

Planetarium projection

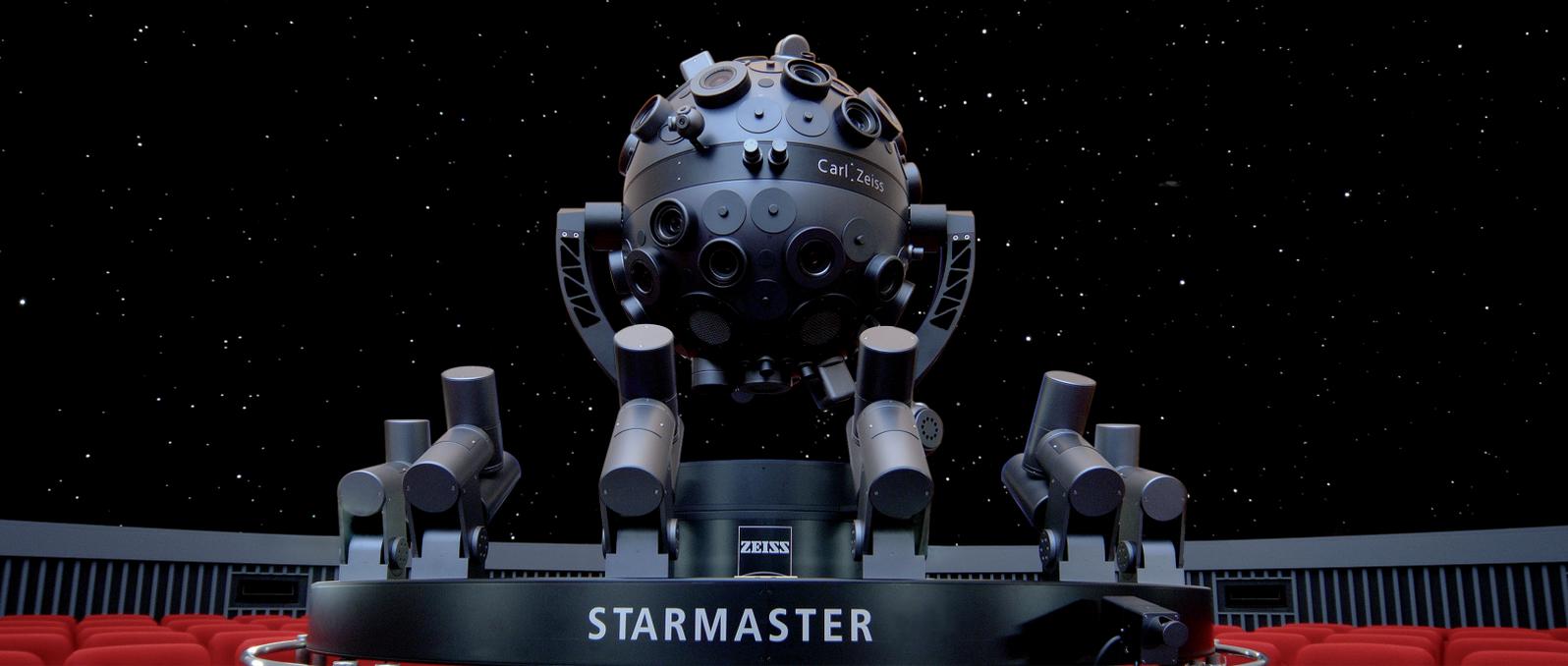


STARMASTER **Planetarium Projector**

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We make it visible.



The natural depiction of the night sky

STARMASTER in the 18-meter dome of the Asahikawa Science Center, Japan

STARMASTER is the Carl Zeiss planetarium projector for domes of medium size.

Radiant stars, as breathtaking as in nature: optical-mechanical projectors by Carl Zeiss are distinguished by the precise simulation of the natural night sky.

With a limiting size of 6^m55 , the same number of stars visible to the unaided human eye is shown under optimal observation conditions and in space. No more, no less.

ZEISS fiber optics provides a brilliant representation of the stars: a high level of brightness combined with small diameters. The starry sky does not fade out when a video projection is launched. STARMASTER is the ideal optical-mechanical partner for combinations with the Carl Zeiss fulldome systems such as powerdome@VELVET.

High-output LEDs are the light source for the stars. They produce pure white light so that all of the stars shine in natural white. But the light spectrum of the LED also makes it possible to filter out reddish, yellowish and bluish star colors. Thus, the bright stars are shown in their true colors.

A scintillation device generates an artificial flickering of the stars which appears as natural as the real thing, and includes all stars, not merely some of the bright ones.

The use of the latest technology facilitates such an excellent representation of star clusters and nebulas that you can view them with binoculars. The accurately detailed projection includes weaker stars (for star clusters) and actual structures (galaxies and nebulae).

STARMASTER is available in various versions. You decide whether you want to integrate Sun, Moon, planets, constellations, didactic projectors (astronomical grids, scales, markings) and additional effect projectors in your optical-mechanical system.

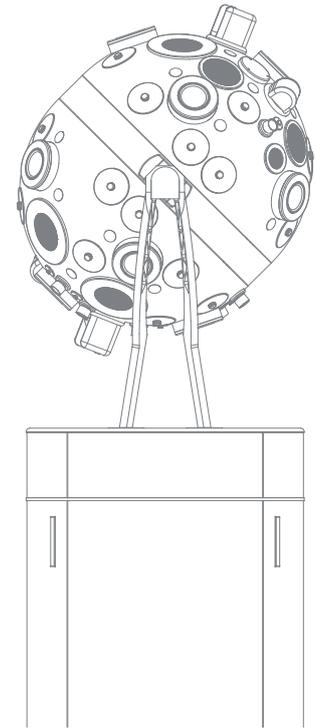
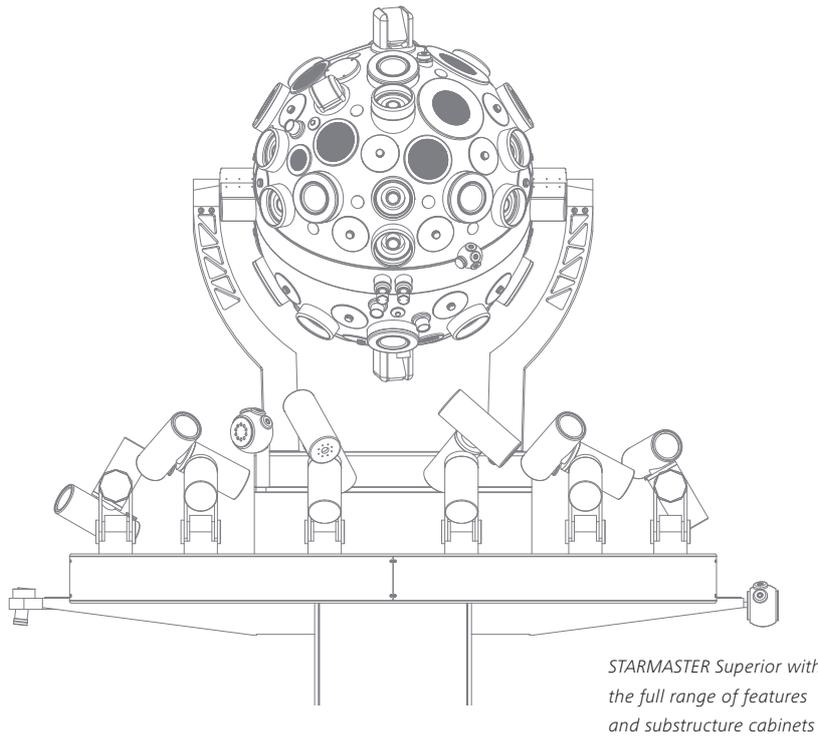
Starry sky

9,100 stars up to 6^m55

99% of all projected stars appear below the resolution of the human eye

Milky Way: brightness can be controlled separately from stars

Model variations



STARMASTER can be configured to meet your requirements. The star field and the white and blue effect lighting for dome brightening and twilight are basic features. All versions can be coupled directly and synchronously with a powerdome system by Carl Zeiss.

STARMASTER Superior is the fully configured version. If you are considering the combination with a fulldome system, certain projections can be adopted from the digital system. These functions can be omitted in the STARMASTER equipment.

The STARMASTER Classic version is designed for presenting the stars alone. Further configuration versions include projectors for Sun, Moon and the planets.

Model variations		Starry sky	Sun, Moon	Planets	Didactic projections	Substructure
STARMASTER	Classic	x	–	–	–	column
	Attraction	x	x	–	–	column
	Premium	x	x	x	–	double cabinet
	Superior	x	x	x	x ¹⁾	double cabinet

1) selectable

The Starball

Stars

The twelve wide-angle projectors making up the night sky are fitted in the starball. Sirius, Canopus and the brightest nebulae are presented by special projectors. Two further projectors deliver a realistic picture of the Milky Way.

Sun and Moon

The projectors for Sun and Moon are integrated in the starball. They are positioned independently of each other via the astronomical algorithms in the control software.

The moon phase mechanism shows even very small crescents in the immediate vicinity of the Sun. The midnight sun can be portrayed without obstruction. The sun projector includes an integrated sun eclipse mechanism with a total, a ring-shaped and several partial eclipses. In addition, a planet transit and a reduced sun image for space travel effects can also be demonstrated. Furthermore, you can use the sun projector to present the gegenschein (counterglow) - a weak circle of light projected opposite to the Sun.



Projector for the Sun



Projector for the Moon

Sun

Brightness to cast shadows

Solar eclipses

Planet transit

Reduced sun image

Gegenschein (counterglow)

Moon

Brightness to generate a full moon atmosphere

Visible surface details

Astronomically correct phase change

Automatic image rotation

True-to-life slender crescent

Didactic Projections

The projectors for the constellations of the northern and southern hemispheres are attached to the starball as well.

The great circles of equator and ecliptic can be projected alternately with the zodiacal constellation figures.

All constellations and zodiac figures are included in the movements of the firmament. Their designs are based on classical, historical models.





Constellation figures

Separate projection of the zodiac figures and northern/southern constellations

Groups of figures are distinguished by color

Great circles

Meridian

Celestial equator und ecliptic

90° hour circle

180° vertical circle

Scales and Markings

Azimuth scale and zenith mark

Hour angle scale and celestial pole

Precession scale and pole of ecliptic

Shutter and Motion Control

The starball has three vertical motion axes which are located above each other. Rotations about these axes enable any astronomic motion process. The real axes are arranged in such a way that they correspond to the diurnal motion, the change of the polar altitude and the azimuth rotation. The combined motion permits the generation of any desired virtual axes, e.g. for the representation of precession, the rotation about any desired celestial pole or the presentation of celestial motions on other bodies of the solar system.

Fading out of projections for the heavens on the dome horizon is accomplished by means of computer-controlled fixed star shutters. For installation in tilted auditoriums the other projectors on the starball are also equipped with computer-controlled shutters instead of gravity shutters. The advantages: the level of the horizon can be adjusted via the programming; panoramic projections and night sky projections adapt to one another; individual star fields can be faded in or out as well.



Planet Projectors and Additional Equipment



Planet projectors with LED light sources

The Planet Projectors

Six projectors with two separately controllable axes each are provided for presenting the planets and other solar system bodies. Installed on a support immediately in front of the starball, they generate nearly starshaped light dots which are set to the respective required brightness level. Mars appears in its typical reddish tint.

By means of the software, planet projections are included in topocentric and other motions. The revolution of the planets about the Sun can also be simulated (orrery projections).

The planets are illuminated with extremely durable high-output LEDs.

Additional Equipment

Upon request, STARMASTER can be equipped with a built-in lifting device. This lowers the starball from the center of the dome, thus facilitating shadow-free projection from the edge of the dome across the center of the dome.

A shooting star projector is available as an option. It not only shows single meteors but also showers.

Planets

Mercury, Venus, Earth, Mars, Jupiter and Saturn (default setting)

Brightness / color tint true-to-life

Independent control about two axes

Topocentric presentations



The Control System

All axis positions, brightness values and other functions are calculated in real time and can be controlled manually. The correct astronomic parameters are taken into consideration in the calculations for the positioning, speed changes and brightness variations, in order to achieve exact positioning of the starry sky and the solar system within a time frame of $\pm 10,000$ years.

The current software supports topocentric projections with all motion options (diurnal motion, annual motion, precession, azimuth rotation, change in pole altitude).

Despite all of this, the operation is simple. Programming skills are not required thanks to the graphic user interface in conjunction with the ergonomic layout of the operating panel. All operating modes and functions can be used simply by clicking on them with the computer mouse.

The operating panel is roughly the size of a computer keyboard and suffices for all functions. This panel permits you to carry out operations in real time and interactively with the spectators.

There is no restriction on manual operation, but in many cases the programs are automated. The automatic run function can be used independently or synchronized with other systems, e.g. a sound source or other computers.

STARMASTER can be combined with any Carl Zeiss powerdome fulldome system. The digital planetarium functions meticulously follow the starball motions.

The operating system, based on Microsoft Windows®, is configured so that upon agreement remote diagnoses, the exchange of control data and software updates can be accomplished over the Internet.



The operating panel for the manual control of the ZEISS planetarium systems.

Specifications

STARMASTER Planetarium

Version	Superior/Premium	Attraction/Classic
Dome diameter	14 m – 20 m (46 ft – 66 ft)	14 m – 24 m (46 ft – 79 ft)
Dome tilt	0° to 30°	0° to 30°
Max. height	2730 mm	2730 mm
Mounting surface substructure	424 mm x 1945 mm	Ø 780 mm
Starball diameter	750 mm	750 mm
Max. diameter	2080 mm	1080 mm
Height of horizon	2200 mm	2200 mm
Projector lift (Option)	650 mm	530 mm
Weight	max. 850 kg	max. 400 kg
Starball/planet illumination	LED	LED

Operating unit

Operating panel (W x D x H)	450 mm x 250 mm x 50 mm
Operating desk	upon requiry

Auditorium

Temperature	+15°C to +30°C
Constancy of temperature	±1° / h
Relative humidity	< 70%

Electrical power supply

Operating voltage	3 x 230/400 VAC ±10% L1, L2, L3, N, PE	3 x 230/400 VAC ±10% L1, L2, L3, N, PE
Fuses	3 x 25 A	3 x 25 A
Mains supply frequency	50/60 Hz	50/60 Hz
Power consumption	max. 6.5 kVA	max. 3 kVA

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