Boosters, Intensifiers and Air/Oil Tanks

Ram and Piston Type

GHN NOPAK

First in Manufacturing. Engineered to Last.

STANDARD FEATURES

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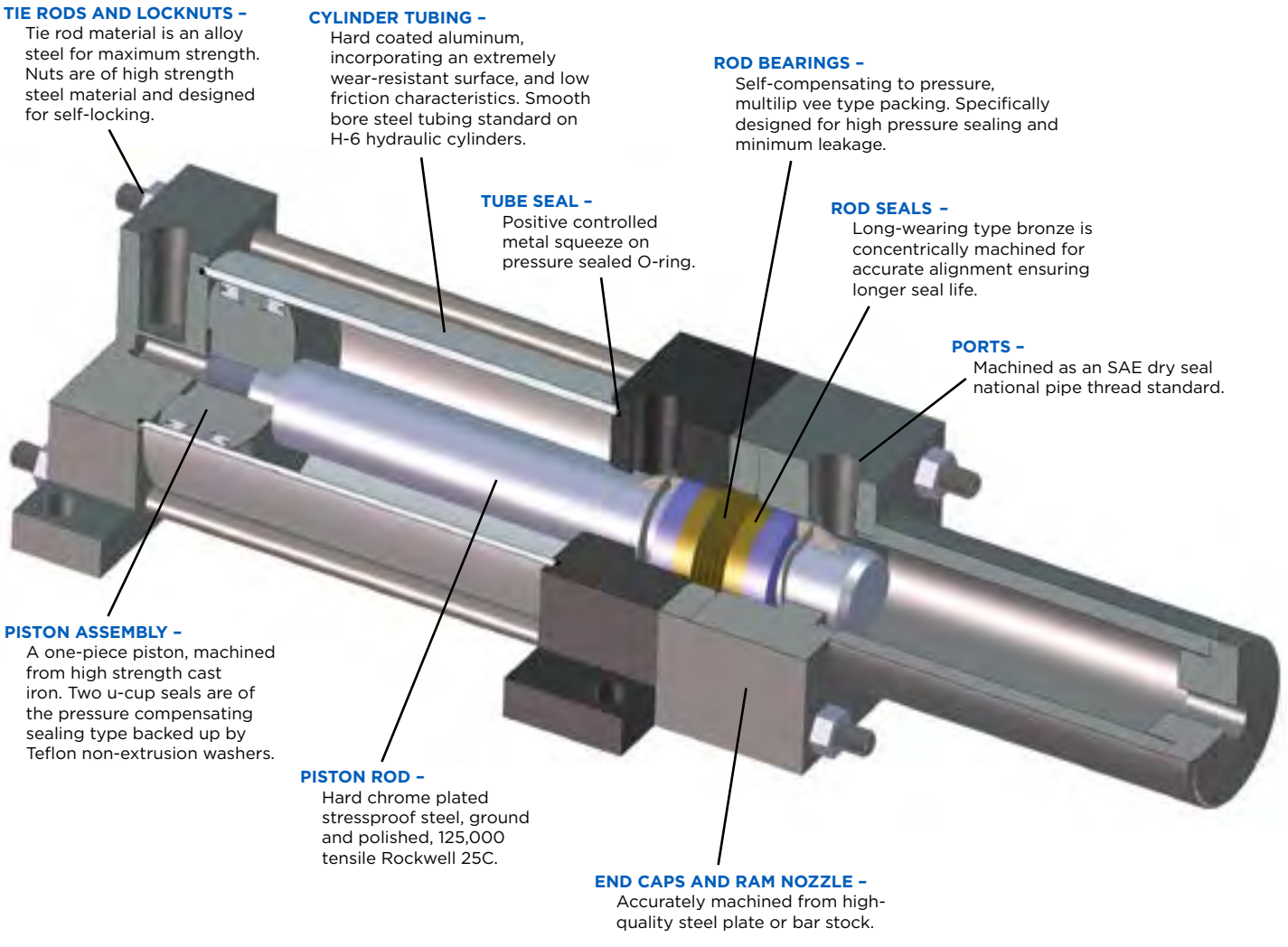
CUTAWAY VIEW



RAM-TYPE BOOSTERS

A Booster is a device used to convert low pressure shop air to an intensified hydraulic pressure. This is accomplished by applying low pressure air to the full piston area of the low pressure side of the booster. This intensified force is transferred by means of a ram to the high pressure side of the booster. Intensification of pressure is based on the ratio in square inches between the low pressure piston and the high pressure ram.

This method of intensification eliminates costly hydraulic pumps or power pack units. It must be stated that a booster intensifier total output power is limited so that rapid cycling of a booster-cylinder combination is not feasible. Only applications where intermittent high pressure hydraulics required for a limited operation can be achieved with the booster intensifier. The unlimited bore-ram ratios makes the booster a versatile customized device. Whether your requirements are in the low, medium or high pressure range, there is a NOPAK booster available for your application.

PISTON TYPE BOOSTERS

This type of booster can also be used as an accumulator depending on its location in the circuit. The operating principle is the same as the ram type booster except that intensification in the output cylinder is transmitted to the full area of a piston instead of the ram. The basic assembly consists of two cylinders connected as a unit using a common ram to transfer thrust from the input side of the booster. Parts for both cylinders are standard inventory for NOPAK's Class 6 air or medium pressure hydraulic cylinder. The output cylinder is a NOPAK Class 3 high pressure hydraulic cylinder. Connection of both cylinders is accomplished by means of an adapter plate. The availability and standardization of adaptable parts makes the NB-3 booster economically priced with faster delivery time. Our engineering personnel can aid and advise you with your booster selection or special applications.

BOOSTERS WITH AIR-OIL TANK COMBINATIONS

The assembly of the air-oil tank to the booster as an integral unit will benefit users with less space required in the circuit and a savings on installation time. Tanks are mounted on the booster with a common plate and tie rods. Tanks are selected with the same diameter bore as the booster. The mounting of the booster must be in a vertical position because of the air over oil function of the tank. Ordering of this unit requires adding "T" (for tank) to booster code combinations. Examples of NOPAK standard boosters are NBT-3, NBST-5 and NBDT-5.

See page 186 and page 187 for air-oil tanks mounted separately in booster circuit.

NOPAK NBS-5 SINGLE PRESSURE RAM TYPE BOOSTERS – 5000 PSI

Single pressure boosters are used in applications where an intensified high pressure output is required throughout the full stroke of the work cylinder. Because of the singular ram seal, this type of booster is not self-bleeding or self-filling. Special care must be taken to bleed out air when filling or installing. The NBS-5 booster has an output pressure limitation of 5000 PSI maximum.

NOPAK NBD-5 DUAL PRESSURE RAM TYPE BOOSTERS – 5000 PSI

Dual pressure boosters are used in applications where low pressure is adequate for the approach stroke of the work cylinder and high pressure for the remainder of the stroke. The booster ram is only effective after entering the secondary seal of the high pressure side of booster. Therefore, a smaller dual booster can be used to do the job that normally it would take for a larger single booster. This type of booster is self-bleeding and self-filling. No external bleed valving is required in inlet line. The NBD-5 booster has an output pressure limitation of 5000 PSI maximum.

NOPAK NB-3 PISTON TYPE BOOSTER AND ACCUMULATOR - 3000 PSI

Single-acting pressure boosters are used in applications where an intensified high pressure output is required throughout the full stroke of the work cylinder. Piston type boosters can be used in double-acting circuits as well. Intensification is accomplished by use of a piston instead of a ram in the output cylinder of the booster. This then makes the intensification area of the piston a factor in output computations. This type of unit can be used either as a booster or an accumulator, dependent on how it is located in the hydraulic circuit. The fact that it is assembled from stock inventory of available Class 3 and Class 6 components makes the booster economically priced. Modification of two components adapts the high pressure Class 3 to the low pressure Class 6 cylinder as a booster assembly. When applied as a booster, the unit is not self-bleeding, so provisions for this function must be made elsewhere in the hydraulic circuit. Use of stock parts makes the NB-3 booster pressure limitation at 3000 PSI maximum.

AIR-OIL TANKS

Air-Oil Tanks offer a means of smooth hydraulic speed control of a cylinder from an air line source. In addition they may be used to prefill a circuit or for low pressure advance of a work cylinder.

HOW TO ORDER

ORDERING CODE EXAMPLE – RAM TYPE BOOSTER

NBS-5 (**N**OPAK **B**ooster **S**ingle pressure **5**000 PSI output max.) / **NBD-5** (**N**OPAK **B**ooster **D**ual pressure **5**000 PSI output max.)

1 - A - 6 - NBS5 - 5 x 14 - ΔΔ - 1-3/8 - 3/4 NPT - OPT

- 1 — QTY.
- A — Mounting Style: Use either NOPAK or NFPA's designation
- 6 — Input Cylinder – Operating Media P-6 (Air), H-6 (Hyd.), H3 (3000 PSI Max.)
- NBS5 — N = NOPAK, B = Booster, S = Single Pressure, D = Dual Pressure
- 5 — Input Cylinder Bore Diameter
- 14 — Stroke
- ΔΔ — Two letters required In Model number: NN = No cushions; AA = Cushioned both ends; NA = No cushion rod end, cushion blind end; AN = Cushion rod end, no cushion blind end
- 1-3/8 — Output Cylinder Ram Diameter
- 3/4 NPT — Port Size
- Type: NPTF, SAE O-Ring
- OPT — OPT = Optional features required such as Fluorocarbon seals, port position, bleeders, etc.

ORDERING CODE EXAMPLE – PISTON TYPE BOOSTER

NB3 (**N**OPAK **B**ooster **3**000 PSI output max.)

INPUT CYLINDER | **OUTPUT CYLINDER**

1 - 6 - NB3 - 6 x 14 A - NN - 3/4 NPT - 2 - 3-3.250 x 14 H - 3/4 NPT - OPT

- 1 — QTY.
- 6 — Input Cylinder Class 6
- NB3 — NOPAK Booster 3000 PSI Max.
- 6 — Input Cylinder Bore Diameter
- 14 — Stroke
- A — Input Cylinder Model
- NN — Non-cushion rod end, blind end
- 3/4 NPT — Port Size
- Type: NPTF, SAE O-Ring
- 2 — Common Rod Diameter of Input & Output Cylinder
- 3-3.250 — Class 3 Output Cylinder
- 14 — Output Cylinder Bore Diameter
- H — Stroke
- 3/4 NPT — Output Cylinder Model
- Type: NPTF, SAE O-Ring
- OPT — OPT = Optional features required such as fluorocarbon seals, port position, bleeders, etc.

ORDERING CODE EXAMPLE – AIR-OIL TANKS

1 - EP *OR* **- H6 - 6 x 8 - AP - OPT**

- 1 — QTY.
- EP — Aluminum Tank EP-Air • 250 PSI
- H6 — Steel Chrome Plated I.D.: H6-L.P. Hyd. See the
- 6 — Tank Diameter AS/Selection See page 186
- 8 — Tank Length AS/Selection See page 186
- AP — Model (MTG.): T, TB, TR, S, AP, H
- OPT — Port Location Position: 1-2, 3-4, 5 Sight Gauge Position*

MATERIAL NOTE: Aluminum heads (Class EP stock) for tank diameter 3-1/4 through 8" diameter steel heads (Class H6 stock) for tank diameters 10-12-14

NOTE: Unless specified, Air-Oil Tanks shall be a separate unit in the Booster Circuit, as illustrated on page 186 and page 187.

* = Sight gauge is considered to be in position 1 in all cases unless specifically called out otherwise. See page 187.

HOW TO SELECT THE MOST EFFICIENT BOOSTER

STEP 1. SELECTING A SINGLE PRESSURE BOOSTER

Preliminary information needed:

A Thrust force or load required from work cylinder for application.

B Bore diameter of work cylinder and stroke length required to do the job (select a force greater than that required as a margin of safety).

C Input PSI pressure of work cylinder needed to obtain force selected.

D Available input PSI pressure to operate booster.

E Booster ratio.

EXAMPLE:

Your application requires a thrust or force of 4,400 lbs. for 4" length.

From Class 3 Section Table C "Thrust Force and Displacement" you read 4,909 lbs. for a 2-1/2" diameter cylinder which requires an input pressure of 1,000 PSI to obtain this force. This allows a 500# force margin of safety.

Your available input pressure at site is 80 PSI shop air. Booster ratio can now be determined.

$$\text{ratio} = \frac{\text{output pressure}}{\text{input pressure}} = \frac{1{,}000}{80} = 12.5$$

You have now established that:

A	Work cylinder force	= 4,900 lbs.
B	Work cylinder diameter	= 2-1/2" bore
	Work cylinder stroke	= 4" length
C	Booster output pressure	= 1,000 PSI
D	Available input pressure	= 80 PSI shop air
E	Booster ratio	= 12.5

STEP 2. SELECT BOOSTER BORE AND RAM SIZE

Using ratio from above Item E, select from Booster Selection Chart, page 184, the bore and ram size that reads closest to ratio. If exact ratio is not shown, then select next larger ratio. Next check if input PSI corresponds to application availability Item D above.

Read down input PSI column to output PSI that is equal or greater than Item C above. If table output is larger than needed then the ratio can be recalculated.

Now with your recalculated ratio, input pressure and closest output pressure, you can now read the booster bore diameter and ram size needed.

STEP 3. DETERMINE BOOSTER STROKE

Calculate the booster stroke using formula

$$S = \frac{V + VcL}{Ra}$$

S = Booster stroke

V = Volume cubic inch of 2-1/2" bore work cylinder times 4" stroke or 19.6 cu. in.

VcL = Volume cubic inch plus oil volume cu. in. in circuit lines (20 cu. in. FOR THIS EXAMPLE) TIMES 1% PER 1,000 PSI OR .01

Ra = Area of 1-3/8" diameter ram or 1.485 sq. in.

NOTE: Substitute Pa (piston area) for Ra (ram area) in the above formula when calculating a piston type booster or accumulator.

$$S = \frac{19.6 + (19.6 + 20).01}{1.485}$$

$$S = \frac{19.996}{1.485} = 13.46 \text{ or } 14\text{" stroke}$$

NOTE: To account for leakage (hydraulic slip) or any other uncertainties, a factor of safety of 20% should be added.

S = 14" x 1.20 = 16.8 OR 17" STROKE

From the following determining selection you would then order:

A 5" diameter single pressure NBS-5 booster with a 17" stroke using a 1-3/8 diameter ram. With an input pressure of 80 PSI air to be intensified to 1,058 PSI for full 4" stroke of 2-1/2" bore work cylinder with a recalculated ratio of 13.22.

SELECTING A DUAL PRESSURE BOOSTER

Steps No. 1 and 2 are the same as a single pressure booster. Proceed with step No. 3.

STEP 3. DETERMINE BOOSTER STROKE

Calculate the booster stroke using formula.

$$S = \frac{V + VcL}{Ra} + 2 \text{ inch stroke required to close H.P. Seal}$$

NOTE: For larger boosters with 3" diameter rod and over, use 3" plus calculated booster stroke.

S = Booster stroke

V = Volume cubic inch of 2-1/2" bore work cylinder times H.P. stroke length or 4.9 sq. in. x 1" = 4.9 cu. in. of H.P. stroke

VcL = Volume cu. in. plus oil volume cu. in. in circuit lines or 20 cu. in. times 1% per 1,000 PSI or .01

Ra = Area of 1-3/8" diameter ram or 1.485 sq. in.

NOTE: Substitute Pa (piston area) for Ra (ram area) in the above formula when calculating a piston type booster or accumulator.

$$S = \frac{4.9 + (19.6 + 20).01}{1.485} + 2$$

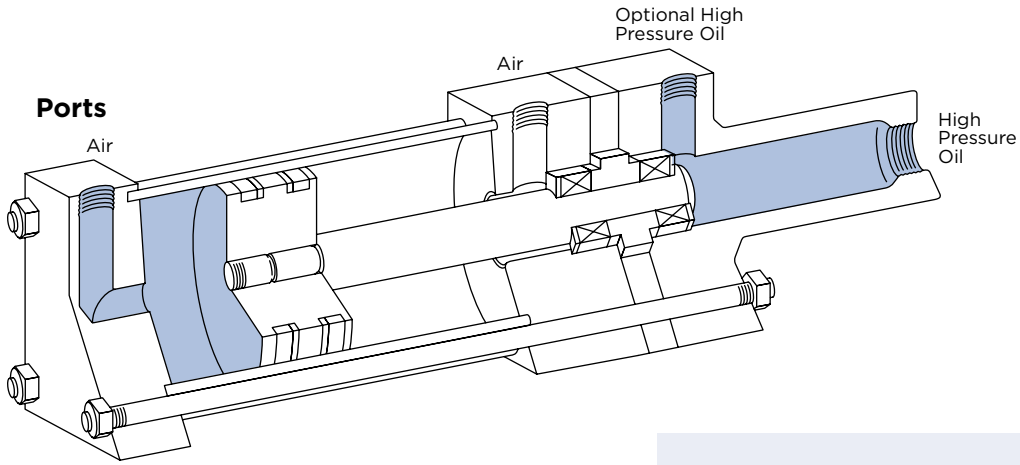
$$S = \frac{5.30}{1.485} + 2$$

S = 5.56 or 6" Booster stroke

S = 6 X 1.20 = 7.2 or 8" stroke (see note above).

From the following determining selection you would then order: A 5" diameter dual pressure NBD-5 booster with an 8" stroke using a 1-3/8" diameter ram. With an input pressure of 80 PSI air to be intensified to 1,058 PSI for last 1" stroke of 2-1/2" bore work cylinder with recalculated ratio of 13.22.

NBS-5 SINGLE PRESSURE RAM TYPE BOOSTER



This type booster has a single ram seal so the entire stroke is of intensified high pressure.

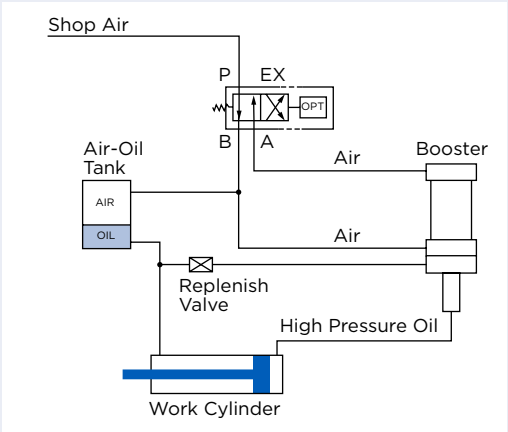
Low pressure air is directed to the booster input cylinder port to the cylinder chamber. Making contact with the larger surface of the retracted piston forces the piston with ram, forward, to begin the cylinder stroke. Low pressure oil is intensified in the nozzle chamber by the ram end force created by the larger air piston pushing. The high pressure oil is forced out of the nozzle port into the work cylinder for a high pressure continuous stroke. Oil flows out and back in through the nozzle port or can be piped in through the optional port located in the nozzle head. Makeup oil is provided from an external replenishing valve. The booster ratio of input and output pressure rated values are charted on page 184.

Booster Series NBS is similar to the dual pressure Series NBD except the center head which contains the port and seal for low pressure oil has been eliminated. Therefore, the primary purpose of this design is to provide high pressure oil to the work cylinder during its entire stroke.

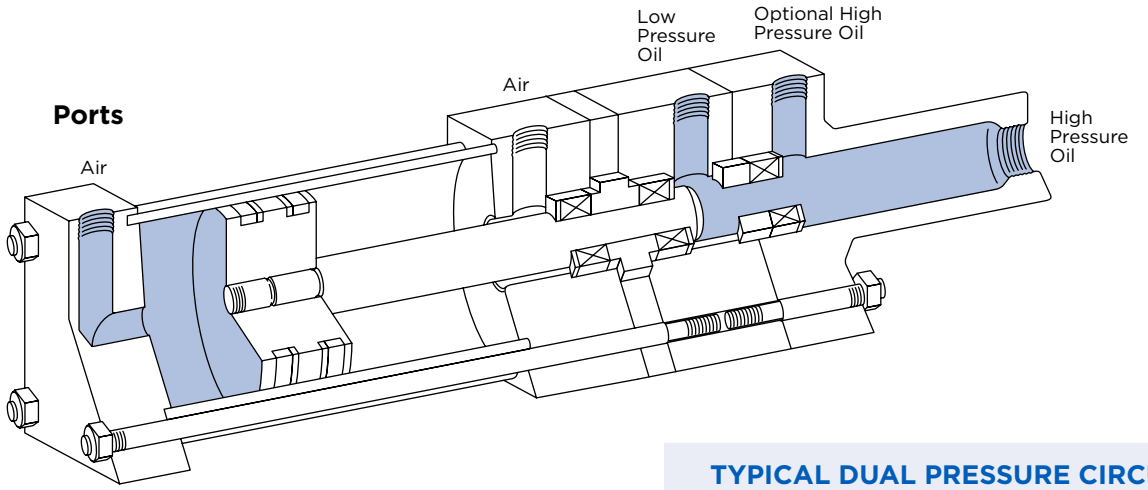
Since the booster is neither self-filling or self-venting, provisions should be made to perform these operations in the external circuit.

See Booster Selection Chart, page 184 and “How To Select The Most Efficient Booster” on page 175.

TYPICAL SINGLE PRESSURE CIRCUIT



NBD-5 DUAL PRESSURE RAM TYPE BOOSTER

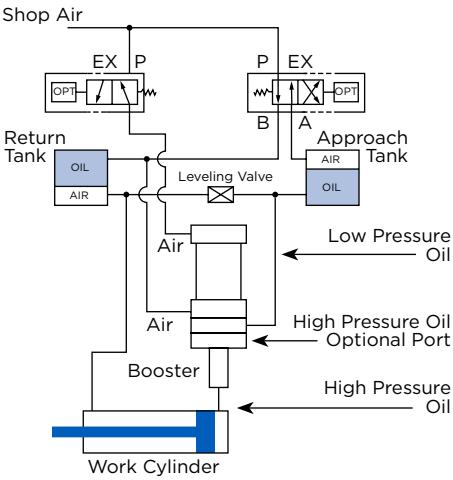


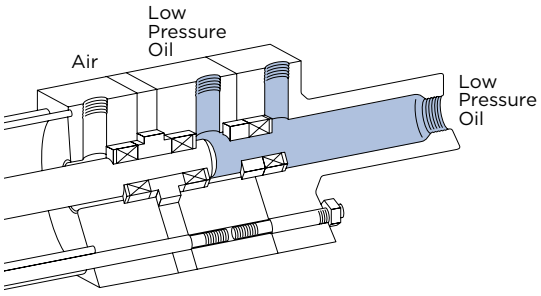
The dual pressure booster is used where the work cylinder is required to travel a short distance at high pressure after a substantial low pressure advance stroke. Because the booster ram operates only during the high pressure portion of the work stroke, a shorter booster stroke is required. In the fully retracted position, the ram is withdrawn from the high pressure ram seal allowing low pressure "approach stroke" oil to pass through to the work cylinder. This design makes the booster both self-filling and self-bleeding.

See Booster Selection Chart, page 184 and "How To Select The Most Efficient Booster" on page 175.

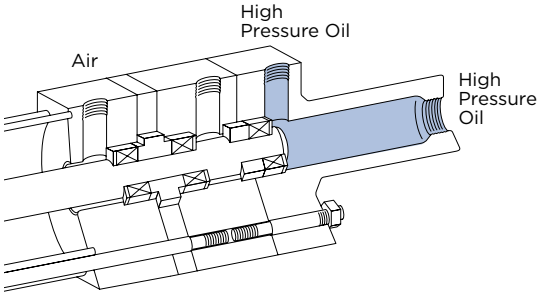
Low pressure air is directed to the Booster input cylinder port into the cylinder chamber. Making contact with the large surface of the retracted piston forces the piston with ram forward to start the cylinder stroke.

TYPICAL DUAL PRESSURE CIRCUIT



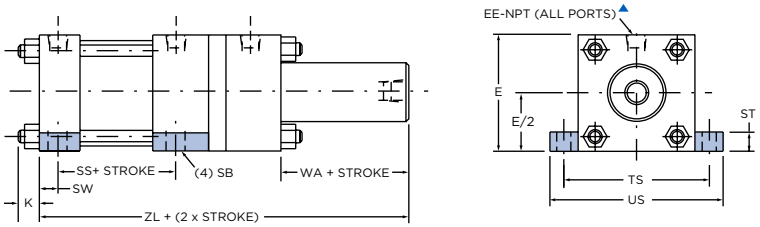


Low pressure oil is flowing through the low pressure port into and through the high pressure bearing I.D. and seal. It continues through the nozzle chamber and out the port to the work cylinder. The ram is traveling under the same pressure as the input air. The low pressure oil reaching the work cylinder forces the rod forward which is called "the approach stroke."

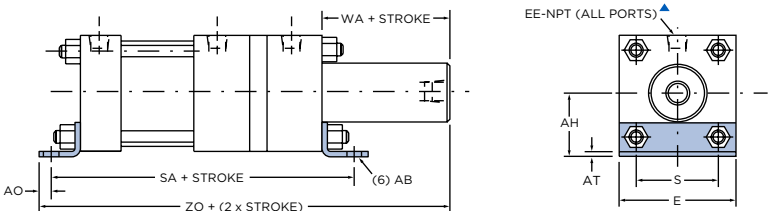


The booster ram traveling forward now enters the high pressure bearing and seal cutting off the low pressure oil supply. The ram end force created by the large air piston now greatly intensifies the oil pressure contained in the nozzle chamber and is pushed out of the high pressure port to the work cylinder. This short stroke of the work cylinder is called the "high pressure stroke" of the work cycle. The booster ratio of input and output pressure rated values are charted on page 184. The input cylinder segment of NBD-5 boosters can be operated either with air or low pressure hydraulics. See the pressure limitations shown on page 184.

MODEL A (NFPA STD. MS2)

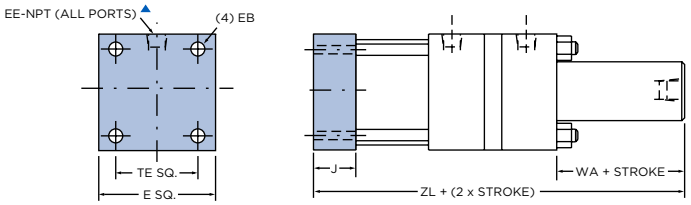


MODEL AP (NFPA STD. STYLE MS1)

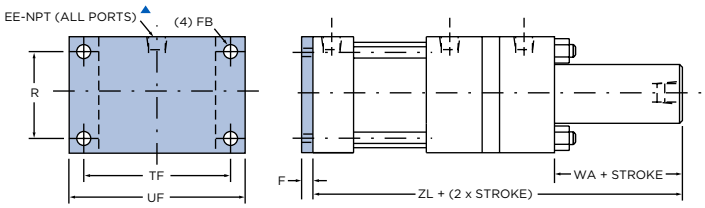


For 2-1/2" diameter through 5" diameter bore, this model is available for small ram diameter only.

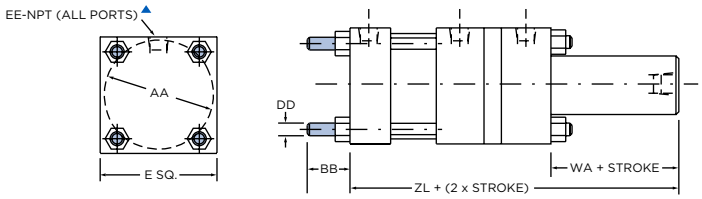
MODEL CJ (NFPA STD. STYLE ME4) *8" THROUGH 14" DIA.*



MODEL C (NFPA STD. STYLE MF2) *2-1/2" THROUGH 6" DIA.*



MODEL TB (NFPA STD. STYLE MX2)



▲ = Large unrestricted ports conforming to NFPA standards are provided. They can be rotated to any 90° position in relation to each other and the booster mounting.

Table 1

• = Dimension refers to bolt diameter.

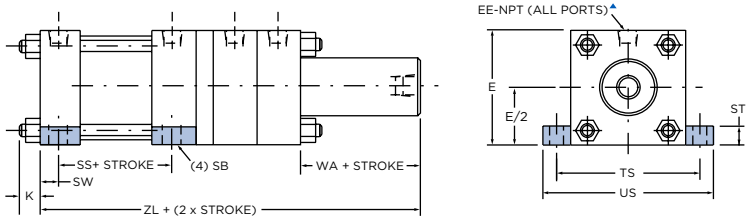
BORE DIA.	INPUT CYLINDER PSI		MOUNTING DIMENSIONS													
	AIR	HYD.	E	F	K	R	S	AA	AB•	AH	AO	AT	BB	DD	EB•	EE
2-1/2	250	1100	3	3/8	5/16	2.19	2-1/4	3.10	3/8	1-5/8	3/8	1/8	1-1/8	5/16-24	–	3/8
3-1/4	250	1350	3-3/4	5/8	7/16	2.76	2-3/4	4.00	1/2	2	1/2	1/8	1-3/8	7/16-20	–	1/2
4	250	950	4-1/2	5/8	7/16	3.32	3-1/2	4.75	1/2	2-1/4	1/2	1/8	1-3/8	7/16-20	–	1/2
5	250	900	5-1/2	5/8	1/2	4.10	4-1/4	5.80	5/8	2-3/4	5/8	3/16	1-3/4	1/2-20	–	1/2
6	200	750	6-1/2	3/4	9/16	4.88	5-1/4	6.90	3/4	3-1/4	5/8	3/16	1-3/4	9/16-18	–	3/4
8	200	500	8-1/2	3/4	5/8	–	7-1/8	9.10	3/4	4-1/4	11/16	1/4	2-1/4	5/8-18	5/8	3/4
10	200	400	10-5/8	3/4	3/4	–	8-7/8	11.31	1	5-5/16	7/8	1/4	2-5/8	3/4-16	3/4	1
12	200	400	12-3/4	3/4	3/4	–	11	13.30	1	6-3/8	7/8	3/8	2-11/16	3/4-16	3/4	1
14	200	400	14-3/4	3/4	7/8	–	12-5/8	15.40	1-1/4	7-3/8	1-1/16	3/8	3-3/16	7/8-14	7/8	1-1/4

Table 2

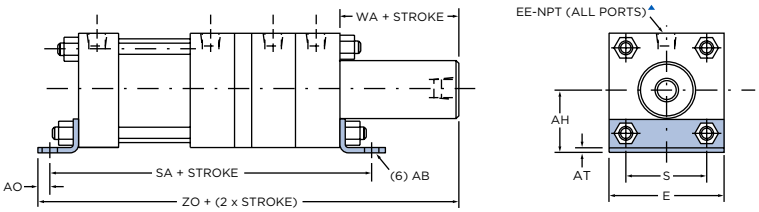
• = Dimension refers to bolt diameter.

BORE DIA.	INPUT CYLINDER PSI		MOUNTING DIMENSIONS											
	AIR	HYD.	FB•	SA	SB•	SS	ST	TE	TF	TS	UF	US	WA	ZL	ZO
2-1/2	250	1100	5/16	7-5/8	3/8	3	1/2	–	3-7/8	3-3/4	4-5/8	4-1/2	5/8	6-1/4	7-1/4
3-1/4	250	1350	3/8	9-1/8	1/2	3-1/4	3/4	–	4-11/16	4-3/4	5-1/2	5-3/4	5/8	7-1/4	9
4	250	950	3/8	9-1/8	1/2	3-1/4	3/4	–	5-7/16	5-1/2	6-1/4	6-1/2	5/8	7-1/4	9
5	250	900	1/2	9-5/8	3/4	3-1/8	1	–	6-5/8	6-7/8	7-5/8	8-1/4	5/8	7-1/2	9-1/2
6	200	750	1/2	10-1/2	3/4	3-5/8	1	–	7-5/8	7-7/8	8-5/8	9-1/4	7/8	8-5/8	10-5/8
8	200	500	–	11-1/2	3/4	3-3/4	1	7.57	–	9-7/8	–	11-1/4	7/8	8-3/4	11-1/4
10	200	400	–	13-5/8	1	4-5/8	1-1/4	9.40	–	12-3/8	–	14-1/8	1-1/8	10-1/2	13-1/2
12	200	400	–	14-1/8	1	5-1/8	1-1/4	11.10	–	14-1/2	–	16-1/4	1-1/8	11	14
14	200	400	–	16-1/2	1-1/4	5-7/8	1-1/2	12.87	–	17	–	19-1/4	1-5/8	13-1/4	16-3/4

MODEL A (NFPA STD. MS2)

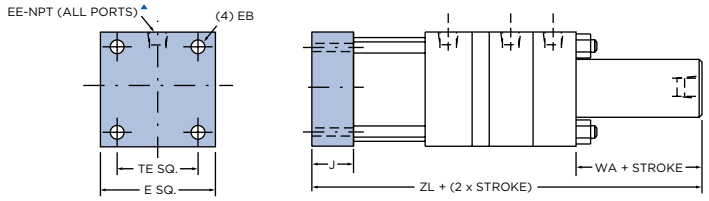


MODEL AP (NFPA STD. STYLE MS1)

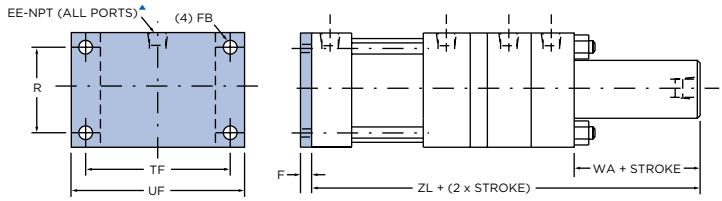


For 2-1/2" diameter through 5" diameter bore, this model is available for small ram diameter only.

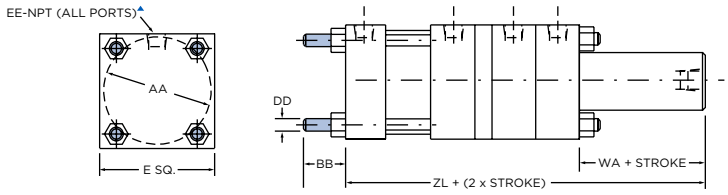
MODEL CJ (NFPA STD. STYLE ME4) *8" THROUGH 14" DIA.*



MODEL C (NFPA STD. STYLE MF2) *2-1/2" THROUGH 6" DIA.*



MODEL TB (NFPA STD. STYLE MX2)



▲ = Large unrestricted ports conforming to NFPA standards are provided. They can be rotated to any 90° position in relation to each other and the booster mounting.

Table 1

• = Dimension refers to bolt diameter.

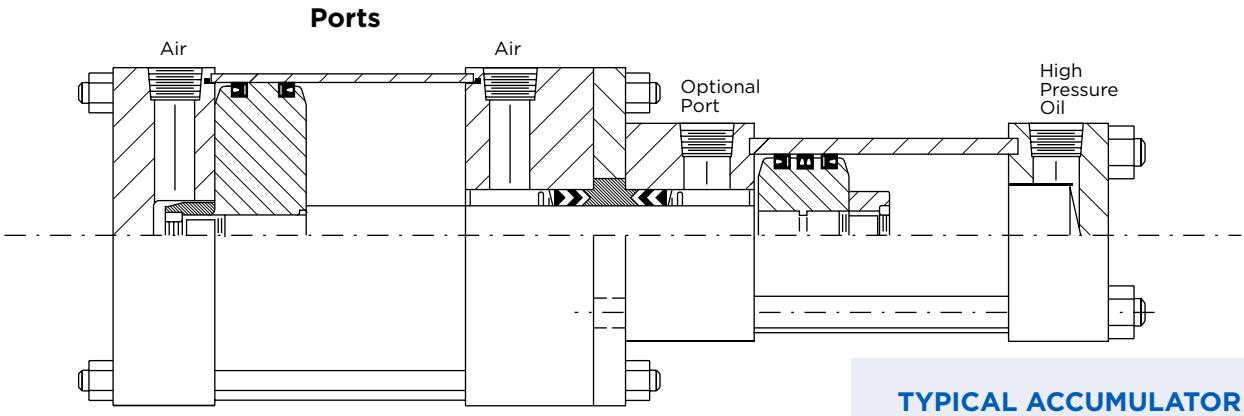
BORE DIA.	INPUT CYLINDER PSI		MOUNTING DIMENSIONS														
	AIR	HYD.	E	F	J	K	R	S	AA	AB•	AH	AO	AT	BB	DD	EB•	EE
2-1/2	250	1100	3	3/8	1-1/8	5/16	2.19	2-1/4	3.10	3/8	1-5/8	3/8	1/8	1-1/8	5/16-24	–	3/8
3-1/4	250	1350	3-3/4	5/8	1-1/4	7/16	2.76	2-3/4	4.00	1/2	2	1/2	1/8	1-3/8	7/16-20	–	1/2
4	250	950	4-1/2	5/8	1-1/4	7/16	3.32	3-1/2	4.75	1/2	2-1/4	1/2	1/8	1-3/8	7/16-20	–	1/2
5	250	900	5-1/2	5/8	1-1/4	1/2	4.10	4-1/4	5.80	5/8	2-3/4	5/8	3/16	1-3/4	1/2-20	–	1/2
6	200	750	6-1/2	3/4	1-1/2	9/16	4.88	5-1/4	6.90	3/4	3-1/4	5/8	3/16	1-3/4	9/16-18	–	3/4
8	200	500	8-1/2	3/4	1-1/2	5/8	–	7-1/8	9.10	3/4	4-1/4	11/16	1/4	2-1/4	5/8-18	5/8	3/4
10	200	400	10-5/8	3/4	2	3/4	–	8-7/8	11.31	1	5-5/16	7/8	1/4	2-5/8	3/4-16	3/4	1
12	200	400	12-3/4	3/4	2	3/4	–	11	13.30	1	6-3/8	7/8	3/8	2-11/16	3/4-16	3/4	1
14	200	400	14-3/4	3/4	2-1/4	7/8	–	12-5/8	15.40	1-1/4	7-3/8	1-1/16	3/8	3-3/16	7/8-14	7/8	1-1/4

Table 2

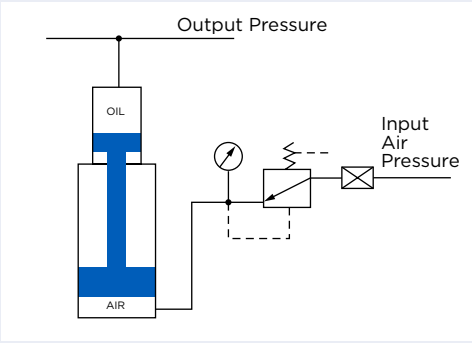
• = Dimension refers to bolt diameter.

BORE DIA.	INPUT CYLINDER PSI		MOUNTING DIMENSIONS													
	AIR	HYD.	FB•	SA	SB•	SS	ST	SW	TE	TF	TS	UF	US	WA	ZL	ZO
2-1/2	250	1100	5/16	9-1/8	3/8	3	1/2	3/8	–	3-7/8	3-3/4	4-5/8	4-1/2	5/8	7-3/4	9-1/8
3-1/4	250	1350	3/8	10-7/8	1/2	3-1/4	3/4	1/2	–	4-11/16	4-3/4	5-1/2	5-3/4	5/8	9	10-3/4
4	250	950	3/8	10-7/8	1/2	3-1/4	3/4	1/2	–	5-7/16	5-1/2	6-1/4	6-1/2	5/8	9	10-3/4
5	250	900	1/2	11-3/8	3/4	3-1/8	1	11/16	–	6-5/8	6-7/8	7-5/8	8-1/4	5/8	9-1/4	11-1/4
6	200	750	1/2	12-1/2	3/4	3-5/8	1	11/16	–	7-5/8	7-7/8	8-5/8	9-1/4	7/8	10-5/8	12-5/8
8	200	500	–	13-1/2	3/4	3-3/4	1	11/16	7.57	–	9-7/8	–	11-1/4	7/8	10-3/4	13-1/4
10	200	400	–	15-7/8	1	4-5/8	1-1/4	7/8	9.40	–	12-3/8	–	14-1/8	1-1/8	12-3/4	15-3/4
12	200	400	–	16-3/8	1	5-1/8	1-1/4	7/8	11.10	–	14-1/2	–	16-1/4	1-1/8	13-1/4	16-1/4
14	200	400	–	19-1/4	1-1/4	5-7/8	1-1/2	1-1/8	12.87	–	17	–	19-1/4	1-5/8	16	19-1/2

PISTON TYPE BOOSTERS AND ACCUMULATORS NB3



TYPICAL ACCUMULATOR CIRCUIT

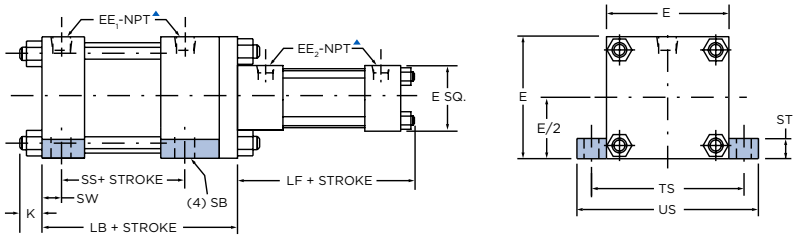


PISTON TYPE BOOSTERS AND ACCUMULATORS NB3

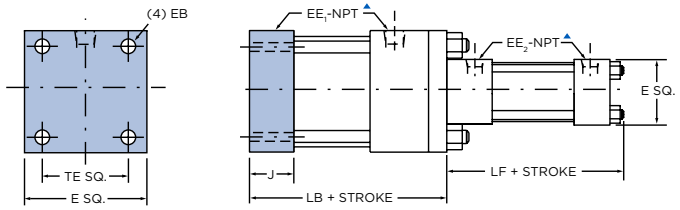
Piston type boosters and accumulators consist of two cylinders with a common ram, joined together as an integral unit. This unit may be used as a booster or accumulator depending on how it is located in hydraulic circuit. When used as a booster, it is not self-bleeding so provisions must be made in the external circuit to bleed the system after each operation and before prefilling.

See Booster Selection Chart, page 184 and "How To Select The Most Efficient Booster" on page 175.

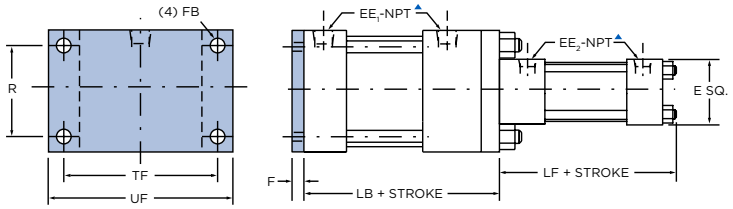
MODEL A (NFPA STD. MS2)



MODEL CJ (NFPA STD. STYLE ME4) *8" THROUGH 14" DIA.*



MODEL C (NFPA STD. STYLE MF2) *2-1/2" THROUGH 6" DIA.*



▲ = Large unrestricted ports conforming to NFPA standards are provided. They can be rotated to any 90° position in relation to each other and the booster mounting.

MODEL TB (NFPA STD. STYLE MX2)

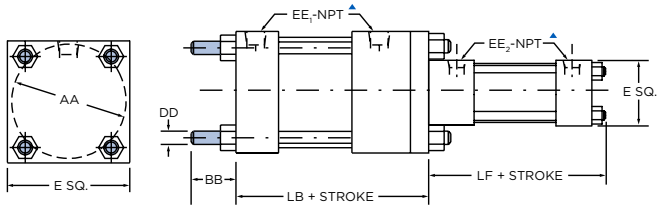


Table 1

INPUT CYLINDER DIMENSIONS A/L■									
BORE		2-1/2	3-1/4	4	5	6	8	10	12	14
PSI	A■	250	250	250	250	200	200	200	200	200
	L■	1100	1350	950	900	750	500	400	400	400
E		3	3-3/4	4-1/2	5-1/2	6-1/2	8-1/2	10-5/8	12-3/4	14-3/4
F		3/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4
J		1-1/8	1-1/4	1-1/4	1-1/4	1-1/2	1-1/2	2	2	2-1/4
K		5/16	7/16	7/16	1/2	9/16	5/8	3/4	3/4	7/8
R		2.19	2.76	3.32	4.10	4.88	–	–	–	–
AA		3.10	4.00	4.75	5.80	6.90	9.10	11.31	13.30	15.40
BB		5/16-24	1-3/8	1-3/8	1-3/4	1-3/4	2-1/4	2-5/8	2-11/16	3-3/16
DD		–	7/16-20	7/16-20	1/2-20	9/16-18	5/8-18	3/4-16	3/4-16	7/8-14
EB•		3/8	–	–	–	–	5/8	3/4	3/4	7/8
EE_1▲		5/16	1/2	1/2	1/2	3/4	3/4	1	1	1-1/4
FB•		4-1/8	3/8	3/8	1/2	1/2	–	–	–	–
LB		3/8	4-7/8	4-7/8	5-1/8	5-3/4	5-7/8	7-1/8	7-5/8	8-7/8
SB•		3	1/2	1/2	3/4	3/4	3/4	1	1	1-1/4
SS		1/2	3-1/4	3-1/4	3-1/8	3-5/8	3-3/4	4-5/8	5-1/8	5-7/8
ST		3/8	3/4	3/4	1	1	1	1-1/4	1-1/4	1-1/2
SW		–	1/2	1/2	11/16	11/16	11/16	7/8	7/8	1-1/8
TE		3-7/8	–	–	–	–	7.57	9.40	11.10	12.87
TF		3-3/4	4-11/16	5-7/16	6-5/8	7-5/8	–	–	–	–
TS		4-5/8	4-3/4	5-1/2	6-7/8	7-7/8	9-7/8	12-3/8	14-1/2	17
UF		4-1/2	5-1/2	6-1/4	7-5/8	8-5/8	–	–	–	–
US		4-1/2	5-3/4	6-1/2	8-1/4	9-1/4	11-1/4	14-1/8	16-1/4	19-1/4

Table 2

OUTPUT CYLINDER DIMENSIONS A/L■									
BORE		1-1/2	2	2-1/2	3-1/4	4	5	6	8
PSI	A■	250	250	250	250	250	250	200	200
	L■	1500	1500	1100	1350	950	900	750	500
E		2	2-1/2	3	3-3/4	4-1/2	5-1/2	6-1/2	8-1/2
EE_2▲		3/8	3/8	3/8	1/2	1/2	1/2	3/4	3/4
LF		3-7/8	4-1/16	4-1/16	4-11/16	4-11/16	5	5-9/16	5-3/4

Table 3

OUTPUT CYLINDER DIMENSIONS H■									
BORE		1-1/2	2	2-1/2	3-1/4	4	5	6	8
PSI	H■	3000	3000	3000	3000	3000	3000	3000	3000
E		2-1/2	3	3-1/2	4-1/2	5	6-1/2	7-1/2	9-1/2
EE_2▲		1/2	1/2	1/2	3/4	3/4	3/4	1	1-1/2
LF		5-1/8	5-1/8	5-3/8	6-1/4	6-1/2	7-1/4	8-1/2	10-7/8

• = Dimension refers to bolt diameter.

■ A = Air
L = L.P. Hydraulics
H = H.P. Hydraulics 3000 PSI

▲ = Large unrestricted ports conforming to NFPA standards are provided. They can be rotated to any 90° position in relation to each other and the booster mounting.

GHN NOPAK
First in Manufacturing. Engineered to Last.

BOOSTER SELECTION CHART

SINGLE PRESSURE NBS-5 AND DUAL PRESSURE NBD-5 (5000 PSI)

DRIVING CYLINDER		PRESSURE RATING	OUTPUT RAM		BOOSTER RATIO•	INTENSIFIED OUTPUT HYDRAULIC PRESSURE (PSI) AT INPUT PRESSURE											
BORE	AREA	AIR / HYD.	DIA.	AREA		60	80	100	200	250	400	500	750	900	950	1100	1350
2-1/2	4.909	250 / 1100	0.625	0.307	16.00	960	1280	1600	3200	4000	6401	8001	12001	14401	15201	17601	–
			1	0.785	6.25	375	500	625	1250	1563	2500	3125	4688	5625	5938	6876	–
			1.375	1.485	3.31	198	264	331	661	827	1322	1653	2480	2975	3141	3637	–
			1.75	2.405	2.04	122	163	204	408	510	816	1020	1531	1837	1939	2245	–
3-1/4	8.296	250 / 1350	1	0.785	10.56	634	845	1056	2113	2641	4225	5282	7922	9507	10035	11619	14260
			1.375	1.485	5.59	335	447	559	1117	1397	2235	2794	4190	5028	5308	6146	7543
			1.75	2.405	3.45	207	276	345	690	862	1380	1725	2587	3104	3277	3794	4656
			2	3.142	2.64	158	211	264	528	660	1056	1320	1981	2377	2509	2905	3565
4	12.566	250 / 950	1	0.785	16.00	960	1280	1600	3200	4000	6400	8000	12000	14400	15200	–	–
			1.375	1.485	8.46	508	677	846	1693	2116	3385	4231	6347	7617	8040	–	–
			1.75	2.405	5.22	313	418	522	1045	1306	2090	2612	3918	4702	4963	–	–
			2	3.142	4.00	240	320	400	800	1000	1600	2000	3000	3600	3800	–	–
			2.5	4.909	2.56	154	205	256	512	640	1024	1280	1920	2304	2432	–	–
5	19.634	250 / 900	1	0.785	25.00	1500	2000	2500	5000	6250	10000	12500	18750	22500	–	–	–
			1.375	1.485	13.22	793	1058	1322	2645	3306	5289	6611	9917	11901	–	–	–
			1.75	2.405	8.16	490	653	816	1633	2041	3265	4082	6122	7347	–	–	–
			2	3.142	6.25	375	500	625	1250	1562	2500	3125	4687	5625	–	–	–
			2.5	4.909	4.00	240	320	400	800	1000	1600	2000	3000	3600	–	–	–
			3	7.068	2.78	167	222	278	556	694	1111	1389	2083	2500	–	–	–
			3.5	9.621	2.04	122	163	204	408	510	816	1020	1531	1837	–	–	–
6	28.274	200 / 750	1.375	1.485	19.04	1142	1523	1904	3808	4760	7617	9521	14281	–	–	–	–
			1.75	2.405	11.76	705	940	1176	2351	2939	4702	5878	8816	–	–	–	–
			2	3.142	9.00	540	720	900	1800	2250	3600	4500	6750	–	–	–	–
			2.5	4.909	5.76	346	461	576	1152	1440	2304	2880	4320	–	–	–	–
			3	7.068	4.00	240	320	400	800	1000	1600	2000	3000	–	–	–	–
			3.5	9.621	2.94	176	235	294	588	735	1176	1469	2204	–	–	–	–
			4	12.566	2.25	135	180	225	450	563	900	1125	1688	–	–	–	–
8	50.264	200 / 500	1.375	1.485	33.85	2031	2708	3385	6770	8463	13540	16926	–	–	–	–	–
			1.75	2.405	20.90	1254	1672	2090	4180	5224	8359	10449	–	–	–	–	–
			2	3.142	16.00	960	1280	1600	3200	4000	6400	8000	–	–	–	–	–
			2.5	4.909	10.24	614	819	1024	2048	2560	4096	5120	–	–	–	–	–
			3	7.068	7.11	427	569	711	1422	1778	2844	3556	–	–	–	–	–
			3.5	9.621	5.22	313	418	522	1045	1306	2090	2612	–	–	–	–	–
			4	12.566	4.00	240	320	400	800	1000	1600	2000	–	–	–	–	–
			4.5	15.904	3.16	190	253	316	632	790	1264	1580	–	–	–	–	–
			5	19.634	2.56	154	205	256	512	640	1024	1280	–	–	–	–	–
			5.5	23.758	2.12	127	169	212	423	529	846	1058	–	–	–	–	–
10	78.538	200 / 400	1.75	2.405	32.65	1959	2612	3265	6531	8163	13061	–	–	–	–	–	–
			2	3.142	25.00	1500	2000	2500	5000	6250	10000	–	–	–	–	–	–
			2.5	4.909	16.00	960	1280	1600	3200	4000	6400	–	–	–	–	–	–
			3	7.068	11.11	667	889	1111	2222	2778	4444	–	–	–	–	–	–
			3.5	9.621	8.16	490	653	816	1633	2041	3265	–	–	–	–	–	–
			4	12.566	6.25	375	500	625	1250	1563	2500	–	–	–	–	–	–
			4.5	15.904	4.94	296	395	494	988	1235	1975	–	–	–	–	–	–
			5	19.634	4.00	240	320	400	800	1000	1600	–	–	–	–	–	–
			5.5	23.758	3.31	198	264	331	661	826	1322	–	–	–	–	–	–
12	113.094	200 / 400	2	3.142	36.00	2160	2880	3600	7200	9000	14400	–	–	–	–	–	–
			2.5	4.909	23.04	1382	1843	2304	4608	5760	9216	–	–	–	–	–	–
			3	7.068	16.00	960	1280	1600	3200	4000	6400	–	–	–	–	–	–
			3.5	9.621	11.76	705	940	1176	2351	2939	4702	–	–	–	–	–	–
			4	12.566	9.00	540	720	900	1800	2250	3600	–	–	–	–	–	–
			4.5	15.904	7.11	427	569	711	1422	1778	2844	–	–	–	–	–	–
			5	19.634	5.76	346	461	576	1152	1440	2304	–	–	–	–	–	–
			5.5	23.758	4.76	286	381	476	952	1190	1904	–	–	–	–	–	–
14	153.934	200 / 400	2.5	4.909	31.36	1882	2509	3136	6272	7840	12544	–	–	–	–	–	–
			3	7.068	21.78	1307	1742	2178	4356	5444	8711	–	–	–	–	–	–
			3.5	9.621	16.00	960	1280	1600	3200	4000	6400	–	–	–	–	–	–
			4	12.566	12.25	735	980	1225	2450	3063	4900	–	–	–	–	–	–
			4.5	15.904	9.68	581	774	968	1936	2420	3872	–	–	–	–	–	–
			5	19.634	7.84	470	627	784	1568	1960	3136	–	–	–	–	–	–
			5.5	23.758	6.48	389	518	648	1296	1620	2592	–	–	–	–	–	–

NOTE: When output pressures are in the gray shaded area, the output pressure has exceeded the rating for the output cylinder and then Boosters NBS-5 THROUGH NBD-5 should not be used. For output pressures greater than 5000 PSI, please consult the factory.

NOTE: When output pressures are not shown, either output pressure has exceeded rating of output cylinder or input pressure has exceeded rating of input cylinder.

• = CL3 series not shown in this ratio combination.

BOOSTER SELECTION CHART

NB-3 (3000 PSI)

INPUT CYLINDER				OUTPUT CYLINDER					BOOSTER RATIO	OUTPUT PRESSURE (PSI) AT INPUT PRESSURE OF										
BORE	AREA	MAXIMUM INPUT PRESSURE		BORE	AREA	MAXIMUM OUTPUT PRESSURE USING				60	80	100	200	250	400	500	750	900	950	1100
		A	L			A	L	H												
2-1/2	4.909	250	1100	1-1/2	1.767	250	1500	3000	2.78	167	222	278	556	695	1111	1389	2084	2500	2639	–
3-1/4	8.296	250	1350	1-1/2	1.767	250	1500	3000	4.69	282	376	469	939	1174	1878	2347	–	–	–	–
				2	3.142	250	1500	3000	2.64	158	211	264	528	660	1056	1320	1980	2376	2508	–
4	12.566	250	950	1-1/2	1.767	250	1500	3000	7.11	427	569	711	1422	1778	2845	–	–	–	–	–
				2	3.142	250	1500	3000	4.00	240	320	400	800	1000	1600	2000	3000	–	–	–
				2-1/2	4.909	250	1100	3000	2.56	154	205	256	512	640	1024	1280	1920	2304	2432	–
5	19.634	250	900	1-1/2	1.767	250	1500	3000	11.11	667	889	1111	2222	2778	–	–	–	–	–	–
				2	3.142	250	1500	3000	6.25	375	500	625	1250	1562	2500	–	–	–	–	–
				2-1/2	4.909	250	1100	3000	4.00	240	320	400	800	1000	1600	2000	3000	–	–	–
				3-1/4	8.296	250	1350	3000	2.37	142	189	237	473	592	947	1183	1775	2130	–	–
6	28.274	200	750	2	3.142	250	1500	3000	9.00	540	720	900	1800	2250	–	–	–	–	–	–
				2-1/2	4.909	250	1100	3000	5.76	346	461	576	1152	1440	2304	2880	–	–	–	–
				3-1/4	8.296	250	1350	3000	3.41	204	273	341	682	852	1363	1704	2556	–	–	–
				4	12.566	250	950	3000	2.25	135	180	225	450	563	900	1125	1688	–	–	–
8	50.264	200	500	2	3.142	250	1500	3000	16.00	960	1280	1600	–	–	–	–	–	–	–	–
				2-1/2	4.909	250	1100	3000	10.24	614	819	1024	2048	2560	–	–	–	–	–	–
				3-1/4	8.296	250	1350	3000	6.06	364	485	606	1212	1515	2424	–	–	–	–	–
				4	12.566	250	950	3000	4.00	240	320	400	800	1000	1600	2000	–	–	–	–
				5	19.634	250	900	3000	2.56	154	205	256	512	640	1024	1280	–	–	–	–
10	78.538	200	400	2-1/2	4.909	250	1100	3000	16.00	960	1280	1600	–	–	–	–	–	–	–	–
				3-1/4	8.296	250	1350	3000	9.47	568	757	947	1893	2367	–	–	–	–	–	–
				4	12.566	250	950	3000	6.25	375	500	625	1250	1563	2500	–	–	–	–	–
				5	19.634	250	900	3000	4.00	240	320	400	800	1000	1600	–	–	–	–	–
				6	28.274	250	750	3000	2.78	167	222	278	556	694	1111	–	–	–	–	–
12	113.094	200	400	3-1/4	8.296	250	1350	3000	13.63	818	1091	1363	2726	–	–	–	–	–	–	–
				4	12.566	250	950	3000	9.00	540	720	900	1800	2250	–	–	–	–	–	–
				5	19.634	250	900	3000	5.76	346	461	576	1152	1440	2304	–	–	–	–	–
				6	28.274	250	750	3000	4.00	240	320	400	800	1000	1600	–	–	–	–	–
				8	50.264	250	500	3000	2.25	135	180	225	450	563	900	–	–	–	–	–
14	153.934	200	400	4	12.566	250	950	3000	12.25	735	980	1225	2450	–	–	–	–	–	–	–
				5	19.634	250	900	3000	7.84	470	627	784	1568	1960	–	–	–	–	–	–
				6	28.274	250	750	3000	5.44	327	436	544	1089	1361	2178	–	–	–	–	–
				8	50.264	250	500	3000	3.06	184	245	306	613	766	1225	–	–	–	–	–

NOTE: When output pressures are not shown, either output pressure has exceeded rating of 3000 PSI at output cylinder or input pressure has exceeded rating of input cylinder.
A = AIR
L = LOW PRESSURE HYDRAULIC
H = HIGH PRESSURE HYDRAULIC

GENERAL INFORMATION

NOPAK air-oil tanks are used as a simple economical method to supply a make up source of oil to any hydraulic circuit. Mounting the tank in a vertical position above the circuit that is being supplied, automatically bleeds the entire circuit system. The air supply to the air over oil tank is supplied by the same shop air source that provides low pressure power to the booster. In addition, air-oil tanks offer a means of smooth hydraulic speed control.

DESIGN FEATURES:

- Baffles on either end of the tank to reduce turbulence caused by rapid intake of air and discharge of oil causing aeration, whirlpooling and foaming.
- Replaceable sight gauge mounted in heads on the tank side. The transparent plastic sight tube clearly shows oil levels in the tank and is compatible with most hydraulic fluids.
- Large pipe ports enable the quick filling or draining of the tank. Aluminum heads are standard for tank diameters of 3-1/4" through 8". Otherwise steel Class 6 inventoried stock of 3-1/4" diameter through 14" diameters modified for added ports plus aluminum tubes are standard stock.

NOTE:

Tanks are also available with glass wound filament fiberglass tubing. Because it is translucent, it provides a visual oil level indication. This eliminates the use of a sight gauge. Fiberglass tubing has the highest strength to weight ratio commercially available. It has a higher resistance for high impact and dents than brass or aluminum tubing. Corrosion resistant to a wide range of chemicals, acids, high moisture and other severe conditions make for a trouble-free operation in most environments. NOPAK can economically supply you with either tank depending on your choice preference or specification.

HOW TO SELECT THE CORRECT SIZED AIR-OIL TANK

1. Determine the bore diameter and stroke of the work cylinder.
2. Calculate the cubic inch oil displacement of work cylinder by multiplying the piston square inch area times the stroke in inches. (Use Class 6 Section, page 137, "TABLE B – VOLUME OF OIL PER 12" OF STROKE" for piston square inch area for ready reference.) Your determination will result in the cubic inch displacement volume requirement needed to select an air-oil tank.

EXAMPLE:

Work cylinder has a 4" diameter bore with 15" long stroke.

From the Class 6 Section, page 137:

12.56 sq. in. area 4" bore
x 15" stroke length

188.4 cu. in. displacement volume needed.

See the tank selector chart below to select proper choice. Select a bore-height combination that has a capacity closest to, but larger than 188.4 cu. in. Your options are the 4" diameter bore with a 21" long tank length or the 5" bore with a 14" tank length or a 6" bore with an 11" tank length.

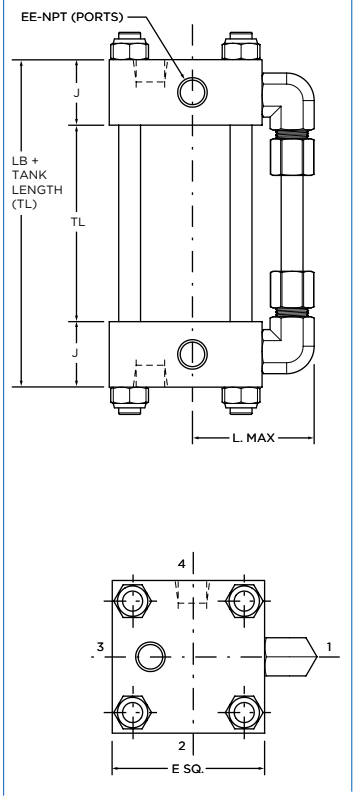
Economics recommends that your selection be the smaller 4" diameter bore with the 21" long tank length. This of course is predicated on available space. The smaller bore tanks are generally less costly than larger bores. Exceptions to this are the booster-tank combination, which then makes your selection to be that the tank diameter be the same diameter as the booster. Next selection would be the type of mount applicable to your requirements. See the chart on opposite page for selection and dimensions. NOPAK offers Models H, S, T, TB, and AP as a standard. However, other mounting styles can be selected from the Class 6 Section. When boosters and air-oil tanks are ordered, specify whether air-oil tanks should be separate or integral. It is assumed that air-oil tanks are to be separate unless specified.

Please consult the NOPAK Sales office or your nearest NOPAK representative for additional information.

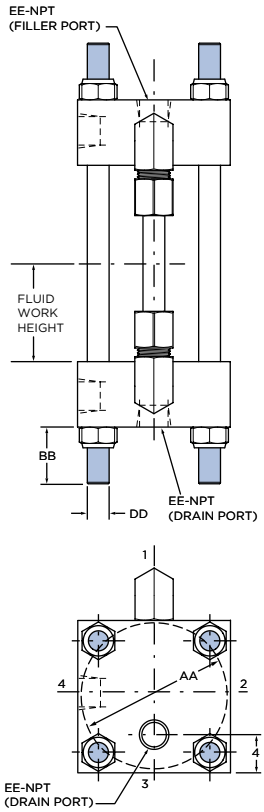
TANK SELECTOR CHART

TANK VOLUME IN CUBIC INCHES																					
TANK BORE (INCHES)	TL – TANK LENGTH IN INCHES																				
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
3-1/4	21	25	32	35	44	51	58	66	73	80	88	95	102	109	116	124	131	139	146	153	160
4	31	38	48	56	67	78	88	100	111	122	133	144	155	166	176	188	199	210	221	232	242
5	49	59	76	88	105	122	137	157	174	191	208	225	243	260	273	294	311	328	346	363	378
6	70	85	109	127	152	176	198	226	250	275	300	325	349	374	396	424	448	473	498	523	544
8	126	151	195	226	270	314	352	402	446	490	534	578	622	666	704	754	798	841	885	929	968
10	196	236	304	353	422	490	550	628	697	765	834	903	971	1040	1100	1178	1246	1315	1384	1453	1512
12	283	339	438	509	607	706	792	904	1003	1102	1201	1300	1399	1498	1583	1696	1795	1894	1993	2092	2177
14	385	462	597	692	827	962	1078	1231	1366	1500	1635	1770	1905	2039	2155	2309	2443	2578	2713	2847	2963
Fluid Working Height In.	2-1/2	3	3-7/8	4-1/2	5-3/8	6-1/4	7	8	8-7/8	9-3/4	10-3/8	11-1/2	12-3/8	13-1/4	14	15	15-7/8	16-3/4	17-5/8	18-1/2	19-1/4

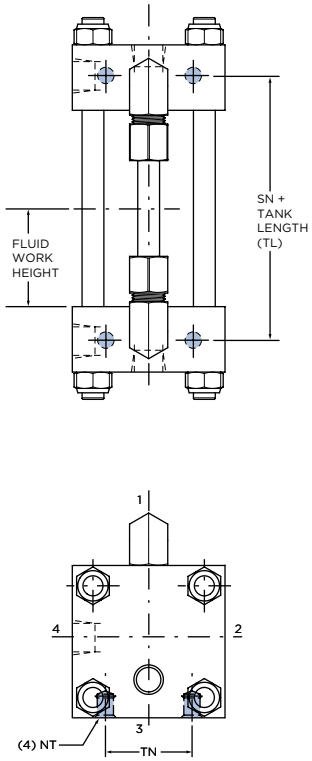
MODEL H



MODEL T-TB
(NFPA STD. STYLE MX1 & MX2)



MODEL S
(NFPA STD. STYLE MS4)



MODEL AP
(NFPA STD. STYLE MS1)

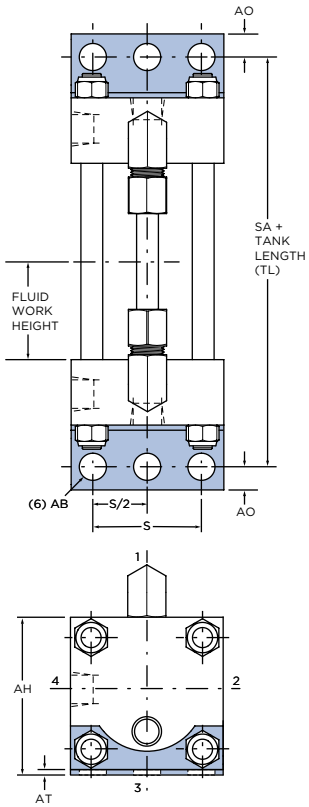


Table 1

• = Dimension refers to bolt diameter.

TANK BORE (INCHES)	E	J	U	S	L	AA	AB•	AT	AH	AO	BB	DD	EE	LB	NT	SA	SN	TN
3-1/4	3-3/4	1-1/4	1-3/8	2-3/4	3-1/4	4.00	1/2	2	1/2	1/8	1-3/8	7/16–20	1/2	2-1/2	1/2–13	5	1-3/8	1-1/2
4	4-1/2	1-1/4	1-5/8	3-1/2	3-5/8	4.75	1/2	2-1/4	1/2	1/8	1-3/8	7/16–20	1/2	2-1/2	1/2–13	5	1-3/8	2-1/16
5	5-1/2	1-1/4	2	4-1/4	4-1/8	5.80	5/8	2-3/4	5/8	3/16	1-3/4	1/2–20	1/2	2-1/2	5/8–11	5-1/4	1-3/8	2-11/16
6	6-1/2	1-1/2	2-1/4	5-1/4	4-5/8	6.90	3/4	3-1/4	5/8	3/16	1-3/4	9/16–18	3/4	3	3/4–10	5-3/4	1-5/8	3-1/4
8	8-1/2	1-1/2	3	7-1/8	5-5/8	9.10	3/4	4-1/4	11/16	1/4	2-1/4	5/8–18	3/4	3	3/4–10	6-5/8	1-5/8	4-1/2
10	10-5/8	2	3-1/4	8-7/8	6-3/4	11.30	1	5-5/16	7/8	1/4	2-5/8	3/4–16	1	4	1–8	8-1/4	2	5-1/2
12	12-3/4	2	3-3/4	11	7-3/4	13.31	1	6-3/8	7/8	3/8	2-11/16	3/4–16	1	4	1–8	8-1/4	2	7-1/4
14	14-3/4	2-1/4	3-7/8	12-5/8	8-3/4	15.40	1-1/4	7-3/8	1-1/16	3/8	3-3/16	7/8–14	1-1/4	4-1/2	1-1/4–7	9-3/8	2-3/8	8-3/8