Professional weather stations

USER MANUAL

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Introduction

This operating manual (hereinafter referred to as the OM) contains information on all modifications of the PRO automatic weather stations, necessary to ensure full use of their technical capabilities, proper operation and maintenance.

The operating manual is intended for personnel performing installation, operation, repair and maintenance of the weather station.

«Jcom-IoT» is the copyright holder for the PRO automatic weather stations. For more information, please contact us in the following ways:

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1. Purpose

PRO automatic weather stations are compact professional weather stations that allow you to record various environmental parameters.

PRO weather stations are available in various models. Each model has a different set of sensors and the number of parameters measured and recorded.

Modifications PRO 200, PRO 300, PRO 400, PRO 500, PRO 600 are included in the state register of measuring instruments (No. 63630-16).

In Table 1 shows possible modifications of the weather station.

Table 1. Modifications of PRO weather stations

	Modifications of the IMETEOLABS weather station									
Measured parameters	**PRO 200**	**PRO 200R**	**PRO 300**	**PRO 400**	**PRO 400R**	**PRO 500**	**PRO 600**	**PRO 600R**	**PRO 800**	**PRO 800R**
Air temperature			+	+	+	+	+	+	+	+
Relative humidity			+	+	+	+	+	+	+	+
Wind direction	+	+				+	+	+	+	+
Wind speed	+	+				+	+	+	+	+
Atmospheric pressure			+	+	+	+	+	+	+	+
Amount of precipitation		+			+			+		+
Intensity of precipitation				+			+		+	+
Type of precipitation		+			+			+		+
Energy illuminance									+	+
UV index									+	+

2. Safety requirements

Before using the weather station, please read the operating documentation.

Installation and commissioning must only be carried out by qualified personnel.

Do not perform measurements or touch live equipment. Follow the technical specifications, storage conditions, and operating conditions of the equipment.

If the equipment is not connected properly:

—there is a possibility that the equipment will not work;

—the equipment may fail completely;

—Under certain conditions, a risk of electric shock may occur.

3. Technical and metrological characteristics

MainThe technical and metrological characteristics of PRO weather stations are given in Table 2.

Table 2. Main technical and metrological characteristics

Name of the characteristic	Characteristic values
Air flow speed	
Air flow velocity measurement range, m/s	from 0.3 to 60
Limits of permissible error in air flow velocity measurements: - absolute in the range from 0.3 to 10 m/s incl., m/s; - relative in the range over 10 to 60 m/s,%	 ± 0.3 ± 3%
Resolution, m/s	0.1
Air flow direction	
Air flow direction measurement range, degrees	from 0 to 360
Limit of permissible absolute error in air flow velocity measurements, degrees	± 3
Resolution, degrees	1
Air temperature	
Air temperature measurement range, ºC	from minus 50 to 60
Limit of permissible absolute error in air temperature measurements, ºC	± 0.1
Resolution, °C	0.1
Relative humidity	
Relative humidity measurement range,%	from 1 to 100
Limit of permissible absolute error in measurements of relative air humidity, %	± 3
Permission, %	0.1
Atmospheric pressure	
Atmospheric pressure measurement range, hPa	from 300 to 1200
Limit of permissible absolute error of atmospheric pressure measurements, hPa	± 1
Resolution, hPa	0.1
Amount of precipitation	
Range of measurements of the amount of precipitation, mm	from 0 to 3250
Limits of permissible relative error in measuring the amount of precipitation, %	± 5
Resolution, mm	0.1
Intensity of precipitation	
Range of measurements of precipitation intensity, mm/min: for PRO 200R, PRO 400R, PRO 600R, PRO 800R for PRO 400, PRO 600, PRO 800	 from 0 to 5 from 0.1 to 2.4
Limits of permissible relative error in measurements of precipitation intensity for PRO 200R, PRO 400R, PRO 600R, PRO 800R, %	±5

Name of the characteristic	Characteristic values		
Limit of permissible absolute error in precipitation intensity measurements, mm/min	±0.2		
Type of precipitation (PRO 200R, PRO 400R, PRO 600R, PRO 800R)			
Type of precipitation	no precipitation rain snow snow and rain hail hail and rain		
Energy illuminance			
Measurement range of irradiance, W/m2	from 0 to 2000		
Limit of permissible relative error in measurements of irradiance, %, no more than	5		
Resolution, W/m2	1		
Ultraviolet Radiation Index			
Ultraviolet Radiation Index (UVRI) reading range	from 0 to 15		
Supply voltage, current consumption			
Supply voltage from DC network, V	12 (± 5%)		
Current consumption at DC supply voltage of 12 V*: with built-in heating turned off, A, no more than with built-in heating on, A, no more than	 0.03 2		
* - a power supply with a minimum power of 30 W is recommended			
Reliability			
Mean time between failures, h	10,000		
Service life, years	8		
Overall dimensions, weight			
Overall dimensions, weight	length, mm	diameter, mm	weight, kg
PRO200	215	140	0.8
PRO200R	279	140	1
PRO300	229	140	1.0
PRO400	278	140	1.3
PRO400R	293	140	1.5
PRO500	311	140	1.2
PRO600	360	140	1.5
PRO600R	375	140	1.7
PRO800	360	140	1.5
PRO800R	375	140	1.7
Degree of protection of the shell, IP code			
Degree of protection of the shell, IP code	IP66		

4. Completeness

The complete set of the weather station is given in Table 3.

Table 3 Weather station completeness

Name	**Quantity, pcs.**
1. Automatic weather station PRO (modification depending on the order)	1
2. Operation manual for the "PRO automatic weather stations"	1 per batch
3. Passport	1
4. Connecting cable*	1
5. Pipe mounting kit	1
*- Standard cable length is 4 m, upon request the cable length can be increased.	

5. Main functions

The PRO family of weather stations is an integrated design for measuring and displaying the following meteorological parameters:

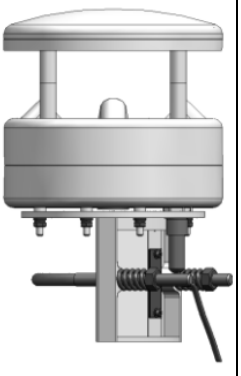
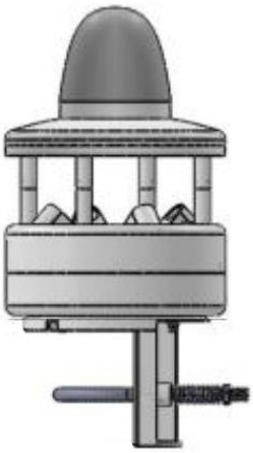
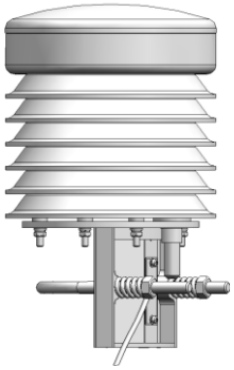
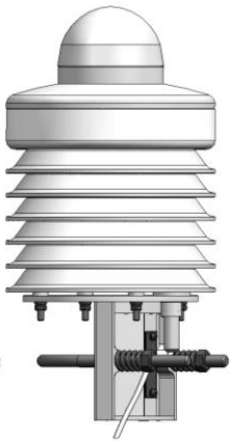
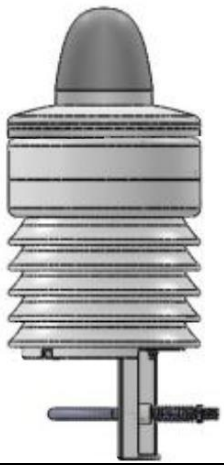
–air temperature;
–relative air humidity;
–speed and direction of air flow;
– amount and intensity of precipitation (type of precipitation);
–atmospheric pressure;
–energy illumination,
–UV index.

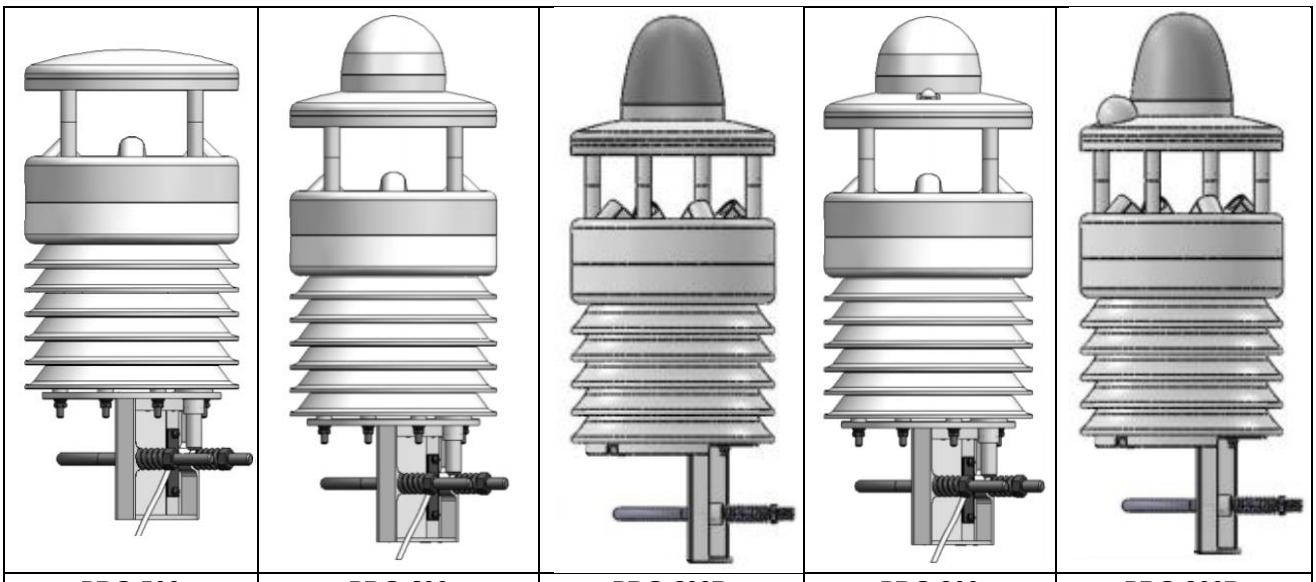
The weather station is connected using a six-pole electrical connector with a threaded joint and a corresponding connecting cable.

6. The structure of a weather station

6.1 Design and appearance

The weather station is housed in a plastic case. The appearance of various versions of the PRO weather station is shown in Figure 1.

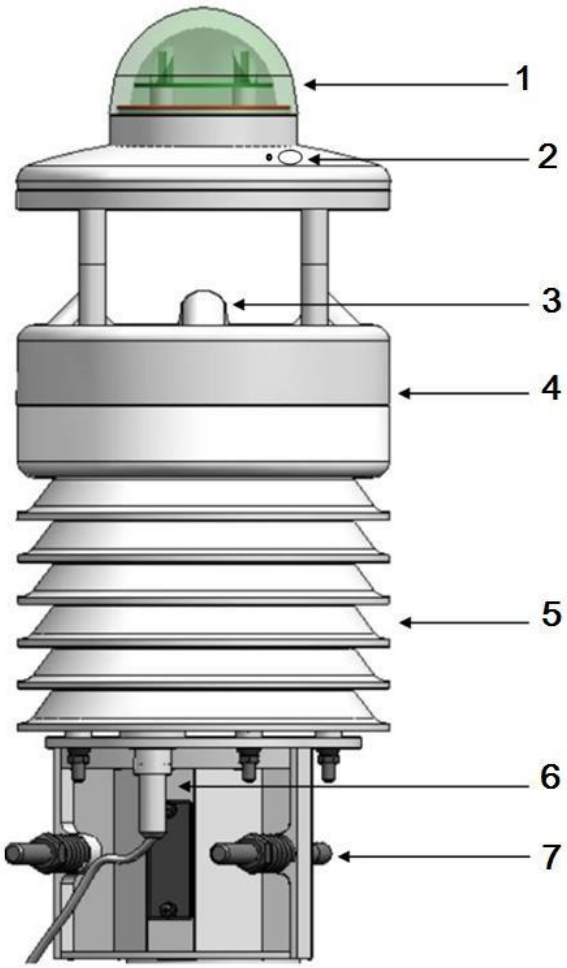
				
PRO 200	PRO 200R	PRO 300	PRO 400	PRO 400R



PRO 500	PRO 600	PRO 600R	PRO 800	PRO 800R

Figure 1– Appearance of various modifications of PRO weather stations

The location of the sensors is shown using the example of the most complete configuration of the PRO 800 (800R) weather station:



1 - precipitation converter.

2 – pyranometer, UV index indicator,

3 – ultrasonic transducer of air flow speed and direction,

4 – atmospheric pressure transducer,

5 - temperature and relative humidity converter,

6 - connector for connecting external converters,

7 - bracket for mounting the weather station.

Figure 2– Location of sensors

6.2 Operating principle. Description of the main measured parameters

6.2.1 Temperature and relative humidity

Relative air humidity is measured using a capacitive sensing element. A high-precision measuring element is used to measure air temperature. To minimize the impact of external factors (such as solar radiation), the sensing elements are housed in a ventilated housing with radiation protection. The default averaging period for temperature and humidity monitoring is 60 seconds.

6.2.2 Atmospheric pressure

Absolute atmospheric pressure is measured using built-in MEMS sensors.

6.2.3 Wind direction and speed

Wind measurements are performed using four ultrasonic sensors, which take cyclical measurements in all directions. Based on this data, the resulting wind speed and direction values are calculated. The default averaging period for wind speed and direction monitoring is 60 seconds.

6.2.4 Atmospheric precipitation

Using a radar or optical precipitation sensor, the amount and intensity of precipitation are measured. A radar sensor can also determine the type of precipitation (rain, snow, hail, and combinations thereof).

6.2.5Energy illuminance

Irradiance is measured by a pyranometer, which is installed in the “dome” of the weather station.

6.2.6UV index

The photosensitive element determines the UV index, which is an international assessment of the level of ultraviolet radiation on the Earth's surface.

6.2.7Heating

The built-in heating automatically turns on at a temperature of approximately 1°C to ensure normal functioning.

6.3 Installation of a weather station

6.3.1 Selecting an installation location

To ensure a long service life and proper operation of the weather station, please pay attention to the following points when choosing an installation location:

– The weather station should be located in an open area where the equipment can be easily

accessed. There should be no significant obstacles around the site where the weather station is located (large buildings, groups of trees).

– It is never recommended to install a weather station near highly heated surfaces, such as roofing felt.

– The installation site is selected in an area that is characteristic (typical) of the surrounding area and does not differ from the surrounding territory in any features of heat and moisture exchange.

– The weather station should not be located in the shade.

– The weather station is mounted on a mast above the ground. The installation height is at least 6 meters above the ground.

– A power source is required for continuous operation of the device.

<u>Note:</u>The measured parameter values are valid only for the location where the weather station is installed. These data should not be used to draw conclusions for the entire surrounding area.

Figure 3 shows a diagram of the installation of a weather station in an open area.

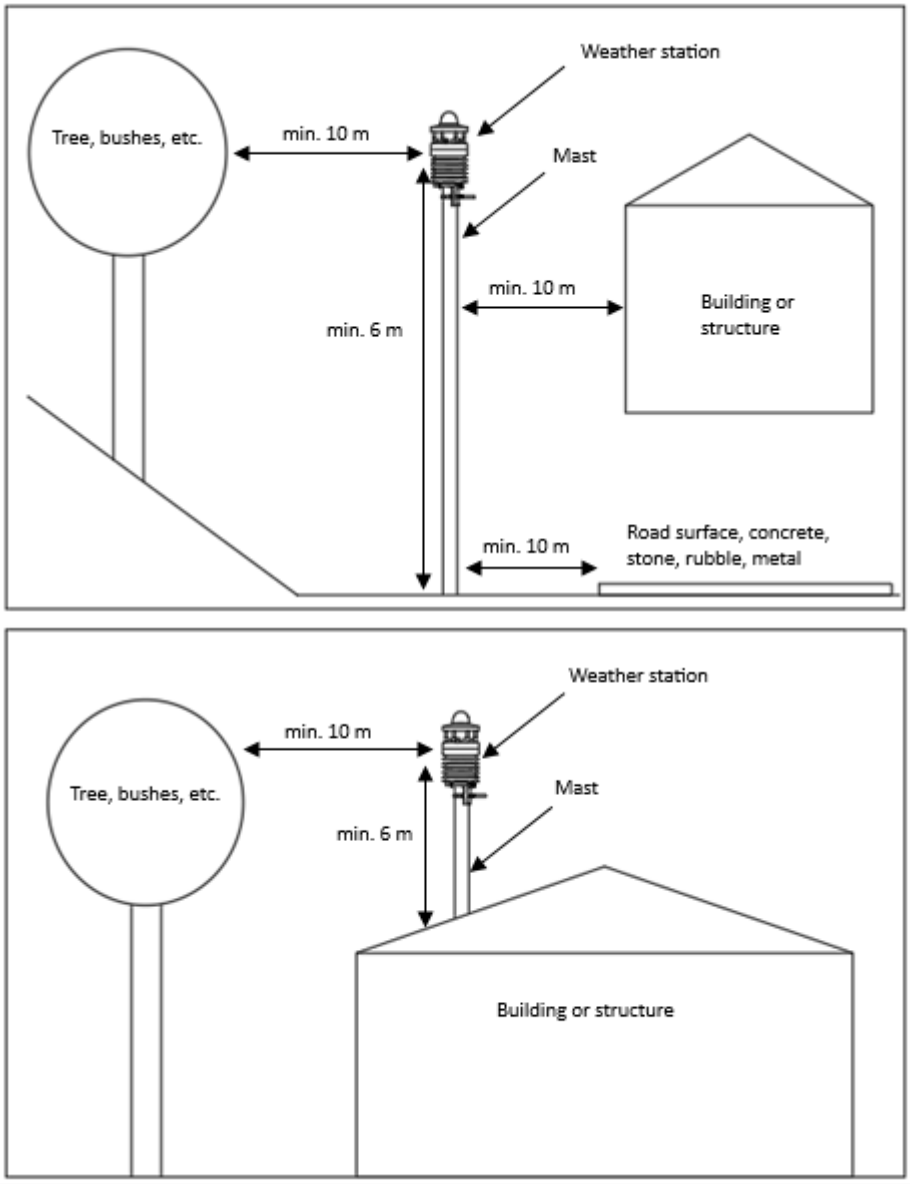


Figure 3– Location of the weather station in space.

6.3.2 Installation procedure

The device bracket is designed for installation on the top of a mast with a diameter of 50-76 mm. The following tools are required for installation:

– A 13 mm spanner (open-end or box-end).

– Compass for setting the anemometer in the north direction.

The procedure for attaching the weather station to the mast is as follows:

– The nuts should be loosened.

– Install the weather station on the top of the mast.

– Tighten the nuts evenly until there is no contact with the base of the mast, but the weather station can still be moved easily.

– Point the weather station north to accurately measure wind direction.

–Tighten both nuts.

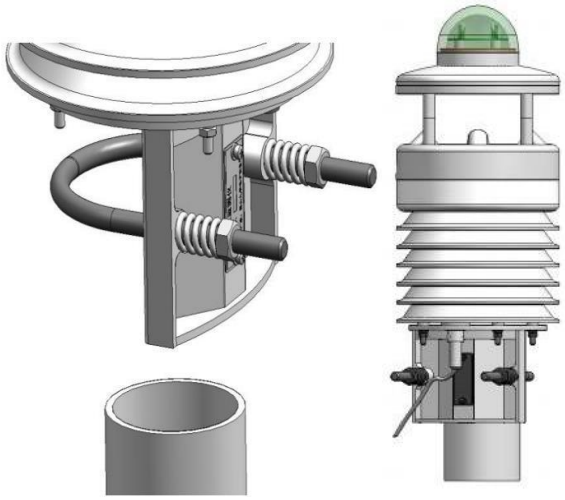


Figure 4– Installation of a weather station on a mast.

In order for a weather station to display accurate data, it must not only be correctly placed, but also accurately configured.

To accurately determine wind direction, the weather station must be oriented north. For this purpose, special arrows are located on the weather station body.

The sequence of actions for aligning the weather station to the north:

– If the sensor is already mounted, first loosen both nuts enough to allow the sensor to rotate easily.

– Using a compass, determine the north and fix the starting point on the horizon.

– Orient the sensor so that south and north are aligned with the north point fixed on the horizon.

– Tighten both nuts 3 turns.

<u>Note:</u>Since the magnetic north indicated by a compass differs from the geographic north pole, the declination at the installation site (magnetic declination) must be taken into account when orienting the sensor. Depending on the location, for example, in North America, the deviation can exceed 15°. In central Europe, the deviation is negligible (< 3°).

On the bottom of the weather station is a six-pin screw connector used for power supply and communication via the interfaces provided with the weather station's connecting cable. The connector is shown below, and Table 4 provides a description of the connectors.

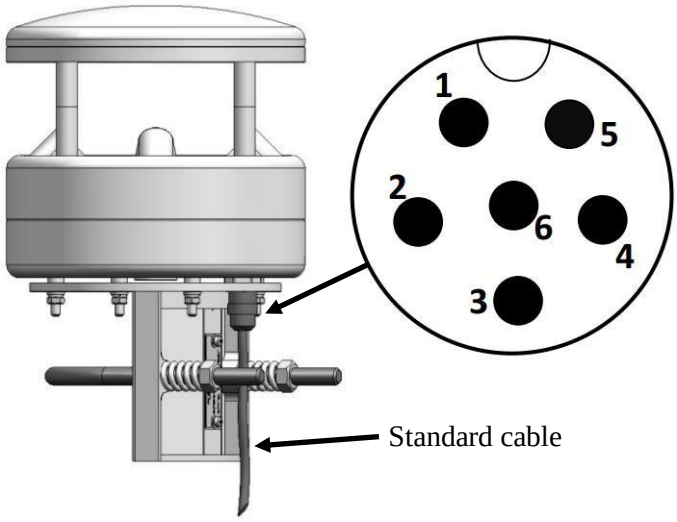


Figure 5– Connector for power supply and interfaces

The standard cable has a connector only on the side where it connects to the weather station. There is no connector on the other end of the cable, and all wires are routed outside the cable's insulation.

Table 4. Contact designation

Contact number	Name of the chain	Wire color
1	+12 V DC	Red
2	GND	Black
3	RS-485 A / RS-232 RX*	Yellow
4	RS-485 B / RS-232 TX*	Blue
5	Not used	Gray, or the wire is missing
6	Not used	Pink, or the wire is missing
* - RS-485 or RS-232 communication interface is determined when ordering a weather station		

***Note*: To connect the weather station connector, you need to remove the plug.**

When connecting the power supply, it is imperative to observe polarity. Incorrect polarity will damage the weather station!

During installation, it is important to ensure that the total length of the power supply circuit from the power supply to the weather station does not exceed 20 m.

7. Software

To poll and display data from the weather station's measurement channels, the personal account of the IMETEOLABS IoT monitoring system, which is part of the software package, is typically used.

A description of the operator's interaction with the above-mentioned personal account of the monitoring system is given in the user manual "Personal account of the IMETEOLABS IoT monitoring system as part of the software and hardware package".

9. Terms of Use

Weather stations are designed for the following operating conditions:
- ambient air temperature from –50 to +60℃;
- relative air humidity from 0 to 100%;
- atmospheric pressure from 300 to 1200 hPa.

10.Maintenance

The equipment does not require maintenance, but it is recommended to perform a functional check once a year. When performing the check, pay attention to the following:

– Visual inspection to detect contamination of the device.
– Checking the operation of sensors by polling measured values.

11.Manufacturer's (supplier's) warranties

The manufacturer guarantees that the product complies with technical specifications, subject to the conditions of transportation, storage, installation and operation.

The warranty period is 12 months from the date of transfer of the product to the buyer.

During the warranty period, the manufacturer has the right to supervise the correct operation of the product in order to improve the quality and efficiency of operation.

Product components that fail during the warranty period are subject to replacement or repair by the manufacturer at the manufacturer's expense.

The user loses the right to free repairs during the warranty period in the event of broken seals, mechanical damage by the user, or if the product was repaired by a person who is not authorized to perform repairs and maintenance.

12. Storage and transportation rules

Climatic conditions for transportation must meet the following conditions:

– ambient air temperature from minus 50℃ to plus 60℃;

– relative air humidity up to 95% at 25℃;

– atmospheric pressure from 84.0 to 107.0 kPa (from 630 to 800 mmHg).

The product can be transported by all types of transport (in covered wagons, closed vehicles, containers) in accordance with the “Rules for the Transportation of Goods” (Transport Publishing House, 1983).

The product must be stored only in the manufacturer's packaging at temperatures ranging from -50°C to +60°C and relative humidity no more than 95%. Storage areas must be free of aggressive impurities (acid or alkali vapors) that could cause corrosion.