


















Technical Specifications v8 : Part 1

	MachineDoctor™ - WIFI	MachineDoctor™ - WIFI - EB	MachineDoctor™ - LTE + W	MachineDoctor™ - LoRa + LTE	MachineDoctor™ - EH ∞
					
Part Number	NS002-A1/D1/D2	NS003-W-0-A1/D1/D2	NS003-W-B/E-A1/D1/D2	NS003-L-B/E-A1/D1/D2	NS003-W/L-0/B/E-A1/D1/D2-EH30/.../150
Sensing Elements	Tri-axial Vibration, Acoustics/ Ultrasonic, Temperature, Humidity, RPM, Magnetic Flux	Tri-axial Vibration, Acoustics/ Ultrasonic, Temperature, Humidity, RPM, Magnetic Flux	Tri-axial Vibration, Acoustics/ Ultrasonic, Temperature, Humidity, RPM, Magnetic Flux	Tri-axial Vibration, Acoustics/ Ultrasonic, Temperature, Humidity, RPM, Magnetic Flux	Tri-axial Vibration, Acoustics/ Ultrasonic, Temperature, Humidity, RPM, Magnetic Flux
Special Features:	Edge Computing for anomaly detection, equipment operation status (on-off), custom sampling strategies	Edge Computing for anomaly detection, equipment operation status (on-off), custom sampling strategies	Edge Computing for anomaly detection, equipment operation status (on-off), custom sampling strategies	Cloud Computing for anomaly detection, fault characterization & Remaining Time to Failure prediction, equipment operation status (on-off), custom sampling strategies	Edge Computing for anomaly detection, equipment operation status (on-off), custom sampling strategies
	Smart power Management to extend battery life	Smart power Management to extend battery life	Smart power Management to extend battery life	Smart power Management to extend battery life	Smart power Management to extend battery life
	Edge Diagnostics for Bearings, Gears, Shaft Anomaly Detection	Edge Diagnostics for Bearings, Gears, Shaft Anomaly Detection	Edge Diagnostics for Bearings, Gears, Shaft Anomaly Detection	Edge Diagnostics for Bearings, Gears, Shaft Anomaly Detection	Edge Diagnostics for Bearings, Gears, Shaft Anomaly Detection
On board Memory Storage	4MB (avg 500kB/day, 4x VIB TWF/day) Up to 8 days	4MB (avg 500kB/day, 4x VIB TWF/day) Up to 8 days	4MB (avg 500kB/day, 4x VIB TWF/day) Up to 8 days	4MB (avg 500kB/day, 4x VIB TWF/day) Up to 8 days	4MB (avg 500kB/day, 4x VIB TWF/day) Up to 8 days
Battery Life	2-5 years depending on operations and communication infrastructure	3-8 years depending on operations and communication infrastructure	3-8 years depending on operations and communication infrastructure	3-8 yrs with Vib,AE,Temp trends /10 min (LORA) VIB TWF /6 hrs (LTE) and AE TWF /24h (LTE)	>15 years (Energy Harvesting)
Mounting Methods	Magentic Base, Adhesive, 1/4-28 stud	Magentic Base, Adhesive, 1/4-28 stud	Magentic Base, Adhesive, 1/4-28 stud	Magentic Base, Adhesive, 1/4-28 stud	Magentic Base, Adhesive, 1/4-28 stud
Certifications	IP68 ASME C1D2 IECEX Zone 0 FCC/ISED UL746C and UL94V0	IP68 ASME C1D2 ATEX & IECEX Zone 0 FCC/ISED/CE/UKCA UL746C and UL94V0	IP68 ASME C1D2 ATEX & IECEX Zone 0 FCC/ISED/CE/UKCA UL746C and UL94V0	IP68 ASME C1D2 ATEX & IECEX Zone 0 FCC/ISED/CE/UKCA UL746C and UL94V0	IP68 ASME C1D2 ATEX & IECEX Zone 0 * (in process) FCC/ISED/CE/UKCA * (in process) UL746C and UL94V0
Physical Size	52mm (2") Diameter x 78mm (3") Tall	72mm (2.8") Diameter x 100mm (4") Tall	72mm (2.8") Diameter x 100mm (4") Tall	72mm (2.8") Diameter x 100mm (4") Tall	72mm (2.8") Diameter x 100mm (4") Tall
Ambient Operating Temperature	Min = -40°C / -40°F If mounting surface > 0°C/32°F Min = -25°C / -13°F If mounting surface < 0°C/32°F Max = 55°C / 131°F	Min = -25°C / -13°F If mounting surface > 0°C/32°F Min = -20°C / -4°F If mounting surface < 0°C/32°F Max = 55°C / 131°F	Min = -25°C / -13°F If mounting surface > 0°C/32°F Min = -20°C / -4°F If mounting surface < 0°C/32°F Max = 55°C / 131°F	Min = -25°C / -13°F If mounting surface > 0°C/32°F Min = -20°C / -4°F If mounting surface < 0°C/32°F Max = 55°C / 131°F	Min = -25°C / -13°F If mounting surface > 0°C/32°F Min = -20°C / -4°F If mounting surface < 0°C/32°F Max = 55°C / 131°F
Maximum Equipment Surface Temp (for max amb. temp 55C)	75°C / 167°F	90°C / 194°F	90°C / 194°F	90°C / 194°F	90°C / 194°F
Maximum Equipment Surface Temp (with thermal isolator, for max amb. temp 55C)	120°C / 230°F	120°C / 230°F	120°C / 230°F	120°C / 230°F	120°C / 230°F

Technical Specifications v8 : Part 2

	MachineDoctor™ - WIFI	MachineDoctor™ - WIFI - EB	MachineDoctor™ - LTE + W	MachineDoctor™ - LoRa + LTE	MachineDoctor™ - EH ∞
					
Part Number	NS002-A1/D1/D2	NS003-W-0-A1/D1/D2	NS003-W-B/E-A1/D1/D2	NS003-L-B/E-A1/D1/D2	NS003-W/L-0/B/E-A1/D1/D2-EH30/.../150
Communications					
Protocol	WiFi: 802.11 b/g/n/e/i	WiFi: 802.11 b/g/n/e/i	WiFi: 802.11 b/g/n/e/i	Low-Power Long Range LoRa Technology	802.11 a/b/g/n/ac
Frequency Range	2.4 GHz	2.4 GHz and 5GHz	2.4 GHz and 5GHz	EU:868MHz, NA: 915MHz, Asia:923MHz, S.Korea: 923MHz, India: 865 - 867MHz	2.4 GHz and 5GHz
Transmission Power	+20dBm for 802.11b	+20dBm for 802.11b	+20dBm for 802.11b	Adjustable up to +14dBm high Efficiency PA	+20dBm for 802.11b
Receiving Sensitivity	-91 dBm for 802.11b	-91 dBm for 802.11b	-91 dBm for 802.11b	n/a	-91 dBm for 802.11b
Range	Up to 50m / 150ft (without repeater)	Up to 50m / 150ft (without repeater)	Up to 50m / 150ft (without repeater)	Up to 5 km (3 miles) (open area) Up to 500m (crowded urban area)	Up to 50m / 150ft (without repeater)
Data Rate	Up to 500kbps	Up to 500kbps	Up to 500kbps	Up to 10 kbps	Up to 500kbps
Cellular Communications Options <i>Each Sensors type can be use in each sensor model</i>	n/a	n/a	B: BG96	E: EG21 or 25	B or E
Cellular Communications Protocols	n/a	n/a	2G, LTE-M, NB-IoT	2G EDGE & GPRS , 3G HSDPA HSUPA WCDMA , 4G LTE-FDD (10Mbps) LTE-TDD (3.1Mbps)	
Cellular Bands	n/a	n/a	2G 1800/900, LTE-M: 12	2G (B2,B3,B5,B8) , 3G (B1/B2/B4/B5/B6/ /B8/B19) , 4G (B1/B2/B3/B4/B5/B7/B8/ /B12/B13/B18/B19/B20/B25/B26 /B28/B38/B39/B40/B41)	
E-Sim Support Countries	n/a	n/a	174 (link to more details below)	174 (link to more details below)	174
E-Sim Telecom Operators	n/a	n/a	343	343	343
Bluetooth 5.0	none	none	yes	none	yes
Antenna	Integrated	Integrated	Integrated	Integrated	Integrated
Security	WPA/WPA2	WPA/WPA2	Not applicable	Not applicable	Not applicable
Encryption	WEP/TKI/AES 256	WEP/TKI/AES 256	WEP/TKI/AES 256	WEP/TKI/AES 256	WEP/TKI/AES 256
Network Protocols	HTTP, TCP/IPv4 - optional MQTT Support	HTTP, TCP/IPv4 - optional MQTT Support	HTTP, TCP/IPv4 - optional MQTT Support	HTTP, TCP/IPv4 - optional MQTT Support	HTTP, TCP/IPv4 - optional MQTT Support
Packet Filtering	limited list of IP addresses and open ports	limited list of IP addresses and open ports	limited list of IP addresses and open ports	limited list of IP addresses and open ports	limited list of IP addresses and open ports
Dynamic IP Support	UL Cybersecurity Standard UL2900-2-2	UL Cybersecurity Standard UL2900-2-3	UL Cybersecurity Standard UL2900-2-4	UL Cybersecurity Standard UL2900-2-5	UL Cybersecurity Standard UL2900-2-6

Technical Specifications v8 : Part 3

	MachineDoctor™ - WIFI	MachineDoctor™ - WIFI - EB	MachineDoctor™ - LTE + W	MachineDoctor™ - LoRA + LTE	MachineDoctor™ - EH ∞
					
Part Number	NS002-A1/D1/D2	NS003-W-0-A1/D1/D2	NS003-W-B/E-A1/D1/D2	NS003-L-B/E-A1/D1/D2	NS003-W/L-0/B/E-A1/D1/D2-EH30/.../150
Vibration Sensor Type Options <i>Each Sensors type can be use in each sensor model</i>	DISCONTINUED A1: MEMS: Analogue Kinox KX220-1071	D1: MEMS: Digital Kionix KX134-1211	D2: MEMS: Digital STM IIS3DWBTR	D1 or D2	D1 or D2
Bandwidth	8kHz for Z & X & Y	8.2kHz for Z & X & Y	6.3kHz for Z & X & Y		
OTA Configurable Fmax settings	8kHz, 4kHz, 1kHz	8.2kHz (default), 2.8kHz, 1.4kHz	1.3kHz (default) 6.3kHz, 5.6kHz, 2.7kHz		
Sample Rate	16kHz default	16.4kHz default (max 25.6kHz)	13.2kHz default (max 26.6kHz)		
# of samples	16k sample (default) max 450k	16k sample (default) max 450k	16k sample (default) max 450k		
Max Acceleration Measurement	± 20g (default) or ± 40g (-1072 upon request)	± 16g (default) or ± 8,16,32,64g (config OTA)	± 8g (default) or ± 2,4,16g (config OTA) (auto range single axis only)		
Noise Sensor Density	700 µg/√Hz	300 µg/√Hz	75 µg/√Hz		
Accelerometer Sensitivity	66mV/g (0.031mg/LSB max)	1.95mg/LSB @±64g to 0.24mg/LSB @± 8g	0.48mg/LSB @±16g to 0.061mg/LSB @± 2g		
Surface Temperature					
IR Resolution	0.1°C / 0.18°F	0.1°C / 0.18°F	0.1°C / 0.18°F	0.1°C / 0.18°F	0.1°C / 0.18°F
Range	-40°C to 120°C / -40°F to 250°F	-40°C to 120°C / -40°F to 250°F	-40°C to 120°C / -40°F to 250°F	-40°C to 120°C / -40°F to 250°F	-40°C to 120°C / -40°F to 250°F
Shock Tolerance	10,000g for 0.2ms	10,000g for 0.2ms	10,000g for 0.2ms	10,000g for 0.2ms	10,000g for 0.2ms
Acoustic/ Ultrasonic Emissions					
Fmin to Fmax	50Hz to 80kHz	50Hz to 80kHz	50Hz to 80kHz	50Hz to 80kHz	50Hz to 80kHz
Peak Sensitivity	26dB FS ±1dB	26dB FS ±1dB	26dB FS ±1dB	26dB FS ±1dB	26dB FS ±1dB
Operating Range	-40°C to 140°C / -40°F to 284°F	-40°C to 140°C / -40°F to 284°F	-40°C to 140°C / -40°F to 284°F	-40°C to 140°C / -40°F to 284°F	-40°C to 140°C / -40°F to 284°F
RPM/ Rotational Speed					
Hall Sensor (Magn Flux) and/or	10 RPM through 5000RPM with 99.9% accuracy	10 RPM through 5000RPM with 99.9% accuracy	10 RPM through 5000RPM with 99.9% accuracy	10 RPM through 5000RPM with 99.9% accuracy	10 RPM through 5000RPM with 99.9% accuracy
Virtual RPM Sensor	600 - 20,000RPM with >85% accuracy	600 - 20,000RPM with >85% accuracy	600 - 20,000RPM with >85% accuracy	600 - 20,000RPM with >85% accuracy	600 - 20,000RPM with >85% accuracy
Magnetic Flux					
Range	Adjustable ±2 Gauss to ±200 Gauss	Adjustable ±2 Gauss to ±200 Gauss	Adjustable ±2 Gauss to ±200 Gauss	Adjustable ±2 Gauss to ±200 Gauss	Adjustable ±2 Gauss to ±200 Gauss
Sensitivity	0.0002 Gauss to 0.02 Gauss	0.0002 Gauss to 0.02 Gauss	0.0002 Gauss to 0.02 Gauss	0.0002 Gauss to 0.02 Gauss	0.0002 Gauss to 0.02 Gauss
Sampling Rate	113kHz	113kHz	113kHz	113kHz	113kHz
Fmax output	667Hz	667Hz	667Hz	667Hz	667Hz
Operating Range	-40°C to 125°C / -40°F to 257°F	-40°C to 125°C / -40°F to 257°F	-40°C to 125°C / -40°F to 257°F	-40°C to 125°C / -40°F to 257°F	-40°C to 125°C / -40°F to 257°F
Humidity					
Range (Relative Humidity)	± 3.5% RH, 20 to +80% RH	± 3.5% RH, 20 to +80% RH	± 3.5% RH, 20 to +80% RH	± 3.5% RH, 20 to +80% RH	± 3.5% RH, 20 to +80% RH
Accuracy (LSB)	0.004% RH/LSB	0.004% RH/LSB	0.004% RH/LSB	0.004% RH/LSB	0.004% RH/LSB
Energy Harvesting Specifications					
Type	n/a	n/a	n/a	n/a	vibration based energy harvesting
Power Output	n/a	n/a	n/a	n/a	0.05g - 1mW, 0.1g - 4.5mW, 0.5g - 70mW, 1g - 150mW, 3g - 300mW
Temperature Range	n/a	n/a	n/a	n/a	-40°C to 100°C / -40°F to 221°F
Harvesting Equipment Operating Frequency - note different ranges based on application	n/a	n/a	n/a	n/a	30Hz, 60Hz, 85Hz, 110Hz, and 120 Hz
Frequency Band Deviation	n/a	n/a	n/a	n/a	±3 Hz - note that machinery can run outside this band but may not generate power during those periods