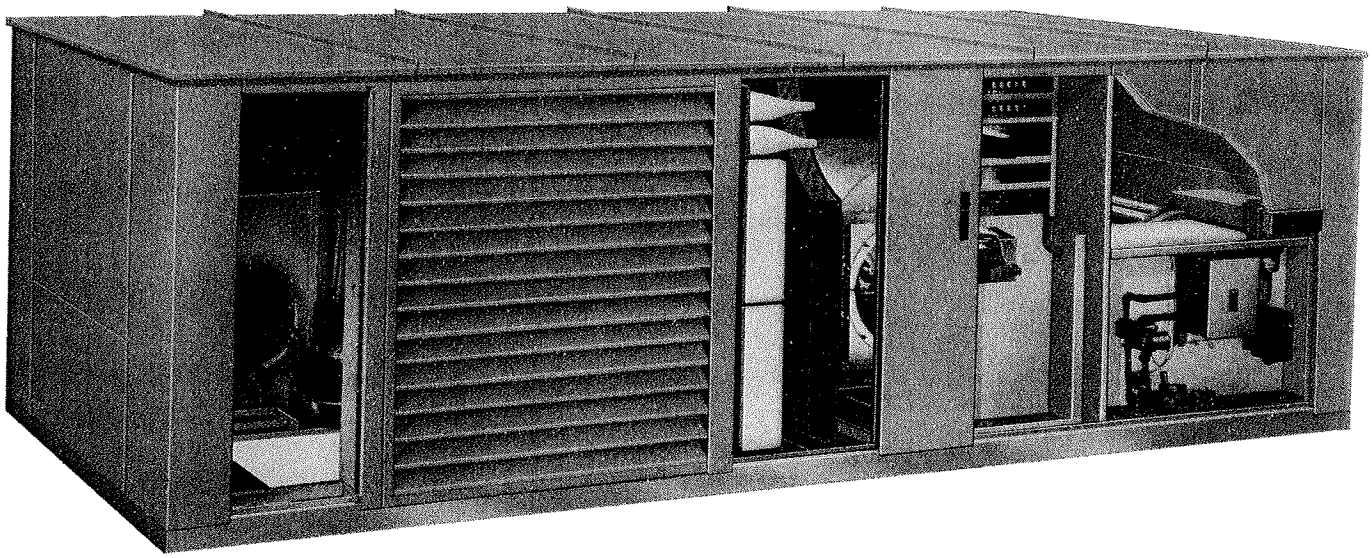
LENNOX

HV3 HEATING and VENTILATING SYSTEMS WITH OPTIONAL COOLING

60 TO 173kW (200,000 to 600,000 Btu/h) Heating Capacity

- **Gas, electric, hot water or steam heating**
- **Chilled water or direct expansion cooling**
- **Heat reclaim**
- **Choice of filters**
- **Smoke detection**
- **Factory assembled and tested**



HV3 is a heating and ventilating system with many options which allows a system designer to meet the energy sensitive environmental requirements of most commercial, industrial and institutional applications today and for the future.

A basic ventilation model can be supplied with prefixed air intake or with a modulating outside air system (Economiser) capable of providing 'free' cooling for much of the year.

Heating by gas, electricity, hot water, or steam can be selected, and cooling by chilled water or direct expansion refrigeration. For budgetary purposes the cooling can be planned for and retro-fitted at a later date.

Other options include bag or slab filters, recirculation air fan, solid state hot water control system (including a three-way valve and secondary pump), and matching roof mounting frame for reduced installation cost.

An optional heat reclaim coil can be incorporated to recover heat rejected from refrigeration displays and coolers which, in many areas, is capable of supplying most of the primary heating requirements in supermarkets.

Each system, which is housed in a single, waterproof cabinet, is factory assembled and test operated. And the package concept makes installation simple. An installer has only to locate the unit, connect ductwork, make power supply and heat source connections, and commission the equipment. A commissioning service is also available from Lennox.

STANDARD FEATURES

Each HV3 system is housed in a heavy gauge, galvanised steel cabinet finished with electrostatic, powder-paint process which gives an even and durable protective coating. The cabinet design ensures protection from the weather, and by siting the unit on a roof, or other convenient outdoor location, no valuable interior space needs to be allocated for HVAC plant. Rapid service access is by means of hinged doors with special latches.

The forward curved supply air fan delivers large air volumes with low power consumption. For quietness, it is resiliently mounted and is provided with an adjustable motor support base allowing quick belt adjustment. Belt and pulley drives are selected to meet customer's performance specifications.

To conform to current Health & Safety requirements motors are totally enclosed, and belts and pulleys fitted with wire mesh safety guards.

Unnecessary service call-outs can often be avoided if a building supervisor can identify certain malfunctions. A standard HV3 read-out panel indicates dirty filters, failure of heating, or tripped blower motors.

OPTIONS

Gas heating – A Duratube heat exchanger, of cylindrical tube and drum construction, permits normal heat element expansion and contraction without metal fatigue. The design also results in a high input to heat surface ratio. There is a low resistance to air travel and it is easy to clean. All heat element surfaces are of aluminised steel.

The fan-assisted burner principle, for combustion air operates at sufficiently high statics to be unaffected by adverse wind or atmospheric conditions. The burner has a pre-purge cycle, intermittent spark ignition during burner operation, flame sensor, and 100% safety shut off controls.

Systems with single heat exchangers provide two stages of heating and units with twin heat exchangers, three stages of heating for economy.

Gas burners are fitted with back-up gas valves for added protection against failure of main gas valves.

Hot water and steam heating – The hot water or steam heating coil can be factory installed to provide further heating alternatives. The coils are constructed of copper tubing with aluminium fins.

An additional option, where low pressure hot water is used, is a factory-fitted hot water solid-state control system including a three-way valve and secondary pump. This energy-saving system modulates the flow of hot water to meet heating demand.

Electric heating – Staged electric heating elements, either open wire or sheathed, provide a further heating option.

Filters – HV3 systems can be fitted with washable, vacuum cleanable, or disposable filters and a large filter area ensures excellent air cleaning and long filter life. Slab filters can be either 25mm or 50mm and bag filters are available.

Filters are easily accessible.

Cooling – An optional evaporator coil constructed of copper tubing with machine-fitted aluminium fins can be factory fitted. The coil is supplied complete with expansion valve ready for connection to a remote condensing unit.

As an alternative to an evaporator coil and condenser, a chilled-water coil can be incorporated.

Recirculation air fan – For applications with high duct pressures, or where positive pressure in the condition space is unacceptable, a recirculation fan can be fitted in the HV3 system. The fans are similar to the supply air blowers, with the pulley and belt drives enclosed in the protective guard. They are equipped with blower motor starters and overload protected. All motors have Star-Delta starting.

Economiser – An optional Economiser can be factory fitted to HV3 systems comprising mechanically linked outside air, recirculation air and exhaust dampers. The positioning of these dampers is accomplished by two modulating damper motors which are controlled by a room thermostat, an adjustable mixed-temperature controller and a minimum positioner.

Where a condensing unit is included in the system, the Economiser will reduce the demand for mechanical cooling and, not only save electricity, but extend the working life of the remote unit.

Refrigeration heat reclaim – An aluminium fin/copper tube coil, which maximises heat transfer, can be factory fitted in HV3 units to recover waste heat from refrigeration plant. The reclaim coil is sized for the capacity and number of circuits specified when ordering. Piping connections are completely accessible for the field connection of refrigerant lines.

The coil is installed downstream of an evaporator coil (if fitted) and upstream from the heating source. This allows dehumidification with reheat, maximum reheat reclaim, and even air distribution over the coil.

Night setback – By automatically reducing the heating supplied to a building when unoccupied, the HV3 night set-back option helps to reduce heating bills. And with a circulating air system normal temperature is rapidly re-established at the end of the 'set-back' period.

Duct connections – HV3 units are designed for roof installation with bottom handling of supply and recirculation air but can be provided with alternative end duct connections.

Controls – In addition to statutory safety controls a specifier can have a variety of optional controls with the HV3 system.

Remote warning – In addition to the standard HV3 readout panel which rapidly pinpoints certain malfunctions, electrical connections can be provided to activate a signal to give remote indication.

Isolator switch – An isolator switch is fitted on all HV3 systems.

Optional life safety routines are available in HV3 systems to meet local fire regulations. Smoke detectors located in the recirculation duct can activate fan motor controls, and other devices, to give a choice of automatic safety actions in the event of smoke being detected.

A typical sequence would be:

- close supply, recirculation, and fresh air dampers
- open exhaust dampers
- shut off system
- activate warning bell or light

Double skin cabinet – HV3 cabinets are of sandwich construction with 50mm of insulation contained between the outer and inner skins, which prevents insulation media deterioration and entry into air stream.

Roof mounting frames – HV3 matching roof mounting frames simplify the siting of units and ensure a positive watertight seal, with all roof penetrations within the frame.

In the case of a new building the frame(s) could be flashed into the roof by a roofing contractor in advance of delivery of the units. The equipment installer has then only to locate the unit(s) on to the frame(s) for a thoroughly waterproof installation.

Fully tested – All HV3 systems are checked for continuity of controls and wiring, and test-operated before leaving the Basingstoke factory.

Table 1 shows the configurations of HV3 functions which can be matched starting with a basic system consisting of two and six which are an end plenum and a supply air blower.

Select the functions required from the diagrams and then refer to Table 2 for the style reference.

Table 1. FUNCTION MODULES

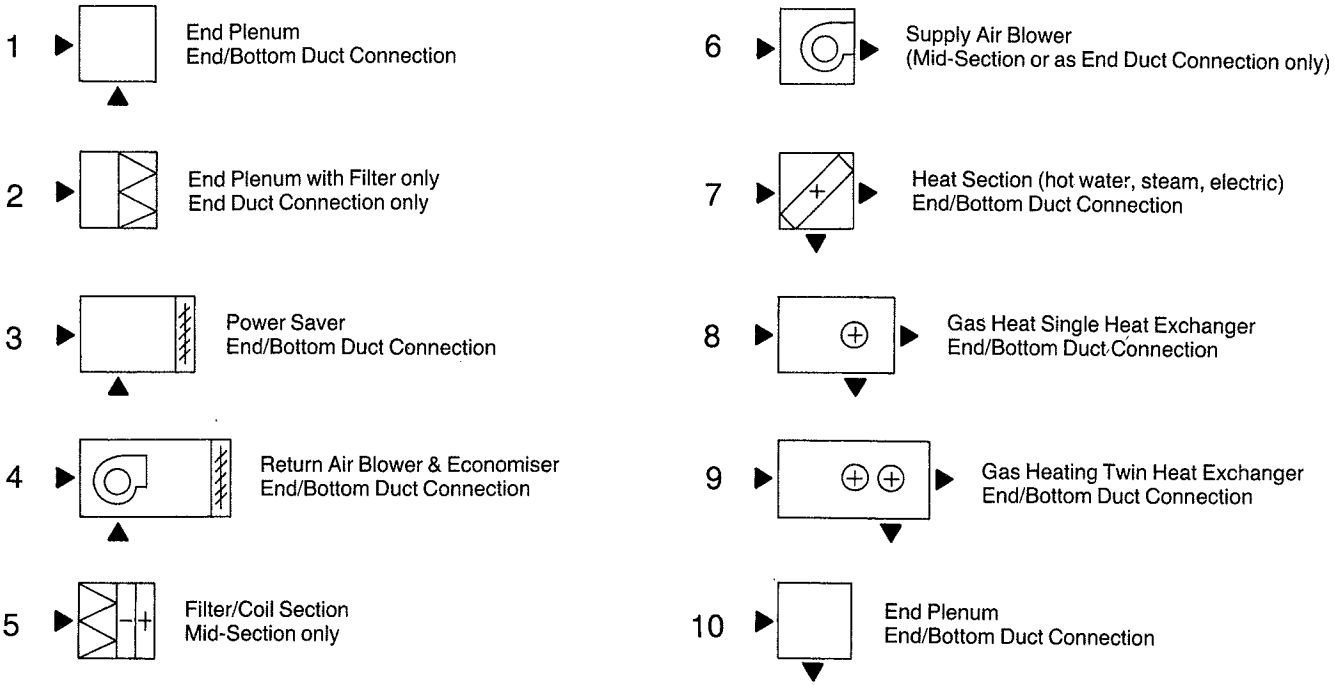


Table 2. MODULE CONFIGURATION

Style ref.	A & B units length (mm)	C & D units length (mm	
HV3-1	3000	3500	1—5—6
HV3-2	4000	5000	1—5—6—7
HV3-3	4500	5000	1—5—6—8
HV3-4	NOT AVAILABLE	5500	1—5—6—9
HV3-5	4000	5000	1—5—6—10
HV3-6	2000	2000	2—6
HV3-7	3000	3500	2—6—7
HV3-8	3500	3500	2—6—8
HV3-9	NOT AVAILABLE	4000	2—6—9
HV3-10	3000	3500	2—6—10

Style ref.	A & B units length (mm)	C & D units length (mm)	
HV3-11	4000	4000	3—5—6
HV3-12	5000	5500	3—5—6—7
HV3-13	5500	5500	3—5—6—8
HV3-14	NOT AVAILABLE	6000	3—5—6—9
HV3-15	5000	5500	3—5—6—10
HV3-16	4500	4500	4—5—6
HV3-17	5500	6000	4—5—6—7
HV3-18	6000	6000	4—5—6—8
HV3-19	NOT AVAILABLE	6500	4—5—6—9
HV3-20	5500	6000	4—5—6—10

Table 3. MODULE CROSS-SECTION

	Unit height (mm)	Unit width (mm)
A	1200	2300
B	1500	2300
C	1800	2300
D	2100	2300

Table 4. BLOWER SECTION (AIR VOLUMES)

Use in conjunction with Table 5 to obtain good filtration along with required air volumes.

Size ref.	Unit height (mm)	Duct opening (mm)	Blower	Supply Air Volume (m^3/h)		Supply Air Volume (cfm)	
				Min.	Max.	Min.	Max.
A	1200	1500 x 700	low	6,800	11,000	4,000	6,475
			high	9,500	17,000	5,600	10,000
B	1500	1500 x 700	low	9,500	17,000	5,600	10,000
			high	11,560	23,750	6,800	13,400
C	1800	1500 x 1000	low	11,560	23,750	6,800	13,400
			high	13,600	28,000	8,000	16,500
D	2100	1500 x 1000	low	13,600	28,000	8,000	16,500
			high	23,800	34,000	14,000	20,000

Table 5. FILTER SECTIONS

To be used in conjunction with Table 4 "Blower section air volumes". Select unit ref. size to give optimum air velocity through filter.

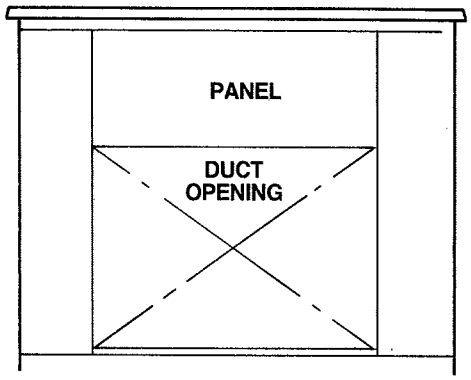
Unit size ref.	Filter details: (a) 50mm slab; (b) bag; (c) 25mm slab with bag.					
	Number of filters 300 x 600mm	Blower	Velocity over filter (m/s)		Velocity over filter (f/m)	
			Min.	Max.	Min.	Max.
A	10	low high	1.05 1.47	1.70 2.62	207 289	335 516
B	14	low high	1.05 1.27	1.87 2.62	207 250	368 516
C	17	low high	1.05 1.23	2.16 2.54	207 242	425 500
D	21	low high	1.00 1.75	2.06 2.50	197 344	405 492

Table 6. Gas heat units

Unit size ref.	Gas heat outputs	
	Single heat exchanger kW	Twin heat exchanger kW
A	60 70 95 108	Not available
B	78 95 108	Not available
C	95 108	125 152 173
D	95 108	125 152 173

DUCT CONNECTIONS

The HV3 supply and return duct connections can be high or low level – see diagram.



PANEL AND DUCT OPENING ARE REVERSIBLE

Table 7. COIL DIMENSIONS

Size	Max. dimension (mm x mm)	Coil dimensions (Max. area available for coil)					
		Max. fin. area		Velocity over coil of max. area			
		(m^2)	(ft^2)	Min. m/s	Max. m/s	Min. (f/m)	Max. (f/m)
A	2000 x 950	1.9	20.5	0.99 1.39	1.61 2.49	199 278	322 498
B	2000 x 1250	2.5	27	1.06 1.28	1.89 2.64	211 257	378 528
C	2000 x 1550	3.1	33.4	1.04 1.22	2.13 2.51	208 244	427 503
D	2000 x 1850	3.7	39.8	1.02 1.79	2.10 2.55	205 359	422 513

SYSTEM SELECTION – WORKED EXAMPLE

A building requires 117kW of heat which is to be obtained from a hot-water source. We need to handle 15,250m^3/h of air, and filtration is very important. The fan will need to work against an external static pressure of 120 Pa.

From Table 1, which shows the standard range of function modules, the following components would be selected:
Module 2 – end plenum with filter
Module 6 – supply air blower/mid-section
Module 7 – coil section with end or bottom duct opening

Table 2 indicates that this is style reference HV3-7 which will have a length of either 3000mm or 3500mm.

Next turn to Table 4 entitled "Blower section – air volumes". An air volume of 15,250m^3/h can be catered for by either the size reference A at the high speed or the size reference B on the low speed with unit heights of 1200mm and 1500mm respectively. The duct opening would be 1500mm x 700mm in either case.

To establish which size reference would be best, turn to Table 5, entitled "Filter section". For size reference A in the high speed, the air speed through the filter would be between 1.47 and 2.62m/s. Whilst with Section B, which has four more filters, the air velocity through the filter at low speed would be 1.05 to 1.87m/s. Choosing Section B achieves the good filtration required and filtration would be improved by using a bag filter in place of a slab filter.

The system selected, therefore, is Style HV3-7, Size B. Table 2 gives the unit length of 3000mm and Table 3 the unit height of 1500mm and unit width of 2300mm.

This information assists a designer to position a unit on his layout, design the necessary duct connections, and duct system, and calculate the external static pressure drop through the ducting and diffusers. The HV3 enquiry form can then be completed and the details given to Lennox who will select the component parts specifically matched to the project requirements.

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