

TSD157B-MRI – LAMINAR FLOW TRANSDUCER ± 120 LPM

The TSD157B-MRI laminar flow transducer (± 120 LPM) is suitable for precision ventilator bidirectional airflow measurements or resting airflow measures in fMRI. It consists of flow head RX157B + pressure transducer TSD160A + Tubing. Available with 20 m tubing for MRI use or 1 m tubing for non-MRI use (option TSD157B-MRI-01). Tubing presses over the barbs on the flow head and transducer and should be cut to fit for max separation, typically 10 m for MRI or 0.5 m for non-MRI.

- For ventilator flow measurements, the flow noise of TSD157B-MRI greatly outperforms earlier offering of TSD127 + TSD117B over the typical ventilator flow range of ± 100 LPM.
- For MRI use, the TSD157B-MRI can go inside the bore; the tubing from the RX157B flow head goes through the waveguide to the TSD160A+DA100C in the Control Room and should be cut to fit. The TSD157B-MRI can also interface with the AFT35-MRI valve: AFT35-MRI to AFT7 tubing to AFT11E to RX157B. (This same setup also works with RX127, instead of RX157B, with an additional coupler AFT11B.)

BIOPAC supplied linearization polynomials are [available on request](#) as a template.

Additional or replacement flow heads available as RX157B. Ask about options for 60 LPM or below or 240 LPM and below.

OPTIONAL ACCESSORIES

TSD157B-MRI can be used with the AFT35-MRI low-profile mouthpiece and non-rebreathing T-valve assembly and AFT7 tubing with AFT11B coupler:



SPECIFICATIONS

Components:	RX157B Flow head + TSD160A Differential Pressure Transducer + Tubing
Type:	Bidirectional Flow Measurement
Range:	±120 Liter/Min
Noise:	Standard Deviation – 0.085 Liters/Min @ 25 LPM @ DC-10 Hz Bandwidth
Interchangeability Accuracy:	±5% (nominal)
Ports:	Single Barb accepts 3.5 mm ID Tubing Connects to Standard 22 mm ID Ventilator Tubing
Tubing—Length options:	1 m (non-MRI) or 20 m (MRI)
Temperature Range:	0 °C to 40 °C
Dimensions:	140 mm long x 22 mm OD x 15 mm ID
Mounting:	¼" x 20 standard female camera mount
MR Safe:	RX157B Flowhead
Sterilization:	Cold sterilization only (Cidex® OPA or equivalent)

Flow Rate (Liters/Min)	Pressure Delta (Inches H ₂ O)
20	0.02
50	0.08
100	0.26
120	0.31

Calibration, noise and accuracy data: download [TSD157B to TSI4000 flow standard \(xls and txt\)](#)

TSD157B Amplifier and Calculation Channel Settings:

Table 1: Amplifier settings

TSD157B Amplifier Settings	
Parameter	Setting
Channel	1
Gain	1000
10 Hz LPF	On
LPF	300
HP	DC

Table 2: Scaling

Note: The ideal range of CAL 1 – CAL 2 needs to be maintained. If after clicking CAL 2 to adjust for an offset of say, -0.12, then CAL 1 must be adjusted = 1 – 0.12 = 0.88

TSD157B Scaling		
	Input V	Map (volts)
CAL 1	1	1
CAL 2	0	0

Table 3: Polynomial equation curve fit

Note: The reference voltage (vref+ and vref-) of DA100C should be +/-5v for the TSD157-MRI.

Calc Channel	Polynomial Equation (C10 is the 10 Hz LPF raw signal from A1-pneumotach)
11	$(-0.00473407 * C10^{11}) + (-0.14136 * C10^{10}) + (-1.84128 * C10^9) + (-13.7084 * C10^8) + (-64.1117 * C10^7) + (-194.359 * C10^6)$
12	$(-378.058 * C10^5) + (-443.201 * C10^4) + (-254.755 * C10^3) + (5.85431 * C10^2) + (115.713 * C10)$
13	$(-0.017143 * C10^{11}) + (0.485291 * C10^{10}) + (-5.96262 * C10^9) + (41.6528 * C10^8) + (-181.939 * C10^7) + (514.133 * C10^6)$
14	$(-936.911 * C10^5) + (1054.05 * C10^4) + (-644.382 * C10^3) + (119.216 * C10^2) + (103.059 * C10)$
15	C11 + C12 LPM
16	C13 + C14 LPM
17	IF(LESS(C10, 0), C15, C16) LPM
18	Math C17/60 LPM->lps

Table 4: Linear equation curve fit

Five segment piecewise-linear mapping of pneumotach flow to reference flow meter:
(C10 is the 10 Hz LPF filtered raw signal from A1-pneumotach)

Segment 1 C11: $(37.29935377 * C10) - 21.8073737$

Segment 2 C12: $(23.26959 * C10) - 29.25648$

Segment 3 C13: $(98.09533 * C10)$

Segment 4 C14: $(19.81710683 * C10) + 33.84804951$

Segment 5 C15: $(39.20728782 * C10) + 22.32275861$

Decision Logic C16: IF(LESS(C10, -0.531), C11, IF(LESS(C10, -0.392), C12, IF(LESS(C10, 0.431), C13, IF(LESS(C10, 0.594), C14, C15))))