# AIR-FLOW
## BASICS

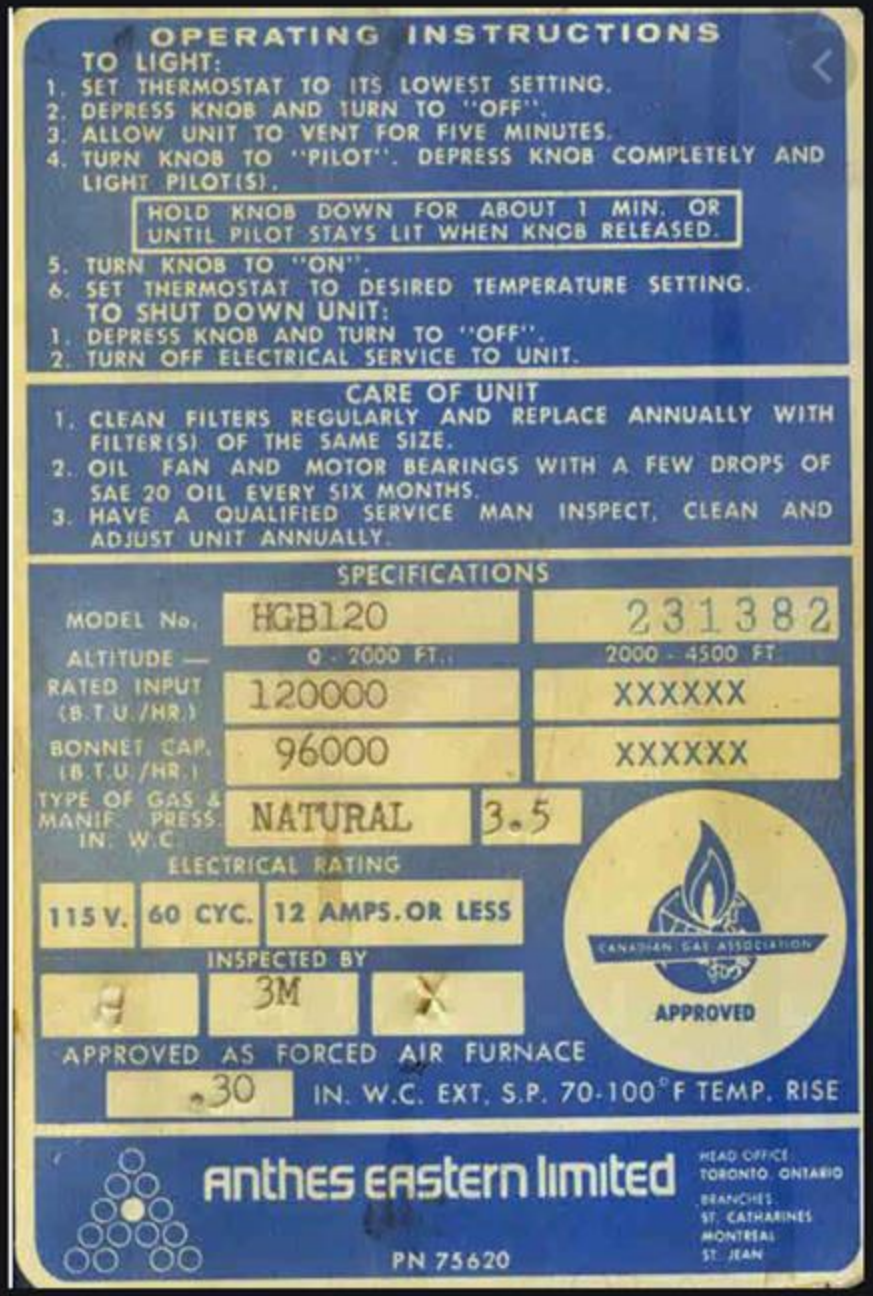
# WHAT IS T.E.S.P ?

TOTAL EXTERNAL STATIC PRESSURE

IT IS THE “PRESSURE” OF THE SYSTEM THAT IS EXERTED ON THE BLOWER WHEEL.

THIS INCLUDES, EVAPORATOR, FILTER, DUCTWORK, AND REGISTERS

ESP HELPS US TO DETERMINE THE “VOLUME” OF AIR BEING MOVED, CFM.



## OPERATING INSTRUCTIONS

TO LIGHT:

1. SET THERMOSTAT TO ITS LOWEST SETTING.
2. DEPRESS KNOB AND TURN TO "OFF".
3. ALLOW UNIT TO VENT FOR FIVE MINUTES.
4. TURN KNOB TO "PILOT". DEPRESS KNOB COMPLETELY AND LIGHT PILOT(S).

HOLD KNOB DOWN FOR ABOUT 1 MIN. OR UNTIL PILOT STAYS LIT WHEN KNOB RELEASED.

5. TURN KNOB TO "ON".
6. SET THERMOSTAT TO DESIRED TEMPERATURE SETTING.

TO SHUT DOWN UNIT:

1. DEPRESS KNOB AND TURN TO "OFF".
2. TURN OFF ELECTRICAL SERVICE TO UNIT.

## CARE OF UNIT

1. CLEAN FILTERS REGULARLY AND REPLACE ANNUALLY WITH FILTER(S) OF THE SAME SIZE.
2. OIL FAN AND MOTOR BEARINGS WITH A FEW DROPS OF SAE 20 OIL EVERY SIX MONTHS.
3. HAVE A QUALIFIED SERVICE MAN INSPECT, CLEAN AND ADJUST UNIT ANNUALLY.

## SPECIFICATIONS

| | | |
|---|---|---|
| MODEL No. | HGB120 | 231382 |
| ALTITUDE — | 0 - 2000 FT. | 2000 - 4500 FT. |
| RATED INPUT (B.T.U./HR.) | 120000 | XXXXXX |
| BONNET CAP. (B.T.U./HR.) | 96000 | XXXXXX |
| TYPE OF GAS & MANIF. PRESS. IN. W.C. | NATURAL | 3.5 |

ELECTRICAL RATING

115 V. | 60 CYC. | 12 AMPS. OR LESS

INSPECTED BY

A | 3M | X

CANADIAN GAS ASSOCIATION APPROVED

APPROVED AS FORCED AIR FURNACE

.30 IN. W.C. EXT. S.P. 70-100° F TEMP. RISE

anthes eastern limited

HEAD OFFICE TORONTO, ONTARIO
BRANCHES ST. CATHARINES MONTREAL ST. JEAN

PN 75620

Model Number 58STX045- - - 16112

Serial Number 4115A19439

ANSI Z21.47 - 2012 / CSA 2.3 - 2012
Gas-Fired Central Furnaces

Carrier Corporation
7310 West Morris Street
Indianapolis, IN 46231

| | |
|---|---|
| PRODUCT | 58STX045- - - 16112 |
| MODEL | 58STX045-12 |
| SERIES | 6 |
| SERIAL | 4115A19439 |
| DATE OF MANUFACTURE | OCT 2015 |

AHRI CERTIFIED - www.ahridirectory.org

| | |
|---|---|
| MAX. UNIT AMPS | 7.2 |
| BLOWER H.P. | 1/3 |
| FORCE | 249 |

NATURAL GAS
FACTORY ORIFICE 43

115 VOLTS / 60 HZ / 1 PHASE

| | | HEAT STAGE | – | – |
|---|---|---|---|---|
| INPUT | UPFLOW BTU/HR | | 44,000 | – |
| | DNFLO/HORIZ BTU/HR | | 42,000 | – |
| OUTPUT | UPFLOW BTU/HR | | 36,000 | – |
| | DNFLO/HORIZ BTU/HR | | 34,000 | – |
| AIR TEMPERATURE RISE | DEG. F | | 20 – 50 | – |
| | DEG. C | | 11 – 28 | – |
| DESIGN MAX. OUTLET AIR TEMPERATURE | DEG. F | | 150 | – |
| | DEG. C | | 71 | – |

| | IN WC/POCE | KPa |
|---|---|---|
| MAX. HEATING EXT. STATIC PRESSURE. | 0.5 | 0.125 |
| MAX. INLET GAS PRESS. | 13.8 | 3.39 |
| MIN. INLET GAS PRESS. | 4.5 | 1.12 |

(FOR PURPOSE OF INPUT ADJUSTMENT)

| | | | | |
|---|---|---|---|---|
| MANIFOLD PRESSURE | ALTITUDE | – | 3.2 – 3.8 | 0.80 – 0.95 |
| | 0 – 2000 FT. 0 – 610 m | – | – | – |
| | 2,000 – 10,000 FT. REFER TO INSTALLATION MANUAL 610 – 3050 m | | | |

CATEGORY I FORCED AIR FURNACE

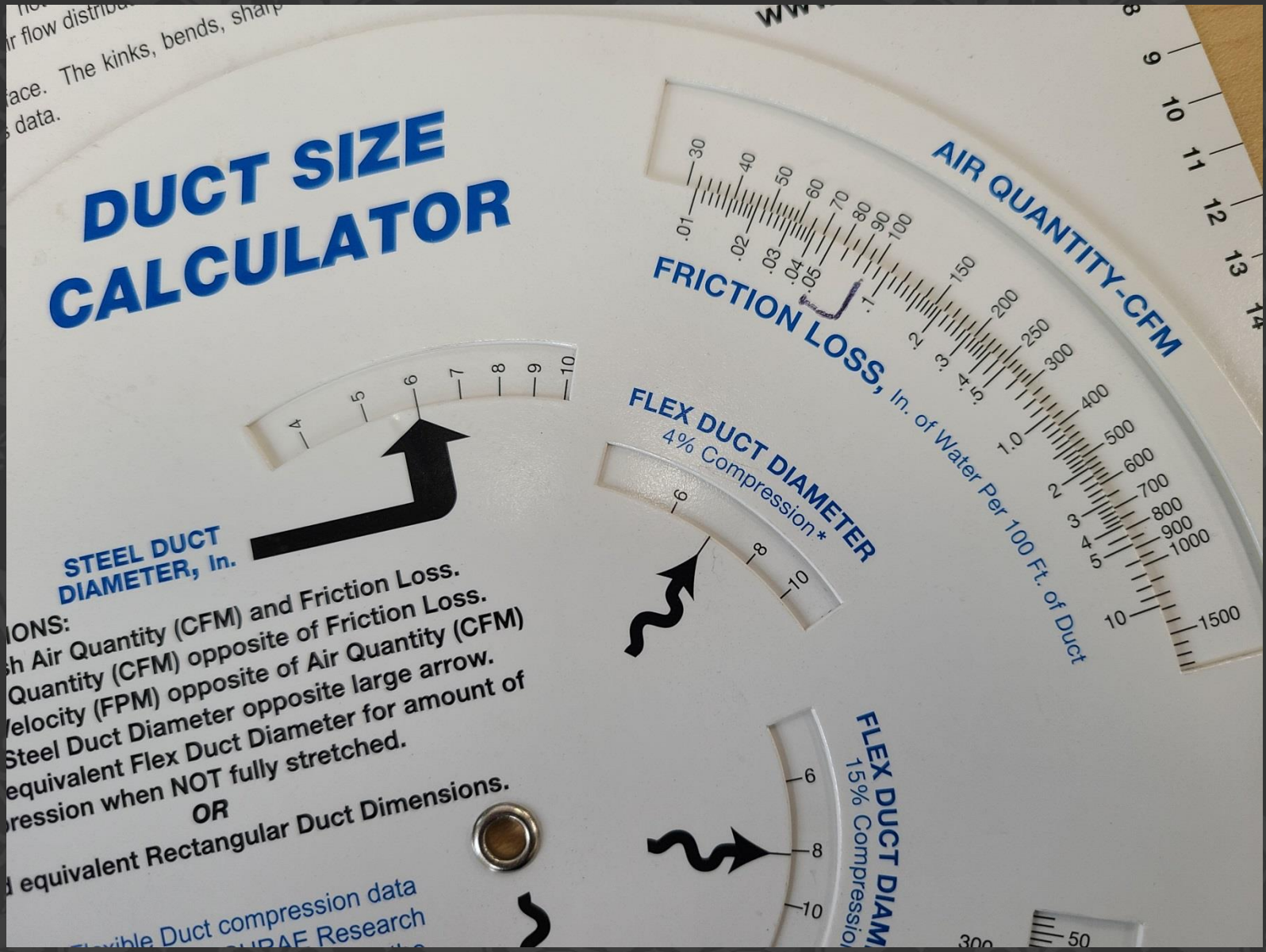
FACTORY AUTHORIZED GAS CONVERSION KITS

| | |
|---|---|
| NATURAL GAS TO PROPANE | KGBNP500115SP |
| PROPANE TO NATURAL GAS | KGBPN420115SP |
| CHIMNEY ADAPTER | KGACA0204IFC |

NOTE: Furnace gas input rate on rating plate is for installations up to 2000 ft. above sea level. In U.S.A., the input rating for altitudes above 2000 ft. must be derated by 4% for each 1000 ft. above sea level.

312 × 800

| | SCFM | 600 | 700 | 800 | 900 | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA*F3030A6* | Wet | 0.151 | 0.173 | 0.204 | 0.238 | 0.267 | 0.281 | 0.326 | 0.380 | 0.406 | 0.451 | --- |
| | Dry | 0.069 | 0.083 | 0.117 | 0.132 | 0.148 | 0.183 | 0.206 | 0.239 | 0.290 | 0.338 | --- |
| CA*F3030B6* | Wet | 0.090 | 0.120 | 0.150 | 0.180 | 0.210 | 0.240 | 0.280 | 0.330 | 0.370 | 0.420 | --- |
| | Dry | 0.080 | 0.100 | 0.130 | 0.150 | 0.180 | 0.210 | 0.250 | 0.280 | 0.320 | 0.360 | --- |
| CA*F3030C6* | Wet | 0.071 | 0.087 | 0.120 | 0.134 | 0.155 | 0.180 | 0.209 | 0.249 | 0.284 | 0.328 | --- |
| | Dry | 0.050 | 0.067 | 0.098 | 0.113 | 0.135 | 0.169 | 0.189 | 0.213 | 0.245 | 0.275 | --- |
| CA*F3030D6* | Wet | 0.069 | 0.078 | 0.090 | 0.108 | 0.136 | 0.168 | 0.206 | 0.244 | 0.288 | 0.337 | --- |
| | Dry | 0.029 | 0.043 | 0.070 | 0.082 | 0.098 | 0.125 | 0.141 | 0.153 | 0.177 | 0.200 | --- |


DUCT SIZE CALCULATOR
AIR QUANTITY-CFM
FRICTION LOSS, In. of Water Per 100 Ft. of Duct
.01 .02 .03 .04 .05 .1 .2 .3 .4 .5 1.0 2 3 4 5 10
30 40 50 60 70 80 90 100 150 200 250 300 400 500 600 700 800 900 1000 1500
FLEX DUCT DIAMETER
4% Compression*
6 8 10
FLEX DUCT DIAM
15% Compressio
6 8 10
STEEL DUCT DIAMETER, In.
4 5 6 7 8 9 10
ONS:
h Air Quantity (CFM) and Friction Loss.
Quantity (CFM) opposite of Friction Loss.
Velocity (FPM) opposite of Air Quantity (CFM)
Steel Duct Diameter opposite large arrow.
equivalent Flex Duct Diameter for amount of
ression when NOT fully stretched.
OR
d equivalent Rectangular Duct Dimensions.
Duct compression data
RAE Research
8 9 10 11 12 13 14
300
50

# 661 & A661 2-Way Supply Register (Page 19)

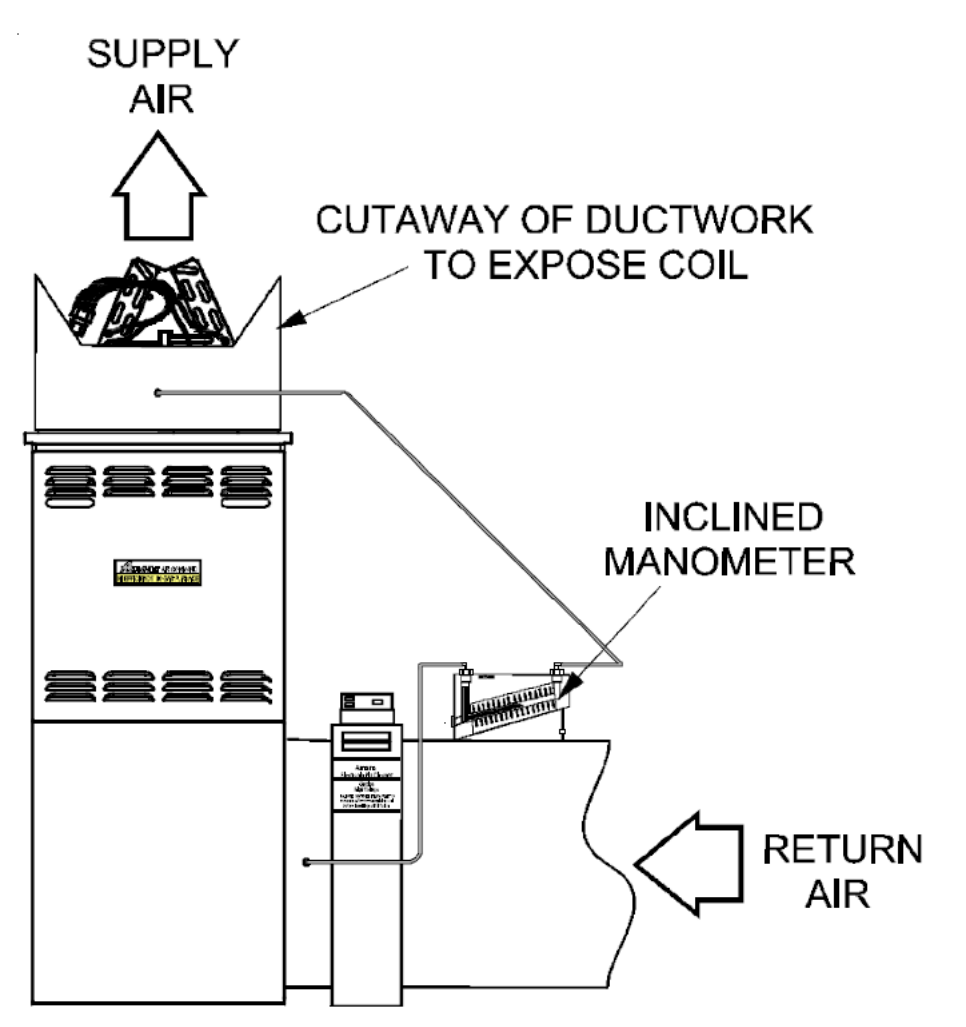
| Face Velocity | | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|---|---|---|---|---|---|---|---|---|---|
| Pressure Loss | | .006 | .010 | .016 | .022 | .031 | .040 | .050 | .062 |
| 6 x 4 | CFM | 25 | 30 | 40 | 50 | 55 | 65 | 70 | 80 |
| Ak .080 | Throw | 4.0 | 4.5 | 6.0 | 7.0 | 8.5 | 10.0 | 11.0 | 12.5 |
| 8 x 4 | CFM | 35 | 45 | 55 | 65 | 75 | 90 | 100 | 110 |
| Ak .110 | Throw | 4.5 | 5.5 | 7.0 | 8.5 | 10.0 | 11.5 | 13.0 | 14.5 |
| 10 x 4 and 8 x 5 | CFM | 45 | 60 | 75 | 85 | 100 | 115 | 130 | 145 |
| Ak .145 | Throw | 5.0 | 6.5 | 8.0 | 9.5 | 11.5 | 13.0 | 14.5 | 16.0 |
| 12 x 4 and 8 x 6 | CFM | 55 | 70 | 90 | 110 | 125 | 145 | 160 | 180 |
| Ak .180 | Throw | 5.5 | 7.0 | 9.0 | 10.5 | 12.5 | 14.0 | 16.0 | 18.0 |
| 14 x 4 | CFM | 65 | 85 | 110 | 130 | 150 | 170 | 195 | 215 |
| Ak .215 | Throw | 6.0 | 7.5 | 9.5 | 11.5 | 13.5 | 15.5 | 17.0 | 19.0 |
| 10 x 6 and 12 x 5 | CFM | 75 | 100 | 125 | 145 | 170 | 195 | 220 | 245 |
| Ak .245 | Throw | 6.0 | 8.0 | 10.0 | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 |
| 12 x 6 and 14 x 5 | CFM | 90 | 120 | 150 | 175 | 205 | 235 | 265 | 295 |
| Ak .295 | Throw | 6.5 | 8.5 | 11.0 | 13.0 | 15.5 | 17.5 | 19.5 | 22.0 |
| 10 x 8 | CFM | 105 | 140 | 175 | 205 | 240 | 275 | 310 | 345 |
| Ak .345 | Throw | 7.0 | 9.0 | 11.5 | 13.5 | 16.5 | 18.5 | 21.0 | 23.5 |
| 14 x 6 | CFM | 110 | 145 | 180 | 215 | 250 | 290 | 325 | 360 |
| Ak .360 | Throw | 7.0 | 9.5 | 12.0 | 14.0 | 16.5 | 19.0 | 21.5 | 24.0 |

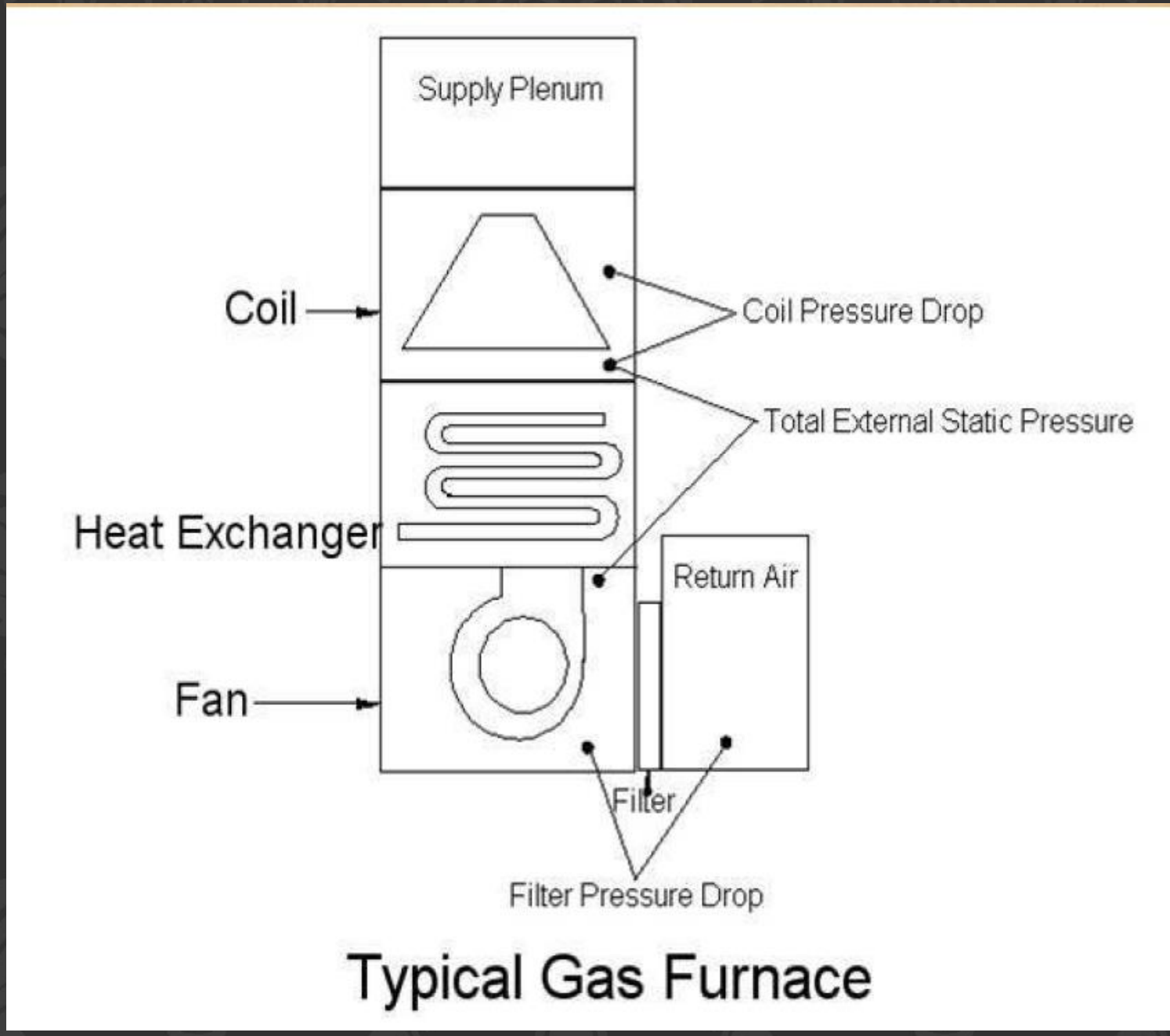
Terminal Velocity of 75 FPM

## Pre-Pleat® 40 LPD Capacities & Dimensions

| Nominal Depth | Nominal Size WxHxD | Standard Capacity | | | | Media Area | Wt. Each | High Capacity | | | | Media Area | Wt. Each |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 300 FPM | | 500 FPM | | | | 300 FPM | | 500 FPM | | | |
| (in.) | (in.) | CFM | PD | CFM | PD | (sq. ft.) | (lbs.) | CFM | PD | CFM | PD | (sq. ft.) | (lbs.) |
| 1" | 12x24x1 | 600 | 0.17 | 1000 | - | 3.2 | 0.3 | 600 | 0.15 | 1000 | - | 3.7 | 0.4 |
| | 14x20x1 | 583 | 0.17 | 972 | - | 3.3 | 0.3 | 583 | 0.15 | 972 | - | 3.7 | 0.4 |
| | 14x25x1 | 729 | 0.17 | 1215 | - | 4.1 | 0.4 | 729 | 0.15 | 1215 | - | 4.6 | 0.5 |
| | 16x20x1 | 667 | 0.17 | 1111 | - | 3.7 | 0.4 | 667 | 0.15 | 1111 | - | 4.1 | 0.4 |
| | 16x25x1 | 833 | 0.17 | 1389 | - | 4.6 | 0.5 | 833 | 0.15 | 1389 | - | 5.2 | 0.5 |
| | 18x24x1 | 900 | 0.17 | 1500 | - | 4.9 | 0.5 | 900 | 0.15 | 1500 | - | 5.7 | 0.6 |
| | 18x25x1 | 938 | 0.17 | 1563 | - | 5.2 | 0.5 | 938 | 0.15 | 1563 | - | 5.9 | 0.6 |
| | 20x20x1 | 833 | 0.17 | 1389 | - | 4.5 | 0.5 | 833 | 0.15 | 1389 | - | 5.1 | 0.5 |
| | 20x24x1 | 1000 | 0.17 | 1667 | - | 5.4 | 0.5 | 1000 | 0.15 | 1667 | - | 6.2 | 0.6 |
| | 20x25x1 | 1042 | 0.17 | 1736 | - | 5.7 | 0.6 | 1042 | 0.15 | 1736 | - | 6.4 | 0.6 |
| | 24x24x1 | 1200 | 0.17 | 2000 | - | 6.4 | 0.6 | 1200 | 0.15 | 2000 | - | 7.4 | 0.7 |
| | 25x25x1 | 1302 | 0.17 | 2170 | - | 7.2 | 0.7 | 1302 | 0.15 | 2170 | - | 8.3 | 0.8 |
| 2" | 12x24x2 | 600 | 0.10 | 1000 | 0.20 | 5.8 | 0.6 | 600 | 0.09 | 1000 | 0.19 | 8.7 | 0.6 |
| | 14x20x2 | 583 | 0.10 | 972 | 0.20 | 5.8 | 0.5 | 583 | 0.09 | 972 | 0.19 | 8.6 | 0.6 |
| | 14x25x2 | 729 | 0.10 | 1215 | 0.20 | 7.2 | 0.7 | 729 | 0.09 | 1215 | 0.19 | 10.8 | 0.8 |
| | 16x20x2 | 667 | 0.10 | 1111 | 0.20 | 6.7 | 0.6 | 667 | 0.09 | 1111 | 0.19 | 9.6 | 0.7 |
| | 16x25x2 | 833 | 0.10 | 1389 | 0.20 | 8.4 | 0.7 | 833 | 0.09 | 1389 | 0.19 | 12.0 | 0.9 |
| | 18x24x2 | 900 | 0.10 | 1500 | 0.20 | 8.7 | 0.8 | 900 | 0.09 | 1500 | 0.19 | 13.3 | 0.9 |
| | 18x25x2 | 938 | 0.10 | 1563 | 0.20 | 9.0 | 0.8 | 938 | 0.09 | 1563 | 0.19 | 13.8 | 1.0 |
| | 20x20x2 | 833 | 0.10 | 1389 | 0.20 | 8.2 | 0.7 | 833 | 0.09 | 1389 | 0.19 | 12.0 | 0.9 |
| | 20x24x2 | 1200 | 0.10 | 2000 | 0.20 | 9.8 | 0.9 | 1200 | 0.09 | 2000 | 0.19 | 14.4 | 1.0 |
| | 20x25x2 | 1042 | 0.10 | 1736 | 0.20 | 10.2 | 0.9 | 1042 | 0.09 | 1736 | 0.19 | 15.0 | 1.1 |
| | 24x24x2 | 1200 | 0.10 | 2000 | 0.20 | 11.5 | 1.0 | 1200 | 0.09 | 2000 | 0.19 | 17.3 | 1.2 |
| 4" | 12x24x4 | 600 | 0.07 | 1000 | 0.14 | 11.1 | 1.0 | 600 | 0.06 | 1000 | 0.12 | 16.5 | 1.0 |
| | 16x20x4 | 667 | 0.07 | 1111 | 0.14 | 12.3 | 1.0 | 667 | 0.06 | 1111 | 0.12 | 18.0 | 1.2 |
| | 16x25x4 | 833 | 0.07 | 1389 | 0.14 | 15.5 | 1.3 | 833 | 0.06 | 1389 | 0.12 | 22.6 | 1.4 |
| | 18x24x4 | 900 | 0.07 | 1500 | 0.14 | 17.3 | 1.4 | 900 | 0.06 | 1500 | 0.12 | 24.2 | 1.5 |
| | 20x20x4 | 833 | 0.07 | 1389 | 0.14 | 15.4 | 1.3 | 833 | 0.06 | 1389 | 0.12 | 22.3 | 1.4 |
| | 20x24x4 | 1000 | 0.07 | 1667 | 0.14 | 18.6 | 1.5 | 1000 | 0.06 | 1667 | 0.12 | 24.0 | 1.7 |
| | 20x25x4 | 1042 | 0.07 | 1736 | 0.14 | 19.3 | 1.6 | 1042 | 0.06 | 1736 | 0.12 | 27.7 | 1.8 |

# HOW DO I MEASURE IT ?






Typical Gas Furnace

# WHY IS MEASURING ESP SOO IMPORTANT ?

**PRODUCT SPECIFICATIONS** — **Gas Furnace: G96VTN**

**PHYSICAL DATA**

| **Heating Capacity and Efficiency** | | | **0401410** | **0401712** | **0601412** | **0601714** | **0801716** | **0802120** | **1002120** | **1002122** | **1202422** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Input | High Heat | (BTUH) | 40,000 | 40,000 | 60,000 | 60,000 | 80,000 | 80,000 | 100,000 | 100,000 | 120,000 |
| | Low Heat | (BTUH) | 26,000 | 26,000 | 39,000 | 39,000 | 52,000 | 52,000 | 65,000 | 65,000 | 78,000 |
| Output | High Heat | (BTUH) | 39,000 | 39,000 | 58,000 | 58,000 | 78,000 | 78,000 | 97,000 | 97,000 | 117,000 |
| | Low Heat | (BTUH) | 25,000 | 25,000 | 38,000 | 38,000 | 50,000 | 51,000 | 63,000 | 63,000 | 76,000 |
| Certified Temperature Rise Range °F (°C) | | High Heat | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) | 40 – 70 (22 – 39) |
| | | Low Heat | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) | 30 – 60 (17 – 33) |
| **Airflow Capacity and Blower Data** | | | | | | | | | | | |
| Rated External Static Pressure (in. w.c.) | | Heating | 0.10 | 0.10 | 0.12 | 0.12 | 0.15 | 0.15 | 0.20 | 0.20 | 0.20 |
| | | Cooling | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Airflow Delivery @ Rated ESP (CFM) | | High Heat | 800 | 850 | 1110 | 1135 | 1450 | 1555 | 1865 | 1765 | 2120 |
| | | Low Heat | 560 | 625 | 770 | 860 | 1130 | 1200 | 1435 | 1350 | 1625 |
| | | Cooling | 1030 | 1105 | 1115 | 1475 | 1655 | 2005 | 2005 | 2275 | 2190 |
| Cooling Capacity (tons) @ 400, 350 CFM/ton | | 400 CFM/ton | 2 | 2.5 | 2.5 | 3.5 | 4 | 5 | 5 | 5.5 | 5 |
| | | 350 CFM/ton | 2.5 | 3 | 3 | 4 | 4.5 | 5.5 | 5.5 | 6 | 6 |
| Direct–Drive Motor Type | | | Electronically Commutated Motor (ECM) | | | | | | | | |
| Direct–Drive Motor HP | | | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 1 | 1 | 1 | 1 |
| Motor Full Load Amps Default / Low Amp Kit† | | | 6.30 | 6.50 | 6.30 | 10.10 | 9.20 | 13.9/10.4 | 13.9/10.4 | 10.4 | 11.7 |
| RPM Range | | | 600 – 2000 | 400 – 1200 | 600 – 2000 | 400 – 1200 | 400 – 1200 | 400 – 1200 | 400 – 1200 | 400 –1300 | 400 – 1200 |

HOW TO CALCULATE CFM USING THE:

# TEMPERATURE RISE METHOD

$$\frac{\text{HTG CAPICITY OUTPUT}}{1.1 \times \text{TEMP. DELTA}} = \text{CFM}$$

?????????????