VFR FLOWPROBE VAV VOLUME VALVE

- CMR Flowprobe volume measurement built in
- Excellent repeatability for fine Volume control
- External Air Tight to DIN 24194 Part 4
- Shut off Air Tight to DIN 1946 Part 4
- Valve blade has very small hysteresis
- 12 mm Ø solid drive shaft for fast speed
- Max. speed 0..90° rotation is 1s
- Shaft bearing bushes for low rotation torque
- Body lip seals for easy site installation
- CMR fast actuators also for outdoor IP65
- DPC controller can be factory fitted
- 24 month warranty
- 30 Years field application experience

VFR Flowprobe Volume control Valve with DPC-220 Controller

Valve Body Construction
The CMR Flowprove VAV or CAV air volume Valve is manufactured to the highest engineering precision with CNC machines.The valve is nudged out as a flat sheet from galvanised senzimir sheet metal with all cut outs for the damper and the blade axle. The flat plate is then formed into a precision round body and the edges are butt laser welded with a CNC Laser, which provides a perfect seal without the need for anti corrosion paint.

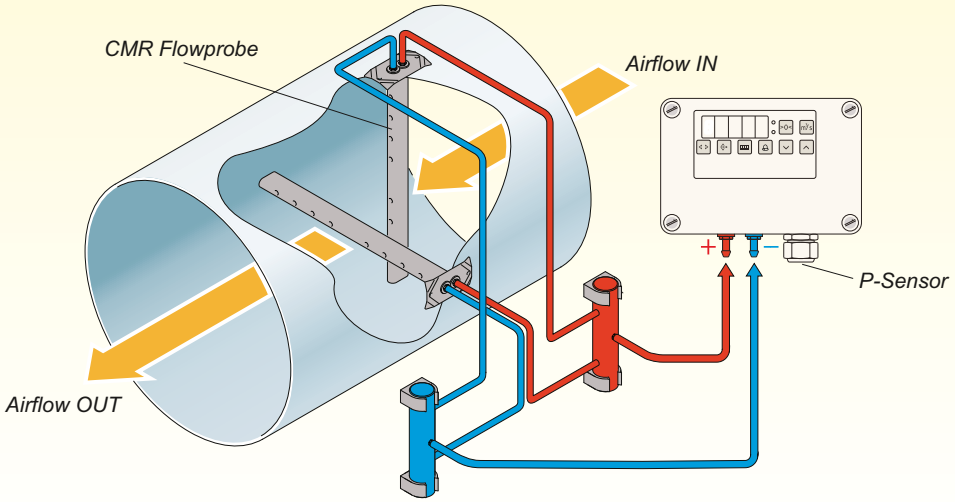
The damper blade consists of two metal round plates which sandwich a silicone disc seal. A 12mmØ axle is fitted with heavy duty clamps onto the blades and is then embedded into air tight bearing bushes on both sides of the valve to provide smooth action with very low torque. The blade and axle are designed for very fast motor rotation i.e. 1 second from open to closed position. With such high speeds, the axle will withstand the enormous torque which develops on the shaft when turning from open to close in small steps to provide high accuracy control without a fluctuating Hysteresis.

CMR Flowprobe Construction
The CMR Flowprobe is made of anodised aluminium and is designed for each Size of valve and is manufactured to very high precision. It consists of sixteen total pressure measurement points and sixteen static pressure measurement points which are mechanically averaged and conditioned. The CMR Flowprobes are bolted to the inside of the Valve with very little reduced open area. The air is forced over the Flowprobes and a velocity pressure is generated.

Volume Measurement Conversion
The velocity pressure is converted by the DPC's internal Volume Sensor into a scaled and linear air volume providing either l/s, m3/s or m3/h. The CMR Flowprobes in combination with the CMR sensors are factory calibrated and provide an accurate and repeatable measurement.

Due to the very unique shape of the CMR Flowprobe the pressure drop is regained after the Flowprobe and a very low total overall

VFR Flowprobe VAV Volume Measurement with P-Sensor and Modbus rtu communication



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VFR FLOWPROBE VALVE SPECIFICATION

Selection of Volume Control Damper

It is essential to determine the air volume during the design stage. Normally there is a minimum and a maximum volume which has to be controlled.

The duct area should be calculated so that the velocity is approximately 2.5m/s at the minimum volume and preferably 5m/s at the operating point if possible. If the velocity is more than 5m/s at the maximum volume then the noise level criteria needs to be considered. The maximum velocity should not exceed 9m/s as the duct resistance shall increase and the overall energy consumption shall go up. Use selection Table on page 4.

The VFR Volume Valve is equipped with an 'A' bracket making it a VFR-A. It has double damper blades with an embedded silicone seal. Other materials are available on request.

The heavy duty drive shaft which is bolted firmly to the valve blade is designed to withstand the very high momentary torque developed by the fast actuator. The shaft is guided by sealed bearing bushes on either side of the valve body.

Installation

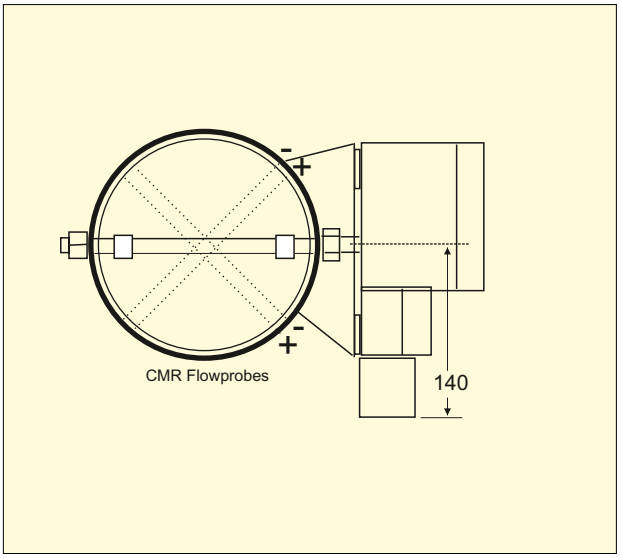
The VFR Volume Valve works in any position provided it is used in non condensing conditions. It is best if the blades and actuator are positioned horizontally rather then having the actuator hanging down. This way, the weight is reduced on the side seals and provides a long term efficient operation. It is also easier for the maintenance engineers to replace an actuator. When the damper is installed, care must be taken to leave sufficient space for the engineers to inspect and replace the motor and DPC. A minimum of 500mm should be kept free.

Hysteresis

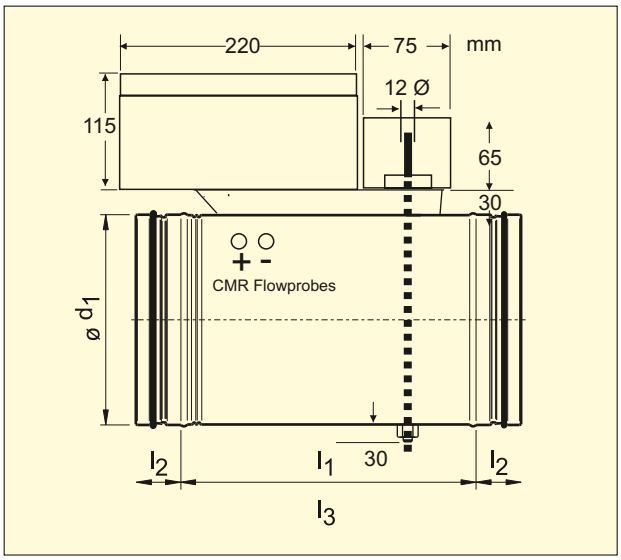
The VFR Volume Valves have a very low hysteresis due to the sturdy single blade construction and therefore the damper can be moved very accurately to a control position.

Maintenance

The VFR Venturi Valve is maintenance free.



VFR-A Valve with a DPC fitted Dimensions



VFR-A Flowprobe Valve with a DPC and motor fitted Dimensions

Materials

VFR valve Body	-	Galvanised Sheet Metal
Blade/Seal	-	Galvanised Sheet Metal/Silicone
Drive Shaft	-	Zinc Plated Steel
Drive Shaft Seal	-	'O'Ringsl
Bearing Bushes	-	Brass
Outer Duct Seals	-	Pressed in Rubber
Actuator Brackets 'A'	-	Galvanised Sheet Metal
Flowprobes	-	Anodised Aluminium

Valve sizes see table on right.
Valve diameters are sized to fit into standard round spiral duct.
The Part No. starting with VFR-A has a DPC/Actuator bracket.
Alternative Brackets on request.

Specifications

Recommended minimum air velocity is	2.5 m/s
Recommended operating air velocity is	5 m/s
Maximum recommended air velocity is	9 m/s

Humidity 10% to 90% non condensing.
Operating Temperature (dry condition) -20 to 80°C

VFR-A Valve dimensions and Magnification Factor (mf)					
Size Ø	Stock Code	L1	L2	L3	mf
100 mm	VFR-A-100	290	40	370	1.8
125 mm	VFR-A-125	290	40	370	1.8
140 mm	VFR-A-140	290	40	370	1.8
150 mm	VFR-A-150	290	40	370	1.8
160 mm	VFR-A-160	300	40	380	1.8
180 mm	VFR-A-180	310	40	390	1.8
200 mm	VFR-A-200	320	40	400	1.8
224 mm	VFR-A-224	345	40	425	1.8
250 mm	VFR-A-250	355	40	435	1.8
280 mm	VFR-A-280	385	60	505	1.8
315 mm	VFR-A-315	415	60	535	1.8
355 mm	VFR-A-355	485	60	605	1.8
400 mm	VFR-A-400	505	80	665	1.8
450 mm	VFR-A-450	582	80	742	1.8
500 mm	VFR-A-500	692	80	852	1.8
560 mm	VFR-A-560	732	80	892	1.8
630 mm	VFR-A-630	792	80	952	1.8

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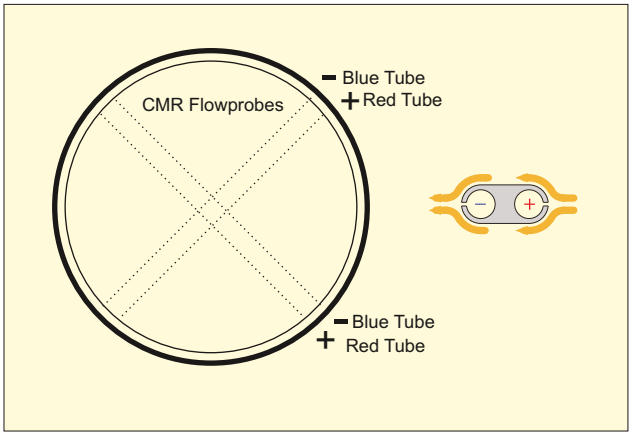
VFR FLOWPROBE VELOCITY PRESSURES



VFR Flowprobe tube connections

The velocity pressure is measured by the CMR Flowprobes built into the VFR Valve and the total impact pressure is measured on the positive (+red) and the static pressure is measured on the negative (- blue) tube connections. The CMR Volume Sensor shall be connected to the corresponding nipples using CMR PVC red and blue tube.
When the CMR Sensors are built onto the VFR Volume Valve then it is pre-adjusted at the factory - i.e. duct diameter, density and VFR Magnification Factor (mf) and the range is in m^3/s ,m^3/h, l/s or ACR (air change rate). It is ready for connection to the central BMS or

If the CMR Volume Sensor such as P-Sensor, V-Sensor, DPM-Sensor or DPC-Controller was ordered separately and it was not factory adjusted then it is quite simple to adjust the parameters on site. All Sensor have a keyboard and display. The duct diameter and the magnification factor (mf) of the VFR Volume Valve must be entered which is stated on each valve size on page 2 .

If the volume indicated on the CMR Sensor display is deviating from the actual measurements, then the magnification factor can be adjusted to suit the installation abnormalities via the Sensor's keyboard. To find the best possible accuracy for your application, adjust the fan to a constant volume – start with 50% of the minimum and maximum operating volume and take a pitot travers reading with a CAL150 instrument. Once the average volume has been established and it is not the same as displayed on the CMR Sensor, then adjust the Magnification Factor (mf) until the same display is achieved. Check at 25%, 75% and 100% volume set point The CMR Sensors have also parameters to linearize each point of the measurement for more critical applications.

Useful VFR Venturi scaling formula:

$$\text{velocity m/s} = \sqrt{\frac{2 \times (\Delta P \text{ in Pa} / (mf)\ \text{factor})}{1.2 \quad \text{Density}}}$$

Example:

2 x (100Pa across VFR-A-315 / 1.8 mf) = 111.11 / 1.2 = 92.59
$\sqrt{92.59}$ = 9.622 m/s
9.622 m/s x (duct area 0.07744) = 0.745m^3/s * 3600 = 2682 m^3/h

Conversion Table - Velocity in m/s at standard density to Velocity Pressure in Pa

m/s	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	0.00	0.01	0.02	0.05	0.10	0.15	0.22	0.29	0.38	0.49
1	0.60	0.73	0.86	1.01	1.18	1.35	1.54	1.73	1.94	2.17
2	2.40	2.65	2.90	3.17	3.46	3.75	4.06	4.37	4.70	5.05
3	5.40	5.77	6.14	6.53	6.94	7.35	7.78	8.21	8.66	9.13
4	9.60	10.09	10.58	11.09	11.62	12.15	12.70	13.25	13.82	14.41
5	15.00	15.61	16.22	16.85	17.50	18.15	18.82	19.49	20.18	20.89
6	21.60	22.33	23.06	23.81	24.58	25.35	26.14	26.93	27.74	28.57
7	29.40	30.25	31.10	31.97	32.86	33.75	34.66	35.57	36.50	37.45
8	38.40	39.37	40.34	41.33	42.34	43.35	44.38	45.41	46.46	47.53
9	48.60	49.69	50.78	51.89	53.02	54.15	55.30	56.45	57.62	58.81
10	60.00	61.21	62.43	63.65	64.90	66.15	67.42	68.69	69.98	71.29
11	72.60	73.93	75.26	76.61	77.98	79.35	80.74	82.13	83.54	84.97
12	86.40	87.85	89.30	90.77	92.26	93.75	95.26	96.77	98.30	99.85
13	101.40	102.97	104.54	106.23	107.74	109.35	110.98	112.61	114.26	115.93
14	117.60	119.29	120.98	122.69	124.42	126.15	127.90	129.65	131.42	133.21
15	135.00	136.81	138.62	140.45	142.30	144.15	146.02	147.89	149.78	151.69
16	153.60	155.53	157.46	157.46	159.41	161.38	163.35	165.34	167.33	169.34
17	173.40	175.45	177.50	179.57	181.66	183.75	185.86	187.97	190.10	192.25
18	194.40	196.57	198.74	200.93	203.14	205.35	207.58	209.81	212.06	214.33
19	216.60	218.89	221.18	223.49	225.82	228.15	230.50	232.85	235.22	237.61
20	240.00	242.41	244.82	247.25	249.70	252.15	254.62	257.09	259.58	262.09
21	264.60	267.13	269.66	272.21	274.78	277.35	279.94	282.53	285.14	287.77
22	290.40	293.05	295.70	298.37	301.06	303.75	306.46	309.17	311.90	314.65
23	317.40	320.17	322.94	325.73	328.54	331.35	334.18	337.01	339.86	342.73
24	345.60	348.49	351.38	354.29	357.22	360.15	363.10	366.05	369.02	372.01
25	375.00	378.01	381.02	384.05	387.10	390.15	393.22	396.29	399.38	402.49

To get the range of the CMR Sensor use the keyboard and display the range . This is the sensor range in m^3/s or m^3/h at 10V / 20mA. Enter this range into your BMS or PLC system. No further calculations are necessary. If you want to use the table above, use the range of the transmitter in Pa and divide it by the (mf) of the VFR. Look up the velocity above. i.e. 100Pa / 1.8 (315 Valve) = 55.55 Pa. Look up above ~ 55.3 Pa and read on side and top ~ 9.6 m/s then multiply with duct area 0.07744(315 Valve) m^2 to get m^3/s then multiply by 3600 to get m^3/h.

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VFR SELECTIONS AND NOISE LEVELS

Part Number Selection Table 1

Part Number	Description	Size DN mm	Length L3 mm	Area m2	Volume at 3m/s m3/s	Volume at 5m/s m3/s	Volume at 9 m/s m3/s	Volume at 3m/s m3/h	Volume at 5m/s m3/h	Volume at 9 m/s m3/h
VFR-A-100	100mm Flowprobe Valve with DPC Bracket	100	370	0.00786	0.024	0.039	0.071	85	141	255
VFR-A-125	125mm Flowprobe Valve with DPC Bracket	125	370	0.01227	0.037	0.061	0.110	133	221	398
VFR-A-140	140mm Flowprobe Valve with DPC Bracket	140	370	0.01540	0.046	0.077	0.139	166	277	499
VFR-A-150	150mm Flowprobe Valve with DPC Bracket	150	370	0.01767	0.053	0.088	0.159	191	318	573
VFR-A-160	160mm Flowprobe Valve with DPC Bracket	160	380	0.02011	0.060	0.101	0.181	217	362	652
VFR-A-180	180mm Flowprobe Valve with DPC Bracket	180	390	0.02545	0.076	0.127	0.229	275	458	825
VFR-A-200	200mm Flowprobe Valve with DPC Bracket	200	400	0.03142	0.094	0.157	0.283	339	566	1018
VFR-A-224	224mm Flowprobe Valve with DPC Bracket	224	425	0.03941	0.118	0.197	0.355	426	709	1277
VFR-A-250	250mm Flowprobe Valve with DPC Bracket	250	435	0.04909	0.147	0.245	0.442	530	884	1591
VFR-A-280	280mm Flowprobe Valve with DPC Bracket	280	505	0.06158	0.185	0.308	0.554	665	1108	1995
VFR-A-315	315mm Flowprobe Valve with DPC Bracket	315	535	0.07794	0.234	0.390	0.701	842	1403	2525
VFR-A-355	355mm Flowprobe Valve with DPC Bracket	355	605	0.09899	0.297	0.495	0.891	1069	1782	3207
VFR-A-400	400mm Flowprobe Valve with DPC Bracket	400	665	0.12568	0.377	0.628	1.131	1357	2262	4072
VFR-A-450	450mm Flowprobe Valve with DPC Bracket	450	742	0.15906	0.477	0.795	1.432	1718	2863	5154
VFR-A-500	500mm Flowprobe Valve with DPC Bracket	500	852	0.19638	0.589	0.982	1.767	2121	3535	6363
VFR-A-560	560mm Flowprobe Valve with DPC Bracket	560	892	0.24633	0.739	1.232	2.217	2660	4434	7981
VFR-A-630	630mm Flowprobe Valve with DPC Bracket	630	952	0.31176	0.935	1.559	2.806	3367	5612	10101

The Part Number is made of the Type i.e. VFR-A 100 is the diameter

Noise Levels

			Static Pressure at Venturi in Pa									Static Pressure at Venturi in Pa									Static Pressure at Venturi in Pa								
							100 Pa									250 Pa									500 Pa				
Valve	Velocity	Volume	LW (dB/Octave) Power level								Sum	LW (dB/Octave) Power level								Sum	LW (dB/Octave) Power level								Sum
Size Ø	m/s	m3/h	63	125	250	500	1k	2k	4k	8k	dB(A)	63	125	250	500	1k	2k	4k	8k	dB(A)	63	125	250	500	1k	2k	4k	8k	dB(A)
100	2	57	59	53	47	41	35	29	21	17	43	64	58	52	46	41	35	27	22	49	68	62	57	51	45	39	31	26	53
	5	141	68	62	56	50	44	39	33	26	52	74	68	62	56	50	44	38	31	58	78	72	66	60	54	48	42	36	62
	7.5	212	72	66	60	54	49	41	35	30	57	78	72	66	60	54	48	42	36	62	82	76	70	64	58	52	47	40	66
	10	283	75	69	63	57	52	46	40	33	60	81	75	69	63	57	51	45	39	65	85	79	73	67	61	55	50	43	69
125	2	88	60	54	48	42	37	31	23	18	45	66	60	54	48	42	36	28	24	50	70	64	58	52	46	40	33	28	54
	5	221	69	64	58	52	46	40	34	27	54	75	69	63	57	51	46	40	33	60	79	73	67	62	56	50	44	37	64
	7.5	331	74	68	62	56	50	42	38	31	58	79	73	67	62	56	50	44	37	64	83	77	72	66	60	54	48	41	68
	10	442	77	71	65	59	53	47	41	34	61	82	76	70	64	59	53	47	40	67	86	80	75	69	63	57	51	44	71
140	2	111	61	55	49	43	37	31	24	19	45	66	61	55	49	43	37	29	24	51	71	65	59	53	47	41	33	29	55
	5	277	70	64	58	53	47	41	35	28	55	76	70	64	58	52	46	41	34	60	80	74	68	62	56	51	45	38	65
	7.5	416	74	68	63	57	51	45	39	32	59	80	74	68	62	56	51	45	38	64	84	78	72	66	61	55	49	42	69
	10	554	77	71	66	60	54	48	42	35	62	83	77	71	65	59	53	48	41	67	87	81	75	69	64	58	52	45	72
160	2	145	62	56	50	44	38	32	25	20	46	67	61	56	50	44	38	30	25	52	71	66	60	54	48	42	34	29	56
	5	362	71	65	59	53	48	42	36	29	56	77	71	65	59	53	47	41	35	61	81	75	69	63	57	51	46	39	65
	7.5	543	75	69	63	58	52	46	40	33	60	81	75	69	63	57	51	46	39	65	85	79	73	67	62	56	50	43	70
	10	724	78	72	66	61	55	49	43	36	63	84	78	72	66	60	54	49	42	68	88	82	76	70	64	59	53	46	73
180	2	183	62	57	51	45	39	33	25	20	47	68	62	56	50	45	39	31	26	53	72	66	61	55	49	43	35	30	57
	5	458	72	66	60	54	48	42	37	30	58	77	72	66	60	54	48	42	35	62	82	76	70	64	58	52	46	40	66
	7.5	687	76	70	64	58	53	47	41	34	61	82	76	70	64	58	52	46	40	66	86	80	74	68	62	56	51	44	70
	10	916	79	73	67	61	55	50	44	37	64	85	79	73	67	61	55	49	42	69	89	83	77	71	65	59	54	47	73
200	2	226	63	57	51	46	40	34	26	21	48	69	63	57	51	45	39	32	27	53	73	67	61	55	49	44	36	31	58
	5	565	73	67	61	55	49	43	37	30	57	78	72	66	61	55	49	43	36	63	82	76	71	65	59	53	47	40	67
	7.5	848	77	71	65	59	53	47	42	35	61	82	76	71	65	59	53	47	40	67	87	81	75	69	63	57	51	44	71
	10	1131	80	74	68	62	58	50	44	38	64	85	79	74	68	62	56	50	43	70	89	84	78	72	66	60	54	47	74
250	2	353	65	59	53	47	41	35	27	23	49	70	64	59	53	47	41	33	28	55	74	69	63	57	51	45	37	32	59
	5	884	74	68	62	56	51	45	39	32	59	80	74	68	62	56	50	44	38	64	84	78	72	66	60	54	49	42	68
	7.5	1325	78	72	68	61	58	49	43	36	63	84	78	72	66	60	54	49	42	68	88	82	76	70	65	59	53	46	73
	10	1767	81	75	69	64	58	52	46	39	66	87	81	75	69	63	57	52	45	71	81	85	79	73	67	62	56	49	76
315	2	561	66	60	55	49	43	37	29	24	51	72	66	60	54	48	42	35	30	56	76	70	64	58	53	47	39	34	61
	5	1403	76	70	64	58	52	46	40	34	60	81	75	69	64	58	52	46	39	66	85	80	74	68	62	56	50	43	70
	7.5	2104	80	74	68	62	56	50	45	38	64	85	79	74	68	62	56	50	43	70	90	84	78	72	66	60	54	47	74
	10	2806	83	77	71	65	59	53	47	41	67	88	82	77	71	65	59	53	46	73	93	87	81	75	69	63	57	50	77
355	2	713	67	61	55	49	44	38	30	25	52	73	67	61	55	49	43	35	31	57	77	71	65	59	53	47	40	35	61
	5	1782	76	71	65	59	53	47	41	34	61	82	76	70	64	58	53	47	40	67	86	80	74	69	63	57	51	44	71
	7.5	2672	81	75	69	63	57	51	45	38	65	86	80	74	69	63	57	51	44	71	90	84	79	73	67	61	55	48	75
	10	3563	84	78	72	66	60	54	48	41	68	89	83	77	71	66	60	54	47	74	93	87	82	76	70	64	58	51	78
400	2	905	68	62	56	50	44	38	31	26	52	73	68	62	56	50	44	36	31	58	78	72	66	60	54	48	40	36	62
	5	2262	77	71	65	60	54	48	42	35	62	83	77	71	65	59	53	48	41	67	87	81	75	69	63	58	52	45	72
	7.5	3393	81	75	70	64	58	52	46	39	66	87	81	75	69	63	58	52	45	72	91	85	79	74	68	62	56	49	76
	10	4524	84	78	73	67	61	55	49	42	69	90	84	78	72	66	60	55	48	74	94	88	82	76	71	65	59	52	79

Noise levels on larger sizes are available on request.

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