MicroStep -MIS

Automatic Road Weather Station

Road Weather Monitoring

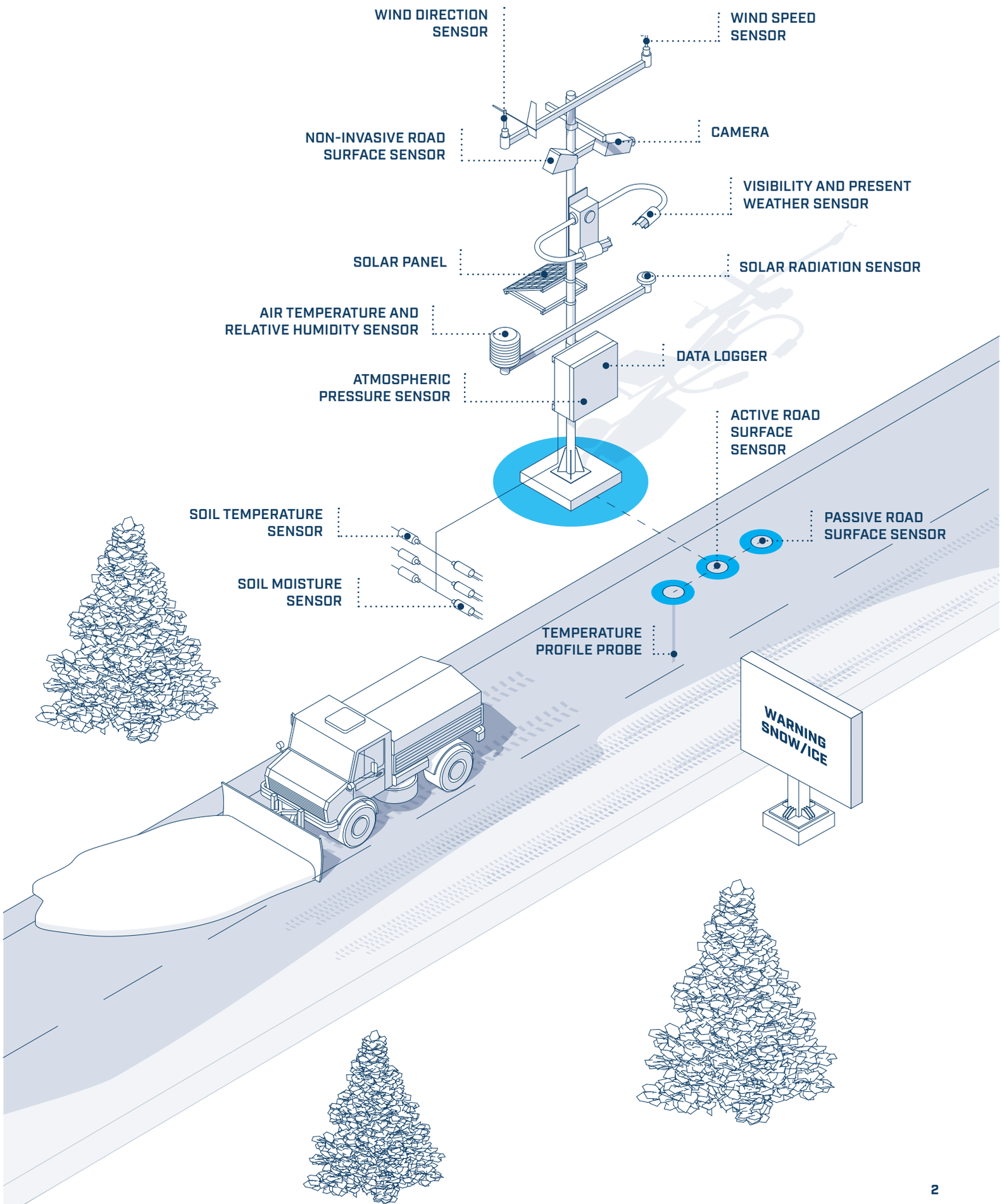
Modular and scalable platform

Multimode data communication

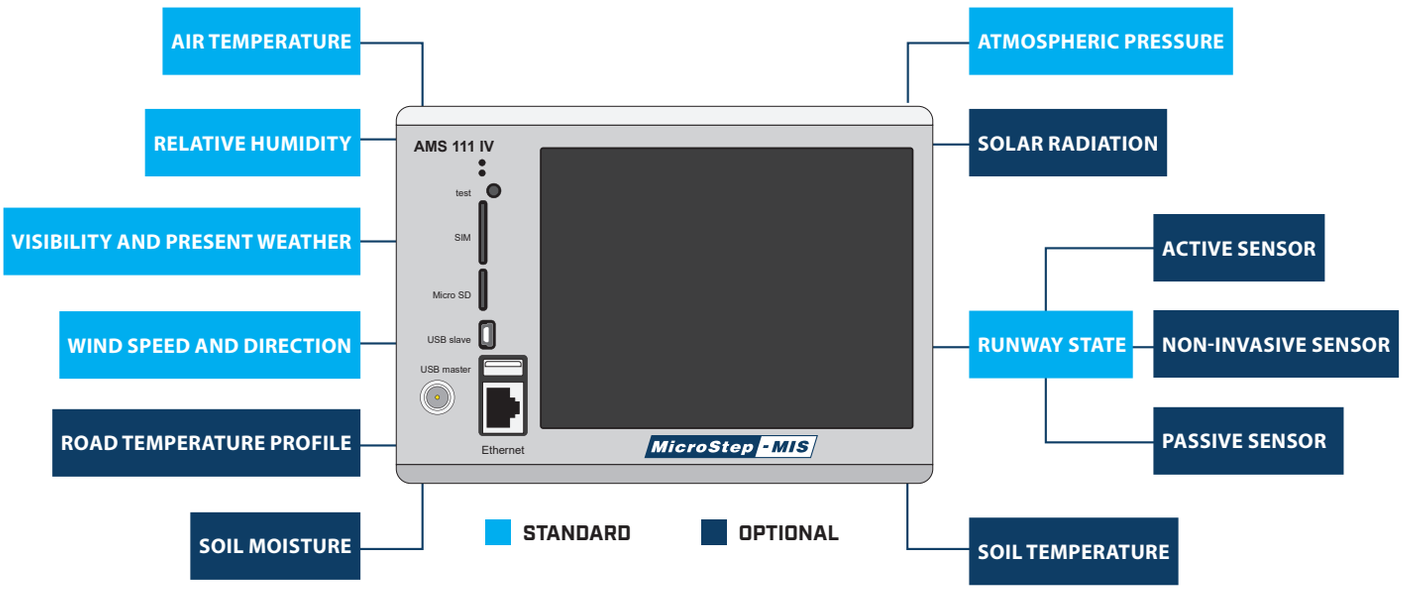
Statistics, alerts and notifications

Customizable web interface

AUTOMATIC ROAD WEATHER STATION



Sensor configuration modules



Technical specifications

Data Logger AMS 111 IV

Memory and RTC

Internal 128 MB Flash memory
Internal 128 MB DRAM memory
Secure digital card up to 64 GB
External USB mass storage up to 256 GB
Real time clock (backup with Lithium battery)

Communication I/O ports

3x RS-232 port (baud rate: 300 to 115200), 1x UART	
2x RS-485 port	
Interface for GSM / Wifi / Radio module	
Ethernet 10/100 Mbit	
USB master, USB slave	
2x SDI-12	
Supported Protocols	FTP server, FTP client, HTTP server, telnet, SMTP, SMTPS, MODBUS RS-485, MODBUS, NTP Ethernet

P4-4G modem

Data rates	• LTE-FDD Max 100 Mbps (DL) Max 50 Mbps (UL) • LTE-TDD Max 61 Mbps (DL) Max 18 Mbps (UL) • DC-HSPA+ Max 42 Mbps (DL) Max 5.76 Mbps (UL) • UMTS Max 384 Kbps (DL) Max 384 Kbps (UL) • TD-SCDMA Max 4.2 Mbps (DL) Max 2.2 Mbps (UL) • CDMA Max 5.4 Mbps (DL) Max 14.7 Mbps (UL) • EDGE Max 236.8 Kbps (DL) Max 236.8 Kbps (UL) • GPRS Max 85.6 Kbps (DL) Max 85.6 Kbps (UL)
Operating temperature range	–40 °C to +85 °C
Environmental conditions	Operating temperature range: –40 °C to +70 °C Operating humidity range: 0 to 100 %

P4-GSM modem

Specification	• Quad Band GSM/GPRS/3G modem E-GSM 850/900/1800/1900 • Class 4 (2 W at 900 MHz) • Class 1 (1W at 1800 MHz) • Data, SMS • Fax and data transmission without extra hardware
Operating temperature range	–40 °C to +85 °C
Environmental conditions	Operating temperature range: –40 °C to +70 °C Operating humidity range: 0 to 100 %
Measuring range	up to 35 m (114.8 ft)
Accuracy	±2 mm

Air temperature sensor

Measurement range	–65 °C to +75 °C
Accuracy	±0.2 (-40 to +60) °C

Atmospheric pressure sensor

Pressure range	500 to 1100 hPa (or custom)
Measurement principle	piezoresistive transducer
Accuracy	*±0.3* hPa (–40 °C to +60°C)*
Long-term stability	±0.2 hPa / year
	**custom range or accuracy available upon request*

Relative humidity sensor

Measurement range	0 to 100 %RH
Accuracy (@ 25 °C)	±1 %RH

Short term hysteresis	< 0.6 %RH
Accuracy over temperature range	1 + |t - 25| *(0.008 + 0.00052 *RH)
Typical long-term stability	±1.0* % per year
Sensor type	thin film capacitive
	** dependent on operating environment*

Soil moisture sensor

Accuracy	± 0.03 $m^3.m^{-3}$ (3 %)
Soil moisture measurement range	full range 0 to 1.0 $m^3.m^{-3}$
Salinity range	50 to 1000 $mS.m^{-1}$

Soil temperature sensor

Measurement range	–65 °C to +75 °C
Accuracy	±(0.1 + 0.00167 x |temperature|) °C
Long-term stability	< 0.1 °C / year

Solar radiation sensor

Classification to ISO 9060: 1990	Secondary Standard
Sensitivity	7 to 14 µV/W/m^2
Maximum operational irradiance	4000 W/m^2
Detector type	Thermopile
Spectral range (20 % points)	270 to 3000 nm
Non-stability (change/year)	< 0,5 %
Non-linearity (100 to 1000 W/m^2)	< 0,2 %

Road surface state sensor - active

Temperature range	–40 °C to 0 °C
Accuracy	• ±0.5 °C RMS for freezing temperature > –15 °C • or ±1.5°C RMS for freezing temperature < –15 °C (with NaCl)
Resolution	0.1 °C

Road surface state sensor - non-invasive

Layer thickness (water, snow, ice)

Principle	optical
Measurement range	0 to 2 mm (snow 0 to 10 mm)
Resolution	0.01 mm

Surface temperature (optional)

Principle	pyrometer
Measurement range	–40 °C to +70 °C
Accuracy	±0.8 °C
Resolution	0.1 °C

Road surface state sensor - passive

Road / runway dampness	dry, damp, wet, damp with salt, wet with salt
Slippery road (runway) conditions	no ice / snow, snow, ice

Freezing point

Temperature range	–40 °C to 0 °C
Accuracy	±0.5 °C (0 °C to –2.5 °C)

Water film height

Measuring range	0 to 4 mm
Accuracy	0.2 to 3 mm (better than ±30 %)

Friction (grip)

Measuring range	0 to 1

Ice percentage

Measuring range	0 to 100 %

Road temperature profile probe

Accuracy classes	PT100 1/5 DIN: ±0.1 °C
Resolution	0.1 °C
Operating temperature range	-50 °C to +70 °C
Length	2000 m
Diameter	30 mm

Visibility and present weather sensor

Range	default 10 m to 75 km
Measurement error	≤4.5 % at 600 m ≤5.0 % at 1,500 m ≤5.1 % at 2 km ≤12.5 % at 15 km ≤20 % at 30 km
Measurement resolution	10 m (default), 1 m (optional)
Present weather output	WMO Table 4680 codes

Wind sensor

Wind speed

Range	0 to 60 m/s (116 knots)
Accuracy	±2 % @ 12 m/s
Resolution	0.01 m/s (0.02 knots)
Response time	0.25 seconds
Threshold	0.01 m/s

Wind direction

Range	0 to 359° (no dead band)
Accuracy	±2° @ 12 m/s
Resolution	1°
Response time	0.25 seconds

Meteorological mast

Lenght	4 m
Material	aluminium or stainless steel