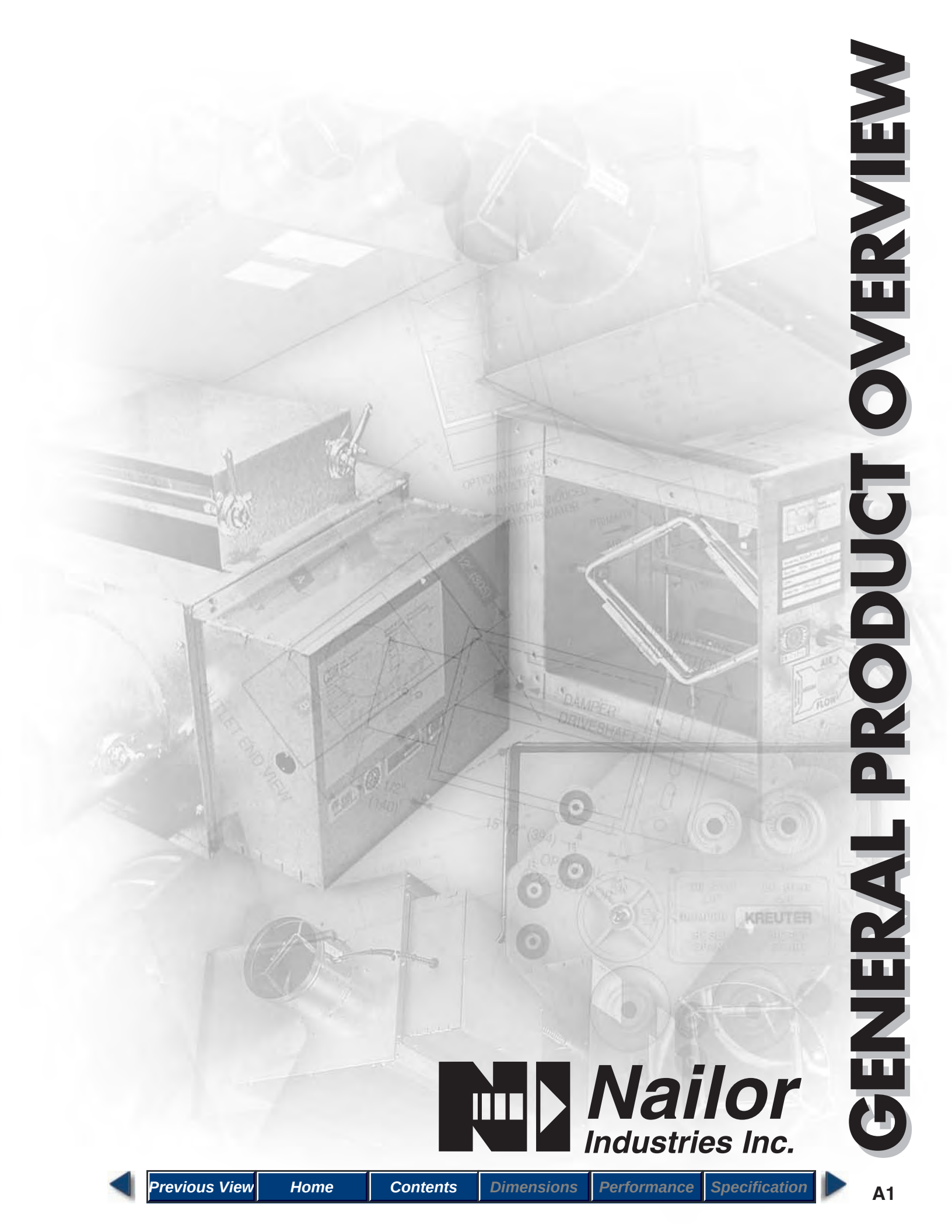


GENERAL PRODUCT OVERVIEW

Nailor Industries Inc.

Contents

NAILOR'S COMPREHENSIVE PRODUCT LINE

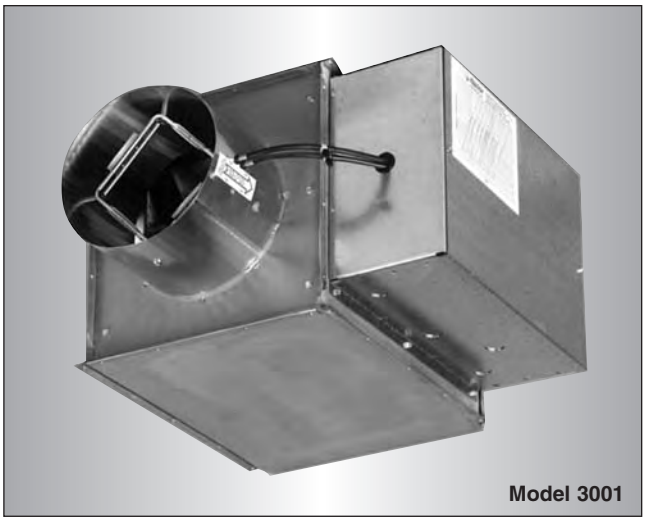
Single Duct Terminal Units

3000 Series

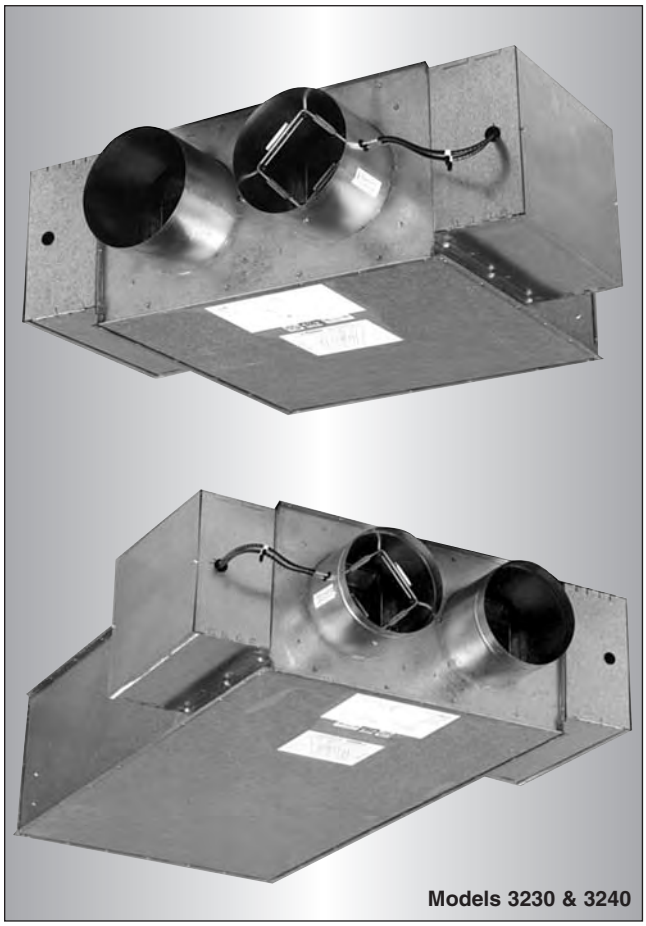
Designed for cooling only, cooling with reheat, heating only or heat/cool changeover applications.

- Available in 11 sizes. 0 – 6435 cfm (0 – 3037 l/s).
- Unit sizes 4 through 16 – up to 3730 cfm (1761 l/s), are a maximum overall height of only 12 1/2" (318). The low profile design is advantageous where ceiling space is restricted. Unit sizes 12 through 16 feature flat oval inlet collars.
- High performance inclined opposed blade damper.
- 'Diamond Flow' multi-point averaging sensor on pressure independent models.
- Pressure dependent or independent airflow control.
- Pneumatic, electric, analog electronic or digital control.
- Options include attenuators, hot water coils or integral electric coils for reheat, and various 'IAQ' linings.

Models 3001, 30RW, 30RE **See Page B3**



Model 3001



Models 3230 & 3240

Dual Duct Terminal Units

3200 Series

Designed for control of hot or neutral and cold air. Variable volume with or without mixing or constant volume applications.

- Three models. 0 – 4050 cfm (0 – 1912 l/s).
- Extra low leakage opposed blade dampers control cold and hot decks.
- 'Diamond Flow' multi-point averaging sensor.
- Mixing models include integral attenuator with internal mixing baffles to minimize downstream stratification.
- Pressure independent airflow control.
- Pneumatic, analog electronic or digital control.
- Options include total air discharge sensing and various 'IAQ' linings.

Model 3210 **See Page C3**

- For non-mixing applications.

Model 3230 **See Page C3**

- Better than 1 in 12 mixing.
- Economical compact design.
- Integral mixing attenuator.

Model 3240 "BlendMaster™" **See Page C10**

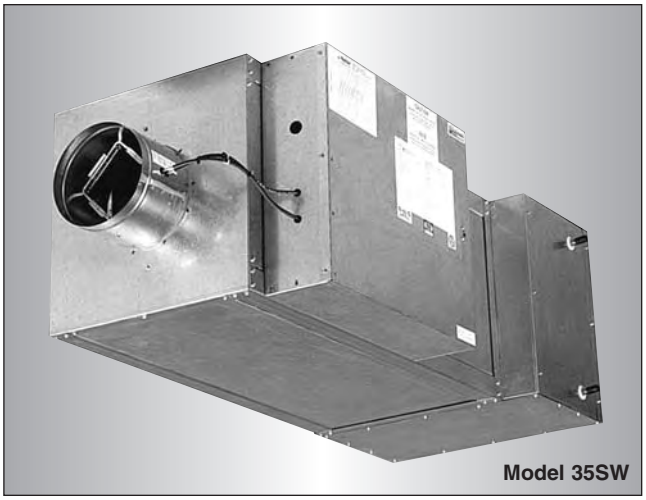
- Industry leading performance provides 1 in 30 mixing.
- Integral mixing attenuator.

Series Flow (Constant Volume) Fan Powered Terminal Units

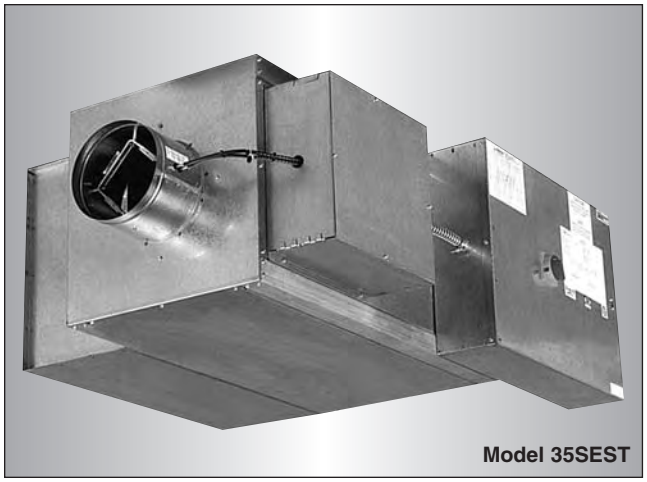
35S Series

- Quiet constant fan operation.
- Available in 6 fan sizes, each with various primary air inlet size options for optimum design flexibility. 300 – 3700 cfm (140 – 1746 l/s) flow range.
- High performance inclined opposed blade primary air damper.
- 'Diamond Flow' multi-point averaging sensor.
- Custom high efficiency PSC motor/blower design.
- Solid state fan speed controller.
- Pressure independent airflow control.
- Pneumatic, analog electronic or digital control.
- Available 'Q' option induced air attenuator.
- Options include hot water coils or integral electric coils for supplementary heat.
- Various 'IAQ' linings.
- Available with ultra-high efficiency EPIC™/ECM motor technology.

Models 35S, 35SW, 35SE **See Page D12**



Model 35SW



Model 35SEST

Super Quiet "Stealth™" Series Flow (Constant Volume) Fan Powered Terminal Units

35SST "Stealth™" Series

- Super quiet premium design. Constant fan operation.
- "Stealth™" design technology.
- Available in 6 fan sizes, each with various primary air inlet size options for optimum design flexibility. 300 – 3700 cfm (140 – 1746 l/s) flow range.
- High performance inclined opposed blade primary air damper.
- 'Diamond Flow' multi-point averaging sensor.
- Custom high efficiency PSC motor/blower design.
- Solid state fan speed controller.
- Pressure independent airflow control.
- Pneumatic, analog electronic or digital control.
- Options include hot water coils or integral electric coils for supplementary heat.
- Various 'IAQ' linings.
- Available with ultra-high efficiency EPIC™/ECM motor technology.

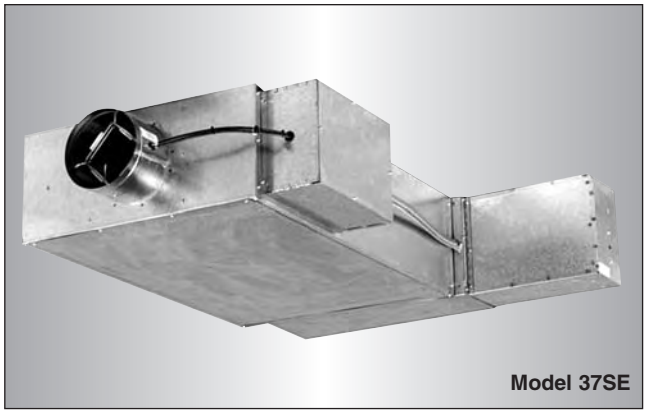
Models 35SST, 35SWST, 35SEST **See Page D23**

Low Profile Series Flow Fan Powered Terminal Units

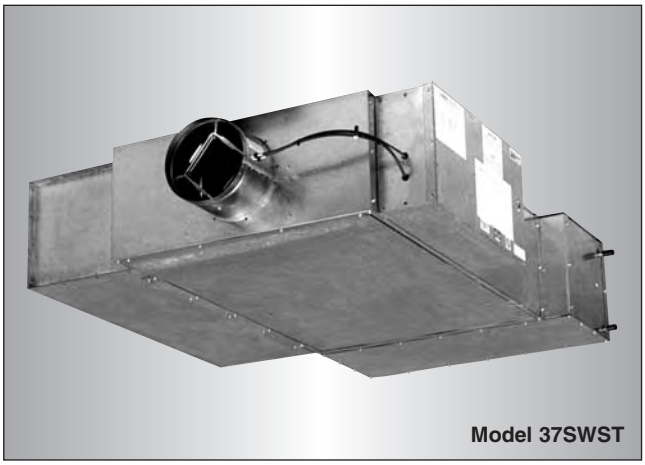
37S Series

- Only 11" (279) in height.
- Designed especially for applications where ceiling plenum space is restricted.
- Quiet constant fan operation.
- Available in 4 fan sizes, each with various primary air inlet size options for design flexibility. 300 – 2000 cfm (140 – 940 l/s) flow range.
- High performance inclined opposed blade primary air damper.
- 'Diamond Flow' multi-point averaging sensor.
- Custom high efficiency PSC motor/blower design.
- Solid state fan speed controller.
- Pressure independent airflow control.
- Pneumatic, analog electronic or digital control.
- Available 'Q' option induced air attenuator.
- Options include hot water coils or integral electric coils for supplementary heat.
- Various 'IAQ' linings.
- Available with ultra-high efficiency EPIC™/ECM motor technology.

Models 37S, 37SW, 37SE **See Page D38**



Model 37SE



Model 37SWST

Low Profile Series Flow Fan Powered Terminal Units

37SST "Stealth™" Series

Incorporates all of the features and benefits found in the 37S standard low profile terminal unit plus the following:

- Super quiet premium design.
- "Stealth™" design technology.
- Available with ultra-high efficiency EPIC™/ECM motor technology.

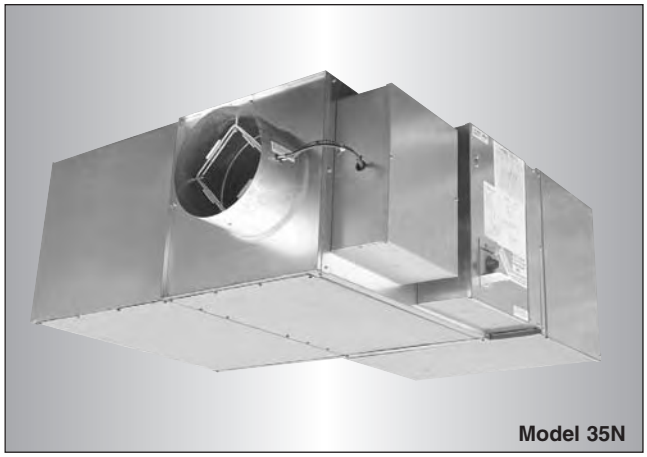
Models 37SST, 37SWST, 37SEST **See Page D48**

Parallel Flow (Variable Volume) Fan Powered Terminal Units

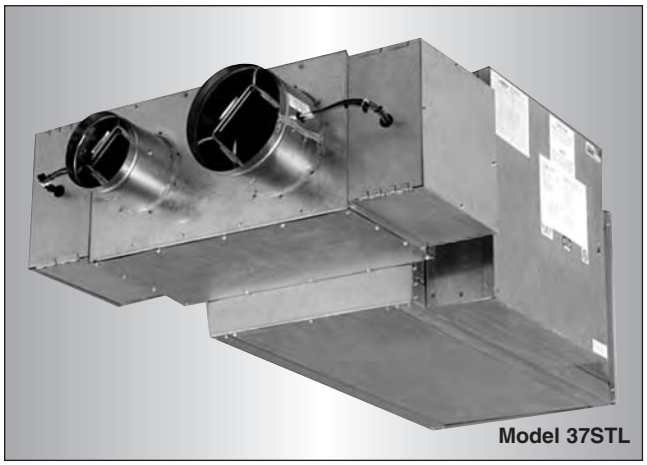
35N Series

- Quiet intermittent fan operation.
- Pressure dependent or independent airflow control.
- Available in four fan sizes, each with various primary air inlet size options for optimum design flexibility. 150 – 2100 cfm (70 – 990 l/s) flow range.
- Primary air cfm range from 0 to 4050 cfm (0 – 1911 l/s).
- 'Diamond Flow' multi-point averaging sensor on pressure independent models.
- Custom high efficiency PSC motor/blower design.
- Solid state fan speed controller.
- Pneumatic, electric, analog electronic or digital control.
- Options include hot water coils or integral electric coils for supplementary heat.
- Various 'IAQ' linings.

Models 35N, 35NW, 35NE **See Page D61**



Model 35N



Model 37STL

Series Flow (Constant Volume) Fan Powered Terminal Units With Outside Air Inlets

35STL Series and 35STLST "Stealth™" Series

Incorporates the features and benefits found in the standard fan powered terminal unit design with a dual duct inlet configuration.

- Separate outside air ventilation inlet damper is provided in addition to the main primary air valve. This second valve is configured for constant volume operation and helps ensure that minimum outside air ventilation requirements are maintained at all times independent of the main AHU operation.
- Available with ultra-high efficiency EPIC™/ECM motor technology.

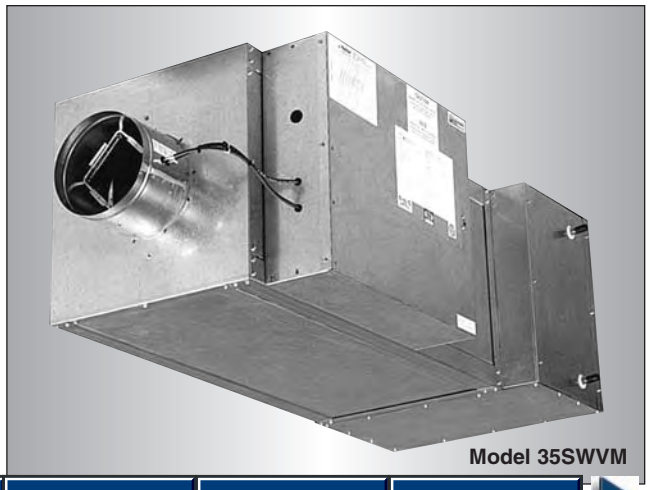
Models 35STL, 35SWTL, 35SETL, 35STLST, 35SWTLST, 35SETLST **See Page D86**

"Pressurization" Fan Powered Terminal Units

35SVM Series

- Designed especially for critical environments such as hospital isolation rooms and bio-tech applications.
- Utilizes Nailor's EPIC™/ECM fan motor technology with an ultra-high efficiency 'Brushless DC' motor to provide a pressure independent assembly.
- Maintains precise volume control and compensates for changes in external static pressure as encountered across a HEPA filter.
- Up to 1650 cfm (780 l/s) at 1" w.g. (250 Pa).

Models 35SVM, 35SWVM, 35SEVM **See Page D93**



Model 35SWVM

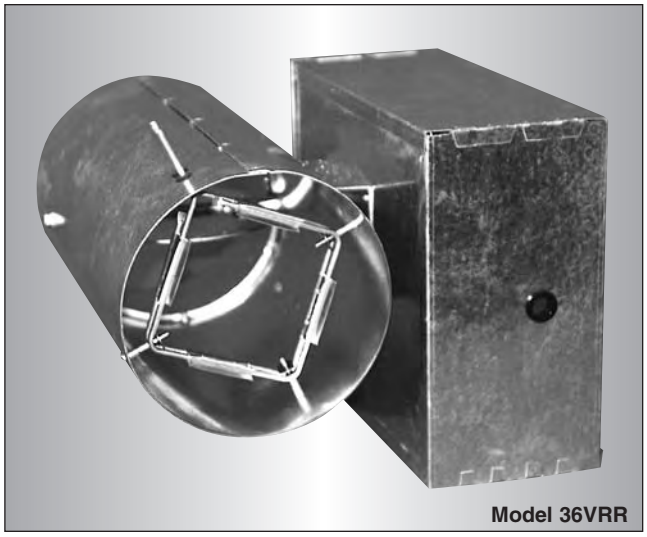
Round External Retrofit Terminal Units

36VRR Series

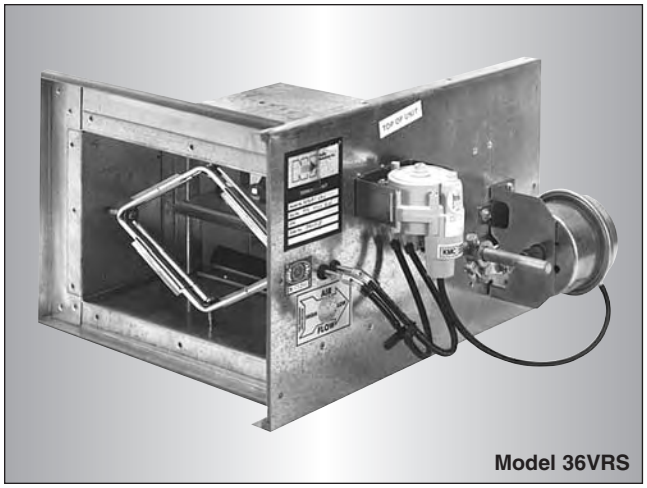
Convert existing constant volume systems or old "system powered" mechanical regulator terminals to energy efficient variable volume operation.

- Available in ten sizes to suit and install simply in round ductwork. 0 – 4050 cfm (0 – 1912 l/s).
- Various configurations custom fabricated to suit individual application.
- Pressure dependent or independent airflow control.
- 'Diamond Flow' multi-point averaging flow sensor on pressure independent models.
- Pneumatic, electric, analog electronic or digital control.

Mode 36VRR **See Page E5**



Model 36VRR



Model 36VRS

Rectangular Slide-in Retrofit Terminal Units

36VRS Series

Convert existing constant volume systems to energy efficient variable volume operation.

- Available in 13 valve sizes to handle a large range of air volumes. 0 – 15000 cfm (0 – 7080 l/s).
- Custom fabricated to suit any duct size from 5" x 5" (127 x 127) up to 52" x 26" (1321 x 660).
- 'Diamond Flow' multi-point averaging sensor.
- Pressure independent airflow control.
- Pneumatic, analog electronic or digital control.

Model 36VRS **See Page E10**

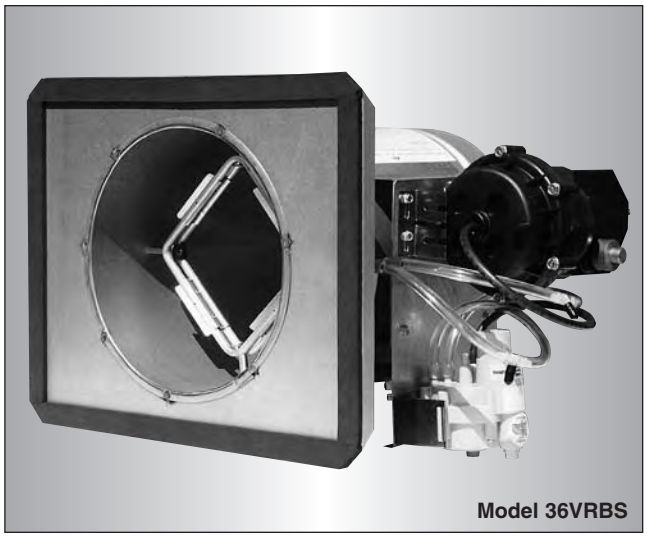
Internal Retrofit Terminal Units

36VR Series

Designed to replace the mechanical regulators in old "system powered" terminal units in order to substantially lower the operational static pressure requirement. The air valves include a damper, flow sensor and actuator and make use of state-of-the-art controls in order to reduce operating cost.

- Custom built on a specific project basis
- Variable or constant volume pressure independent airflow control.
- 'Diamond Flow' multi-point averaging flow sensor.
- Models available to retrofit most 'brand name' terminal units.
- Pneumatic, analog electronic or digital control.

Model 36VR **Contact your Nailor Sales Rep.**



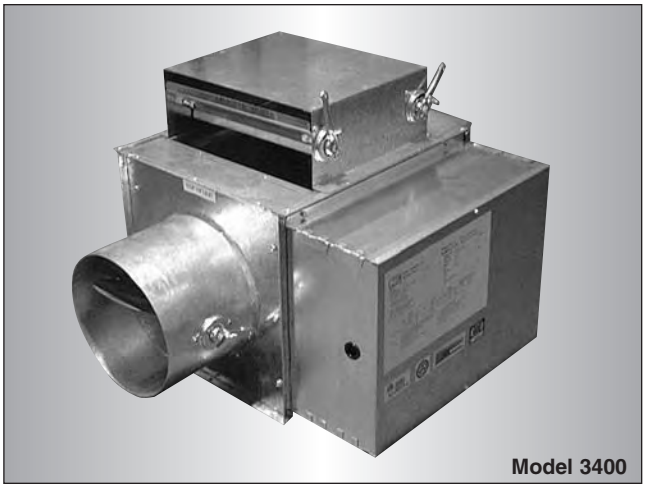
Model 36VRBS

Bypass Terminal Units
3400 Series

Designed to provide variable air volume supply when used with constant volume fan low pressure packaged air handling systems or roof-top air conditioning units. Excess air is diverted through a bypass opening and into the system return.

- Unique low torque "flow diverter" valve.
- Simple, inexpensive VAV control.
- Pressure dependent operation.
- Pneumatic or analog electronic control.
- Options include hot water and electric coils for reheat.

Models 3400, 34RW, 34RE **See Page F3**


Model 3400

ARI CERTIFICATION

Nailor is a participating company in the Air Conditioning and Refrigeration Institute's 880 certification program for variable air volume terminal units. Nailor has completed and received ARI certification for our complete line of Single Duct, Dual Duct, Fan Powered and Bypass Terminal Units presented in this catalog.

To comply with ARI Standard 880, manufacturers must rate their products at "standard rating conditions" as specified by the standard. This permits direct comparison between manufacturers. In addition to standard ratings, Nailor also publishes application ratings. These application ratings are based upon tests conducted in accordance with the standard but at other conditions as well in order to provide the design engineer with a wider range of data from which to make his selection.

Participation in the ARI program provides assurance that manufacturers' equipment will meet the claimed performance ratings. Compliance with ARI 880 by participants in the certification program is assured by regular testing of random samples by an independent laboratory.

ARI PERFORMANCE CERTIFIED
ARI Standard 880

A Participating Corporation in the ARI 880 Certification program.

INDEPENDENT LABORATORY CERTIFICATION

Although ARI Certification, as explained above, provides some assurance of product performance, the program only verifies a single "standard rating condition" (certification rating point) for each terminal size. This is for valid logistical reasons. However, the correlation of the ARI rating points with the comprehensive application data is sometimes difficult to reconcile in some manufacturers catalogs.

In order to provide assurance and complete credibility to the engineering community, Nailor has taken the unprecedented step of conducting 100% of its sound power level testing at an independent laboratory – Energistics Laboratory. Compare that to the competition!

ENERGISTICS LABORATORY

COMMON COMPONENTS

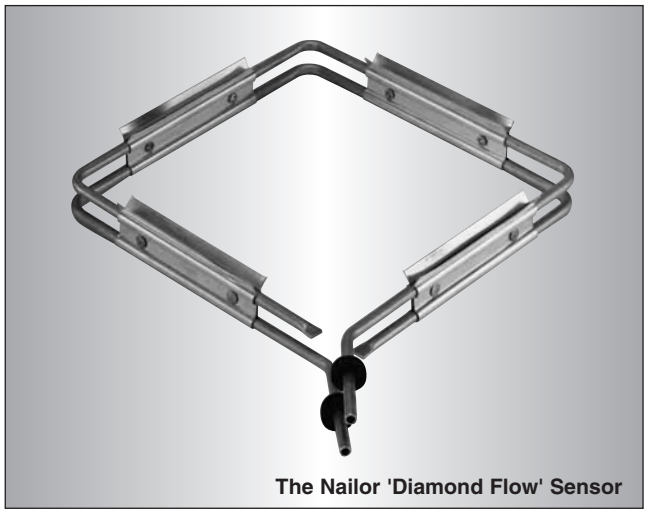
'Diamond Flow' Sensor

The Nailor 'Diamond Flow' is a multi-point airflow sensor that is designed to provide an averaged and very accurate flow signal for use with pressure independent controls.

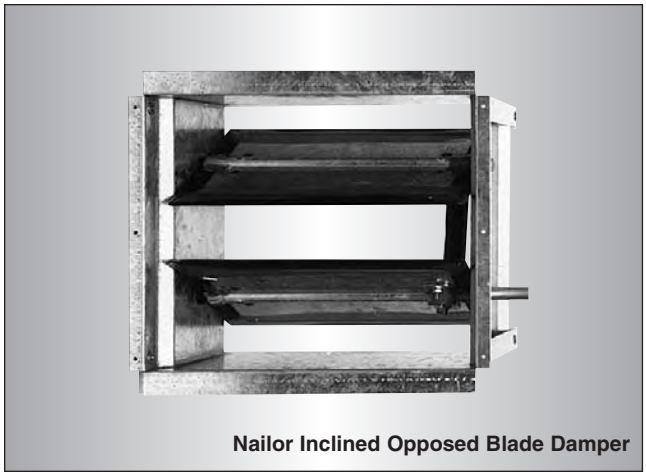
The 'Diamond Flow' is constructed of aluminum (stainless steel is optional) to ensure longevity and strength and is therefore not affected by adverse ambient temperature fluctuations before or after installation. It has a minimum of four pick-up points on each side which sample airflow in each quadrant of the inlet and then averages those readings. The 'Diamond Flow' has a maximum error envelope of only ± 5% regardless of the inlet configuration, even with a hard 90° elbow. Therefore, flow measurement is always accurate within normal measuring method. Additionally, security is provided against poor or non-ideal installations. A laboratory is about the only place where differences in this sensor and a flow cross design can be measured; therefore, these devices are equivalent.

The second advantage of the 'Diamond Flow' is that it amplifies the velocity pressure signal (Δp) sent to the controller by an average factor of about 2.5. Inside pneumatic reset controllers, the static pressure signal is subtracted from the total pressure signal by piping these pressures to opposite sides of a diaphragm. The combined diaphragm and spring assembly have a mass equivalent to about 0.03" w.g. (7.5 Pa). This mass defines the dead band and the minimum Δp setting. By amplifying the velocity signal, the controller is 'tricked' into a lower minimum capability and a narrower dead band. The same advantage is realized with digital and analog electronic controls utilizing a flow sensor and transducer. Low flow sensitivity is increased and lower settings can be held.

Thirdly, the sleek aluminum sensor design causes minimal disturbance to the airstream. Therefore, compared with other bulkier sensor designs, it produces only a minimal pressure drop increase across the terminal unit damper, reducing the inlet static pressure requirement and increasing energy efficiency, while at the same time producing negligible sensor generated noise.



The Nailor 'Diamond Flow' Sensor



Nailor Inclined Opposed Blade Damper

Opposed Blade Damper

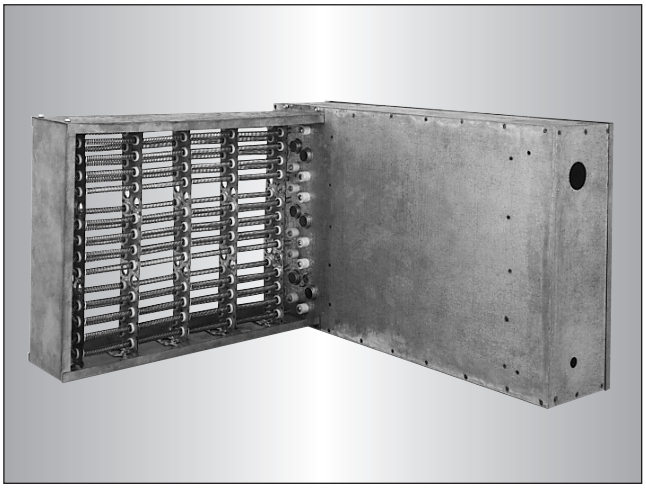
All Nailor single duct and fan powered terminals are equipped with inclined opposed blade dampers that provide premium performance and control accuracy. Blades shut-off at 45° in the direction of airflow. This ensures quiet operation with near linear performance for primary air control. Airflow disturbance and hence the turbulence created over a throttling opposed blade damper is less than that produced when compared with a similarly throttling round 'butterfly' type damper design, therefore generating less noise.

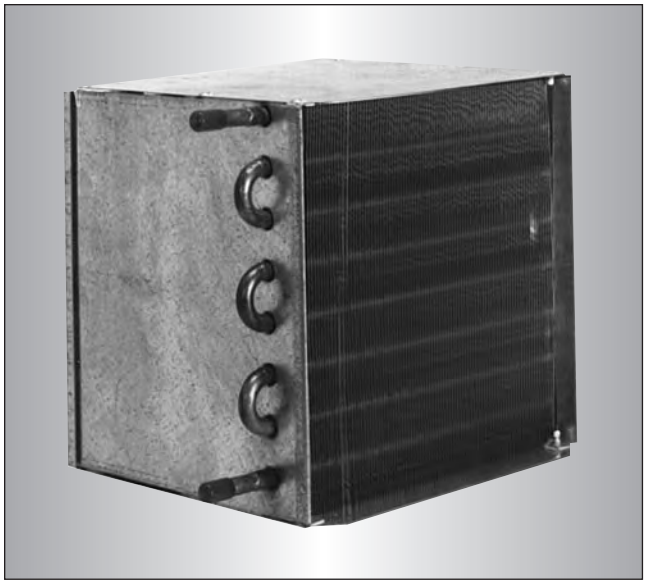
Controlled throttling of the airflow is achieved throughout the complete damper rotation from fully open to fully closed, desirable characteristics not found in round 'butterfly' dampers, thereby providing accurate control under all conditions. Opposed blade dampers ensure Nailor customers of a smooth response as airflow is adjusted in response to changing thermostat demand or the damper adjusts to compensate for varying static pressure conditions.

All Nailor dampers feature a solid plated steel 1/2" (13) dia. driveshaft with an indicator mark on the end of the shaft to show damper position.

Electric Heaters

All Nailor terminal units supplied with electric heaters will have heaters manufactured by Nailor Industries. Special orders are not required for specific kW ratings. All units have built-in controls for all options required by the engineer. Controls for the terminal unit will also be in the heater control box. Units are ETL listed for safety with the electric heaters as a component of the terminal unit.





Hot Water Coils

Nailor single duct, fan powered and bypass terminal units are available with factory installed hot water coils with up to four rows for reheat and supplementary heating applications. Coils are custom designed specifically for Nailor terminal units. The number of circuits and header/connection size have been selected to optimize performance.

- Tubes are 1/2" (13) O. D. copper.
- Fins are rippled aluminum, 10 fins per inch.
- Connections: 1/2" (13), 7/8" (22) or 1 3/8" (35) O. D. male solder, dependent on size and number of rows.
- Coils are pressure tested to 360 psi (2481 kPa).
- Water coil valves for pneumatic, electric and electronic control are available from Nailor.
- ARI Certified.

CONTROLS

• Pneumatic Controls

A comprehensive range of factory supplied, installed and calibrated controls are available for pressure independent control applications with all terminal types. Pressure dependent controls are also available for certain terminals and applications.

• Analog Electronic Controls

Pressure Independent: New, improved controller/actuator and thermostat design. A comprehensive range of control options are available for all terminal types and pressure independent application sequences. Featuring 'Diamond Flow' multi-point sensor for accurate feedback control.

Pressure Dependent: Factory supplied and installed. A new generation of pressure dependent controls featuring advance micro-computer electronics and proportional integral control algorithms provide precise temperature control. Available for single duct and by-pass applications.

• Direct Digital Controls (DDC)

Nailor has a wealth of experience supplying terminal units for use with state-of-the-art digital controls. We have worked with all major controls companies in recent years and have developed standard factory mounting programs to ensure operational efficiency is maximized for all terminal types and applications.

Nailor has designed its VAV terminal units to be generic in nature and compatible with all DDC controllers.

Pneumatic Control Components

Pressure Independent Operation

The heart or 'brain' of the control package is the reset controller, which processes signals from the room thermostat (temperature) and 'Diamond Flow' sensor and resets the primary air damper accordingly.

Airflow is controlled in response to the thermostat demand for heating and cooling to accurately meet the load conditions. At the same time, it holds the airflow rate dictated by the thermostat, regardless of fluctuations in upstream duct pressure. In other words, it is pressure independent. The flow control or reset function is between the minimum and maximum air volume limits. These limits are factory set to the job specification, but can be easily readjusted in the field as required.

In operation, the amplifying sensor located in the terminal inlet signals to the pneumatic reset controller which in turn energizes the pneumatic damper actuator to obtain the required airflow. There is actually a pressure signal feedback to the controller as a result of the damper movement which will correct itself for any velocity pressure fluctuations. Hunting and over controlling are minimized, resulting in stable operating conditions.

Nailor 3000 Controller

Currently the industry's most popular model. Universal pneumatic reset controller **(Model CSC-3011)** compensates for changes in duct pressure-flow. Control is pressure independent with adjustable minimum and maximum air volume settings. Can be used for any combination of direct or reverse acting thermostat action with a normally open or normally closed damper fail position.

Features:

- The controller is factory calibrated to the specified airflow, and is field adjusted easily. Field adjustment is needed only when operating conditions change.
- Pressure independent.
- Reset span remains constant with both maximum and minimum cfm adjustments.
- Reset span is adjustable from 0 to 10 psi (69 kPa) to match any thermostat. Standard setting is 5 psi (35 kPa).
- Reset start point is adjustable from 0 to 10 psi (69 kPa) to work with auxiliaries such as reheat coils. Standard setting is 8 psi (55 kPa).
- Settings for either direct acting or reverse acting thermostat action. Settings for either normally-open or normally-closed damper position, without further controls.
- Accurate control over a duct velocity range of 0 – 3000 fpm (15 m/s).
- Adjustments are made on the face of the controller.
- Adjustments are directly accessible through a ceiling opening with controls mounted and facing downward.
- Operates at low system pressure. Effective from as low as 0.02" w.g. (5 Pa) Ps and as high as 6.0" w.g. (1.5 kPa) Ps.
- Control air consumption is no more than 1.0 SCFH @ 20 psi (0.472 l/min @ 138 kPa).
- Operates on a control air pressure of 15 to 30 psi (103 to 207 kPa).

Nailor 3000 Controller

All pneumatic velocity controllers are not equal

Often an otherwise well designed HVAC system doesn't perform as well as expected, mainly because the reset span (throttling range) of the velocity controllers is too narrow.

Some conventional controllers will modulate over a full 5 psi reset span only when the maximum cfm limit is set at 100% of the terminal unit's capability. Other controllers have a full 5 psi reset span only when the minimum cfm limit is zero. The reset span may also be affected by both the maximum and minimum setting.

Under normal operating conditions the maximum cfm limit is more often set at less than 100% (typically 60 – 80%) of the unit's capability, and the minimum may be above zero. As a result, there are many controllers with working reset spans of only a fraction of 5 psi (see example 1).

This situation is analogous to oversizing a valve so that all of its regulating must be done in a nearly closed position. Accurate control is difficult at best, because of practical limits to the sensitivity of a thermostat.

The Nailor 3000 Solution

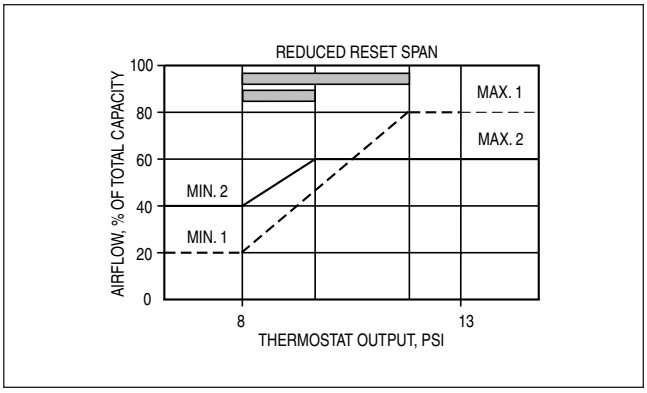
The **Nailor 3000** universal controller always modulates through the full reset span, regardless of the maximum or minimum cfm setting. Hunting is avoided. (See example 2).

The reset span can be adjusted from 3 to 10 psi (5 psi is standard). It is then held constant, even if the cfm settings are changed.

Also, the reset start point is adjustable to match various thermostat throttling ranges such as 3 – 8, 5 – 10, or 8 – 13 psi and to co-ordinate with auxiliaries such as heating coils.

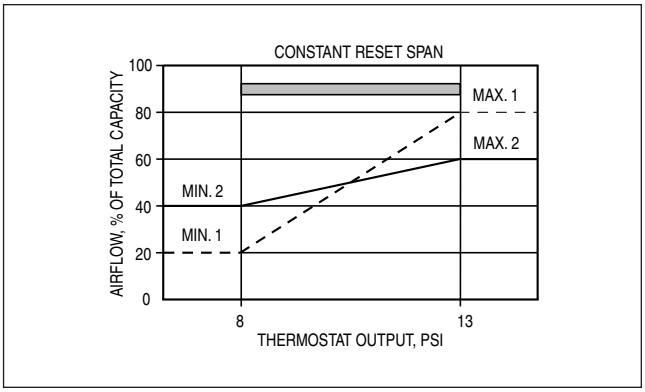
Nailor 2000 Controller (No Longer Available)

While the pneumatic controls market for VAV Terminal Units continues to decline at the expense of DDC and Analog controls, there is still a significant amount of retrofit business. Due to the superior performance of the Nailor 3000 controller described above and the small cost differential, Nailor no longer offers the 2000 controller (CSC-2003 and CSC-2004).



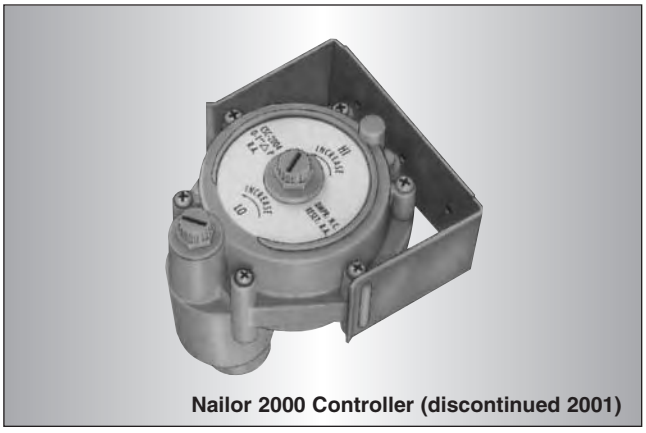
Example 1. Standard Controller (old Nailor 2000)

Reset span is reduced as utilized capacity of terminal and flow settings are reduced.



Example 2. Nailor 3000 Controller

Reset span remains constant regardless of minimum and maximum flow settings.



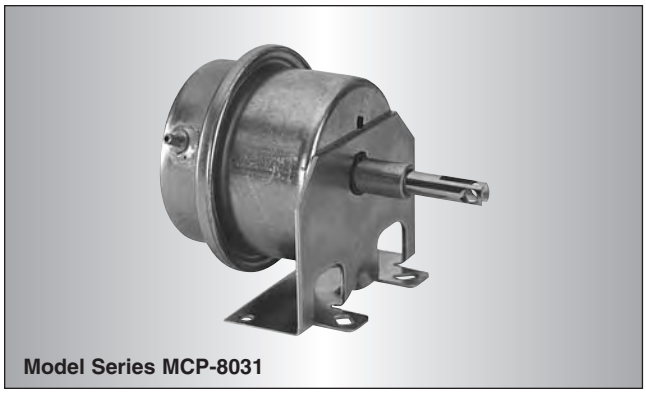
Nailor 2000 Controller (discontinued 2001)

Nailor 3500 Controller

The **CSC-3501** linear pneumatic reset controller provides state of the art technology. Actual velocity is reset linearly with thermostat pressure rather than velocity pressure resulting in a constant reset slope throughout the reset curve. Room stability is improved at low flow conditions.

The 3500 controller has real advantages in dual duct terminal applications where hot and cold decks track each other more accurately as 'reset curve' hysteresis is eliminated and therefore maintain an accurate and near constant total volume flow level during mixing.

Nailor 3500 Controller


Model Series MCP-8031

MCP-8031 Series Actuator

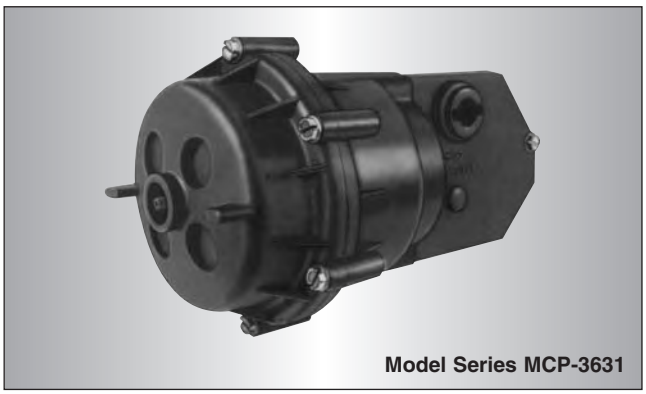
'Piston type' spring return pneumatic damper actuator; totally enclosed all metal casing with neoprene diaphragm. (8 sq. inch effective area). Standard 5 – 10 psi spring range on pressure independent reset controller applications, maximizes performance. Standard on all single duct, dual duct and fan powered pneumatic control terminal units.

MCP-8031-3101 5 – 10 psi spring range
MCP-8031-5101 8 – 13 psi spring range
MCP-8031-8101 3 – 8 psi spring range

MCP-3631 Series Rotary Actuator

Unique rotary-drive design with spring return action upon main air failure. Glass-filled nylon body with neoprene diaphragm (8 sq. inch effective area). Direct drive operation eliminates any possible linkage play. Compact design is suited to tight or restricted installations, such as internal retrofit applications. Standard on 3200 Series Dual Duct and 3400 Mk II Series Bypass terminal units. Optional on other models.

MCP-3631-3000 5 – 10 psi spring range
MCP-3631-5000 8 – 13 psi spring range
MCP-3631-8000 3 – 8 psi spring range


Model Series MCP-3631

Pressure Dependent Operation

In pressure dependent control operation, the pneumatic controller and flow sensor are omitted and the pneumatic actuator is controlled directly by the thermostat. Airflow is entirely pressure dependent. This version of the pneumatic terminal unit is used where neither pressure independent nor regulated maximum airflow settings are required.

One example is a single duct variable air volume supply in which the supply duct pressure is held constant by other controls. A mechanical airflow setting can be made as a function of the damper driveshaft rotation. Bypass terminal units, due to their design, are inherently pressure dependent.

Electric and Analog Electronic Components

Pressure Dependent Control

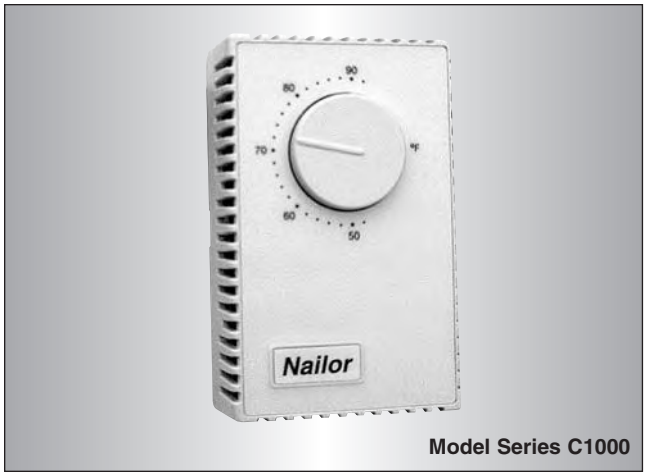
Micro-processor based technology has resulted in the widespread development and use of pressure independent controls for VAV terminal units and the demise of pressure dependent controls. Although more expensive, they generally provide superior room temperature control of the occupied space and improved occupant comfort. Pressure dependent controls are still used however on some light commercial projects with constant volume packaged air handlers. A popular use still is on Bypass terminal units which are an inherently pressure dependent design. The following components are used in pressure dependent control applications.

Tri-State Floating Actuators

These 3-wire 24 VAC reversible actuators are available in varies cycle time models to suit the application. All models feature direct drive mounting and built in adjustable mechanical end stops which limit damper rotation and provide a minimum position air volume capability. A manual clutch release speeds installation. A magnetic coupling provides stall torque protection. Optional auxiliary end switches for heat activation are available.

KMC Controls, 50 in. – lb., 95° rotation.
MEP-5061: 18°/min. (5 minutes 90°)
MEP-5071: 60°/min. (1 1/2 minutes 90°)

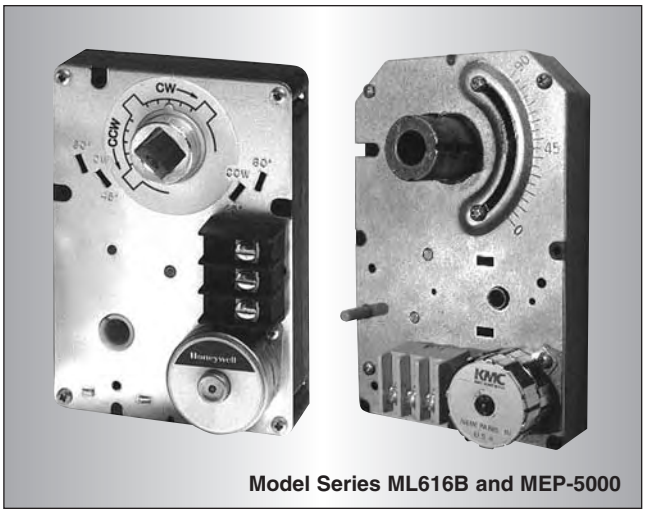
Honeywell, 35 in. – lb., 90° rotation.
ML6161B-2032: 12.9°/min. (7 minutes 90°)
ML6161B-2073: 30°/min. (3 minutes 90°)
ML6161B-2024: 60°/min. (1 1/2 minutes 90°)



Model Series C1000

T641A SPDT Room Thermostat

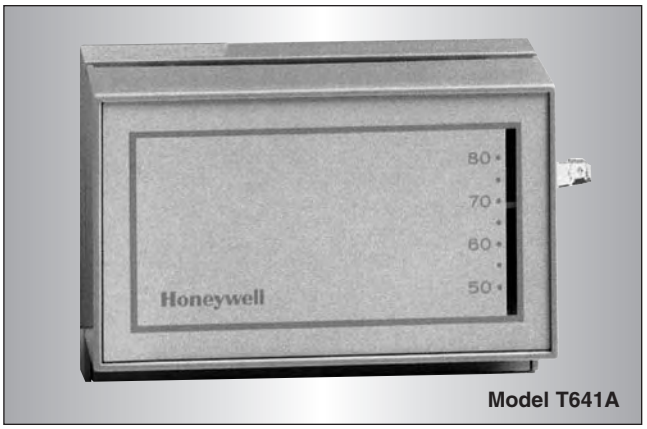
A 24 VAC single pole double throw, center-off, floating control thermostat for use with slow cycling 3-wire (floating type) electric actuators in pressure dependent VAV systems. Features include silent mercury switches, thermometer indication and external warmer/cooler set point adjustment, 3°F dead band.



Model Series ML616B and MEP-5000

C1000 Series Room Thermostat

Advanced micro-computer electronics and PI control algorithms provide precise temperature control. The thermostat provides a true multi-position modulating output to a tri-state floating actuator. This eliminates wasted energy caused by typical on-off cycling with conventional thermostats resulting in significant energy savings and superior comfort. Control accuracy is ± 0.4°F (± 0.2°C) around set point. The room occupant is able to reduce the set point to the lowest comfortable setting. A mechanical air volume minimum stop is provided (field set) on the damper actuator.



Model T641A

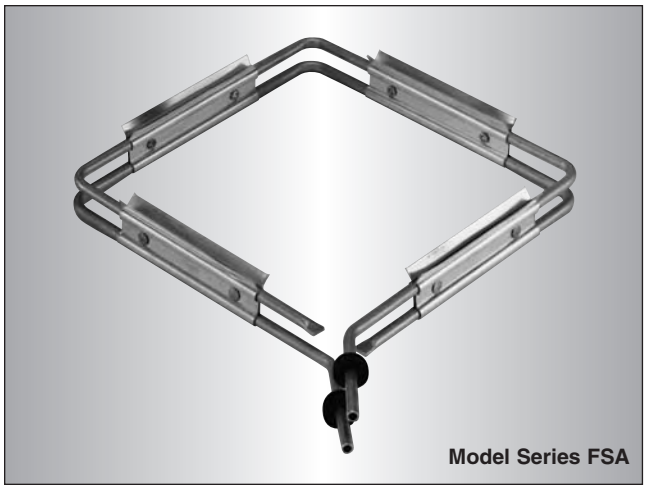
Analog Electronic Components

Pressure Independent Control

Control Features:

- Proportional plus integral control function provides precise flow and temperature control.
- Stand alone operation.
- Simple installation and balancing.
- Reliable operation and excellent repeatability (settings do not drift with time)
- Less costly than digital controls with no programming requirement.
- Suitable for all types and sizes of building applications.
- Flexibility built-in to handle all control applications.

Nailor is pleased to make available a new and improved range of pressure independent analog electronic controls for terminal units. These controls now incorporate the 'Diamond Flow' multi-point averaging sensor for accurate flow measurement as standard, a re-designed higher torque controller/actuator and new room thermostat design.



Model Series FSA

'Diamond Flow' Sensor

All components are matched and calibrated to provide regulated airflow in response to the electronic room thermostat, which is furnished as an integral part of the control package. Minimum and maximum airflow settings are adjusted at the thermostat, using a small screwdriver and digital voltmeter. Voltage settings correspond to airflow volumes on the Nailor calibration chart supplied with each project. It is not necessary to enter the ceiling space and locate the terminal itself for field calibration thereby reducing time and disruption.

Model Series CSP-5000

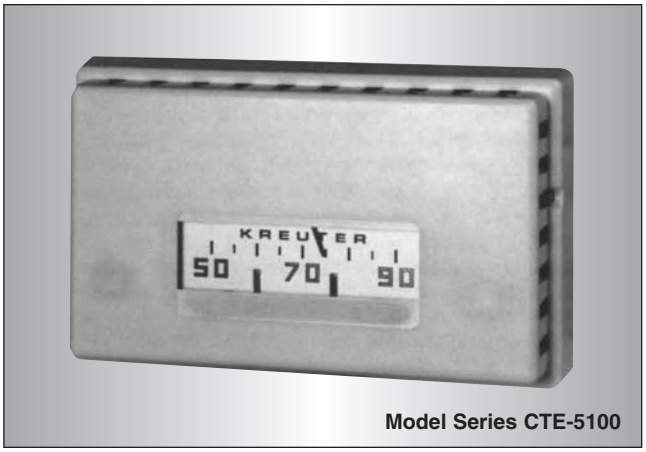
Controller/Actuator Features

- Compact combination design eliminates separate circuit boards.
- Onboard flow-through transducer utilizing twin platinum resistance temperature detectors.
- Direct drive 24 VAC tri-state damper actuator @ 50 in. - lb. (5.7 Nm) torque.
- Magnetic clutch and gear disengagement button.
- Tri-color LED indicates green for opening, red for closing and white for satisfied damper positions.
- Available control options include proportional (0 – 10 VDC) or two position hot water or electric reheat, dual minimum, fan induction, dual duct and automation interface. (Additional relays supplied as necessary).
- Heat/cool auto changeover ability with addition of duct temperature sensor.

Analog Electronic (continued)

Thermostat Features:

- Single function models with single set point slider for cooling only or heating only applications.
- Dual function models with two set point sliders for cooling/heating applications.
- Bi-metallic thermometer and set point indicator.
- Live velocity readout.
- Minimum, maximum and auxiliary flow limit adjustments.
- Attractive modern design.
- Fahrenheit or Celsius scale plate option.
- Set point sliders hidden on underside of tamper-proof cover.
- Mounting choice – decorative backing plate for electrical box attachment or drywall mounting kit.



Model Series CTE-5100

Direct Digital Controls (DDC)

Microprocessor based technology is now commonplace in HVAC building management systems, particularly in larger building applications. Most controls companies have therefore developed DDC controllers and software programs for terminal units, to enhance energy efficient VAV systems and the well proven associated control strategies. VAV digital controllers are only one part of a much larger fully integrated building management system and the common availability and specification of terminal unit DDC controllers from control companies ensures compatibility and common protocol for trouble-free systems communication, maintenance support and trouble shooting. Digital VAV controls offer all the advantages of accurate, pressure independent operation plus the additional benefits of a networking capability and two-way communication. Parameters can be loaded and downloaded via communication with a remote PC.

Nailor has extensive experience factory mounting digital controls supplied by the temperature control contractor. Nailor has developed individual factory mounting programs for most manufacturers currently offering digital controls, providing the assurance of a high quality, professional installation and minimizing start-up problems.

Nailor has designed its VAV terminal units to be generic in nature and compatible with all DDC controllers.

- Nailor supplies as standard a NEMA 1 full controls enclosure for protection of the controls during shipment, installation and for the life of the building HVAC system. Dust tight construction is an option.
- The vast majority of digital controls require a flow sensor. Nailor's 'Diamond Flow' multi-point averaging sensor is compatible with all such controls. Nailor will mount its own sensor as standard, whether the digital controls are to be factory or field mounted, ensuring accurate measurement regardless of inlet conditions. Factors have been developed for loading into the flow control algorithm.
- UL Class 2 control transformers and disconnect switches are available from Nailor factory installed. All components carrying 120 VAC or higher should be supplied and installed by Nailor in order to maintain ETL listings.
- Separate isolation control transformers are available on fan terminal units to protect digital components from potentially harmful voltage spikes.
- An economical factory approved tri-state 24 VAC, 50 in. - lb. (5.7 Nm) torque direct drive actuator is available from Nailor when the DDC controller being mounted is available for use with a separate actuator.

Models: MEP-5061 18°/minute
MEP-5071 60°/minute


Optional Nailor supplied and mounted 'Tri-state' MEP-5000 Series Actuator.

Performance Data Caveat

Comparing Manufacturers' Sound Power Levels and NC Levels

CAUTION – ROUGH ROAD AHEAD

Many engineers rely on the NC tables in manufacturers' catalogs to give them both an estimate of noise levels in their proposed finished spaces and a comparison between manufacturers. This is a relatively easy process for the consultant or the contractor because NC values are a single number comparison and they are readily found in manufacturers' catalogs; however, THIS WILL NOT WORK. And that is the problem.

There is only one standard for predicting occupied space sound levels. It is ARI Standard 885, "Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets". Until the current version, ARI Standard 885-98, was released in early 2000, there were no recommended attenuation values for manufacturers to use when preparing catalogs. Consequently, each manufacturer was on his own to develop what criteria he wished to use for calculating the attenuation values in each sound path from the equipment and into the room. A careful examination of different manufacturers' catalogs will show a large variation. For example, a range from approximately 17 dB to 40 dB attenuated in the second octave band for radiated sound. You can find similar variations in octave bands 3 through 7. Yet they all claim to be ARI Certified. How can this be?

First, ARI certification does not encompass NC levels or any other room sound level predictions. There are no ARI certified NC values. ARI certifies only sound power levels as measured in a reverb room. Furthermore, ARI only certifies and tests units at one operating condition, the "Certified Rating Point". That is at 1.5" w.g. inlet static pressure and 2000 fpm inlet velocity. On fan powered terminal units, they also test the fan only condition with the fan set at the manufacturer's suggested maximum rating point. These fan set points may or may not match the respective primary damper airflows. These are the only points where ARI tests a terminal unit. They are not necessarily typical operating points for terminal units, and, in fact, most units are not operating at these points. However, if the manufacturer meets his submitted performance data at these points, then his equipment is ARI certified. Except for periodic testing, that is the end of ARI certification.

Second, as mentioned above, each manufacturer, up until now, has used whatever attenuation values he pleases to predict room sound levels for each sound path into the room. These values are deducted from the raw sound power levels that are generated per ASHRAE Standard 130 "Methods of Testing for Rating Ducted Air Terminal Units" and ARI Standard 880 "Air Terminal Units" to arrive at the predicted sound pressure levels and NC value in the space. If his equipment is very noisy, he may choose to use very high attenuation values to make his equipment look more competitive. If his equipment is quiet, he may use more reasonable values. Since the raw sound power levels are derived under ARI Standard 880, it might be assumed that all sound power level data and NC values are ARI certified, when they are not. Look closely, the ARI certification label is not supposed to be displayed on the page with the NC values. You should only find it on the page showing the sound power levels at the ARI certification rating points.

Comparing Manufacturers' Sound Power Levels and NC Levels (continued)

Another trick most manufacturers are now using is not tabulating application sound power levels at 1.5" w.g. inlet static pressure. By omitting this data from the catalog, it becomes very difficult to check it against the ARI rating points in the smaller boxes at the bottom of their respective catalog pages. BEWARE THOSE MANUFACTURERS NOT SHOWING THE 1.5" W.G. INLET STATIC PRESSURE PERFORMANCE COLUMN WITH THE REST OF THEIR SOUND POWER LEVELS. They may be attempting to make it hard for you to compare their relative data points.

ARI Standard 885-98 attempts to correct some of these problems. You will find in Appendix E, on the last page of the standard, a list of recommended deductions that can be used for charting catalog performance in predicting NC values in unknown conditions. This will even the playing field somewhat, but only after all the manufacturers have reprinted their catalogs. This can take up to 4 or 5 years. In the meantime, if you wish to use the NC values, be sure to specify NC values as calculated per ARI Standard 885-98, Appendix E. However, there are still shortcomings concerning the use of cataloged NC values.

Since NC values are single numbers, they do not reflect which octave band is setting the value (where the noise peaks). This can still cause some confusion. Units peaking in the 3rd or 4th octave bands are likely to be quieter in the room than those peaking in the 2nd octave band. They will also add noise differently to the other noise levels in the space, which will change the type of noise heard by the occupant. It is impossible to determine rumbly from hissy or neutral spectrums using only NC values. That is why ASHRAE no longer recommends using NC values for room noise level predictions. They now recommend RC values. RC values are averaged numbers with quality descriptors. (For a complete description of these ratings, see ARI Standard 885-98. It also describes why RC values cannot be applied to equipment because of their respective averaged values. You can download a free copy of ARI Standard 885-98 at www.ari.org on the Internet).

It is also important to note that the deductions in Appendix E of ARI Standard 885-98 are typical of a large number of averaged conditions. They are described in detail in the standard. However, this does not mean that they are relative to your job. They certainly are not specific to your job. They may be similar, and they may have no similarity at all. That is what ARI Standard 885 is all about: how you can reasonably predict the room sound levels of a particular room in a particular building with the proper known construction and finishing details. This could never be done in a manufacturer's catalog because these conditions are unknown at the time the catalog is printed. While Appendix E may be typical of an average office space, it is specific to none. Consequently it can only be used as general criteria.

The only way to compare performance between manufacturers using their respective catalogs is to look at their sound power levels as generated in reverb rooms. Those are the sound power levels by octave band, which are listed in all the catalogs. This is more difficult than single number comparisons, but it is the only way to compare without testing each unit in a fixed mock up environment. It is also the only way to add the sound pressure levels contributed by other pieces of equipment such as air handlers, ducts, dampers, terminal devices, etc. (This addition process by octave band is also described in ARI Standard 885.) Using these added numbers, the resultant sound pressure levels for the room can then be plotted on an RC chart to predict the room sound pressure level and quality.

All the NC values found in this catalog are calculated using Appendix E of ARI Standard 885-98.