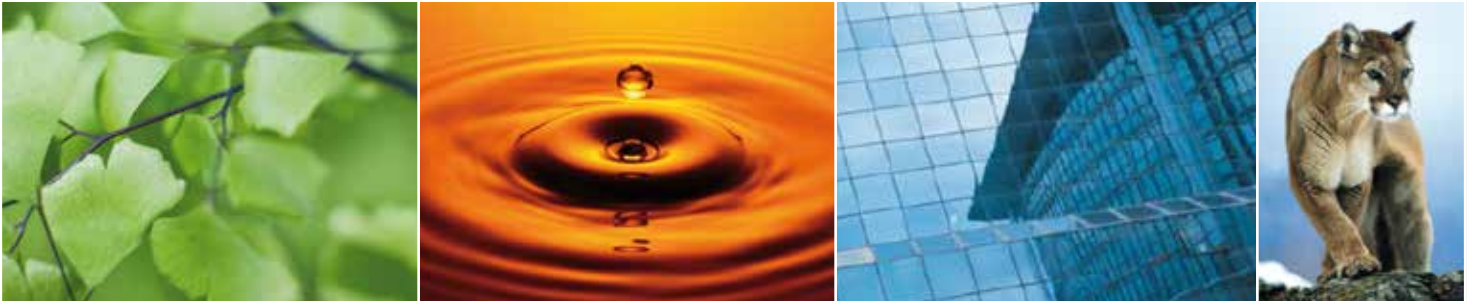




Cougar



- Energy efficient slimline 180mm fan coil unit
- Chilled water cooling & hot water heating
- Waterside control with variable air volume
- Commercially quiet with excellent acoustics
- Programmable communicating control systems

INTRODUCTION

The 'Cougar', manufactured by Dunham-Bush is a high quality, compact, 'slim-line' fan coil unit, designed to fit in the shallowest ceiling voids and perform quietly and powerfully for many years.

'Cougar' fan coil units are built to no-compromise engineering standards using only the most modern and reliable components available. Combined with the very latest design and manufacturing technology, the 'Cougar' provides the ideal solution where ceiling void space is at a premium. Careful consideration has been given to safe site handling, fast / simple installation and ease of access for maintenance. Designed to offer maximum site flexibility, the 'Cougar' is one of the most versatile and user-friendly products available in today's market.

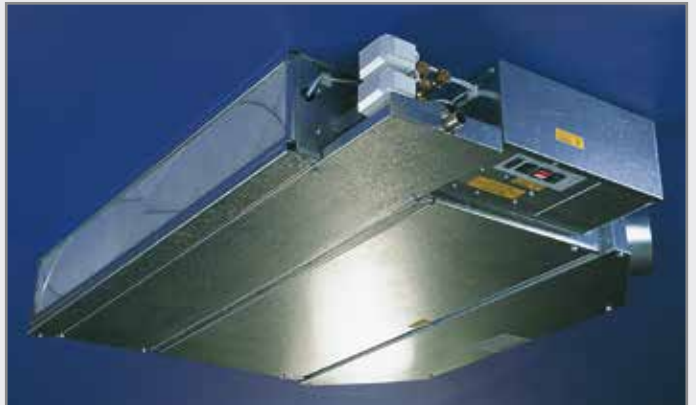
Flexibility Is The Key

The 'Cougar' uses a non-handed, dual-purpose coil block covered by a stainless steel 'V' formed condensate pan, terminating with a central drain at the lowest end of the tray. This universal design is used on both RH and LH configurations and allows the complete assembly to be site reversible without the need for any additional parts. The discharge plenum is supplied with a combination of spigots and blanking plates that are screw fixed to the plenum for ease of site interchange. The added facility to re-locate the controls box from one side of the unit to the other gives the 'Cougar' the flexibility to accommodate site layout changes and client fit-outs.

Simple Access For Maintenance

'Cougar' brings a 'breath of fresh air' to maintenance tasks. Filters are simple to remove for cleaning; they withdraw from either the rear or side of the unit without the use of tools or need to remove panels. The main access panel is secured by quarter turn 'quick release' fasteners and gives access to fan/motor assemblies. Each fan/motor is mounted separately onto the main bulkhead plate to facilitate easy removal.

On model sizes 4-7 both the filters and fan access panels are split into two smaller sections for easier removal and handling. Electrical and controls work can be easily carried out via a hinged cover giving access to all components housed in the box. The stainless steel condensate pan can also be easily removed for cleaning via it's own separate access panel.



Quiet, Powerful Operation

The 'Cougar' incorporates high performance, single inlet, external rotor motor fans as standard. The fan / motor assemblies are individually mounted on to a 'floating' bulkhead plate, isolating them from the rest of the unit chassis, reducing resonance and casing breakout noise.

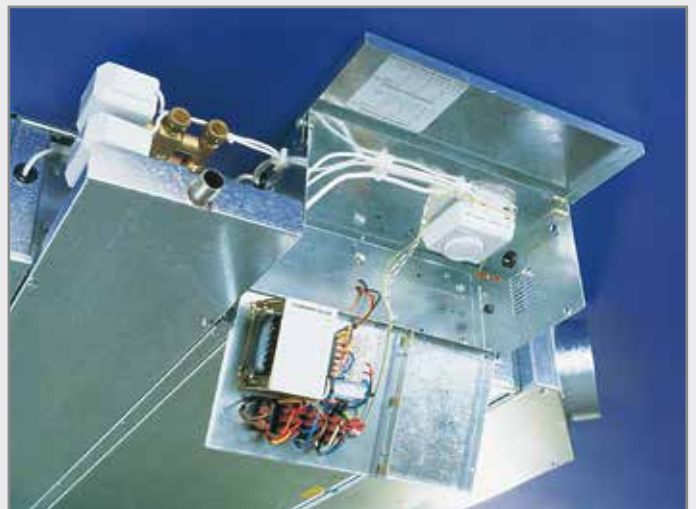
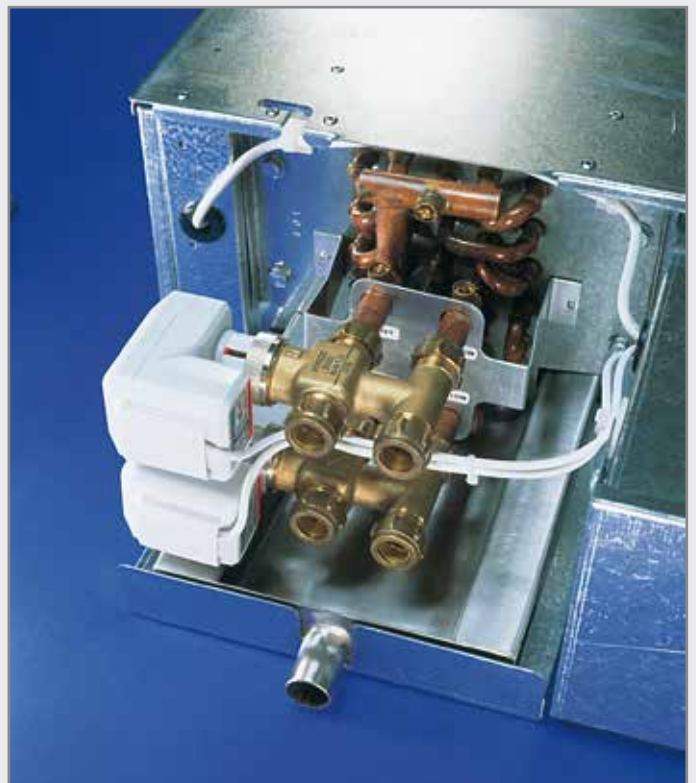
Long Life Stainless Steel Condensate Pans

'Cougar' fan coil units incorporate stainless steel condensate pans as standard. By using stainless steel, cleaning is made easier whilst the resistance to corrosion is increased, vastly improving the longevity of the pan. The fully welded 'V' formed pan creates a positive seal against the coil preventing any air bypass. The pan is mounted to provide a positive fall in two directions to the central outlet at the lowest end of the pan. The 22mm stainless steel outlet is welded flush with the bottom of the pan ensuring that condensate flows freely and completely away. The externally insulated pan is mounted in a separate galvanised steel carriage, inherent strength of the stainless steel pan and outlet offers vital protection against accidental site damage.

Adaptable Controls Box

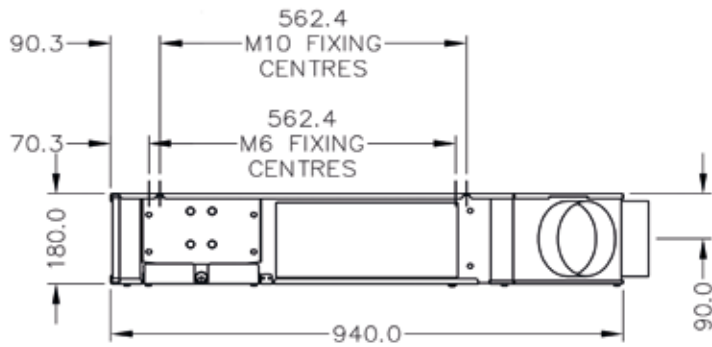
'Cougar' units are supplied with a well-ventilated controls box supplied with a one metre flying lead for connection to an adjacent fused spur. The box wired in accordance with I.E.E regulations, has been designed to accommodate most available temperature controllers and associated electrical components.

The control box lid conveniently hinges to facilitate any on-site electrical or DDC controls work. The lid can also be removed in the case of an obstruction to the opening circle. The complete control box has the added benefit of being connected to the fan/motor electrical loom via a plug in connector mounted in the side panel of the unit. This feature allows the complete control box to be disconnected from the unit for any major electrical / controls refurbishment, or enables the controls box to be retrofitted after the unit has been installed.

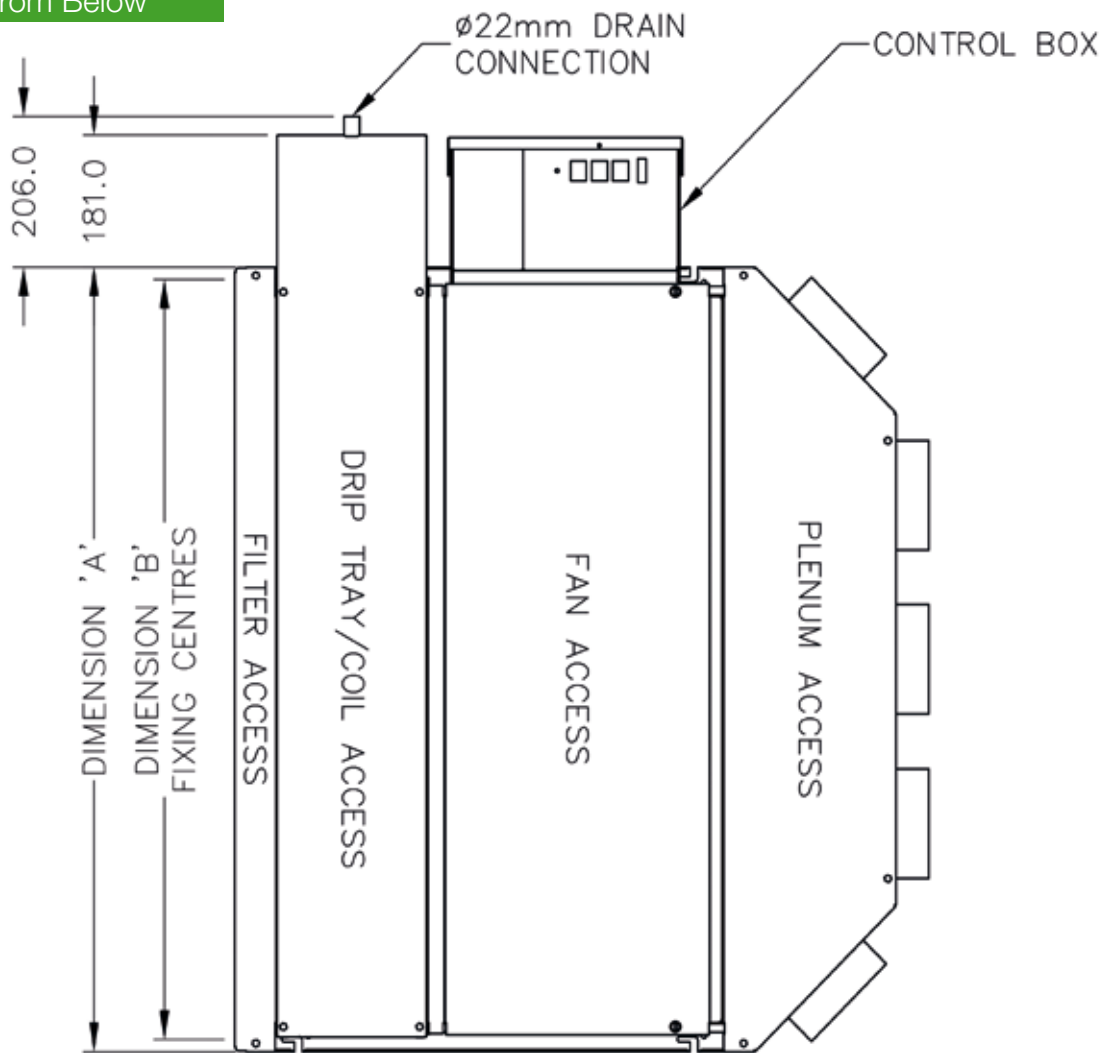


DIMENSIONS

View On Coil Connections



View From Below



Model	Dimension 'A'	Dimension 'B'	Dry weights (kg)
1	675	641	43
2	1075	1041	61
3	1075	1041	66
4	1475	1441	83
5	1475	1441	88
6	1875	1841	104
7	1875	1841	109

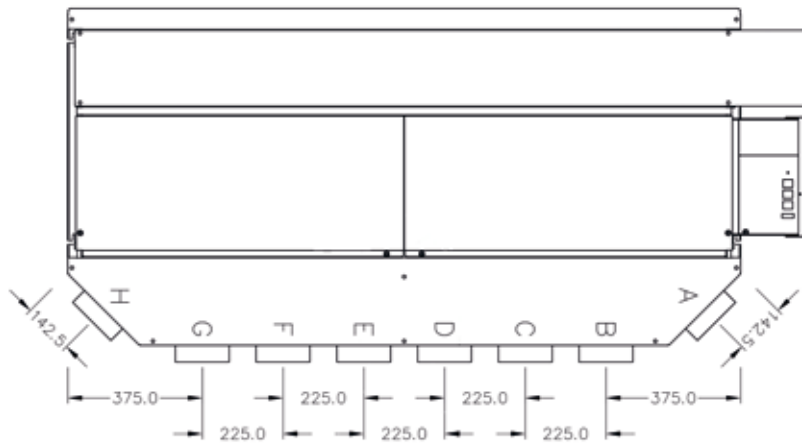
LH Unit shown, RH opposite.

Note: unit handings are viewed looking against the direction of air flow.

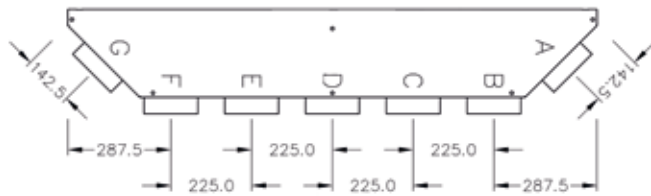
DIMENSIONS

Circular Spigot Connections

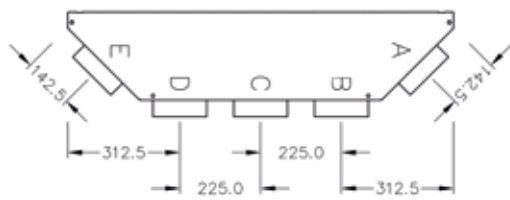
Standard Spigot Sizes
160 Ø
150 Ø
125 Ø
100 Ø
Rectangular or Flat Oval Spigots are available on all models



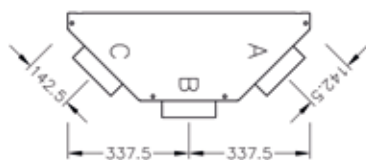
Models
Cougar 6 & 7



Models
Cougar 4 & 5



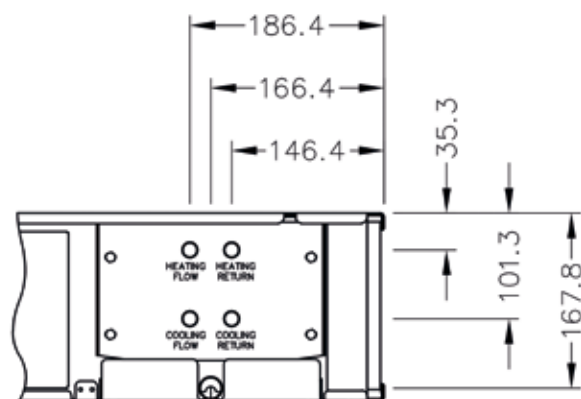
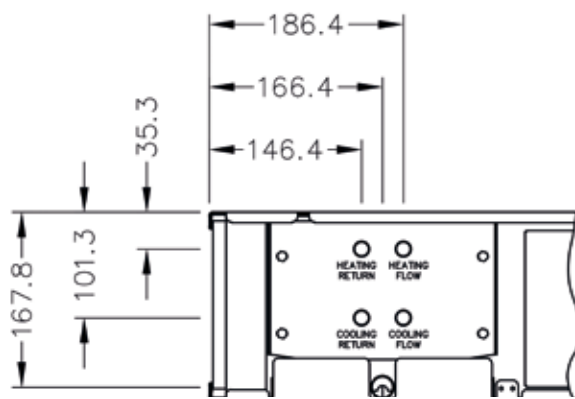
Models
Cougar 2 & 3



Model
Cougar 1

LH Coil Connections

RH Coil Connections



Ø 22mm Drain Connection

KEY FEATURES

Compact and efficient design

- **180mm slimline chassis height for shallow ceiling voids**

Simple range of size options

- **7 unit sizes in a range of 4 chassis sizes with multiple fan options**

Draw through airflow

- **Fan sound is attenuated by coil block, reducing inlet radiated noise levels**
- **Effective heat transfer with airflow by uniform air velocity across coil face**

Robust chassis

- **Precision fabrication with CNC punched and folded chassis components**
- **Rigid construction in stiffened 1.2mm thick galvanised steel**

Excellent acoustics

- **Plenums lined with 12mm open cell acoustic foam with optional attenuators**
- **Forward curved centrifugal fans isolated from the chassis on a floating bulkhead**

High performance cooling and heating

- **Integral heat exchanger coil block with dedicated cooling and heating sections**
- **Copper tube with 'AC' profile aluminium fins for better heat transfer**
- **Compatible with CHW and LPHW systems with or without glycol treatment**

Responsive waterside control

- **Rapid response to cooling and heating demand**
- **Optional pressure independent (PICV), 2 port, 3 port + bypass or 4 port control valves**

Effective condensate removal

- **Precision condensate pan to minimise air bypass**
- **Condensate pan is graded in two directions to provide rapid removal of condensate**

Energy efficient variable air supply

- **Electronically commutated (EC) motors with 0-10VDC signal speed control (on-board with fitted fan speed potentiometer or external BMS control)**
- **Low specific fan powers (SFP) between 0.1W/l/s to 0.4W/l/s**

Bespoke control strategy

- **Flexible cooling and heating outputs**
- **Variable CHW and LPHW flowrates with variable air volume**

Easy commissioning and maintenance

- **Double hinged control box lids**
- **Removable washable inlet air filters (to either side or from underneath)**
- **Removable access panels**

OPTIONAL FLEXIBILITY

Fitted acoustic attenuators

- **Reduce noise levels with optional inlet and discharge attenuators**

Extended drip trays

- **Factory fitted commissioning sets with condensate pans extended by 200mm**

Filter upgrade

- **Improved supply air quality with inlet air filter upgrade to G3**

Stainless steel condensate pans

- **Additional corrosion resistant stainless steel condensate pans to standard or extended lengths**

Flexible supply air delivery

- **Multiple circular discharge spigots or single rectangular discharge spigots**
- **Optional octagonal or rectangular discharge plenums**

Stand-alone or communicating controls

- **Factory fitted 'free-issue' bespoke controls to suit any BMS network**

Pumped condensate removal

- **Fitted condensate pump with automatic operation and alarm signal**

Fan fault monitoring and alarm

- **Fitted fan monitoring board with fan speed output, relay alarm signal and fan status LEDs**



All Dunham-Bush fan coils are available with optional extended drip tray and fitted condensate pumps



Optional fan monitoring board with relay fault output

COOLING DATA

Size	Fan Speed (VDC)	NR Level	Airflow Rate (l/s)	Specific Fan Power (W/l/s)	CHW 6/12°C		CHW 7/13°C		CHW 9/15°C	
					Sens Cooling (kW)	Total Cooling (kW)	Sens Cooling (kW)	Total Cooling (kW)	Sens Cooling (kW)	Total Cooling (kW)
01	4.00	25	44	0.20	0.64	0.82	0.57	0.69	0.48	0.48
	5.25	30	85	0.29	1.21	1.56	1.14	1.38	0.94	0.94
	6.50	35	115	0.42	1.69	2.18	1.55	1.88	1.27	1.27
	7.50	40	137	0.53	2.00	2.58	1.82	2.21	1.50	1.51
02	4.25	25	53	0.22	0.78	1.00	0.71	0.86	0.58	0.58
	5.25	30	84	0.29	1.23	1.58	1.13	1.37	0.92	0.92
	6.75	35	121	0.46	1.78	2.29	1.63	1.98	1.33	1.33
	8.00	40	142	0.59	2.05	2.64	1.91	2.32	1.56	1.57
03	4.25	25	110	0.23	1.61	2.07	1.48	1.80	1.21	1.21
	5.50	30	174	0.31	2.56	3.30	2.34	2.84	1.92	1.93
	7.00	35	250	0.46	3.67	4.73	3.37	4.09	2.70	2.71
	8.50	40	291	0.57	4.26	5.49	3.91	4.74	3.20	3.21
04	3.50	25	86	0.18	1.26	1.62	1.15	1.40	0.94	0.94
	4.50	30	141	0.24	2.05	2.64	1.89	2.29	1.50	1.51
	5.75	35	208	0.33	3.04	3.91	2.79	3.39	2.28	2.29
	7.00	40	270	0.46	3.96	5.10	3.63	4.40	2.97	2.98
05	3.50	25	93	0.15	1.37	1.76	1.25	1.52	1.02	1.02
	4.50	30	189	0.22	2.61	3.36	2.38	2.89	1.95	1.96
	5.50	35	275	0.28	4.04	5.20	3.70	4.49	3.03	3.04
	7.00	40	393	0.42	5.76	7.42	5.28	6.41	4.32	4.33
06	3.50	25	104	0.17	1.52	1.96	1.39	1.69	1.14	1.14
	4.25	30	178	0.22	2.61	3.36	2.37	2.90	1.95	1.96
	5.25	35	260	0.28	3.81	4.91	3.50	4.25	2.86	2.87
	6.75	40	374	0.43	5.48	7.06	5.00	6.07	4.11	4.12
07	3.00	25	43	0.15	0.63	0.81	0.57	0.69	0.47	0.47
	4.00	30	166	0.23	2.44	3.14	2.24	2.72	1.83	1.84
	5.00	35	285	0.31	4.18	5.38	3.83	4.65	3.13	3.14
	6.50	40	432	0.42	6.34	8.16	5.81	7.05	4.75	4.77

1. Cooling performance based on entering air 23°C 50%RH and external static pressure drop 30Pa
2. NR Level are approximate for guidance only and assume typical commercial room acoustic conditions

HEATING DATA

ELECTRICAL DATA

Size	Fan Speed (VDC)	NR Level	Airflow Rate (l/s)	Specific Fan Power (W/l/s)	LPHW 80/70°C	LPHW 70/50°C	LPHW 50/40°C	Size	Fan Speed (VDC)	Current (A)
					Heating (kW)	Heating (kW)	Heating (kW)			
01	4.00	25	44	0.20	0.86	0.59	0.32	01	4.00	0.10
	5.25	30	85	0.29	1.67	1.14	0.62		5.25	0.22
	6.50	35	115	0.42	2.25	1.55	0.84		6.50	0.40
	7.50	40	137	0.53	2.68	1.84	1.00		7.50	0.60
02	4.25	25	53	0.22	1.04	0.71	0.39	02	4.25	0.13
	5.25	30	84	0.29	1.65	1.13	0.61		5.25	0.23
	6.75	35	121	0.46	2.37	1.63	0.89		6.75	0.45
	8.00	40	142	0.59	2.78	1.91	1.04		8.00	0.67
03	4.25	25	110	0.23	2.16	1.48	0.81	03	4.25	0.23
	5.50	30	174	0.31	3.41	2.34	1.28		5.50	0.41
	7.00	35	250	0.46	4.90	3.37	1.83		7.00	0.83
	8.50	40	291	0.57	5.69	3.91	2.13		8.50	1.22
04	3.50	25	86	0.18	1.68	1.15	0.63	04	3.50	0.17
	4.50	30	141	0.24	2.76	1.89	1.03		4.50	0.28
	5.75	35	208	0.33	4.06	2.79	1.52		5.75	0.52
	7.00	40	270	0.46	5.28	3.63	1.98		7.00	0.95
05	3.50	25	93	0.15	1.82	1.25	0.68	05	3.50	0.21
	4.50	30	189	0.22	3.48	2.29	1.30		4.50	0.35
	5.50	35	275	0.28	5.38	3.70	2.02		5.50	0.59
	7.00	40	393	0.42	7.69	5.28	2.88		7.00	1.24
06	3.50	25	104	0.17	2.02	1.39	0.76	06	3.50	0.23
	4.25	30	178	0.22	3.48	2.39	1.30		4.25	0.39
	5.25	35	260	0.28	5.09	3.50	1.90		5.25	0.58
	6.75	40	374	0.43	7.31	5.03	2.74		6.75	1.21
07	3.00	25	43	0.15	0.84	0.57	0.31	07	3.00	0.20
	4.00	30	166	0.23	3.25	2.24	1.22		4.00	0.32
	5.00	35	285	0.31	5.57	3.83	2.09		5.00	0.58
	6.50	40	432	0.42	8.46	5.81	3.17		6.50	1.28

1. Heating performance based on entering air 21°C and external static pressure drop 30Pa
2. NR Level are approximate for guidance only and assume typical commercial room acoustic conditions

ACOUSTICS

Fan Coil Unit Acoustics

To predict Noise Rating (NR) levels of installed fan coil units, Dunham-Bush use the following assumptions for horizontal fan coil units installed above a false or suspended ceiling:

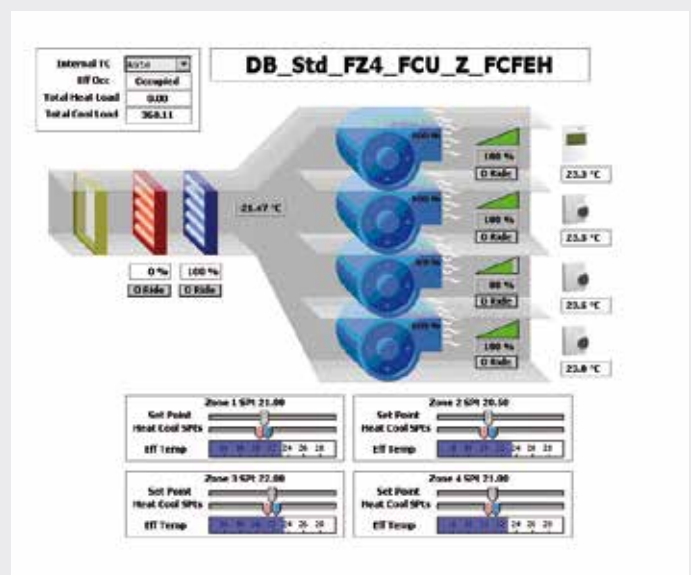
- Room acoustic characteristics are taken as medium or average, with a typical reverberation time of 1.0s. Room construction would typically be contract carpet, fibreboard lay-ceiling tiles in a ceiling grid, wall surface areas comprising glazing and conventional wall finishes, room furnished with office equipment and occupied.
- Room dimensions typically taken as 8m x 8m with a ceiling height of 2.7m and the listener is assumed to be 1.5m from all noise sources.
- Supply/return air paths are via typical ceiling grilles/diffusers, installed within the ceiling at least 1.0m from any wall surfaces
- Sound pressure levels are determined with fan coil units installed above the ceiling, with return air from the ceiling void; fan coil units are installed at least 6.0m apart in all directions.

The following corrections can be used to provide an approximate adjustment to predicted NR levels for different room conditions:

- | | |
|--|------|
| • Good quality suspended ceiling; medium dead room acoustics | -2dB |
| • Medium live room acoustics | +1dB |
| • Poor quality suspended ceiling; medium live room acoustics | +4dB |
| • No suspended ceiling; live room acoustics | +9dB |

'Zone Flow' Control System

The 'Zone Flow' system by Dunham-Bush includes a fully functional communicating controller, enabling FCUs to communicate with external networks. The system allows individual control of FCUs via a router or gateway, communicating to any network such as BACnet, Echelon, Modbus networks as well as BMS networks. Alterations to the control strategy can be made using a web-serving graphical user interface, allowing the user to edit control software and algorithms. The controller is fitted with an enhanced range of analogue, digital and universal inputs/outputs as well as sensors for monitoring FCU status.



SPECIFICATION

Cougar fan coil units shall be manufactured by Dunham-Bush Ltd, Downley Road, Havant, Hampshire, PO9 2JD. Units shall be selected to achieve required performance, operating in the specified design parameters. Units shall be of a draw through design and comprise washable air filter, dual purpose coil with separate connections for cooling and heating, stainless steel condensate pan, low noise external rotor motors/fans, integral multi-outlet discharge plenum and an electrical / controls box.

Unit Chassis - Chassis shall be of a rivetted construction manufactured from a minimum thickness of 1.2mm galvanised steel. Stiffeners and strengthening folds shall be used to form a solid robust structure. Recessed, reinforced mounting slots shall be provided for M6 or M10 drop rods or similar. Panel design and use of 'dutch folds' produce a flush external finish with no sharp edges. Fan assemblies shall be mounted on a 1.6mm 'floating' isolated bulkhead plate, to prevent noise resonance through the unit casing. Panels shall be designed to allow separate access to serviceable items, namely filters, condensate pan, coil, fans, motors and controls.

Discharge (Supply Air) Plenums - A mitred, integral acoustically lined discharge plenum shall form part of the unit with outlet spigots sized to supply air ductwork. Spigots and blanking plates shall be interchangeable, fixed to the plenum by screws, allowing outlet positions to be moved or extra spigots to be added for site layout changes or fit-out.

Access - Access for inspection and service to the fans/motors shall be via an insulated panel secured with 1/4 turn captive quick release fasteners. On sizes 4 - 7 this panel will be in two sections to allow easy removal by a single person through a standard ceiling grid. Access to the condensate pan, coil, filters and discharge plenum are via separate insulated panels retained by M6 setscrews into captive nutserts and panels will form an airtight seal against the main unit chassis.

Insulation - Unit chassis and panel work shall be both thermally and acoustically insulated with 95kg/m³, CFC & HFC free, Class 'O' open cell expanded foam insulation, having a maximum thermal conductivity of 0.047 W/mK, fully complying with London Borough and CAA flammability and toxicity requirements. The adhesive is a modified acrylic, light and ageing resistant synthetic resin with high temperature tolerance.

Air Filters - Filters shall be fully framed, washable, polyester G2 media with a dust holding capacity of 450g/m². Filters shall be easily removable from either the rear or side of the unit without the need to remove any panel work.

Condensate Pan - The condensate pan shall be of a one-piece construction manufactured from 1.2mm grade 316L stainless steel with fully welded corners. Pans to be 'V' formed and mounted to provide a positive fall in two directions ensuring the free flow of condensate to the 22mm diameter stainless steel end connection. Pans shall be externally insulated with 3mm closed cell class 'O' thermal insulation. Pans to be enclosed within a galvanised steel carriage providing both protection against damage and easy removal for cleaning.

Coils - Coils shall be single block with two sections to provide both cooling and heating, constructed from 3/8" seamless copper tube mechanically expanded into aluminium fins and brazed into copper headers. Aluminium fins shall be spaced at 12 F.P.I and have die formed collars to provide maximum contact and optimised heat transfer. Coils shall be circuited to provide low hydraulic pressure drops under normal operating conditions and designed to prevent air locks, ensuring positive venting via slotted hexagonal vent plugs. Coils to terminate with plain 15mm copper tails, spaced at 40mm centres to accept standard 4-port valves. Tails are to terminate within a restraining plate providing adequate support to the control valves and adjoining pipework. Coils shall be tested by dry air under water to 30 barg.

Fans/ Motors - Cougar incorporates high efficiency EC (electronically commutated) motors. Speed adjustment is by an infinitely adjustable potentiometer fitted on the control box, or continuously variable fan speed is affected by a 2-10v DC control signal.

Fan Speed Control - Speed control shall be effected by means of a multi-tapped auto-transformer with twelve outputs, plus a screened 24 volt a.c (30VA) output for operation of a controls package. Transformers shall be pre-wired to a selector switch providing three main speeds to suit the unit duty requirements, whilst a separate three position 'fine tuning' switch allows accurate commissioning on each of the main speeds. Speed control transformers shall be fitted within a ventilated controls box mounted on the side of the unit.

Controls Box - Each unit shall be provided with a well-ventilated electrical box complete with a removable/hinged lid for ease of access. The box shall contain a terminal block, auto transformer, on/off switch, three speed and 'fine tuning' fan selector switches, and mains fuse whilst also providing space to accommodate most available temperature controllers along with any associated relays (if required). The control box shall be wired to current I.E.E regulations and be provided with a 1 metre flying lead for site connection to an adjacent fused spur. The complete control box shall be provided with a quick release electrical plug & socket connector attaching the box to the side of the fan coil unit, allowing the box to be simply removed from the unit for any major refurbishment/warranty work or retro-fitting of DDC controls by others.

Controls - Temperature controls shall meet the project specification, comprising modulating 4 port valves and actuators with an stand alone or DDC temperature controller wired to a air or room sensors. A wide variety of controls packages are available, either supplied and fitted by Dunham-Bush, or 'free-issued' to Dunham-Bush for factory fitting.



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Manufacturer reserves the right to
change any product specification
without notice

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