NEPTUNE Weather station presentation

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1. STATION PRESENTATION

1.1. Description

Generalities

The Neptune station (also called EUCAWS for European Common Automatic Weather Station) is the new European station for the ships. The station has been developed by the company Stéréla according to EUMETNET specifications.

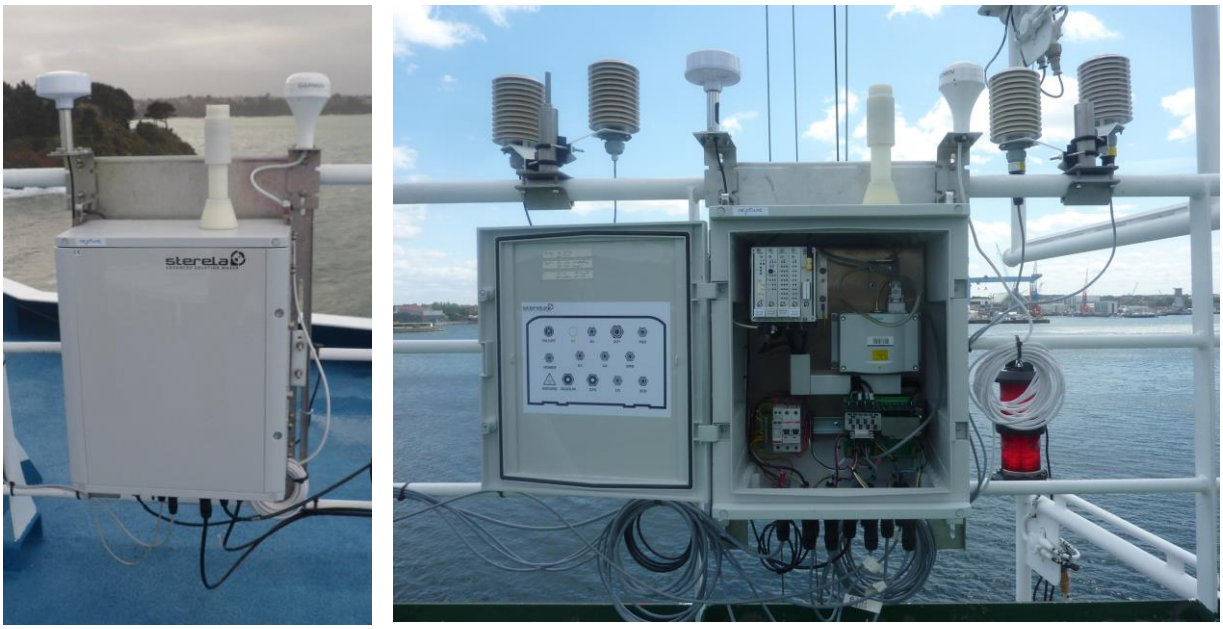
It is powered by 24V and allows the acquisition of several sensors : barometer, thermometer, hygrometer, wind sensor, sea surface thermometer. It is also connected to a GPS and if possible to the ship compass.

It can be connected to a software to visualize and capture of visual parameters (for some parameters which are not automatically measured: waves, clouds).

Data are transmitted by Iridium satellite to a processing center. The station transmits generally every hour, but it is possible transmit every 5,10,15,20,30 minutes if needed. The station can work in automatic mode and transmits only if the ship is in movement, to avoid the transmissions when the ship is in the port.

Enclosure

The station size is : 550 x 450 x 250 mm and its weight is 16 kg without its fixation interface.



Neptune station outside and inside

Configuration by default

The Neptune station contains:

- A rack containing several electronic boards (Analogue, digital, power, UC, Iridium)
- A circuit-breaker
- Internal connectors to wire the sensors
- The barometer is installed inside

Outside the enclosure

- An Iridium antenna
- A marine GPS
- One connector for each sensor and output
- A pressure outlet to improve pressure measurement

Options

According to the ship and to the requests of the crew, it is possible to add to this configuration:

- **A board for user interfaces :**
  1. **SMD** (Ship Monitoring Display): To connect to computer (laptop…) equipped with the software Turbowin+, allowing the visualization of measured data and the capture of human observations
  2. **PSO** : (Permanent Sensor Output): to transmit to the data users all the measures of the station every second, (Often used for the research vessels).

- **A remote Iridium modem** in the case of the station can not be installed outside.

1.2. Sensors

By default, the possible measures which are done on Neptune station are :

- Pressure
- Air temperature
- Humidity
- Wind
- Sea Surface Temperature
- Gyrocompass of the ship
- GPS
- Human data from Turbowin+

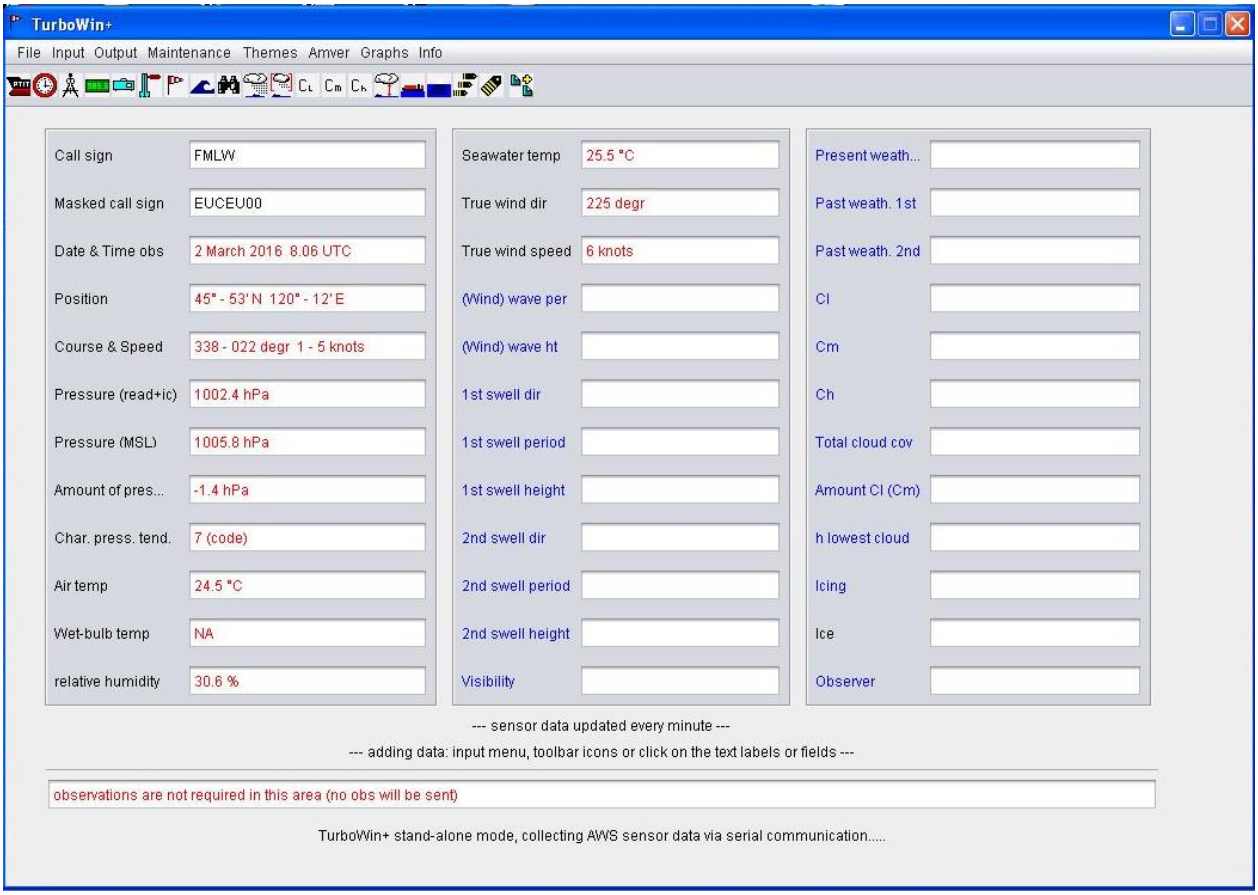
The station can be configure to set the number of digital and analogue channels according to the type of sensors. The standard configuration is the following one :

- 2 analogue channels
- 3 digitals channels
- 1 digital channel for the barometer
- 1 digital channel for the gyrocompass
- 1 digital channel for the GPS

1.3. User interfaces

1.3.1. Turbowin+ (Ship Monitoring Display)

Turbowin+ software installed in wheelhouse allows the crew to visualize the data acquired by the station (1 minute data) and to capture every hour of the visual parameters, to complete the automatic measurement by measures observed visually.



Turbowin+ Software

1.3.2. Permanent Sensor Output (PSO)

The permanent sensor output allows to the crew to receive the 1s data of the station on their equipments via a serial connection in NMEA format. The frequency of data transmission is 1s. Then it is chargeable to the user to store and process the data.

The PSO output has exactly this format :

$PEUMA,YYYYMMDD,HHMMSS,sDD.ddd,sDDD.ddd,CCC.c,SS.s,HHH.h,PPPP.p,PPPP.p,
sPP.p,A,sTA.a,UUU.u,sTD.d,sTW.w,WS.r,WDR.r,WS.t,WDT.t,SPARE,SPARE,SPARE*hh<CR><LF>

Parameter	Description	Format	Range	Resolution	Units
$PEUMA	Identifier SMD output telegram	$: start P : proprietary EUMA : ID of the manufacturer			
YYYYMMDD	Date	YYYY : Year MM : Month DD : Day			
HHMMSS	Time (UTC)	HH : Hour MM : minute SS : secondes			
sDD.ddd	Latitude	s : sign (+:north -:south) (+ omitted) DD.ddd	-90..90	0.001	Deg
sDDD.ddd	Longitude	s : sign (+:east -:west) (+ omitted) DDD.ddd	-180..180	0.001	Deg
CCC.c	Course over ground	CCC.c	0..359.9[1]	0.1	Deg
SS.s	Speed over ground	SS.s	0..99.9	0.1	m/s
HHH.h	True Heading	HHH.h	0..359.9[1]	0.1	Deg
PPPP.p	barometric pressure at sensor level	PPPP.p	900..1100	0.1	hPa
PPPP.p	barometric pressure at sea level	PPPP.p	900..1100	0.1	hPa
sTA.a	air temperature	s: sign (+/-) (+ omitted) TA.a	-60..60	0.1	°C
UUU.u	Relative humidity	UUU.u	0..100	0.1	%
sTD.d	dewpoint	s: sign (+/-) (+ omitted) TD.d : dewpoint	-60..60	0.1	°C
sTW.w	water temperature (SST)	s: sign (+/-) (+ omitted) TW.w	-5..45	0.1	°C
WS.r	relative wind speed, 1-second average	WS.r	0..75	0.1	m/s
WDR.r	relative wind direction, 1-second average	WDR.r	0..359.9[1]	0.1	Deg
WS.t	true wind speed, 1-second average	WS.t	0..75	0.1	m/s
WDT.t	true wind direction, 1-second average	WDT.t	0..359.9[1]	0.1	Deg
SPARE	for future use				
SPARE	for future use				
SPARE	for future use				
*hh	Checksum according to NMEA proprietary sentences / IEC 61162-1	Checksum	00-FF		
<CR><LF>	carriage return line feed				

[1] 0° will be used for North direction, as provided by the sensors

Example

$PEUMA,20120715,123827,52.405,-5.338,192.0,5.2,184.0,997.4,999.9,16.0,87.5,,11.1,9.4,98.5,12.5,55.2,,,*7E <CR><LF>

Parameter	Value
Identifier SMD input telegram	$PEUMA
Date	15th of july, 2012
Time (UTC)	12:38:27
Latitude	52.405 °N
Longitude	5.338 °W
Course over ground	192.0 °
Speed over ground	5.2 m/s
True Heading	184.0 °
barometric pressure at sensor level	997.4 hPa
barometric pressure at sea level	999.9 hPa
air temperature	16.0 °C
Relative humidity	87.5 %
Dewpoint	missing
water temperature (SST)	11,1°C
relative wind speed	9.4 m/s
relative wind direction	98.5 °
true wind speed	12.5 m/s
true wind direction	55.2 °
checksum	7E (value probably not correct)

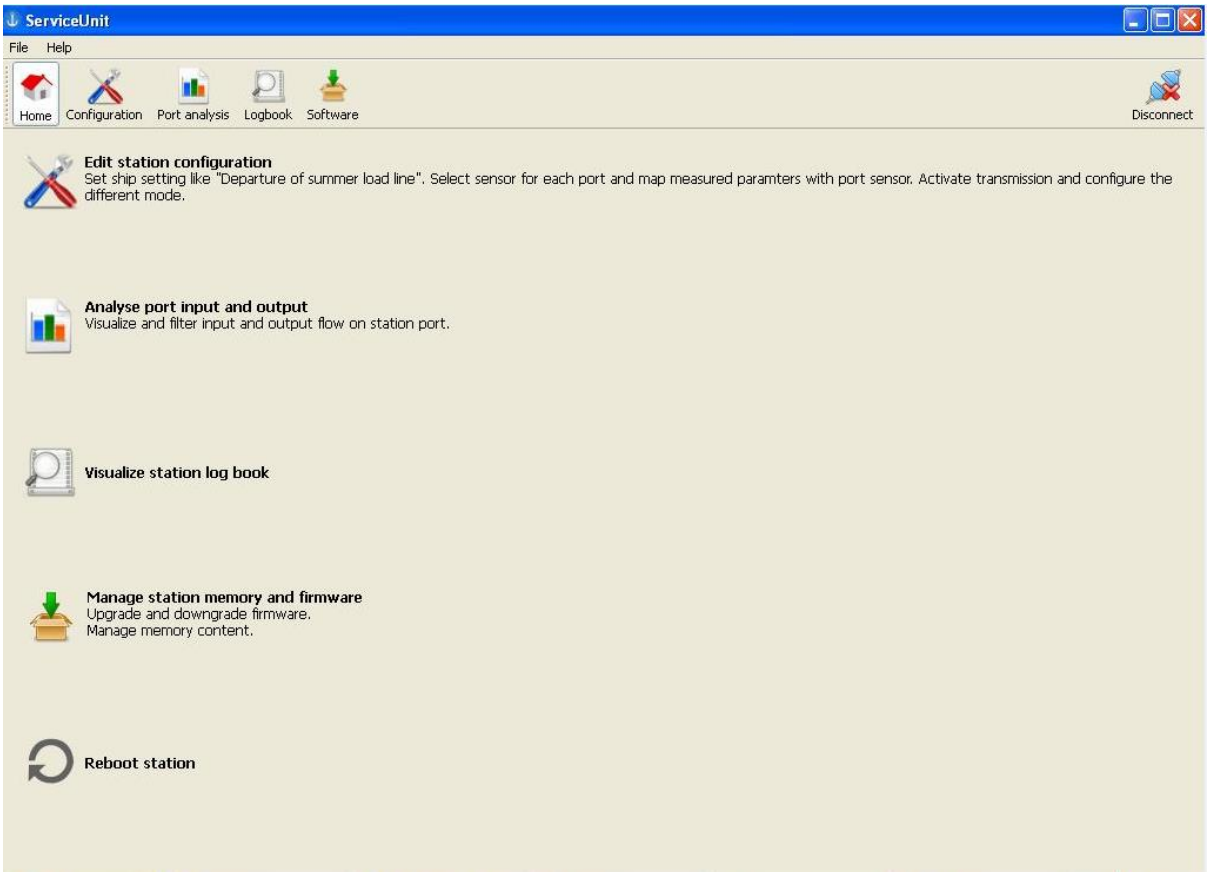
1.4. Configuration

The configuration of the station can be done by meteorological agencies either locally thanks to the software "Service Units (SU)" or remotely thanks to the software "Landbased Monitoring Facility (LMF)".

1.4.1. Service Unit (SU) Software

The SU allows to

- Edit station configuration
- Analyze port input and output
- Visualise the station logbook
- Update the software



1.4.2. Landbased Monitoring Facility (LMF)

The LMF allows to configure the station when the station in on the ship thanks to Iridium communication. Functionalities are almost similar to those of the SU.

2. INFRASTRUCTURES AND CABLINGS

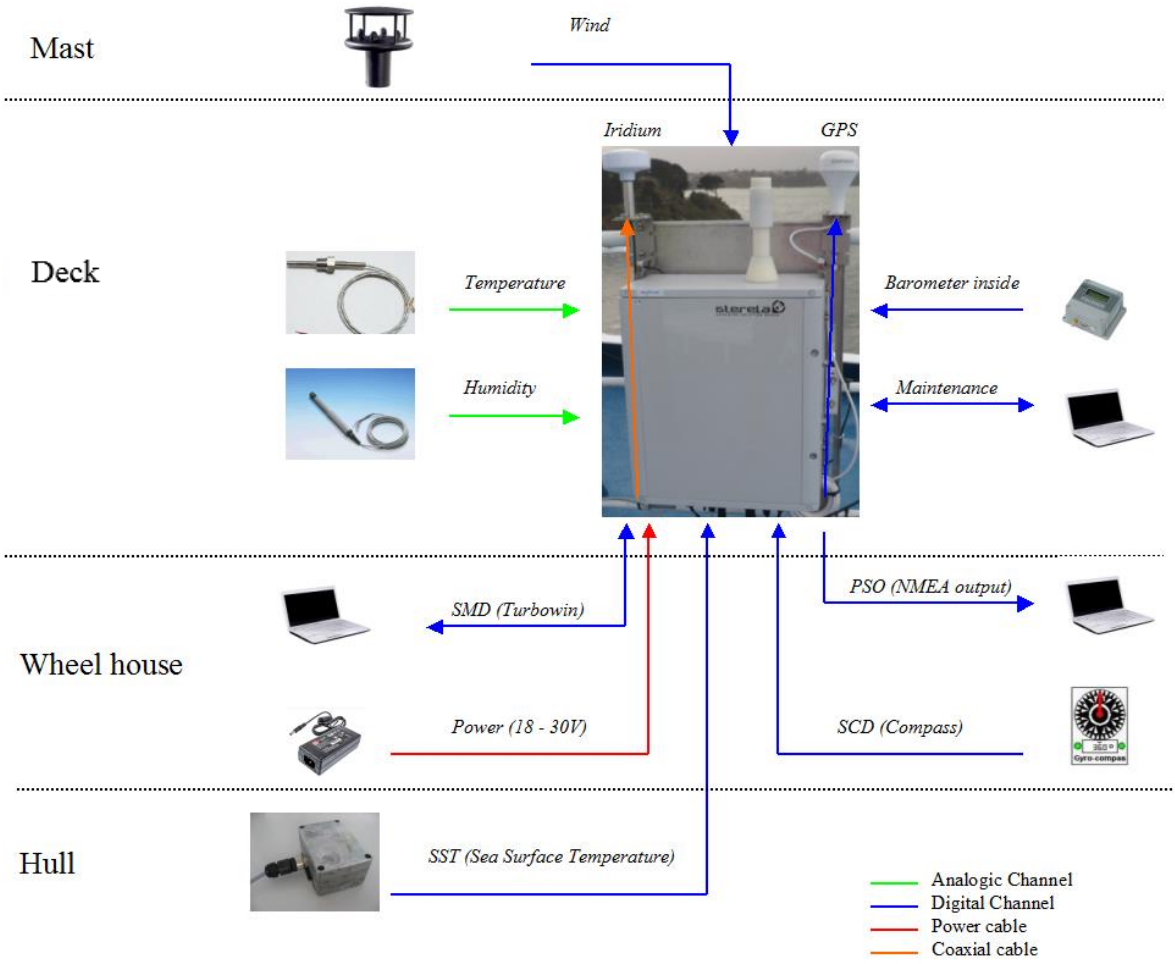
2.1. Generalities

- **The Neptune box** is preferentially installed outside. Thanks to a metallic backplane, it can be easily fixed on the railway of the ships. Iridium and GPS antennas are fixed on that backplane.
- **The wind sensor** will be installed at the highest and most in front of the possible ship cleared of any obstacle. We make sure, by aim, that the mark northeast directed in a parallel to the axis of the ship connecting the bow with the stern and managed towards the bow
- **The temperature sensor** will be installed in the meteorological shield
- **The humidity sensor** will be installed in the meteorological shield (Note that humidity and temperature sensor are often mixed).
- **The pressure sensor** will be installed in the Neptune enclosure

  NB : Multi-sensors can be used for pressure, temperature, humidity and wind.
- **Turbowin+** is generally installed on a computer in the wheelhouse.

- **The Sea Surface Temperature sensor** is most of the time fixed to the hull of the ship by magnets (plan a steel flat surface of 10 x 7 cm)

2.2. Synoptic scheme



2.3. Infrastructures preparation

The preparation of infrastructures on the ship consist:

For the station : Choose rail near the existing cableway.

For the shield : Find of fix on a vertical or horizontal tube near the station.

For the wind : At the top of the main mast, cleared of any disturbances, fix a galvanized or aluminium steel tube (according to the material of the ship); specially adapted to fix the sensor.

To fix these tubes, the ideal is to be able to weld the tube on the existing structure. When welding is impossible (authorization of the shipowner not granted) it is always possible to fix the tube by bolting with a typical support " universal fixation ".

Example:

		
Station on railway and shield on a pipe fixed to the rail of the ship	**Wind sensor on a pipe with universal fixation**	**Wind sensor on a pipe welded**

2.4. Preparation of the cabling

The cableway on ships have particular constraints (tight partitions, binding standards). It obliges us to anticipate with the crew, the way of crossing these cables.

Three scenarios are possible: subcontracting, work made by the crew or by meteorological technicians. A first visit prior to the installation is very important for estimating the time, the place and the cost of these cable installation, as well as for getting organized on the work to come.

Concerning the cabling the different cables necessary for a complete installation are the following :

- A power cable 24V coming from the wheelhouse
- A cable connecting the sensor wind with the Neptune box . Type : **4 wired x 0,35mm²**
- A cable connecting the temperature sensor with the station. Organized in the installation except particular case with a distant shield.
- A cable connecting the humidity sensor with the station. Organized in the installation except particular case with a distant shield.
- A cable connecting the compass sensor with the station. Type : **2 wired x 0,35mm²**
- A cable going from the station to wheelhouse for Turbowin+. Type : **4 wired x 0,35mm²**
- A cable going from the station to wheelhouse for the permanent sensor output (for the research vessels essentially). **Type : 2 wired x 0,35mm²**
- A cable of connection, connecting the Sea Surface Temperature sensor with the station. Type : **4 wired x 0,35mm²**

2.5. Particular case of the remote Iridium modem

If the station can not be installed outside, it is possible to use a remote iridium modem.

In this case, it is necessary to plan :

- A remote Iridium board for the rack of the station
- A remote Iridium modem + antenna.
- A cable connecting this box to the station. (**8 wired x 0,35mm²)**

This solution is not favoured because the purchasing cost of such an option is more expensive.