百纳
BENA

DOME WINDOW

BENA OPTICS

Leading in optics with cutting-edge technology

Introduction to dome

Bena optics' dome window consists mainly of hemispheres and hyper-hemispheres. Itis composed of two parallel optical surfaces, (A convex surface & A Concave surface). Normally we can control the parallel tolerance <±2μm. A perfect parallel surface, in the imaging, the image does not distort, and in the measurement of light, the light does not distort. Bena Optics Optical Dome, the optical properties are unique, which are produced by the optical technology of optical grinding and polishing.

Bena Optics large clear optical glass dome window mainly are hemisphere, hyper-hemisphere, and customized designing. Whether it is a visible dome, UV dome, or IR dome, Bena Optics Dome has been confirmed in the international market.

According to the unused application scenarios of dome window, it is divided into solar radiation dome, underwater and deep-sea imaging dome, sky camera dome, and defense application dome.

Professional in optical dome window solutions

R&D capabilities

- Currently there are 5 professional technical engineers, including process design, equipment upgrades and mass production planning
- Cooperate with University & Chinese Academy of Sciences on academic research
- Has utility model patent certification

Product Strengths

- Hemisphere / Hyper hemisphere & OEM
- ABS of parallel tolerance ≤20 μm
- High precision surface accuracy

01 Solar radiation – dome window

The dome at the upper end of the solar radiometer is a specialized structure utilized for collecting and concentrating solar radiation. A radiometer is a device employed to measure solar radiation, and it can measure the radiation emitted by the sun, encompassing both direct and scattered radiation. These measurements are crucial for comprehending the impacts of solar radiation on the Earth, particularly in climate change and energy research. The dome atop the heliometer is engineered to maximize the collection of solar radiation from all directions to guarantee the accuracy and reliability of the measurement. The design of the dome considers the characteristics of solar radiation, including its wavelength range (0.15 to 4.0μm) and how it propagates through the Earth's atmosphere. Through the specialized design of the dome, it can effectively collect the direct and scattered radiation of the sun, thereby providing precise data for scientific research. Additionally, the dome design also takes into account the reduction of interference from other sources, such as radiation from the Earth and other celestial bodies, to ensure that the measured data is purer and more accurate. This design enables the solar radiometer to make precise Measurements under various environmental conditions and provides significant data support for scientific research.

Type No.	Out diameter (mm)	Height (mm)	Wall thickness (mm)
DW-10	10	5	1
DW-15	15	8	1.5
DW-24-1	24	12	2
DW-24-2	24	13	2
DW-25-1	25	12.5	2
DW-25-2	25	12.5	4
DW-25-3	25	14.5	2
DW-28-1	28	14	1.5
DW-28-2	28	16	1.5
DW-30-1	30	15	2
DW-30-2	30	16	2
DW-30-3	30	16	4
DW-30-4	30	16.5	2
DW-30-5	30	17	2

Type No.	Out diameter (mm)	Height (mm)	Wall thickness (mm)
DW-32-1	32	16	2
DW-32-2	32	15	4
DW-32-3	32	17	2
DW-32-4	32	17	4
DW-36	36	18	2
DW-40-1	40	20	2
DW-40-2	40	21	2
DW-50-1	50	25	2
DW-50-2	50	25	4
DW-50-3	50	26	2
DW-50-4	50	26.6	2
DW-50-5	50	28	2

02

Deep Sea Imaging and ROV –DOME WINDOW

Used to safeguard the front end of the robot to facilitate its operation in extreme underwater circumstances. The front dome of the deep-sea robot is engineered to confront the pressure and corrosiveness of the deep-sea environment. Owing to the extreme pressure of the deep-sea setting and the highly corrosive nature of seawater, the front section of the robot demands special protection. The dome configuration can effectively withstand the high pressure of the deep sea, concurrently prevent the ingress of seawater and corrosive substances, and safeguard the mechanical and electronic apparatuses inside the robot from damage. This design enables the deep-sea robot to operate stably in the extreme underwater environment, to undertake scientific research, exploration, mining, and other tasks. Additionally, the dome design also takes into account the particular challenges of the deep-sea environment, such as the thermal expansion and contraction of materials resulting from temperature variations, and the impact of seawater corrosion and deep-sea pressure on the robot. By employing special materials and reinforcing methods, it ensures the "structural seal" of the robot in an extremely cold environment, thereby ensuring the stability and reliability of the robot in a complex environment.

Type No.	Out diameter (mm)	Height (mm)	Wall thickness (mm)
DW-60	60	30	5
DW-70-1	70	35	5
DW-70-2	70	35	8
DW-75	75	37.5	3
DW-76	76	38	6
DW-80	80	40	4
DW-100-1	100	50	2
DW-100-2	100	50	4
DW-100-3	100	50	5
DW-127	127	50.8	4
DW-136	136	60	4
DW-140-1	140	70	4
DW-140-2	140	70	12
DW-170	170	56	6.5
DW-180	180	60	7.5
DW-184	184	61	7
DW-190	190	95	5
DW-203	203	80	4
DW-212	212	106	6
DW-230	229.6	87.4	8

For the dome used in deep-sea imaging and ROV, in addition to requiring high-precision surface accuracy, it must also withstand a certain water pressure.

The BENA Optics team, while continuously improving the surface accuracy, improves the customer's design, selects materials accurately, and enhances the surface strength through physical annealing. At present, the Bena optics' dome can reach the deepest depth of 3000m.

03 Missile seeker -dome

The main function of the missile guide head dome is to reduce aerodynamic resistance and interference, to protect the warhead (or bullet head) from force, heat and other natural environment and nuclear environment. A dome is a thin-shell structural assembly designed to optimize missile performance by reducing length and mass. During the high-speed flight of the missile, dome needs to withstand high pneumatic heating temperature and large pneumatic pressure and may be eroded by wind sand, rain and hail. Therefore, the material and design of dome must have good optical, mechanical, thermal properties, and good aerodynamic appearance, to ensure that the missile can fly stably and efficiently in a complex environment. In addition, dome also helps the missile separation system work normally, to ensure the satellite dome separation smoothly. The dome also regulates the temperature and prevents pollution during the launch of the carrier rocket and protects the satellite from the effects of low temperature and various environmental factors. To sum up, the role of the missile guidance head dome is not only limited to reducing aerodynamic drag and protecting the warhead, , but also includes optimizing the flight performance of the missile, to ensure that the missile can carry out its mission safely and effectively in various environments.

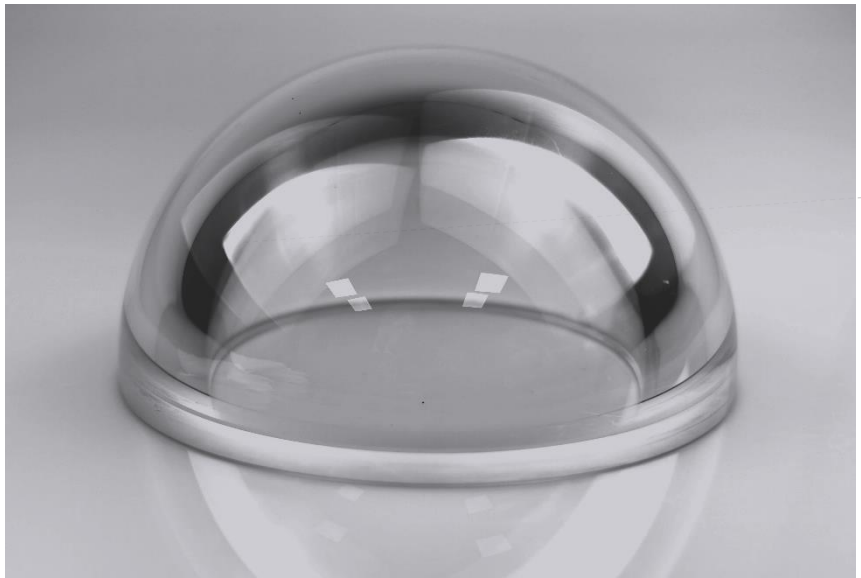
Bena Optics IR Dome is mainly based on infrared substrates, usually sapphire, ZnSe, single crystal silicon and other materials. In terms of meteorological detection, monocrystalline silicon material is mainly used. Use high-purity and high-resistance single-crystal silicon material. Moreover, the thickness of the dome is required to be controlled at 1mm ± 0.05mm to fully detect the infrared radiation of sunlight. In national defense technology, many sapphire materials are used, and sapphire dome is the backbone of national defense technology.

1. Sapphire
2. Silica crystal
3. ZnSe

03 All-sky camera dome

The function of the upper dome of the sky imager is to protect the imager from the external environment and ensure the image quality. The sky imager is a kind of equipment that can record the sky condition under all-weather conditions. it works in outdoor environment by means of high-precision automatic sun tracking system and rainproof monitoring device. it collects visible color images 24 hours a day and generates animated videos. These images and videos are of great importance for meteorological observation, cloud cover analysis and visibility estimation. In order to ensure the imaging quality and long-term stable operation of the equipment, sky imager adopts an environmental seal design, to prevent external environmental factors such as rain, dust and so on from causing damage to the equipment. The upper dome, as part of the equipment, plays a key protective role. it not only prevents direct incoming sunlight from damaging the imager. It also protects the interior imaging equipment from damage in inclement weather conditions. In addition, the design of dome also helps to reduce the influence of external environment on the equipment, to ensure that the equipment can work stably in various environments, to provide accurate observation data

Type No.	Out diameter (mm)	Height (mm)	Wall thickness (mm)
DW-127	127	50.8	4
DW-136	136	60	4
DW-140-1	140	70	4
DW-140-2	140	70	12
DW-170	170	56	6.5
DW-180	180	60	7.5
DW-184	184	61	7
DW-190	190	95	5
DW-203	203	80	4
DW-212	212	106	6
DW-230	229.6	87.4	8



Bena Optics hold that a company should be as tolerant / encompassing as the vast ocean which admits hundreds of rivers and should draw upon other's strengths.

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