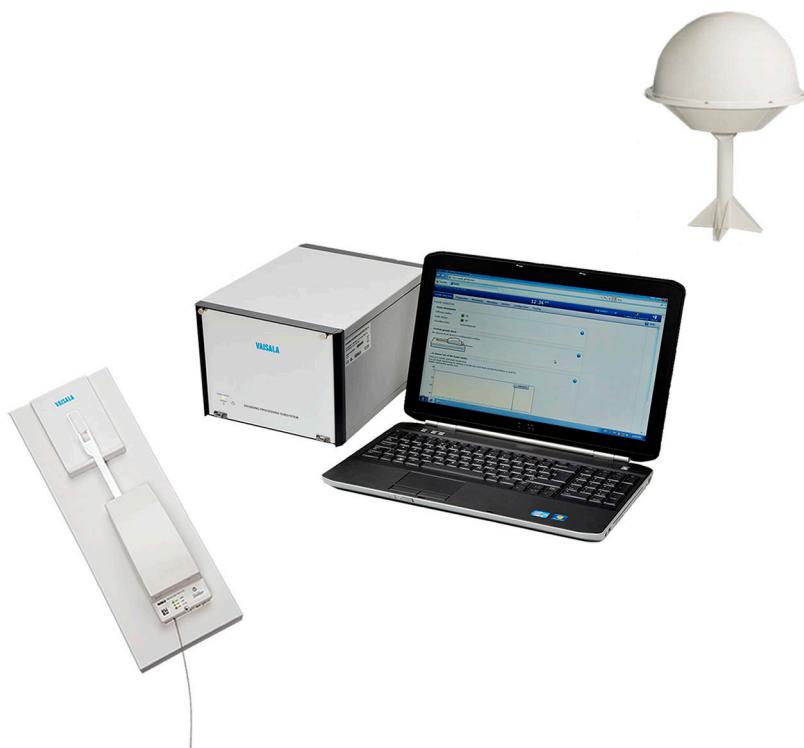


Product Description

Vaisala DigiCORA® Sounding System
MW41



VAISALA

PUBLISHED BY

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1. About this document

1.1 Version information

This manual provides information about Sounding System MW41 and Radiosonde RS41 with peripherals.

Table 1 Document versions

Document code	Date	Description
M211397EN-S	September 2020	Updated for MW41 sounding software version 2.17.
M211397EN-R	May 2019	Updated for MW41 sounding software version 2.15. Added information on BUFR 3'09'056 and 3'09'057.
M211397EN-P	February 2019	Updated for MW41 sounding software version 2.14.

1.2 Related manuals

Table 2 Radiosondes and ground equipment

Document code	Name
M211429EN	<i>Vaisala DigiCORA Sounding System MW41 Getting Started Guide</i>
M211415EN	<i>Vaisala DigiCORA Sounding System MW41 Technical Reference</i>
-	<i>Vaisala DigiCORA Sounding System MW41 Online Help</i> , embedded in the MW41 sounding software
M211367EN	<i>Vaisala Guide to Sounding Preparations Technical Reference</i>
M211667EN	<i>Vaisala Radiosonde RS41-SG and RS41-SGP User Guide</i>
M211752EN	<i>Vaisala Radiosonde RS41-SGM User Guide</i>
M211952EN	<i>Vaisala Radiosonde RS41-D User Guide</i>
M211428EN	<i>Ozone Sounding with Vaisala Radiosonde RS41 User Guide</i>
M211596EN	<i>Vaisala Sounding Processing Subsystem SPS311G Technical Reference</i>
M212199EN	<i>Vaisala Sounding Processing Subsystem SPS341AG Technical Reference</i>
M211477EN	<i>Upgrading MW11/12/15, MW21 and MW31 to Sounding System MW41 Technical Reference</i>
M210768EN	<i>Vaisala Filling Balance FB13 User Guide</i>
M211594EN	<i>Creating Defense Messages with DigiCORA Sounding System MW41 User Guide</i>
M212085EN	<i>Radiotheodolite RT20 and DigiCORA Sounding System MW41 User Guide</i>
M211577EN	<i>Parallel Sounding with MW41 and MW31/MW21 Technical Note</i>

Table 3 Antennas

Document code	Name
M210538EN	<i>Vaisala Telemetry Antenna RB31 User Guide</i>
M211725EN	<i>Vaisala Telemetry Antenna RM32 User Guide</i>
M210814EN	<i>Vaisala Telemetry Antenna RM32 Quick Reference Guide</i>
M210843EN	<i>Vaisala Portable Antenna Set CG31 User Guide</i>
M210546EN	<i>Vaisala GPS Antenna GA31 User Guide</i>
M211030EN	<i>Vaisala GPS Antenna GA31N User Guide</i>
M211031EN	<i>Vaisala Telemetry Antenna RM31N User Guide</i>
M211633EN	<i>Vaisala GPS Antenna GA41 User Guide</i>

Table 4 Launchers

Document code	Name
M210767EN	<i>Vaisala Balloon Launcher FB15 User Guide</i>
M210766EN	<i>Vaisala Balloon Launcher FB16A User Guide</i>
M210980EN	<i>Vaisala Balloon Launcher FB32 User Guide</i>

Table 5 Automatic weather stations

Document code	Name
M211938EN	<i>Vaisala Automatic Weather Station AWS310 System Description</i>
M211948EN	<i>Vaisala Automatic Weather Station AWS310 Installation Manual</i>
M211939EN	<i>Vaisala Automatic Weather Station AWS310 Configuration and Maintenance Manual</i>
M211840EN	<i>Vaisala Weather Transmitter WXT530 Series User Guide</i>
M211406EN	<i>Vaisala Maritime Observation System AWS430 User Guide</i>

1.3 Documentation conventions



WARNING! **Warning** alerts you to a serious hazard. If you do not read and follow instructions carefully at this point, there is a risk of injury or even death.



CAUTION! **Caution** warns you of a potential hazard. If you do not read and follow instructions carefully at this point, the product could be damaged or important data could be lost.



Note highlights important information on using the product.



Tip gives information for using the product more efficiently.



Lists tools needed to perform the task.



Indicates that you need to take some notes during the task.

1.4 Trademarks

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2. Product overview

2.1 Introduction to Vaisala DigiCORA Sounding System MW41

Vaisala DigiCORA Sounding System MW41 processes, analyses, archives, and relays sounding data. The system consists of a computer (sounding workstation) that runs the sounding software and is connected to a sounding processing subsystem via a network adapter. The sounding processing subsystem contains the processor units for PTU (Pressure, Temperature and Humidity) and wind finding, and appropriate connections to the required antennas.

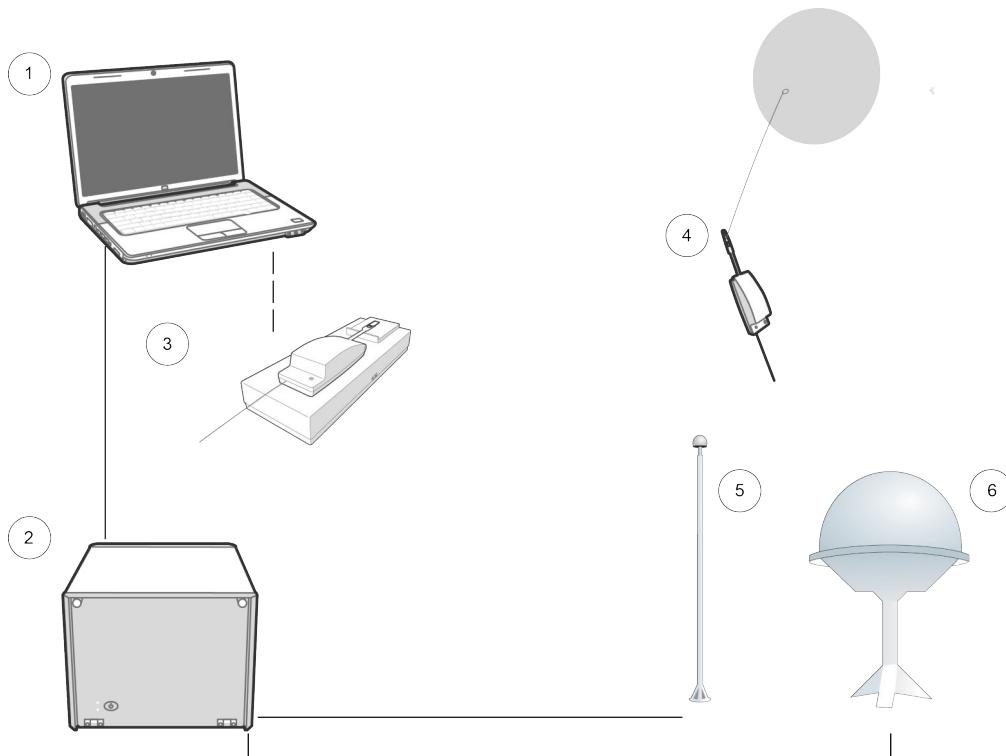


Figure 1 DigiCORA Sounding System MW41 setup

- 1 Sounding workstation
- 2 Sounding Processing Subsystem SPS3xx
- 3 Ground Check Device RI41
- 4 Radiosonde RS41
- 5 GPS antenna
- 6 UHF antenna

Table 6 Compatibility

Item	Description
Radiosondes	Vaisala Radiosonde RS41-SG Vaisala Radiosonde RS41-SGP Vaisala Radiosonde RS41-SGM Vaisala Radiosonde RS41-D RS41 refers to all Radiosonde RS41 models.
Sounding processing subsystems	Vaisala Sounding Processing Subsystem SPS311G Vaisala Sounding Processing Subsystem SPS341AG SPS3xx refers to both SPS311G and SPS341AG.
Ground check devices	Vaisala Ground Check Device MWH322 Vaisala Ground Check Device RI41 Vaisala Ground Check Device RI41-B with a barometer module. RI41 refers to both RI41 and RI41-B.
Wind finding	Vaisala Radiotheodolite RT20 Vaisala Radiotheodolite RT20A Vaisala Radiotheodolite RT20M RT20 refers to all the above.
Printing sounding data	Printer options: <ul style="list-style-type: none">• Matrix printer 23• Inkjet printer 24• Portable thermal printer
Remote monitoring	Vaisala Observation Network Manager NM10 software

2.1.1 MW41 sounding software

MW41 sounding software provides user-friendly tools for preparing radiosondes, for following soundings, creating messages and sending them forwards. It consists of the sounding processing software running as services on the sounding workstation and an optional remote client for remote access/use.

2.1.1.1 Requirements for sounding workstation

Table 7 Sounding workstation requirements

Property	Description/Value
Supported operating systems	Windows 10 Pro 64-bit (English) .NET version 4.5 or later is required.
Supported web browsers	<ul style="list-style-type: none">• Microsoft Edge (latest version)• Mozilla Firefox (latest version)• Google Chrome (latest version)

Property	Description/Value
Minimum hardware requirements	<ul style="list-style-type: none"> Processor Intel Pentium Dual Core or equivalent, Quad core recommended Memory 8 GB RAM Hard Disk Space 160 GB Display 1366 × 768 Serial port, either integrated or via USB/RS232 converter, for possible Automatic Weather Station (AWS) USB port for RI41 Ethernet adapter



CAUTION! When taking computers not delivered by Vaisala into use, check energy saver and similar settings of the computer. Default settings may cause shutdown of computer parts if there is a long time period with no input from the user, for example, during a sounding. This might result in a lost sounding.



CAUTION! Make sure that your computer name follows the URI RFC syntax. For example, the name may not contain an underscore _. If some characters are not recognized as valid URI, this may prevent MW41 from starting.

2.1.1.2 Requirements for remote client

It is recommended to use devices that fulfill the same requirements as for sounding workstations. However, it is likely that devices with lower hardware specifications, other operating systems or other browsers can be used.

2.2 Safety

Vaisala DigiCORA Sounding System MW41 delivered to you has been tested for safety and approved as shipped from the factory. Note the safety precautions.



WARNING! Ground the product and verify outdoor installation grounding periodically. Failure to provide proper grounding can result in injury or death from electrical shock and can severely damage the equipment.



WARNING! Do not substitute parts or modify the system, or install unsuitable parts in the system. Improper modification can damage the product or lead to malfunction.

2.2.1 ESD protection

Electrostatic Discharge (ESD) can damage electronic circuits. Vaisala products are adequately protected against ESD for their intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects in the equipment housing.

To avoid delivering high static voltages to the product:

- Handle ESD-sensitive components on a properly grounded and protected ESD workbench or by grounding yourself to the equipment chassis with a wrist strap and a resistive connection cord.
- If you are unable to take either precaution, touch a conductive part of the equipment chassis with your other hand before touching ESD-sensitive components.
- Hold component boards by the edges and avoid touching component contacts.

3. System components

3.1 Vaisala Radiosonde RS41



Sounding System MW41 supports Radiosondes RS41-SG, RS41-SGP, RS41-SGM, and RS41-D. The radiosonde offers excellent data availability and accuracy of humidity, temperature, pressure, and wind measurement. The radiosonde is fast and stable with individual, traceable calibration.

Vaisala Radiosonde RS41 temperature sensor utilizes linear resistive platinum technology. The small size of the sensor results in low solar radiation error and guarantees fast response. Wind data, height, and pressure are derived from Vaisala Radiosonde RS41 GPS data combined with differential corrected GPS data from the MW41 sounding system.

Robust design, Physical Zero Humidity Check, and In-built Functional Temperature Check ensure reliable performance in every situation. The radiosonde is also easy to use. For example, there is no need for the user to connect the batteries to the radiosonde to activate it. The radiosonde is automatically activated when placed on the ground check device. To make it easier to check the status of the radiosonde, Radiosonde RS41 has LED light indicators visible on the cover.

Radiosonde RS41-SGM features radio silence, which means that the radiosonde can be launched in radio silence up to a specified height. All data is recorded also during the radio silence and, when the radio silence ends, transmitted to the ground equipment. All transmitted data is encrypted, and surface observations can be obtained directly from the radiosonde.

3.1.1 RS41 unwinder

The RS41 unwinder is specifically designed for use with Radiosonde RS41. It is installed to the radiosonde so that it bends the sensor boom into the correct position, ensuring repeatable results in the soundings.

Table 8 Unwinder

Property	Description/Value
Material of the string	Non-UV treated polypropylene
Tenacity	< 115 N
Length of the string	55 m
Unwinding speed	0.35 m/s
Weight	25 g

3.2 Ground check devices

The following ground check devices can be used for checking the functioning of the RS41 radiosonde and the accuracy of its sensors, and for setting the radiosonde frequency:

- Ground Check Device RI41 and RI41-B
- Ground Check Device MWH322

RI41-B contains a barometer module, which provides an alternative for surface pressure observation and/or for the radiosonde's ground check pressure measurement.

3.2.1 Vaisala Ground Check Device RI41 and RI41-B



Vaisala Ground Check Device RI41 is available in two versions: RI41, and the similar RI41-B, which is equipped with a barometer module to provide an alternative to the ground check of the radiosonde's pressure measurement or surface pressure observation.

RI41 requires no cable for radiosonde configuration and is powered on automatically when connected to the sounding workstation with a USB cable.

The radiosonde is automatically switched on when placed on RI41. During the preparations, the status is clearly indicated by MW41 sounding software.

RI41 transmits the results of the radiosonde ground check to the ground equipment and allows the user to configure the radiosonde. The configuration is done automatically via a wireless short-range communication link. A short-range wireless communication link is also used for turning the radiosonde power on. The communication link is based on RF technique with a range of about 5 cm.

3.2.2 Vaisala Ground Check Device MWH322



MWH322 is a robust ground check device designed for preparing a sounding with RS41. It is suitable for field use, and it can be operated with mittens on. The rugged design of the device withstands harsh transportation handling.

Thanks to a wireless connection, the radiosonde can be prepared in its cardboard package, which protects the radiosonde sensors until the balloon is launched.

MWH322 includes precise barometer modules whose reading can be automatically supplied to the sounding software as a surface observation.

3.3 Vaisala Sounding Processing Subsystem SPS311G and SPS341AG



Sounding Processing Subsystems SPS311G and SPS341AG are subsystems for Vaisala sounding systems. They consist of:

- Front panel with a power switch
- Chassis containing a card frame with slots for nine units
- Motherboard
- I/O extension board
- Plug-in units
- Connector panel at the back

SPS341AG comes with Windows 10 IoT Enterprise operating system.



Unless otherwise mentioned, SPS3xx refers to all Sounding Processing Subsystem models (SPS311G and SPS341AG).

3.4 Vaisala Filling Balance FB13

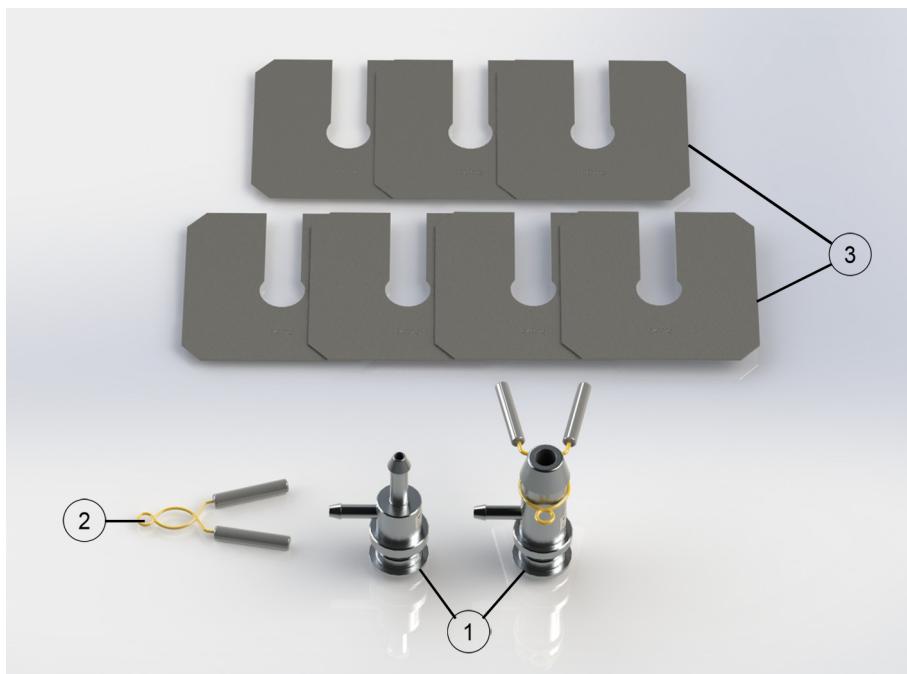


Figure 2 Filling Balance FB13

- 1 Nozzle
- 2 Spring clamp
- 3 Weight plates

Vaisala Filling Balance FB13 facilitates the use of radiosondes. It is used as ballast for obtaining the correct nozzle lift (free lift plus payload) for the sounding balloon. Nozzle lift refers to the weight a balloon is capable of lifting when filled. In addition, the balance also acts as a gas inflation pipe.

FB13 contains two different nozzles for convenient attachment of balloons with small and large neck diameters.

The balloon neck is secured on the nozzle with a spring clamp. Each nozzle has a clamp of its own, and the nozzles are easily interchangeable.

3.5 MW41 transport case



MW41 transport case offers a convenient way of transporting the sounding system components, apart from the antennas. The transport case is made of lightweight Strong HPX® Resin, it is watertight, and it has padded dividers inside to protect the contents. The case includes five press-and-pull latches.

The transport case carries Sounding Processing Subsystem SPS3xx, sounding workstation laptop, Ground Check Device RI41, Filling Balance FB13, and the installation folder, along with the necessary cables. The transport case includes in-line wheels and a telescopic pull-out handle for easy transportation.



Figure 3 Transportation case with pull-out handle

Table 9 MW41 transport case measurements

Property	Description / Value
Exterior dimensions (L × W × D)	79.5 × 51.8 × 39.4 cm
Weight (case only)	13 kg
Weight with MW41 and FB13	29 kg

3.6 Antennas

Vaisala DigiCORA Sounding System MW41 has several antenna options available for different applications.

3.6.1 Vaisala Telemetry Antenna RB31



Vaisala Telemetry Antenna RB31 is a directional UHF antenna well-suited for use in fixed installations. The antenna has no moving parts; the radiation pattern of the antenna can be electrically directed to track the flying radiosonde.

The main idea of the RB31 antenna is to obtain a radiation pattern that provides a good signal during a sounding under any wind conditions.

Telemetry range for RB31 is 350 km.

3.6.2 Vaisala Telemetry Antenna RM32



Vaisala Telemetry Antenna RM32 is an omnidirectional UHF antenna designed to receive radiosonde signals in the 400 MHz meteorological band.

RM32 has two antenna elements which have been selected to optimize the performance in all elevation angles, both near the horizon and at the zenith. The vertical antenna has a maximum gain of 5 dBi just below zero elevation, and the helix antenna has approximately hemispheric coverage and a maximum gain of 3 dBIC at the zenith.

RM32 is well suited for fixed installations, but it can also be used in portable systems, when feasible. The mounting sleeve at the bottom of the tubular stand makes it easy to install the whole antenna assembly on top of an external mast.

3.6.3 Vaisala Telemetry Antenna RM31N



Vaisala Telemetry Antenna RM31N is an omnidirectional UHF antenna used with Vaisala Sounding Systems MW41 and MW32 to receive radiosonde signals in the 400 MHz meteorological band.

RM31N is optimized for naval use.

3.6.4 Vaisala GPS Antenna GA31



Vaisala GPS Antenna GA31 is used with Vaisala Sounding Systems for local reception of GPS signals when performing GPS soundings. This way the system gets orbital and other navigational data directly from the GPS satellites. The local reception is also used to get differential corrections for positioning.

Vaisala GPS Antenna GA31 is sealed with epoxy for protection against ambient conditions. It is shipped with a 1.5-meter aluminum pole with a cast-aluminum flange and pole mounting clips and 33 meters of cable.

3.6.5 Vaisala GPS Antenna GA31N



Vaisala GPS Antenna GA31N is intended for the reception of C/A code signals from the NAVSTAR satellites. These signals are Right Hand Circular Polarization (RHCP) centered at 1575.42 MHz. GA31N is suitable for stations equipped with the GPS wind finding system and it is optimized for naval use.

3.6.6 Vaisala GPS Antenna GA41



GA41 is used for receiving GPS C/A code signals at L1 frequency. These signals are Right Hand Circular Polarization (RHCP) centered at 1575.42 MHz. GA41 is suitable for stations equipped with GPS wind finding system.

GA41 differs from GA31, another GPS antenna version, in that it is a GPS antenna with enhanced multipath rejection. Multipath occurs when a GPS signal arrives at the GPS antenna from more than one propagation route, that is, from multiple propagation paths. Compared with GA31, GA41 provides more accurate information in demanding signal conditions when height is calculated from GPS.

The GA41 active antenna element provides Low Noise Amplifier, high out-of-band rejection performance, and a highly stable phase center, improving the accuracy of the calculated height and atmospheric pressure profiles.

3.6.7 Vaisala Portable Antenna Set CG31



Vaisala Portable Antenna Set CG31 consists of a UHF antenna for radiosonde reception and a GPS antenna for GPS satellite signal, mounted on a tripod. Telemetry range for CG31 is 150 km.

The antennas and the tripod fold compactly for transportation. The assembly of the antenna takes less than two minutes. The antenna is of military green color.

3.6.8 Vaisala Radiotheodolite RT20A



Vaisala Radiotheodolite RT20A provides independent and passive windfinding for artillery and other defense applications. RT20A can be used with Vaisala Souding Systems DigiCORA Sounding System MW41 and MARWIN Sounding System MW32.

Power Unit RP20 is a power supply used for feeding power to Radiotheodolite RT20A and the sounding system.

3.7 Balloon launchers

3.7.1 Vaisala Balloon Launcher FB15 and FB16A

Vaisala Balloon Launchers FB15 and FB16A are manually operated sets for launching meteorological balloons with radiosondes. The balloon launchers are designed for one-man operations and they are used on meteorological stations and on-board ships.

The balloon launcher is equipped with an octagon-shaped (FB16A) or hexagon-shaped (FB15) stitched bag closed with a canvas belt. The balloon is launched by releasing the canvas that holds it down.

In normal use, the balloon launcher is secured with pegs driven into the ground and with three straps. In shipboard use, the balloon launcher is fastened with the straps to the ship's superstructure.

3.7.2 Vaisala Balloon Launcher FB32



Vaisala Balloon Launcher FB32 is a manually operated set for launching meteorological balloons with radiosondes for defense use. The lightweight balloon launcher is made of fiberglass tubing and canvas. The canvas is made of camouflage material suitable for field use. The balloon launcher folds compactly into its transportation case.

3.8 Peripherals

3.8.1 Vaisala Weather Transmitter WXT530 Series



Vaisala Weather Transmitter WXT536 is a small and lightweight transmitter that offers six weather parameters in one compact package. WXT536 measures wind speed and direction, precipitation, atmospheric pressure, temperature, and relative humidity.

3.8.2 Vaisala Automatic Weather Station AWS310



Vaisala Automatic Weather Station AWS310 is a compact, robust, and easy-to-use system which provides quality-controlled data in applications including climatology, synoptical observation, meteorology, hydrology, and aviation weather – even concurrently. AWS310 is an optimal choice for National Meteorological Institutes in the modernization of their measurement networks, hydrological institutes, nuclear power plants, wind energy farms, and TV stations to support their mission-critical needs.

AWS310 is especially designed for unmanned operations at remote sites requiring high reliability and low power consumption with ultimate expendability.

3.8.3 Vaisala Automatic Weather Station AWS430



Vaisala Automatic Weather Station AWS430 is especially designed for maritime environments such as ports, ships, and offshore platforms.

AWS430 contains either a water-proof outdoor enclosure with various mounting options, or a 19" equipment rack unit. The outdoor enclosure is designed to withstand the salty and wet conditions that prevail aboard ships and platforms as well as the freeze/thaw conditions experienced in extreme-weather environments. AWS430 is also able to endure vibration and shock.

The basic weather parameters measured are wind speed and direction (relative wind, true wind, upwind), atmospheric pressure, air temperature, and humidity. Additional sensors can be installed for measuring other parameters, including water temperature, duration of rain and sunshine, global and long wave radiation, amount of precipitation, cloud height, visibility, wave height, water level, water current, and ship motion. AWS430 calculates many meteorological and statistical parameters such as dew point temperature.

3.8.4 Vaisala Observation Network Manager NM10

Vaisala Observation Network Manager can receive data from various different observation sites to remotely monitor and manage these sources using one integrated platform. The observation sites include surface weather stations (AWS), airport weather observation systems, and MW41 and AUTOSONDE systems.

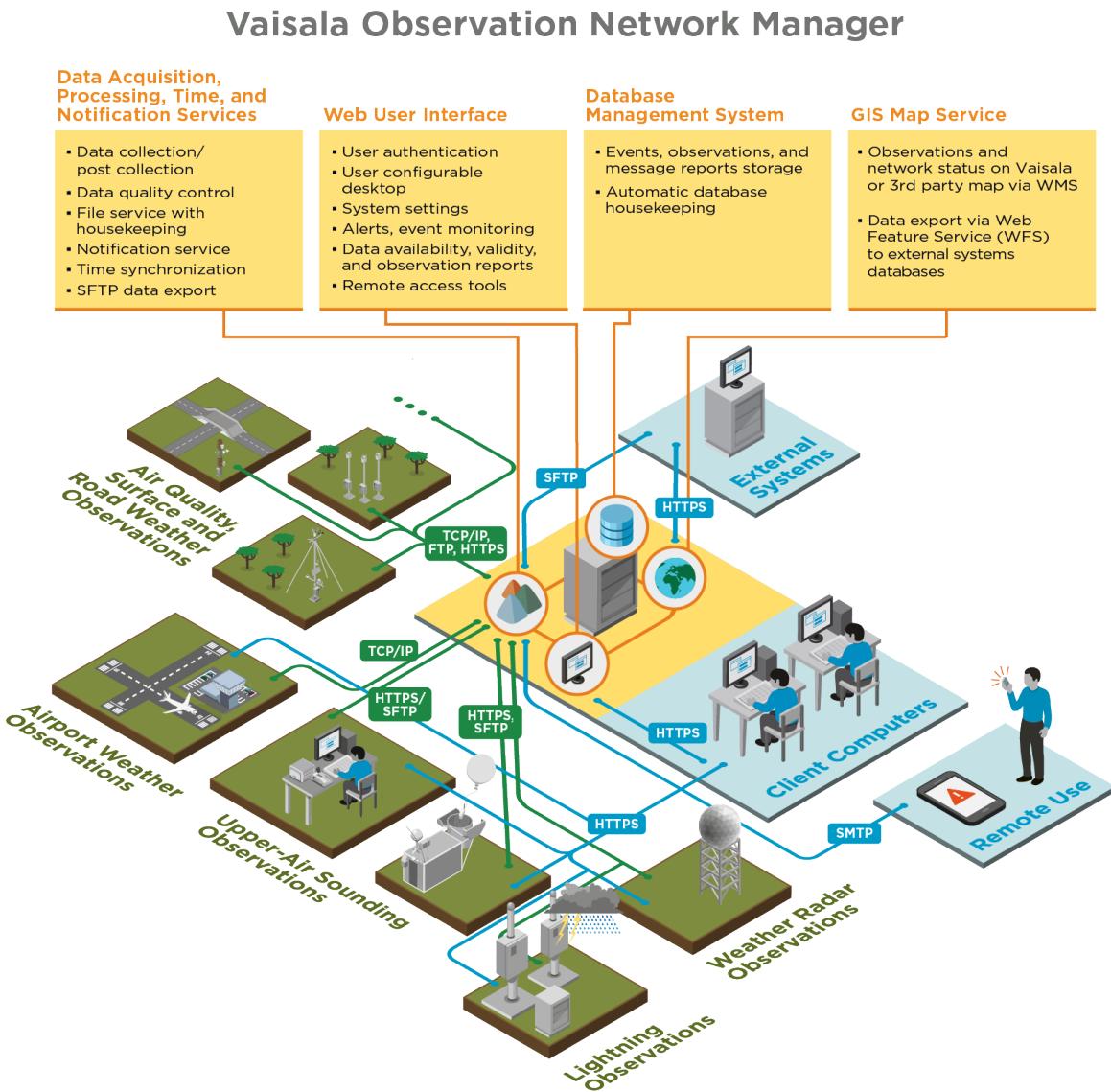


Figure 4 Main components and interfaces

4. Operational features

4.1 Operational flow

Performing a sounding with MW41 is very straightforward. A basic sounding operation consists of the following phases:

- ▶ 1. Turning on Sounding Processing Subsystem SPS3xx.
- 2. Turning on the sounding workstation and starting the sounding software.
- 3. Preparing the radiosonde for the sounding.
- 4. Launching the radiosonde.
- 5. Entering surface observation values.

The system can also be set to fetch the surface observation values automatically.

- 6. Monitoring the sounding and obtaining sounding data.
- 7. Terminating the sounding, in case the sounding does not end automatically.
- 8. Turning off SPS3xx.

The system collects sounding data right from the beginning of the sounding, so that the sounding information is available in the sounding archive even if the sounding ends prematurely.

4.2 MW41 Sounding System features

4.2.1 Graphical user interface

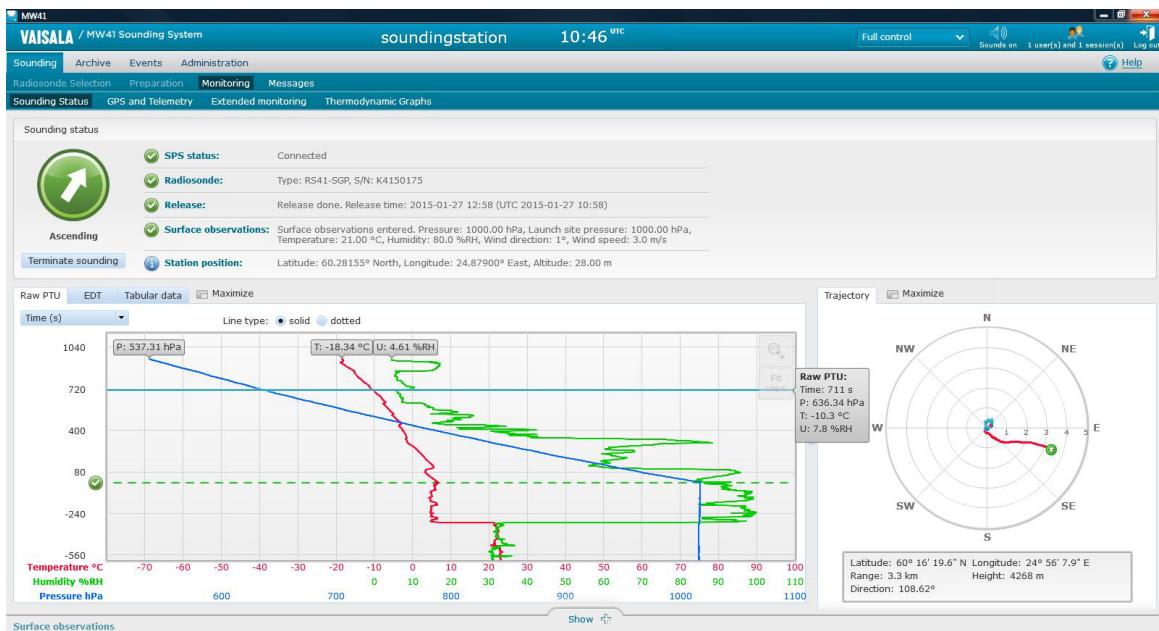


Figure 5 MW41 Sounding System graphical user interface

MW41 graphical user interface provides all necessary functionalities for installing, configuring, and operating the sounding system. It offers alternatives for:

- Performing a sounding
- Monitoring an ongoing sounding
- Examining an archived sounding

4.2.2 Ease of use

Usability matters have been taken into great consideration when designing the MW41 graphical user interface. Focus has been set on easy operation of the system, and the number of commands required during a sounding have been minimized.

In addition, the system guides the user throughout the sounding by providing information on the state of the sounding and by giving instructions, for example, for filling in the required information and proceeding with the sounding. The instructions are given in the form of messages, animated and still images, and tooltips appearing on the screen.

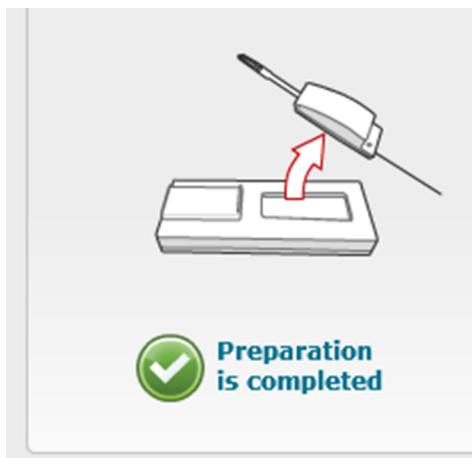


Figure 6 Radiosonde preparation completed message

In case the user needs any help in using the sounding system, the sounding software provides an extensive on-line help to help solve any problem situations.

Because the system is so straightforward to use, the need for excessive training is reduced, and the number of unintentional operator mistakes is lower.

With the help of the user interface, it is also easy for the user to check the status of the devices connected to the sounding system before starting a sounding and make sure that all system components are functioning properly.

4.2.3 Standard options

The standard software includes the following features:

- Sounding simulation
- System backup and restore
- TEMP and PILOT messages
- BUFR messages
- Automatic Weather Station (AWS) interface
- Audio messages
- ASAP-specific configuration
- Two web clients (1 local and 1 remote)
- Degraded mode for continuing the sounding in the case of sensor failure or GPS calculation failure

4.2.4 Licensed options

By obtaining optional software, the standard software can be completed with more advanced features.

The following licensed options are available:

- Advanced option
- Special sensor option
- Extended graphics

- Significant Point editing
- Thermodynamic graphics
- Web clients
- Defense messages
- P(Y) Codeless

4.2.4.1 Advanced option

The Advanced option includes the following:

- Report template editor and generator
- Python scripts
- Script library (for example, Asecna list, Aero)
- Report template library
- Descending sounding and 3'09'053 BUFR down message

4.2.4.2 Special sensor option

Special sensor option requires the Advanced option. The following are included:

- Ozone calculation and graphics
- Special sensor interface
- NILU message
- World Ozone and Ultraviolet Radiation Data Centre operated by Environment Canada (WOUDC) message

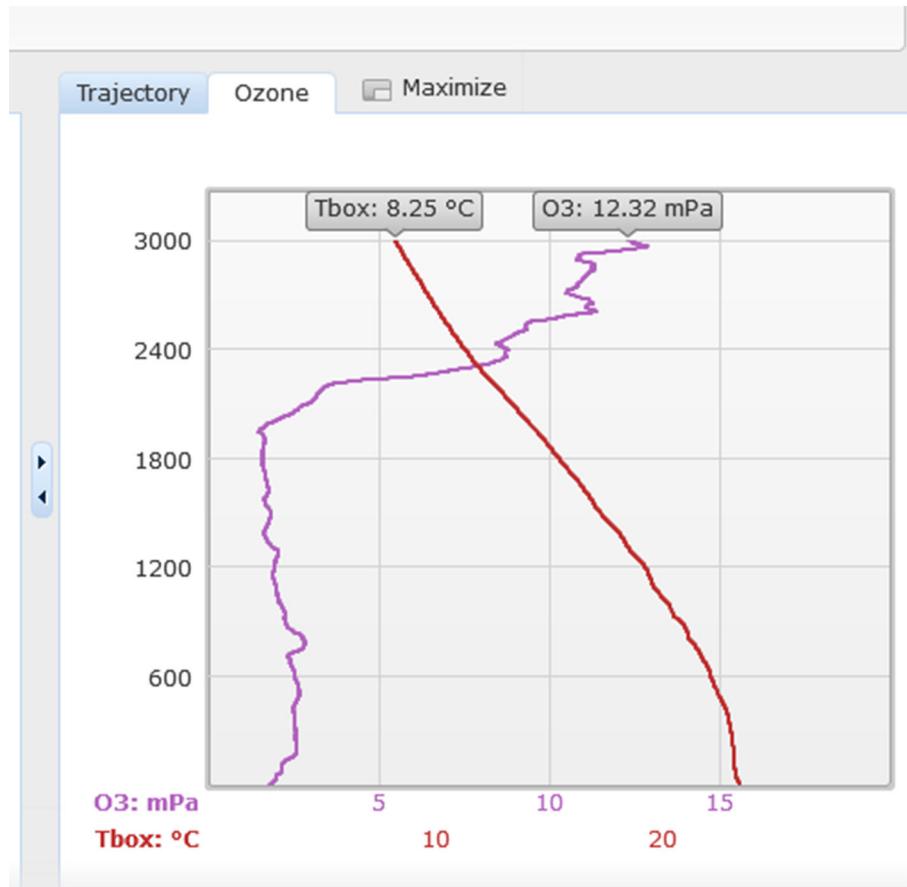


Figure 7 Ozone graphic

More information

- [Special sensor data \(page 44\)](#)

4.2.4.3 Extended graphics

This option includes the following:

- Graphical representation of edited sounding data.
- Graphics for which temperature, humidity, wind speed and direction, and wind components can be displayed according to the user's selection. Profiles of three soundings can be compared in the same graphic.

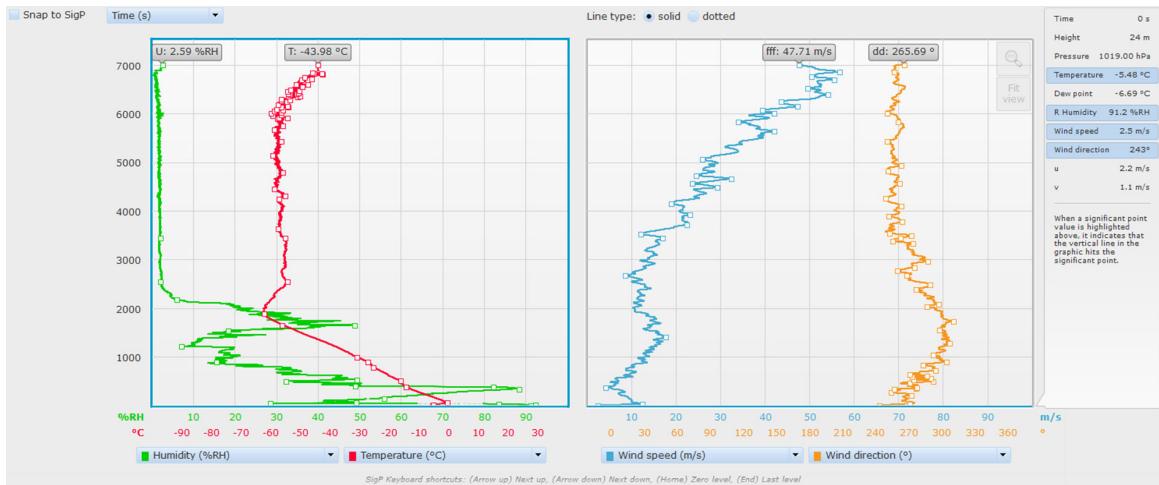


Figure 8 Extended graphics window

4.2.4.4 Significant point editing

Editing significant points (SigP) requires the Extended graphics option.

Extended graphics offers the possibility of viewing and editing significant points (SigP) and comparing the current sounding with an archived one.

4.2.4.5 Thermodynamic graphics

Meteorologists use thermodynamic diagrams to study atmospheric temperature and humidity with simple graphical techniques. Lengthy calculations are not necessary as the mathematical relationships have been accounted for in the diagram. Meteorologists utilize the thermodynamic diagram to forecast cloud height and atmospheric stability, the latter of which indicates the probability of severe weather.

The following thermodynamic graphics are implemented in MW41: Hodograph, Tephigram, Skew-T / Log-P diagram, and Stüve diagram. The graphics contain five sets of gridlines: isobars, isotherms, dry adiabats, pseudo-adiabats, and saturation moisture lines.

4.2.4.6 Defense messages

The following options are included:

- STANAG messages
- METEO 11 messages

More information

- [Defense messages \(page 43\)](#)

4.3 Remote access

With a remote client application, it is possible to control and monitor soundings remotely, as well.

The MW41 graphical user interface provides a means to transfer the control of a sounding from one location to another. This is useful, for example, when a part-time operator on a sounding station uses the sounding software only to perform actions needed to successfully release a sounding balloon. After the balloon launch, the control of the sounding software may be taken over by professional personnel located on a central observatory, or a similar location.

It is also possible to monitor a sounding from several parallel remote client stations without transferring the sounding control to them. This makes it possible for MW41 Sounding System to be part of a network of sounding stations.

Currently, the maximum number of remote users is 2 + 5. One session is always reserved for the local user.

4.4 IT security

MW41 sounding software provides a secure HTTPS connection between the web browser and the web server. The MW41 web server contains a security certificate granted by Vaisala. The customer can replace the certificate with one granted by the customer's own IT, or with any commercial Certificate Authority (CA), if needed.

MW41 users are authenticated with a username and a hidden password when they log in to the system. Role-based access control is enforced for each action.

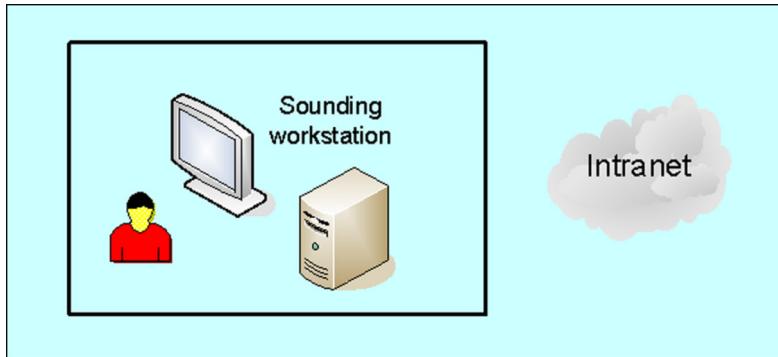
MW41 user management takes place in a separate **User Management** application, where a user with the **User Administrator** role can manage the MW41 users: add, edit, and delete users. Users can be given individual usernames and passwords that meet the complexity requirements for strong passwords. To further enhance security, users can be configured to change the given passwords into a new password of their own choice on the first login.

4.5 Typical network scenarios

The following figures present typical network scenarios with a MW41 sounding workstation.

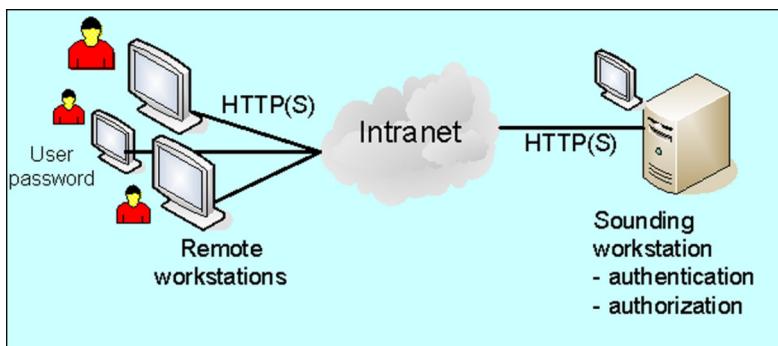
4.5.1 Case 1: Standalone

In this case, the sounding workstation is in an isolated subnet. There is no connection to intranet.



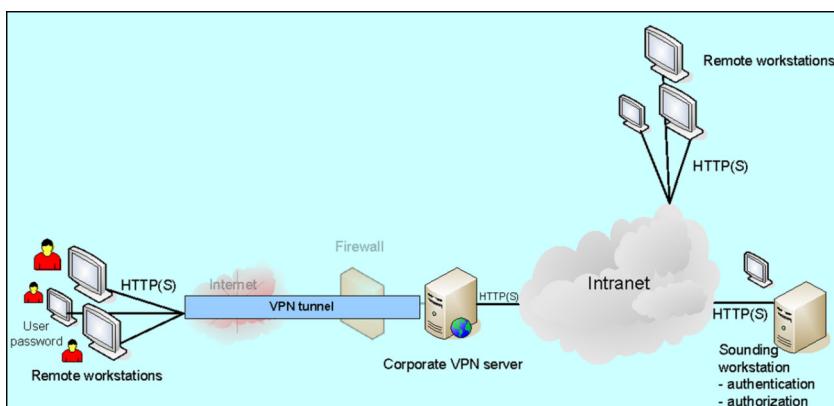
4.5.2 Case 2: Intranet

In this case, the sounding workstation is configured to deny connections from a local host outside. In this configuration, there is a network connection to intranet, but incoming HTTPS requests to the sounding workstation are denied.

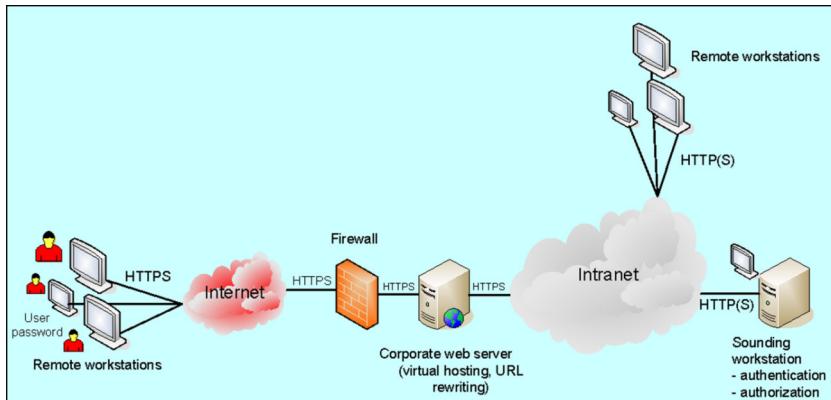


4.5.3 Case 3: Intranet and VPN

In intranet and Internet use, the MW41 sounding workstation is always protected by using a HTTPS connection. A Virtual Private Network (VPN) tunnel provides security through tunneling protocols and security procedures, such as encryption.



4.5.4 Case 4: Internet



5. System data

5.1 Data interfaces

The MW41 sounding software provides several different ways to obtain data from a sounding.

5.1.1 XML standard

Each sounding results in a data file whose contents the user can configure according to their specific needs. The data format is based on open eXtensible Markup Language (XML) standard. The standard is programmatically accessible by using open-source or commercially available XML parsers.

Besides the data, the XML standard provides a means to describe the data elements (for example, purpose, unit, type, resolution) by associating respective metadata fields to a data element structure, resulting in self-explanatory data contents.

5.1.2 Exporting data

Data can also be exported using different kind of ASCII files whose contents and format the user can configure. Legacy Vaisala formats are also supported to some extent.

5.2 Sounding data backup

MW41 stores all sounding data right from the beginning of the sounding. Each sounding results in a backup data file (file extension `*.mwx`), exported from the sounding archive to a default local disk folder, for example, `D:\MW41Backup`.

The backup files contain multiple separate XML-formatted datafiles, each of them holding different type of data. To save disk space, the files are zipped. The contents of the `.mwx` file are configurable and they are minimized to contain only the essential data sets.

As all sounding data is backed up, sounding data missing from the sounding archive can be imported back to the archive, if needed.

5.3 Parameter backup and restore

With the system backup and restore feature the operator can restore a global set of system parameters, that is, other than the station-specific parameters such as location. The backup is done with the help of an exported backup file so that the operator can configure one system and then use the same global settings for all other systems. This saves a lot of configuration time.

6. Messages and reports

6.1 Standard messages

MW41 Sounding System generates various messages for various purposes.

You can create messages manually at any time during a sounding in the **Messages** window, or they can be generated automatically with a trigger.

The standard MW41 sounding software can generate the following standard messages:

Table 10 Standard messages

Message	Description
FM 35-XI Ext. TEMP	Upper-level pressure, temperature, humidity and wind reports from a fixed land station
FM 36-XI Ext. TEMP SHIP	Upper-level pressure, temperature, humidity and wind reports from a sea station
FM 38-XI Ext. TEMP MOBIL	Upper-level pressure, temperature, humidity and wind reports from a mobile land station
FM 32-XI PILOT	Upper-wind report from a fixed land station
FM 33-XI PILOT SHIP	Upper-wind report from a sea station
FM 34-XI PILOT MOBIL	Upper-wind report from a mobile land station
3'09'050	BUFR for wind sounding (Pressure - PILOT)
3'09'051	BUFR for wind sounding (Height - PILOT)
3'09'052	BUFR for temperature, humidity and wind sounding
3'09'056	BUFR for descending sounding. Includes WIGOS identifiers.
3'09'057	BUFR for temperature, humidity, and wind sounding type data with higher precision of pressure and geopotential height. Includes WIGOS identifiers.

6.2 Licensed message options

- Defense messages are available with a separate licence.
- 3'09'053 - BUFR down message requires the Advanced option.
- NILU and World Ozone and Ultraviolet Radiation Data Centre operated by Environment Canada (WOUDC) messages require the Special sensor option.
- WMO FM 75-X CLIMAT TEMP - Report of monthly aerological data from a land station. Requires the Advanced option.

6.2.1 Defense messages

The optional Defense Messages feature extends the use of the MW41 sounding software to customers with defense weather observation needs. The feature consists of:

- NATO Standardization Agreement (STANAG) messages
- METEO 11 (Eastern Block Ballistic Meteorological Message)

The following defence messages are available with a licence:

Table 11 Defense messages

Message	Description
METB2/METB3	Standard Ballistic Meteorological Message (STANAG 4061)
METCM	Standard Artillery Computer Meteorological Message (STANAG 4082)
METFM	Standard Fallout Meteorological Message (STANAG 2103)
METSR	Sound Ranging Meteorological Message
METSRX	Sound Ranging Meteorological Message
METTA	Standard Target Acquisition Meteorological Message (STANAG 4140)
METEO 11	Eastern block Ballistic Meteorological Message

6.3 Reports

The MW41 sounding system has a new feature which provides the users a possibility to configure and output formatted data reports according to their own needs. A report is basically a tabular format text file with optional header sections and a data table.

Configuring takes place in the **Report templates** configuration window under the **Administration** menu tab. The configuration window provides the possibility to import and edit report templates, and to create new report templates. Report templates may also be exported from the user's current system and imported to other MW41 systems, if necessary.

There are multiple parameters to be selected for both header sections and the data table. The parameters are selected and added using a drop-down menu with additional controls for specifying the desired column widths and the number of digits and decimals to be output. Alternatively, if a strict format for the report is not needed, the user can select the default format settings.

For the header section, there are various metadata type of parameters to be selected, for example, radiosonde type and station information. The data table may contain measured data parameters such as pressure, temperature and humidity, or derived parameters such as mixing ratio, virtual or potential temperature, and many other parameters.

The data table may be configured to consist of layers with different output rates. Also, parameter titles may either be included or left out for the header section and for each data table layer.

Some pre-defined reports are included on the software installation media as examples. They can be used as a basis for creating new reports.

The MW41 sounding software provides a set of logical destinations where data reports and messages can be sent during and after a sounding, either automatically or manually. Destinations can be preconfigured during or after system installation and include, among others, FTP server, e-mail, local or remote disk drive, and traditional serial port transmission.

6.4 Scripts

The MW41 sounding system includes and runs script programs coded using the Python script language (more specifically, the IronPython variant of the Python language). Scripts can either be used to create data outputs which are too complex to be configured using the Report functionality, or to perform any kind of calculations using the sounding data.

A script is created in the MW41 sounding system using the **Scripts** configuration window in the **Administration** menu tab. The MW41 control service starts the scripts when a new sounding is initiated.

The MW41 sounding system provides a specific scripting interface to use some system services, to retrieve sounding data, and to receive system events for controlling the flow of the script program. Otherwise, it is up to the script program to take care of what and when to do something with the received events and data.

The MW41 installation media includes the scripting interface documentation and some sample script programs.

6.5 Special sensor data

The MW41 sounding system supports the calculation of special sensor data, such as ozone. Special sensor calculation is implemented using the scripts. The user can modify the basic equations to produce final data values from the special sensor raw data and to modify data filtering parameters and add their own custom filters. It is also possible to simulate the soundings with archived data to repeat the calculations as well as use different methods and filtering parameters for the data.

The supported ozone sensors are:

- Science Pump Corporation (SPC) Model ECC-6A ECC ozone sensor
- Droplet Measurement Technologies Model Z ECC ozone sensor

Technical support



Contact Vaisala technical support at helpdesk@vaisala.com. Provide at least the following supporting information as applicable:

- Product name, model, and serial number
- Software/Firmware version
- Name and location of the installation site
- Name and contact information of a technical person who can provide further information on the problem

For more information, see www.vaisala.com/support.

Warranty

For standard warranty terms and conditions, see www.vaisala.com/warranty.

Please observe that any such warranty may not be valid in case of damage due to normal wear and tear, exceptional operating conditions, negligent handling or installation, or unauthorized modifications. Please see the applicable supply contract or Conditions of Sale for details of the warranty for each product.

Recycling



Recycle all applicable material.



Follow the statutory regulations for disposing of the product and packaging.

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