

Standard Cylinder

FA、FB Dimension：

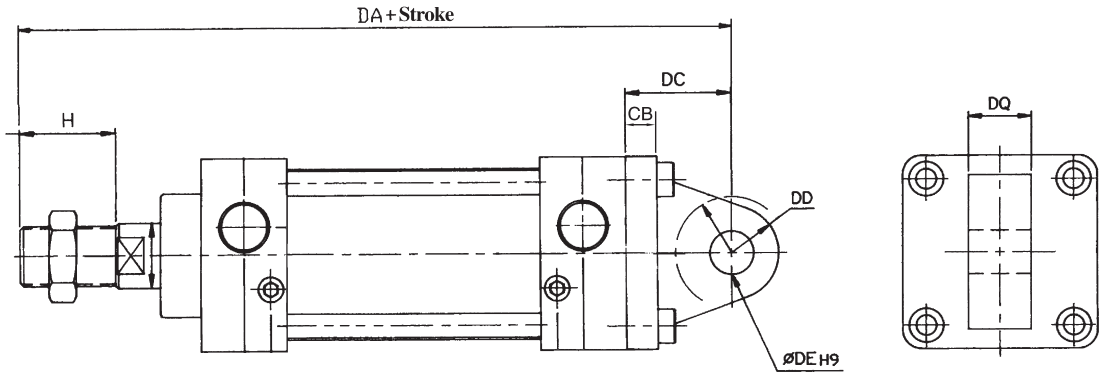
■ ϕ 32~ ϕ 200



bore/symbol	C	H	BA	BB	BC	BD	BE	BF	BP
32	93	22	37	10	48	33	73	58	6.5
40	93	24	39	10	52	36	83	70	6.5
50	93	32	46	11	65	47	104	86	6.5
63	96	32	46	11	75	56	117	98	9
80	108	40	59	16	94	70	143	119	11
100	110	40	59	16	115	84	162	138	11
125	124	45	72	20	140	90	215	180	16
160	146	50	77	20	180	115	270	230	18
200	150	60	90	25	220	135	315	270	22

CA Dimension：

■ ϕ 32~ ϕ 200

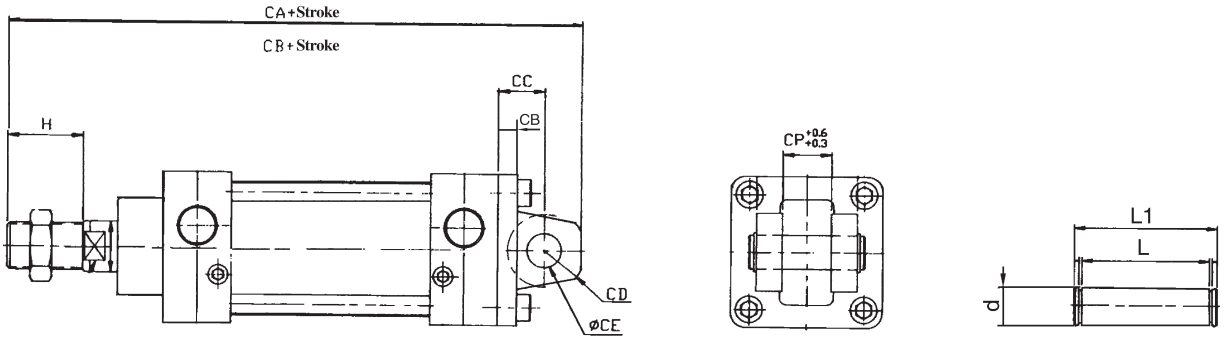


bore/symbol	H	DA	DC	CB	DD	ϕ DE H9	DQ
32	22	174	34	10	14	12	16
40	24	176	34	11	14	14	20
50	32	184	34	12	15	14	20
63	32	187	34	12	15	14	20
80	40	232	48	16	20	20	32
100	40	237	48	16	20	20	32
125	45	269	53	20	25	25	70
160	50	298	57	20	30	30	90
200	60	322	60	25	30	30	90

Standard Cylinder

CB Dimension :

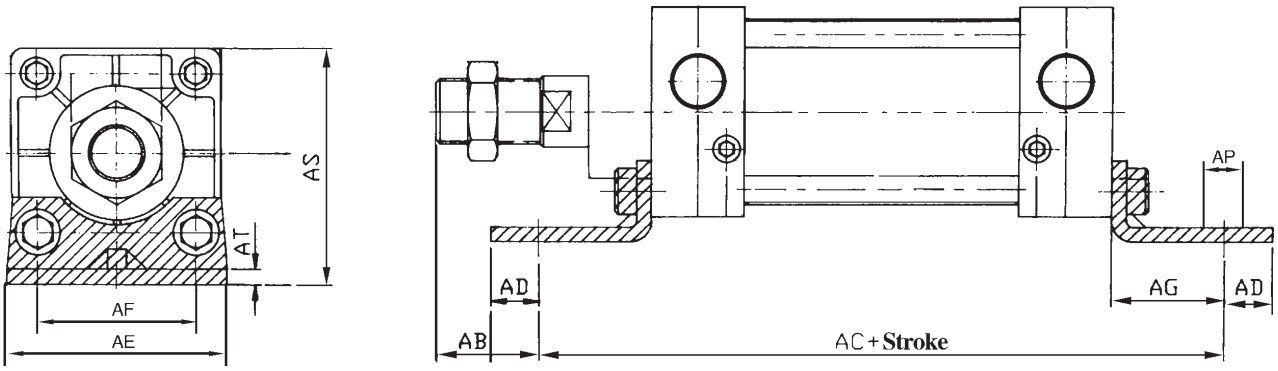
■ ϕ 32~ ϕ 200



bore/symbol	H	S	T	CA	CB	CC	CD	CE	CP+0.6 +0.3	L1	L	d
32	22	44	33	159	10	19	15	12	16	41	34	12
40	24	50	37	161	10	19	15	14	20	41	34	14
50	32	62	47	169	11	19	17	14	20	61	54	14
63	32	75	56	172	11	19	17	14	20	61	54	14
80	40	94	70	215	16	32	23	20	32	74	66	20
100	40	112	84	221	16	32	23	20	32	74	66	20
125	45	140	110	266	20	50	25	25	70	133	124	25
160	50	178	140	294	20	53	30	30	90	179	170	30
200	60	220	175	324	25	62	30	30	90	187	178	30

LBDimension :

■ ϕ 32~ ϕ 200

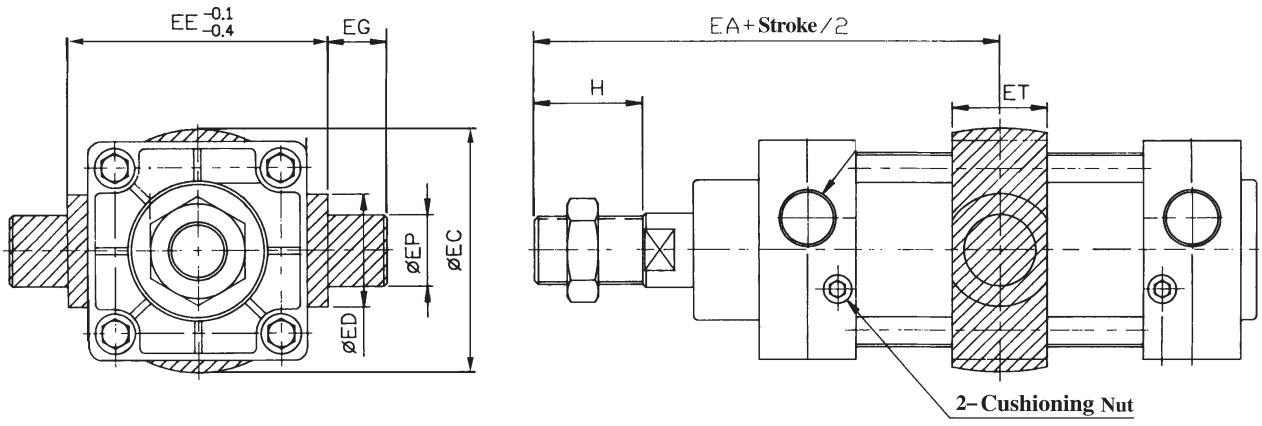


bore/symbol	H	AB	AC	AD	AE	AF	AP	AS	AT
32	22	26.5	134	9.5	50	33	9	50	3.2
40	24	25.5	140	14.5	57	37	12	55	3.2
50	32	29	149	12	68	47	12	68	3.2
63	32	26	158	13	80	56	12	78	3.2
80	40	45	168	16	97	70	14	96	4
100	40	45	174	18	112	84	14	113	4
125	45	57	194	25	140	110	16	160	5
160	50	62	216	20	178	140	18	204	5
200	60	75	275	30	220	175	22	245	6

Standard Cylinder

TC Dimension:

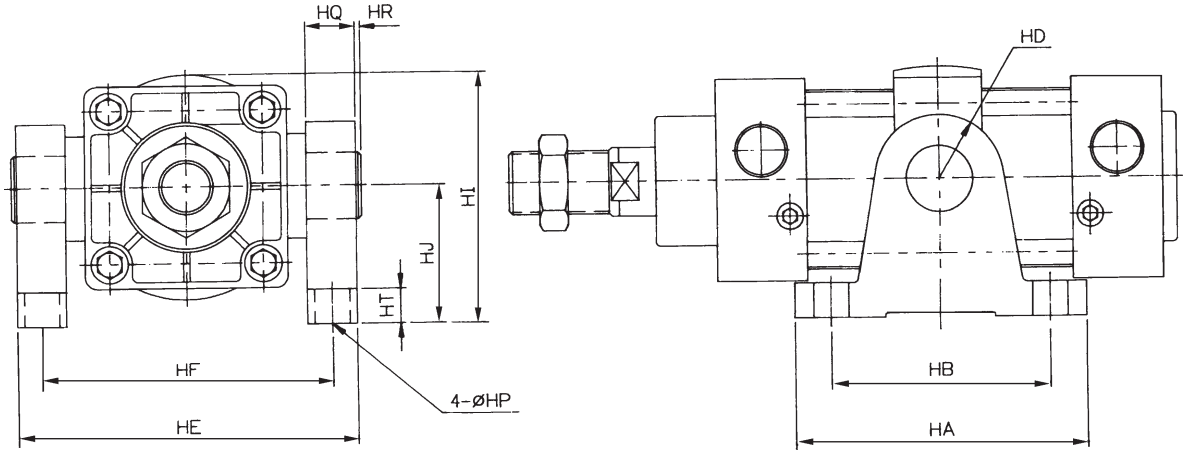
■ ϕ 32~ ϕ 200



bore/symbol	H	EA	EC	ED	EE	EG	EP	ET
32	22	93.5	50	20	53	12	12	20
40	24	95.5	59	35	63	25	25	30
50	32	103.5	71	35	76	25	25	30
63	32	105	86	35	89	25	25	30
80	40	129	104	35	114	27	25	35
100	40	132	128	40	133	25	25	40
125	45	154	153	35	165	25	30	40
160	50	170	200	37	207	29	32	40
200	60	190	245	–	243	36	36	50

TC Dimension:

■ ϕ 40~ ϕ 100

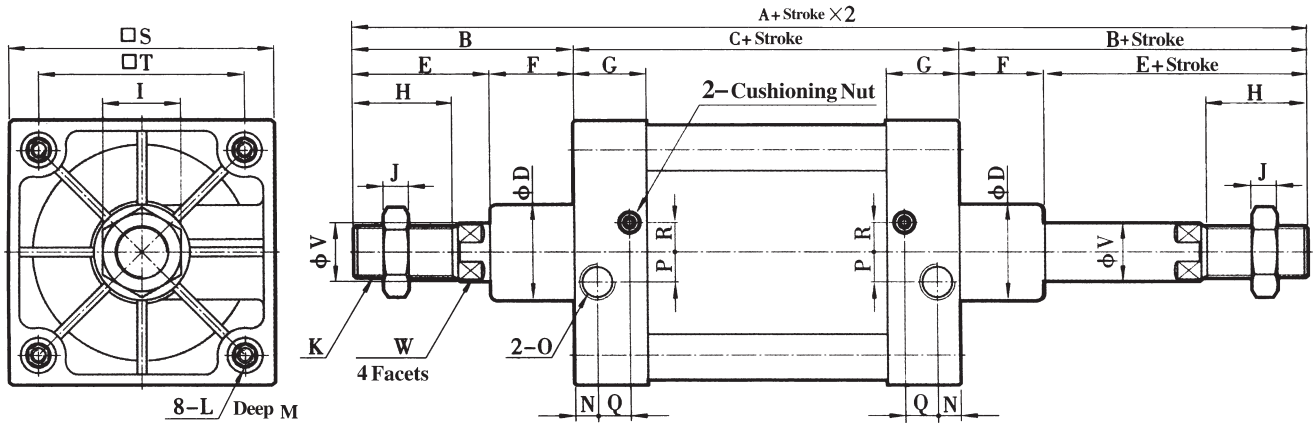


bore/symbol	HA	HB	HD	HE	HF	HI	HJ	HP	HQ	HR	HT
40	110	80	22	109	86	80	50	12	23	2	12
50	110	80	22	122	99	86	50	12	23	2	12
63	110	80	22	134	111	93	50	12	23	2	12
80	120	80	22	160	137	123	70	14	23	2	14
100	120	80	22	178	155	135	70	14	23	2	14

Standard Cylinder

Standard Dimension:

■ ϕ 32~ ϕ 200



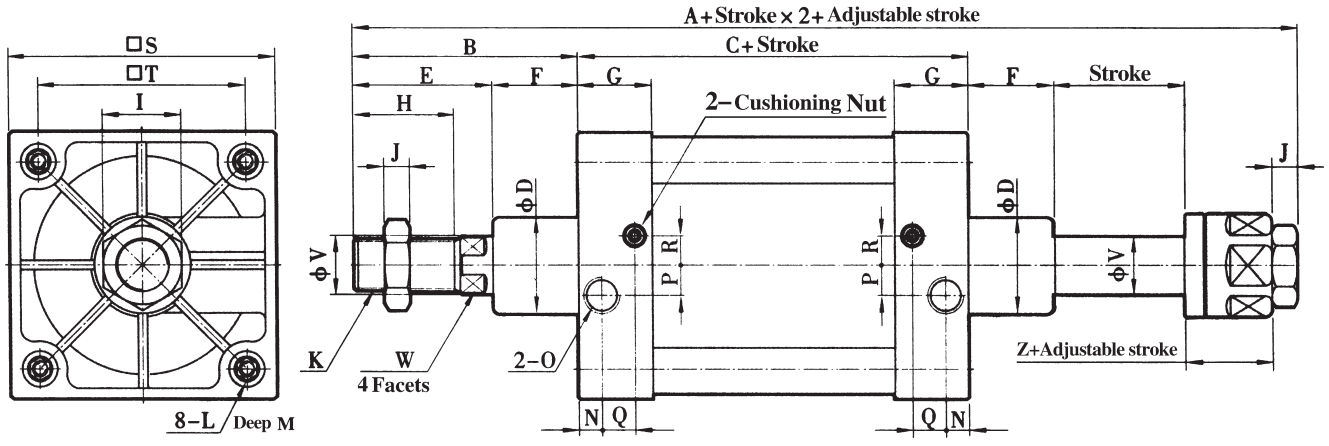
bore/symbol	A	B	C	D	E	F	G	H	I	J	K	L
32	187	47	93	28	32	15	27.5	22	17	6	M10 × 1.25	M6
40	191	49	93	32	34	15	27.5	24	17	7	M12 × 1.25	M6
50	207	57	93	38	42	15	27.5	32	23	8	M16 × 1.5	M6
63	210	57	96	38	42	15	27.5	32	23	8	M16 × 1.5	M8
80	258	75	108	43	54	21	33	40	26	10	M20 × 1.5	M10
100	260	75	110	43	54	21	33	40	26	10	M20 × 1.5	M10
125	308	92	124	56	60	32	32	45	38	11	M27 × 2	M12
160	338	97	146	64	65	32	40	50	50	13	M36 × 2	M16
200	376	114	150	66	80	34	42.5	60	50	13	M36 × 2	M16

bore/symbol	M	N	O	P	Q	R	S	T	V	W
32	9.5	13.75	G1/8”	3.5	7.5	7	45	33	12	10
40	9.5	13.75	G1/4”	6	8.2	8	50	37	16	14
50	9.5	13.75	G1/4”	7	8.2	8	62	47	20	17
63	9.5	13.75	G3/8”	7	8.2	8.5	75	56	20	17
80	11.5	16.5	G3/8”	10	9	14	94	70	25	22
100	11.5	16.5	G1/2”	11	9	14	112	84	25	22
125	15	17	G1/2”	11	9	11	140	110	32	29
160	20	23	G1/2”	12	9	12	178	140	40	37
200	20	25	G1/2”	15	10	15	220	175	40	37

Standard Cylinder

Standard Dimension:

■ ϕ 32~ ϕ 1200



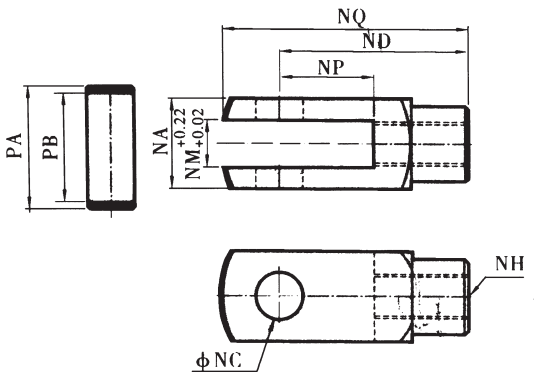
Type	A	B	C	D	E	F	G	H	I	J	K	L
32	187	47	93	28	32	15	27.5	22	17	6	M10 × 1.25	M6
40	191	49	93	32	34	15	27.5	24	17	7	M12 × 1.25	M6
50	207	57	93	38	42	15	27.5	32	23	8	M16 × 1.5	M6
63	210	57	96	38	42	15	27.5	32	23	8	M16 × 1.5	M8
80	258	75	108	43	54	21	33	40	26	10	M20 × 1.5	M10
100	260	75	110	43	54	21	33	40	26	10	M20 × 1.5	M10
125	308	92	124	56	60	32	32	45	38	11	M27 × 2	M12
160	338	97	146	64	65	32	40	50	50	13	M36 × 2	M16
200	376	114	150	66	80	34	42.5	60	50	13	M36 × 2	M16

Type	M	N	O	P	Q	R	S	T	V	W	Z
32	9.5	13.75	G1/8”	3.5	7.5	7	45	33	12	10	21
40	9.5	13.75	G1/4”	6	8.2	8	50	37	16	14	21
50	9.5	13.75	G1/4”	7	8.2	8	62	47	20	17	23
63	9.5	13.75	G3/8”	7	8.2	8.5	75	56	20	17	23
80	11.5	16.5	G3/8”	10	9	14	94	70	25	22	29
100	11.5	16.5	G1/2”	11	9	14	112	84	25	22	29
125	15	17	G1/2”	11	9	11	140	110	32	29	35
160	20	23	G1/2”	12	9	12	178	140	40	37	40
200	20	25	G1/2”	15	10	15	220	175	40	37	40

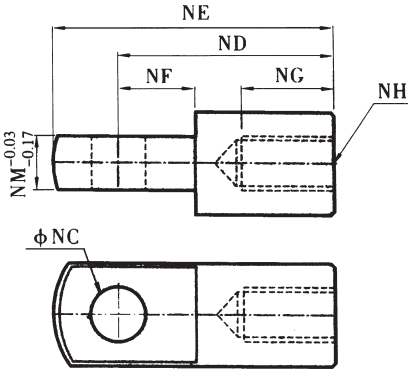
Standard Cylinder

Connector Dimension:

Y type

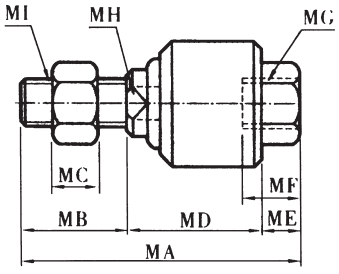


I type



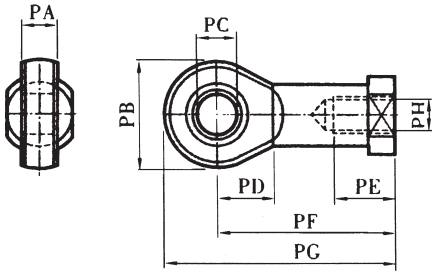
Type	NA	NC	ND	NE	NG	NH	NM	NP	NQ	PA	PB
32	19	10	40	52	20	M10 × 1.25	10	20	52	26.2	20
40	25.4	12	48	67	20	M12 × 1.25	12	24	62	32.8	26.5
50	33	16	64	89	23	M16 × 1.5	16	32	83	39.3	33
63	33	16	64	89	23	M16 × 1.5	16	32	83	39.3	33
80	44.4	20	80	112	30	M20 × 1.5	20	40	105	53.3	45
100	44.4	20	80	112	30	M20 × 1.5	20	40	105	53.3	45
125	64	20	102	119	56	M27 × 2	32	50	119	73	67
160	82	28	125	155	72	M36 × 2	41	60	155	90	83
200	82	28	125	155	72	M36 × 2	41	60	155	90	83

Float type



Type	MA	MB	MC	MD	ME	NG	MH	MI
32	73	20	6	45	8	M10 × 1.25	12	M10 × 1.25
40	77	24	7	46	7	M12 × 1.25	12	M12 × 1.25
50	106	32	8	62	12	M16 × 1.5	19	M16 × 1.5
63	106	32	8	62	12	M16 × 1.5	19	M16 × 1.5
80	122	40	10	68	14	M20 × 1.5	19	M20 × 1.5
100	122	40	10	68	14	M20 × 1.5	19	M20 × 1.5
125	147	54	13.5	77	16	M27 × 2	24	M27 × 2
160	251	72	18	161	18	M36 × 2	36	M36 × 2
200	251	72	18	161	18	M36 × 2	36	M36 × 2

Fish eye type



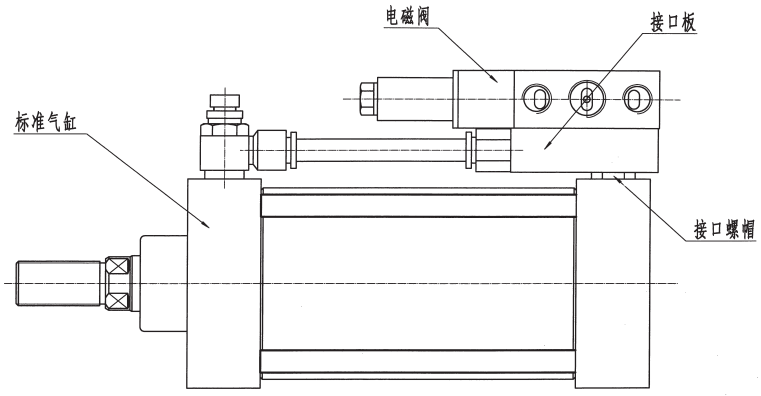
Type	PA	PB	PC	PE	PF	PG	NG
32	14	28	10	20	43	57	M10 × 1.25
40	16	32	12	22	50	66	M12 × 1.25
50	21	42	16	28	64	85	M16 × 1.5
63	21	42	16	28	64	85	M16 × 1.5
80	25	50	20	33	77	102	M20 × 1.5
100	25	50	20	33	77	102	M20 × 1.5
125	37	70	30	51	110	145	M27 × 2
160	43	80	35	56	125	165	M36 × 2
200	43	50	35	56	125	165	M36 × 2

Standard Cylinder

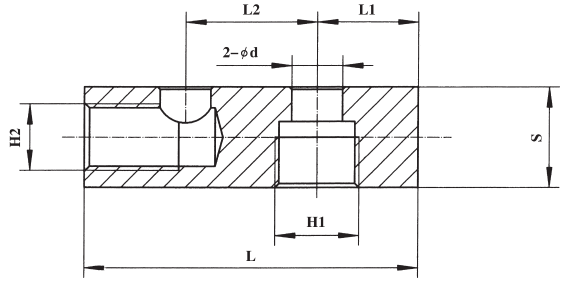
Character:

AVS assembly pedestal can directly set the valve on make one pneumatic working unit
Attention:Min.stroke 100mm

Assembly example

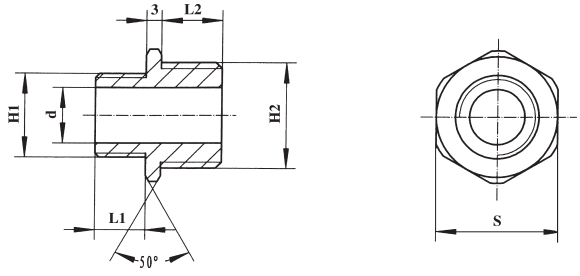


AVS jiont panel



Mode	d	G1	G2	L	L1	L2	S	Solenoid Valve optional
AVS-32-40-50	7	1/4"	1/4"	50	13.5	23	20	4M210、4M220、4M230
AVS-63-80	10	3/8"	3/8"	66	20	26	20	4M310、4M320、4M330
AVS-100以上	12	1/2"	1/2"	104	29	36	34	4M410、4M420、4M430

AVS connector



Sequence No	H1	H2	d	L1	L2	S
1	1/4"	1/8"	5	7	7	14
2	1/4"	1/4"	9	7	7	14
3	3/8"	3/8"	11	7	10	17
4	1/2"	1/2"	12	14	14	22