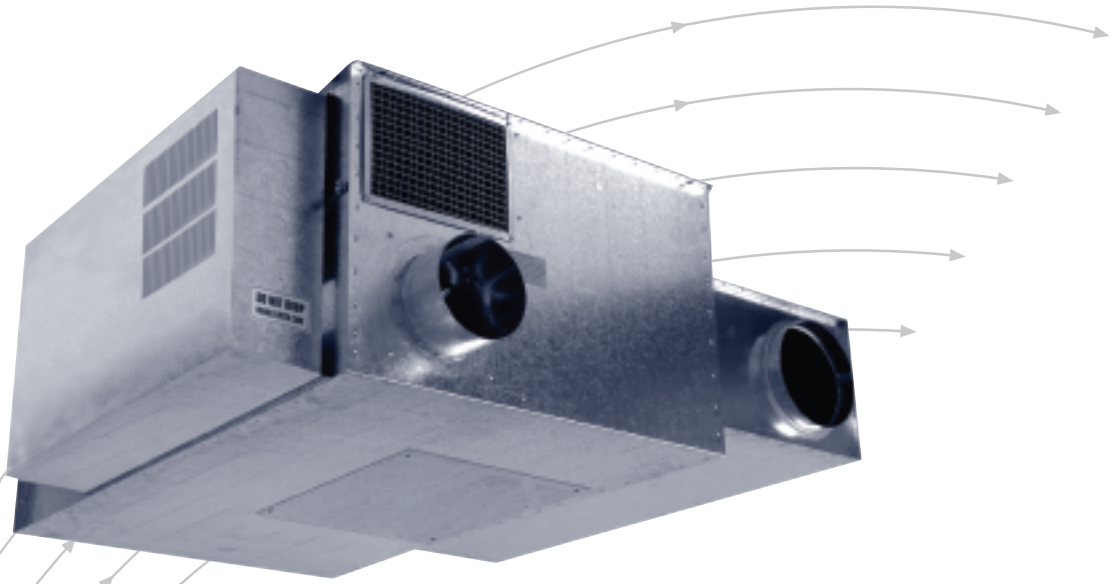
Series Fan VAV Terminal Boxes

Type CVFB



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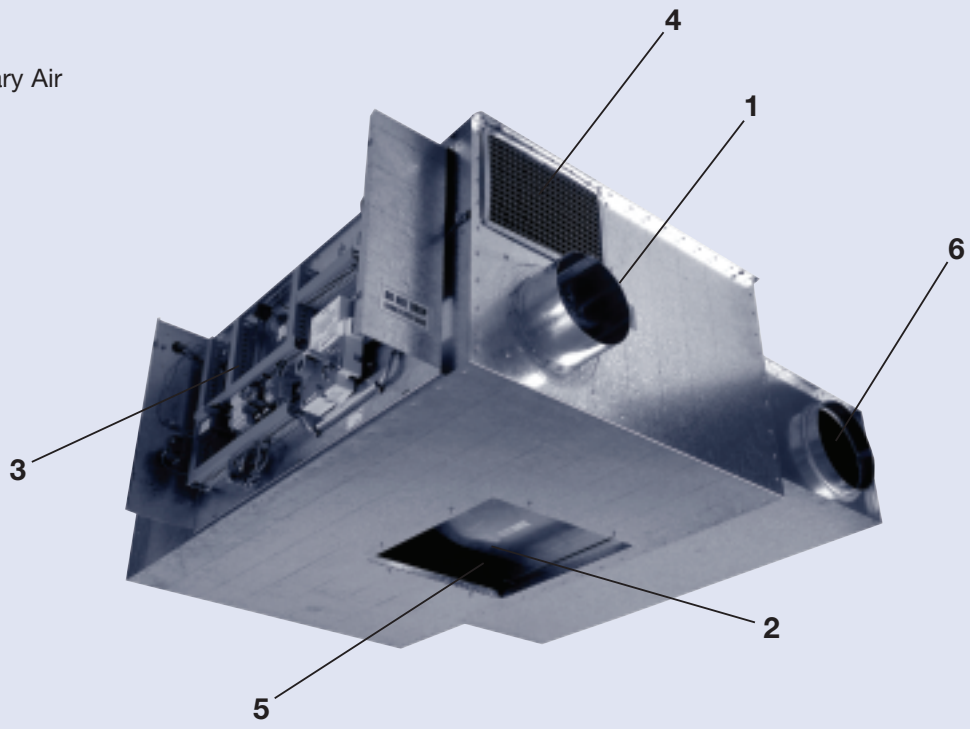
Contents · Description

1 Velocity Flowgrid Primary Air
2 Fan/Motor
3 Controls Package
4 Air Induction Port
5 Fan Access Opening
6 Multi-Outlet Spigot



Trox Series Fan VAV Terminal Boxes take primary and induction air, mix the two thoroughly and provide a constant air supply to the occupied zone of the building.
Total flow from the diffuser is kept substantially constant thus giving very good air distribution even with high turn down of the primary air volume. The primary air damper can be fully shut.
Trox Series Fan VAV Terminal Boxes have been designed and developed to achieve lower room noise levels.
Discharge and case radiated sound pressure levels of NR 35 can be achieved in the occupied zone.
Pressure independent control of the primary VAV damper is accomplished by use of a Multi-point flowgrid which gives accurate control of air flow even with a 90° bend on the inlet spigot.
Mixing between the primary airstream and the induced warm air from the ceiling void is by forward curved blade centrifugal fan with a direct drive motor. This direct drive motor is of the permanent split capacitor type, eminently suitable for use with stepless fan speed controllers.

Trox Series Fan VAV Boxes save energy by utilising the warm air in the building already generated by other sources and mixing it with primary air before distributing a constant volume air supply direct to the occupied zone. This reduces energy consumption, so providing long term operational savings. Trox Series Fan VAV boxes are suitable for pneumatic or electronic control. Volume flow tolerance is dependent on the type of control system but is typically ±5% to ±10% of set volume.
The units are designed for use in VAV systems and in conjunction with DDC controllers permit communications between the boxes and a centralised control area.

General

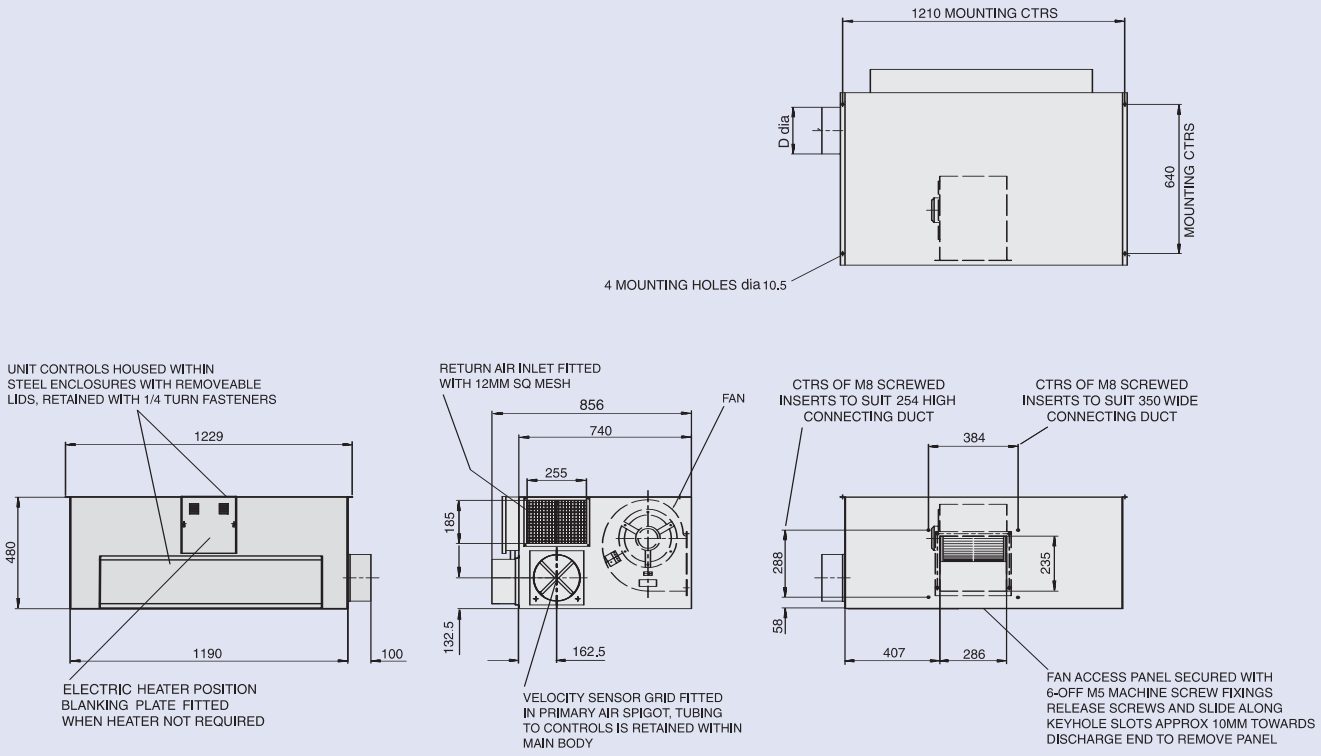
Series Fan VAV terminal VAV boxes are constructed from galvanised steel meeting all relevant UK construction standards. All electrical control components are protected by sheet metal enclosures to meet UK practices. The enclosure has a single electrical (230 V or 400 V) mains entry position.

Casing

The casing is sturdily constructed of galvanised sheet steel. The overall construction is reinforced to meet acoustic performance requirements.

- Casing with acoustic and thermal insulation, erosion resistant up to 20 m/s.
- High pressure side with duct spigot suitable for circular ducting.
- Low pressure side suitable for angle frames or slide-on flanges (type FDS outlet) or fitted outlet box.
- Casing leakage rate to DW 144 Class A.
- Drilled mounting holes for support rods are provided in the top flange of the casing.
- Outlet plenum available (type 20B or 20C).

Type CVFB - ER with Internal Electric Heater



CVFB Outlet Size	Spigot mm	D dia mm	Weight kg
210	160, 200	1mm smaller than spigot size	73

Access Door

To avoid removal of the terminal box once fitted in the system, an access door is provided in the casing underside so that the fan/motor can be serviced, or in the unlikely event of failure, removed without disturbing the duct connections.

Insulation

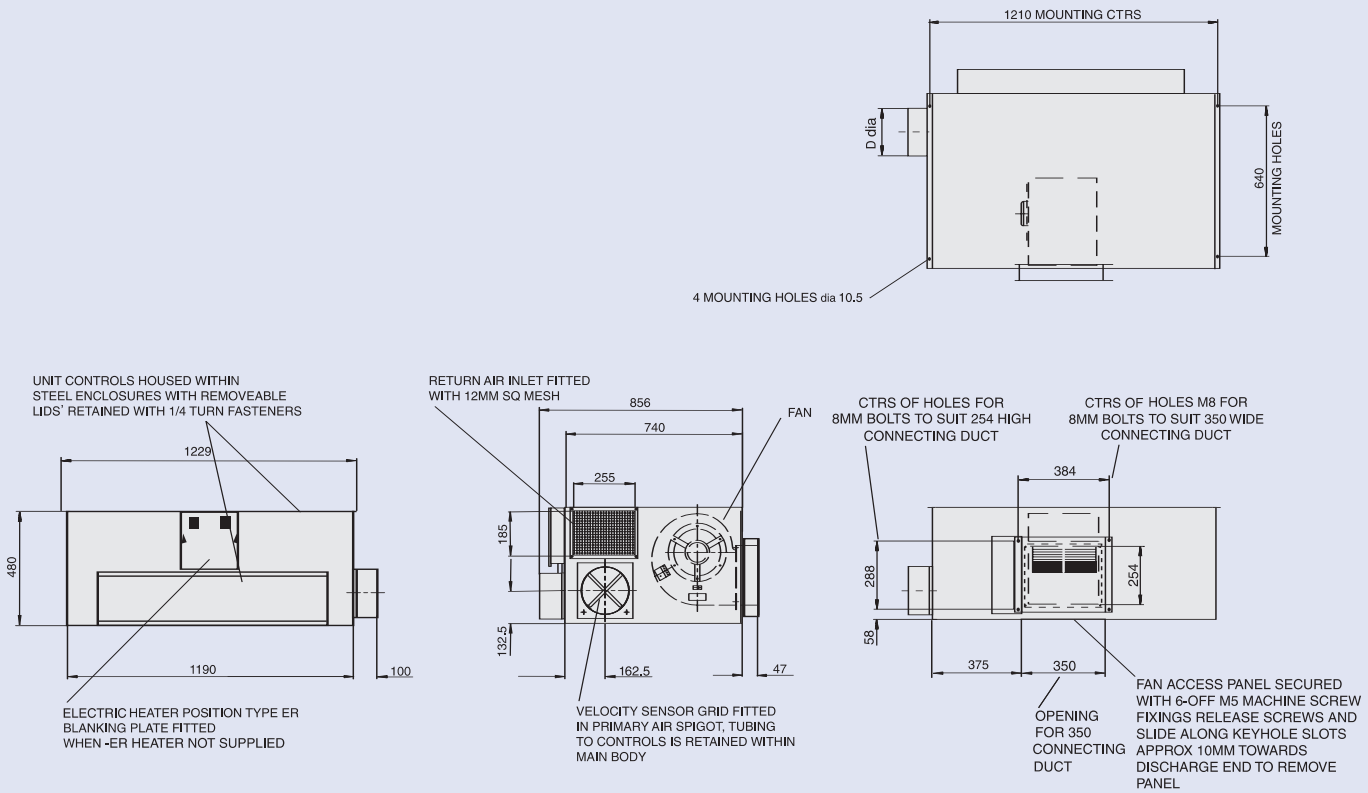
- The inside of the terminal box is acoustically lined with a PU foam.
- The access door is also lined with the same material.
- All lining materials have Class 'O' fire rating conforming to UK building regulations.

VAV Section – Volume Flow

The Series Fan VAV Terminal Box is suitable for pressure independent control. Volume flow is sensed by a multi-point, averaging flowgrid measuring pressure differential.

- Primary volume flow tolerance is dependent on type of control system but is typically ±5% to ±10% of set volume.
- Primary volume flow control range typically 100% to 15% depending on type of control.
- Free issue electronic controllers can be fitted.
- Primary air volume flow range adjustment at factory.
- Volume measurement can be made on site using the flowgrid; also adjustment of volume flow through controller.
- Control and full shut off is achieved with a single damper.

Type CVFB - ER - FDS (Details of CVFB - 1R LPHW heater on request)



CVFB Outlet Size	Spigot mm	D dia mm	Weight kg
210	160, 200	1mm smaller than spigot size	75

Pressure Differential Flowgrid

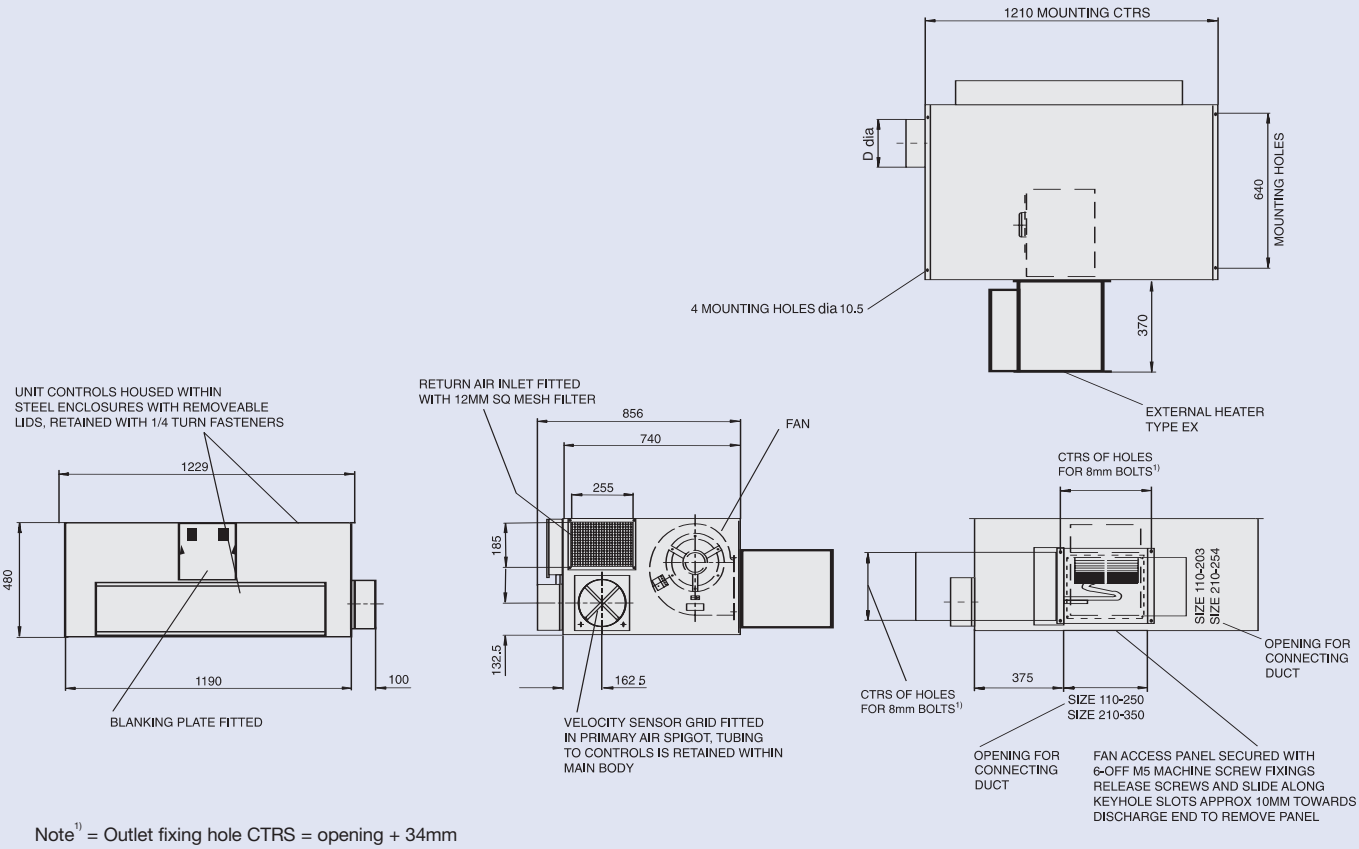
- Minimum pressure differential signal from 2Pa upwards.
- Sensor tubes in aluminium.
- Test pressure tappings are supplied with tight fitting caps.
- Calibration graphs and constants are provided to relate volume flow in litres/second to the measured pressure differentials.
- The differential pressure generated by the averaging sensor is within ±3% of the calibration chart value over the range of typical primary air flow rates.

Control Damper

The single blade damper is mounted in the circular duct behind the flow measuring grid. The drive spindle is extended through the casing and a suitable actuator slips over the shaft and locks directly to it.

- The closed damper has a shut off leakage at 500Pa inlet pressure of less than 0.5% of rated flow.
- The damper blade is positively connected to its drive shaft which runs in maintenance free plastic (Pocan) long life bearings.
- Evoprene damper seal, thermoplastic elastomer compound seal suitable for temperatures up to 50°C.

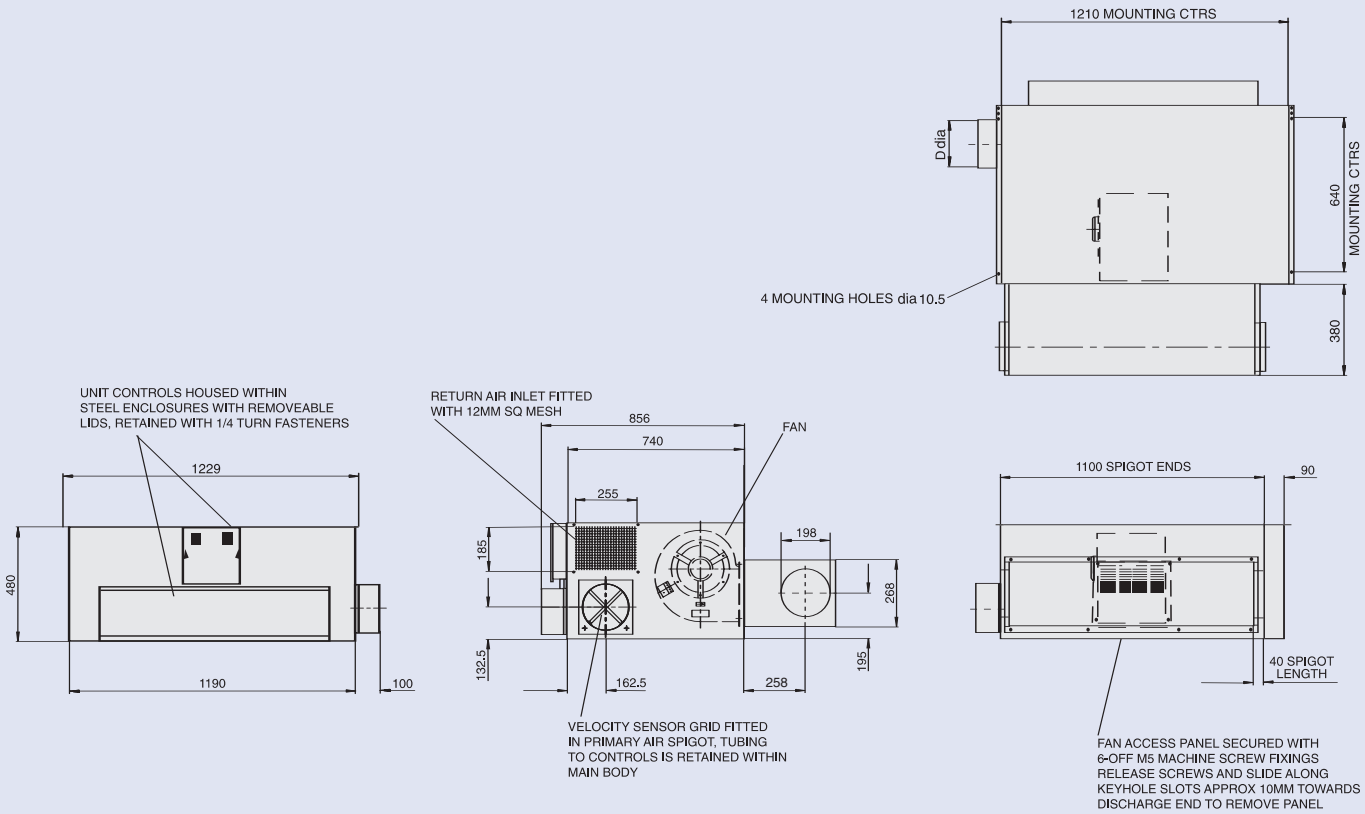
Type CVFB - EX with External Electric Heater



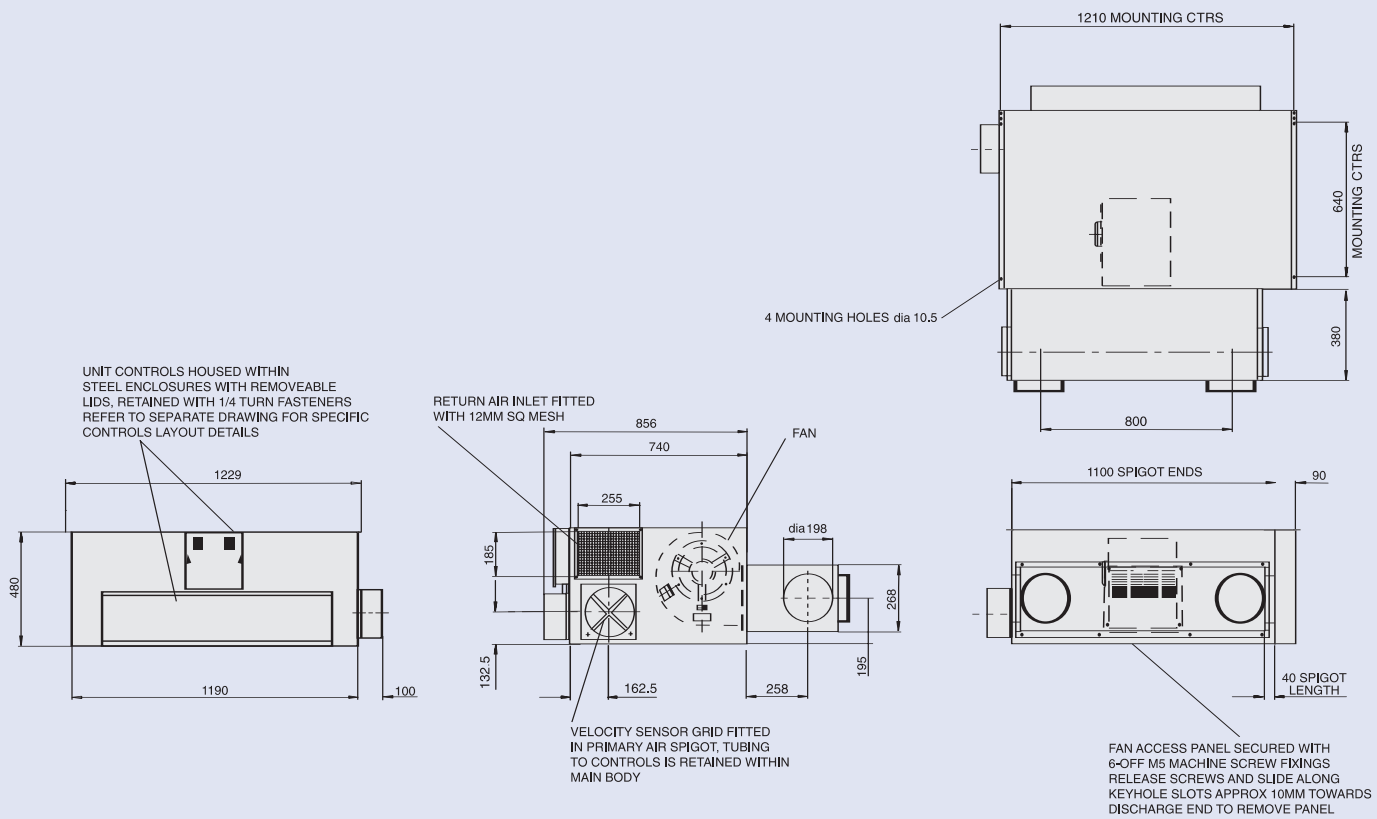
Note[1)] = Outlet fixing hole CTRS = opening + 34mm

CVFB Outlet Size	Spigot mm	D dia mm	Weight kg
110	160	1mm smaller than spigot size	77
210	160, 200		80

Type CVFB - * - 20B



Type CVFB - * - 20C



Aerodynamic Data

Primary Air Volume Range · Fan Volumes

Performance Details

- Discharge flow remains constant within ±7.5% from 100% primary to minimum primary air.
- Minimum primary air pressure differential required typically 25Pa. For actual values see page 9.

Notes

The minimum primary air volume shown is the minimum factory set value for control purposes. See page 9 for leakage on full shut off.
Fan volume is given for typical downstream pressures. Other downstream pressures duties available on request.

Primary Air Volume Range

Spigot Code	Spigot Size	Minimum* Primary Airflow (l/s)	Maximum Primary Airflow (l/s)
160	159	30	180
200	199	50	260

Table 1: Fan Volume CVFB-ER and CVFB-EX

CVFB Size	Fan Code	Fan Speed	Total Fan Volume ESP[1] 50Pa (l/s)
110	8	Min Max	100 140
210	2	Min Max	160 230

[1] ESP = External Static Pressure

Selection Method

- First select case size and fan code on basis of fan volume flow rate.
- Select inlet spigot size to meet maximum and minimum primary air requirements.

Example

Given Fan flow 180 l/s ESP 50 Pa
Maximum Primary Air 120 l/s
Minimum Primary Air 35 l/s

Selection

Spigot Code	160
Fan Code	2
Case Size	210

Table 3: Minimum Inlet Static Pressure

Primary Inlet Spigot Code	V_I (l/s)	$\dot{p}_{SI}$ min Pa
160	30 180	20 40
200	50 260	20 35

Table 4: Leakage Across Closed Primary Air Damper

Primary Inlet Spigot Code	$\dot{V}_L$ (l/s)	
	$\dot{p}_{SI}$ Pa	
	250	500
160	0.20	0.28
200	0.31	0.44

Fan and Motor

The Series Fan VAV terminal boxes are fitted with fan casings (Scrolls) manufactured from sheet steel.
The fans have a forward curved fan impeller.
All fan motors are direct drive resiliently mounted via location brackets suitable for 230 volts 50 Hz single phase and are supplied with auto reset thermal overloads.
The fan motors are permanent split capacitor types fitted with permanently lubricated bearings.
All earthing wiring and component selection conforms to BS/IEE wiring requirements.

Fan Motor Speed Control

All fan motors fitted to Trox Series Fan VAV Terminal Boxes are suitable for fan speed control.
Supplied as standard is a manually adjusted solid state Triac based fan speed controller which provides stepless adjustable fan speed – from maximum to minimum. The system is matched to the motor and includes minimum voltage limits to ensure stable motor operation.

Table 5: Fan Motor Details

Fan Code	W_2 watts	W_1 watts	A_R amps	A_S amps
2	120	275	1.2	2.8
8	40	100	0.43	0.63

Power factor: 0.9 approx.

Nomenclature

L_{WNR}	:	NR rating of octave sound power levels for ductborne regenerated noise.
NR_1	:	NR rating of octave sound power levels of ductborne regenerated noise including insertion loss of TSFB secondary silencer and 8 dB room attenuation.
NR_2	:	NR rating of octave sound power levels for case radiation and induction port noise including a combined 14 dB ceiling reduction and room attenuation, for the case of zero primary air (fan only).
NR_3	:	NR rating of octave sound power levels for case radiation and induction port noise including a combined 14 dB ceiling reduction and room attenuation, for the case of 100% primary air and 200 Pa primary air pressure.
p_{SD}	in Pa:	Downstream static pressure.
p_{SI}	in Pa:	Inlet static pressure.
$p_{SI}\,min$	in Pa:	Minimum inlet static pressure.
V_I	in l/s:	Primary air volume flow rate.
$\dot{V}_D$	in l/s:	Discharge (fan)volume flow rate.
V_L	in l/s:	Leakage volume flow rate across closed primary air damper.
W_1	in Watts:	Input power to motor at maximum fan volume flow rate.
W_2	in Watts:	Output power of motor.
A_S	in amps:	Motor starting current.
A_R	in amps:	Motor running current.
M_W	in kg/s:	Mass flow water.
Q	in kW:	Heat output.
Δp_W	in kPa:	Water pressure drop.

Quick Selection

Table 6: Quick selection (Guide Figures)

CVFB Outlet Size	Fan Code	$\dot{V}_D$ l/s	p_{SD} Pa	L_{WNR}	NR_1	NR_2	NR_3
110	8	100 140	50 50	53 56	30 33	17 20	24 26
210	2	160 230	50 50	53 58	28 33	28 29	25 29

Refer to table on page 8 for relationship of inlet spigot diameter and primary air flow rate.

Sound Power Level spectrum available on request.

For NR30 rooms, it is recommended that the -AR- attenuated return is used (with EX heater if required).

Insulation

- The inside of the TSFB Attenuator is acoustically lined with a minimum 50mm thickness.
- Face of the mineral wool has a glass fibre tissue covering securely fixed to the substrate. PU Foam side liners are incorporated.
- All lining materials have Class ‘O’ fire rating conforming to UK building regulations.
- A perforated plate liner is available on request.

Secondary Attenuator Type TSFB

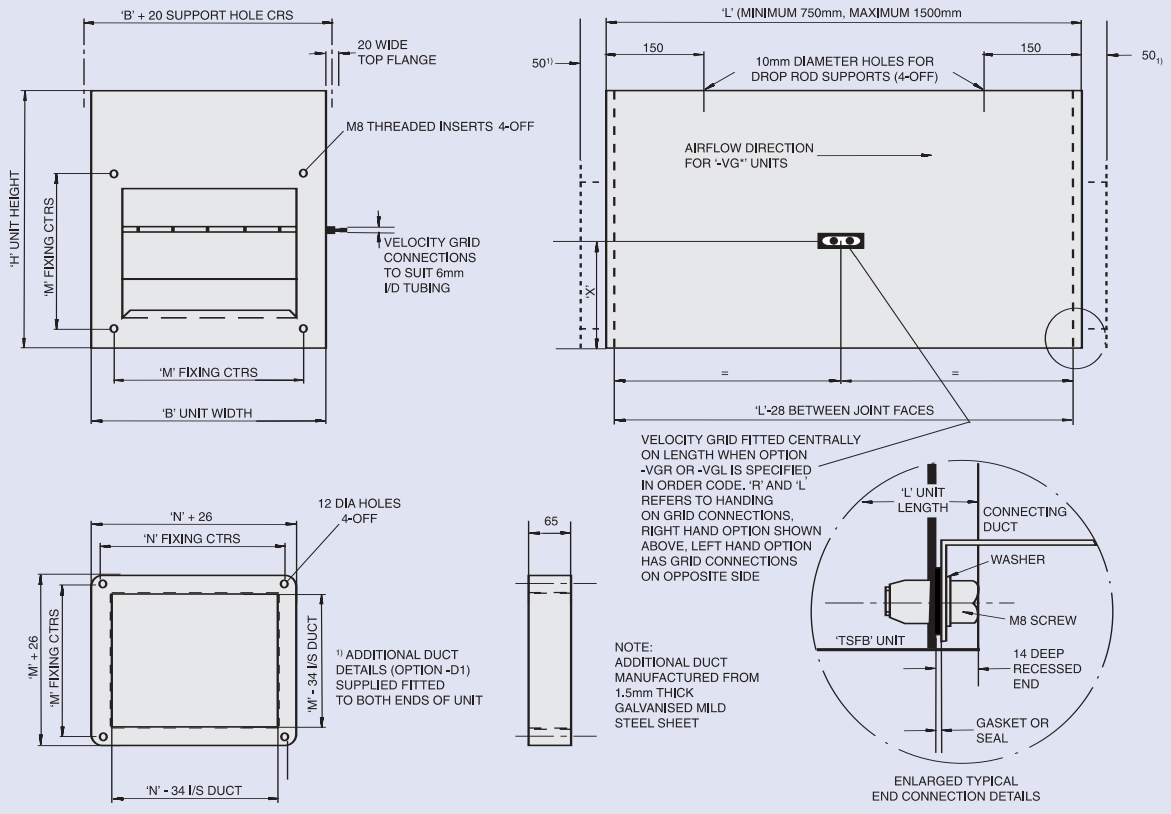


Table 7:

CVFB Outlet Size	L	B	H	N	M	X
110	750	354	392	284	237	170
210	1000	454	402	384	288	175

Water Coil Output Data

Hot Water Coils

The hot water heating coil is manufactured from 3/8 inch diameter copper tube with aluminium fins spaced at 1.8mm. The tubes are formed into circuits to limit water velocity and mounted in a galvanised sheet steel flanged frame with copper headers. The heating coils meet the requirements of British Standards/Codes as applicable. Coil connections are 1/2 inch BSP as standard.

Plugged air vent and drain points are provided.
Water control valves can be supplied as a loose item if required.
The maximum coil output is shown in kW for water temperatures of 82°C flow and 71°C return and based on air temperature entering the coil of 22°C. The water pressure drop is shown in kPa and the water rate in kg/s. Other water/air temperatures available on request.

Table 8: One Row Coil

CVFB Outlet Size	$\dot{V}_D$ l/s	$\dot{Q}$ kW	$\dot{M}_W$ kg/s	Δp_W kPa
110	100 125	2.2 2.6	.052 .062	3 5
210	165 220	3.8 4.4	.090 .105	2 3

Electric Heaters [1)]
The electric heater is available as an integral unit complete with controls including fuses and interlocks. The integral air heater has elements designed for black heat operation and consists of 80/20 nickel chrome wire in a stainless steel tube (grade 312) filled with magnesium oxide.
An automatic reset high temperature cut out is fitted and a brass earth stud included. The heater is manufactured to British Standards/Codes as applicable and fully factory tested. A low air pressure switch is fitted on type EX. On type ER a velocity switch is used.. This switch will disconnect the heater if the fan stops. The heater elements are wired back into the control enclosure, including the earth, and heater fuses can be supplied.

Control of the heater can be arranged for stepless control by thyristors. Control type should be selected to suit the temperature controller used and the degree of accuracy required on temperature control.

1) Electric heaters are available on request.
Full details required such as kW, Voltage,
Phase should be stated.

Note: type ER heaters are only suitable for heating at minimum primary air volume.
When heating is required at maximum primary air, e.g for meeting rooms, use type EX.

Table 9: Electric Heaters

CVFB Outlet Size	$\dot{Q}$ kW	
	Supply Voltage	
	230V / 1ph 50Hz	Type
110	1.0	EX
210	1.0 or 1.5	ER
210	1, 2 or 3	EX

Order Details

Specification Text

Series Fan VAV boxes type CVFB for constant room air supply volume combined with VAV primary air control having high turndown by use of a multi-point flowgrid. Induction of warm air from the ceiling void by forward curved blade centrifugal fan with direct drive motor.
Single blade control damper with seal for shut off. Stepless speed controller to enable fan duty to be set to match the downstream duct system pressure.

Materials

Casing manufactured from galvanised sheet steel. Internally lined with PU Foam.
Multi-point flowgrid construced from aluminium tubes.
Fan casing manufactured from sheet steel. Fan impeller from aluminium alloy.

Order Code

CVFB - ER - - - 20B / 210 x 200 x 2 / BC0 / EO - 180 - 170 - 50 / ****

Type

Reheat
ER = internal electric heater [5]
EX = external electric heater
1R = LPHW coil (1 row)
or no entry

Attenuated Return [2]
AR
or no entry

Outlet
20B Integral Outlet Box [1] 2 outlet
FDS Flanged Duct Section [3]
20C Integral Outlet Box [4] 4 outlet
or no entry

Outlet Size
110
210

Spigot Size
160
200

Fan Code
2
8

Controller/ Actuator
Refer to Trox

E0 = Control Signal 0-10 V dc for standard BCO controller/actuator

Fan volume l/s

Maximum primary l/s

Minimum primary l/s

Control Diagram
Refer to Trox

Notes
[1] With 198mm dia spigots (2 off) Not available with 'EX' external reheat or LPHW coil
[2] Not available with ER reheat
[3] Not available with EX reheat. Required with LPHW coil
[4] With 198mm dia spigots (4 off). Not available with 'EX' external electric reheat or LPHW coil
[5] Not available on size 110

Order Code - Secondary Silencer

TSFB - LB - VGR - D1 / 210 / 0 /

Product Type

Lining
LB = Perforated plate lining
or no entry

Flowgrid
VGL = Left Hand
VGR = Right Hand
or no entry

Duct Piece
D1 = Additional ducts fitted
or no entry

Size
110
210

Not used

No entry for standard length or special length in mm on request

Order Example

Make : TROX
Type : CVFB-ER-20B/210x200x2/BC0/EO-180-170-50
COMPLETE WITH 1KW HEATER