



Mechanical Ground Support Equipment

Sener in Poland



About Sener in Poland

Sener in Poland has focused on developing innovative solutions in space engineering for the following institutions: European Space Agency (ESA), NASA and European Southern Observatory (ESO), as well as for commercial clients, among which, since 2012, are Airbus, Thales Alenia Space, OHB.

The company specializes in two fields of mechanical engineering: flight mechanisms and mechanical ground support equipment for satellite assembly. Sener in Poland is part of an international technology group with over **50 years** of experience in the space industry.

We cooperate with over **80 entities** from all over the country, acting as a link between them and the global space sector. Our Polish team of more than **40 people** carries out projects in the largest ESA missions, so that we contribute to building our country's recognition among the key actors of the European space market.

The company invests in research and development of its own products, such as containers for transporting and storage satellites. Satellite transport and storage containers are products that respond to a new trend in the space sector, which is to use a single solution for many different missions. The level of technological advancement of the containers is unique on a national scale, and after the completion of the project, Poland will join the elite group of manufacturers of this type of equipment in Europe. Due to the wide range of requirements, a whole group of products will be created – this customization of technology is particularly important for customers such as the European Space Agency or prime-contractors' companies.

Products

MECHANISMS FOR:
HOLDING AND RELEASING
DEPLOYMENT
POSITIONING
TAILOR-MADE SPECIAL APPLICATIONS

MECHANICAL GROUND SUPPORT EQUIPMENT (MGSE) AS:
ADAPTERS
LIFTING DEVICES
MANIPULATORS
ROTATION DEVICES
SUPPORT DEVICES

Sener is a leader in MGSE in Poland

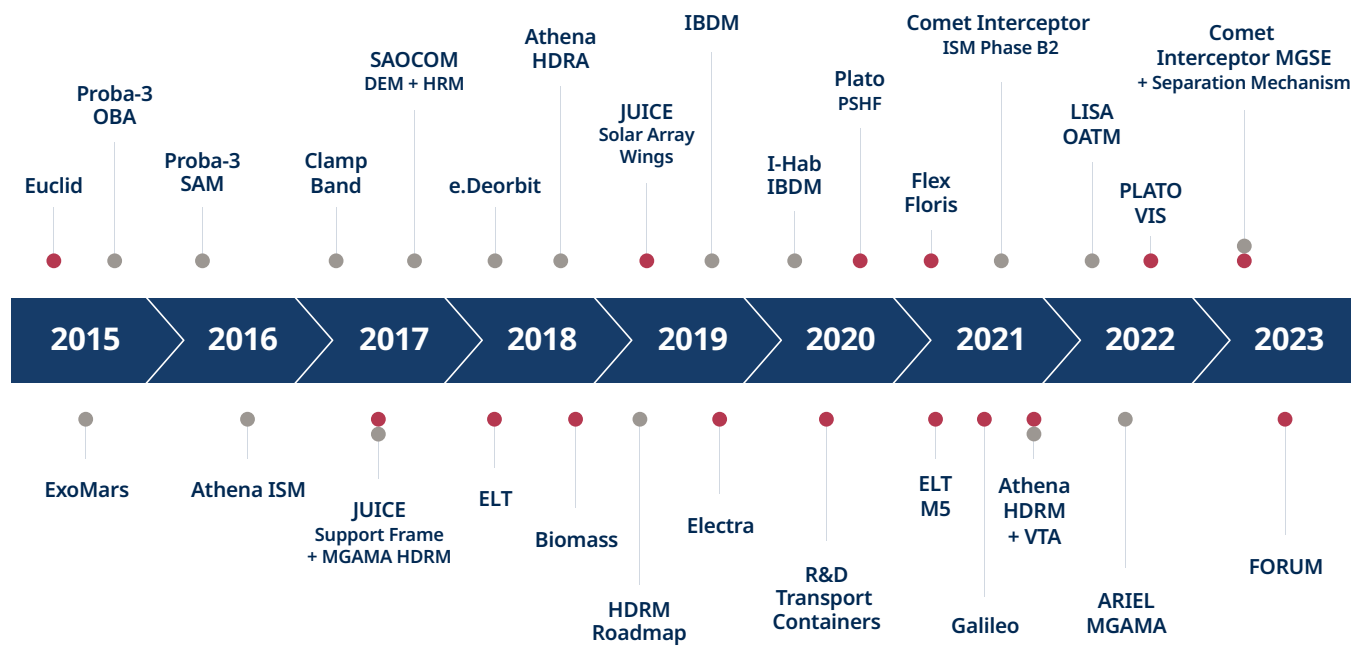
Mechanical Ground Support Equipment (MGSE), including mechanisms and devices for satellite integration, is a crucial element of Sener in Poland's business development strategy. Our steady development through internal expenditure and R&D allowed us to acquire and execute projects for the most critical ESA missions, such as EUCLID and PLATO. Sener Poland tailors its mechanisms and devices to match clients' individual needs as well as market requirements, and enhance

mission success from the very beginning. This approach resulted in a portfolio of **29 mechanisms and devices, and growing as in 2023 Sener in Poland signed two contracts to develop the MGSEs for COMET and FORUM missions.**

Our passion for innovation, precision, and excellence makes Sener in Poland one of the few European companies able to conduct such complex projects.



Project timeline



- Mechanical Ground Support Equipment (MGSE)
- Mechanisms

Product portfolio

MECHANISMS

HOLD DOWN DEVICES

DEPLOYMENT

PANELS

BOOMS

STRUCTURES

ANTENNAS

SOLAR ARRAYS

SPECIAL APPLICATIONS

POSITIONING AND POINTING

CLAMPING

SEPARATION MECHANISMS

MECHANICAL GROUND SUPPORT EQUIPMENT (MGSE)

ADAPTERS

HANDLING & LIFTING ADAPTERS

THERMAL ADAPTERS

VIBRATION ADAPTERS

PHYSICAL PROPERTIES
MEASUREMENT ADAPTERS

LIFTING DEVICES

VERTICAL LIFTING DEVICES

HORIZONTAL LIFTING DEVICE

PANEL/PAYLOAD LIFTING DEVICE

OTHERS

MANIPULATION DEVICES

STANDS / TROLLEYS

SUPPORT FRAMES

THERMAL / MASS DUMMIES

Product guide

MGSE



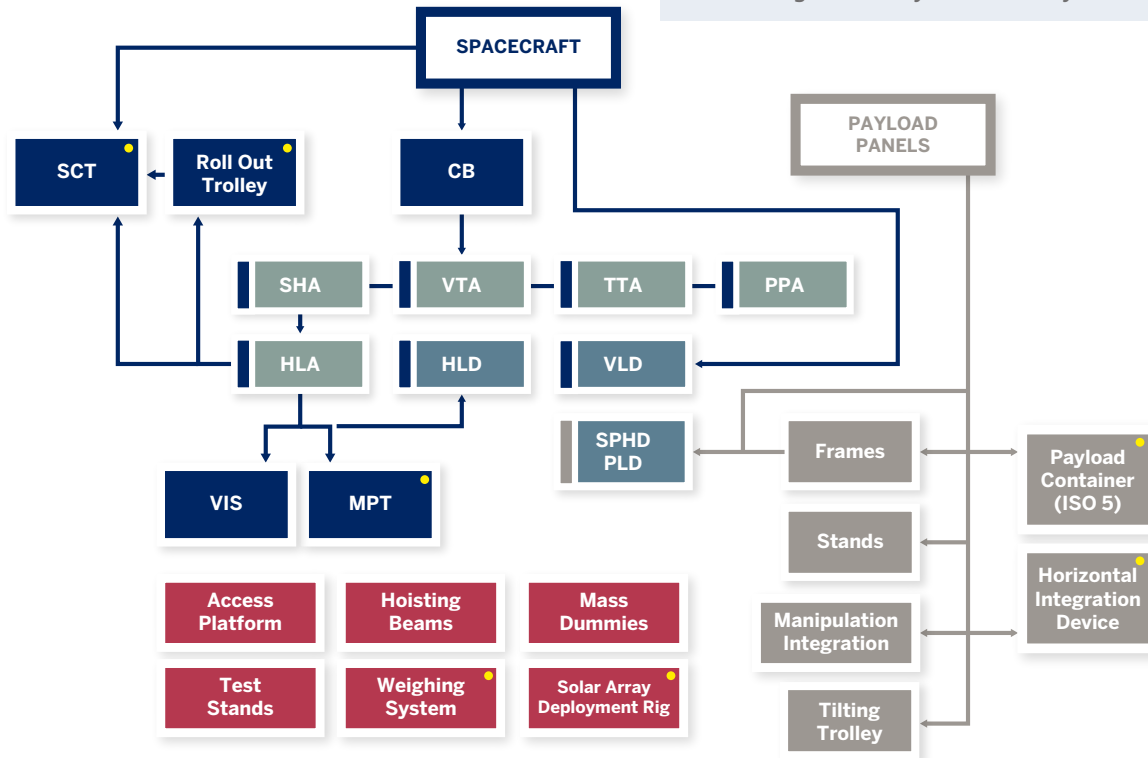
In Europe there are very few companies trained to design specialized satellite integration equipment. Sener has extensive experience in the manufacturing of Mechanical Ground Support Equipment (MGSE) and in the assembly of satellites, which is a great engineering challenge, since each satellite is virtually unique in its class.

The first MGSE devices were designed, manufactured and tested by Sener in Poland for a mission of the European Space Agency – Euclid – and the set of 13 devices was the largest set of its kind that was created in Poland.

Other missions, for which Sener in Poland designs, manufactures and tests the devices, are Biomass (a global, three-dimensional map of forests will be created with the data from this mission), Electra (an European, fully electronic commercial platform), one of ESA's largest missions: JUICE, which aims to study the magnetosphere of Jupiter and its moons or PLATO which is being prepared for the study of extra-solar planetary systems.

MGSE Scheme

Sener's MGSE family allows for composition of functional system covering all AIT aspects, at low costs, high efficiency and reliability.



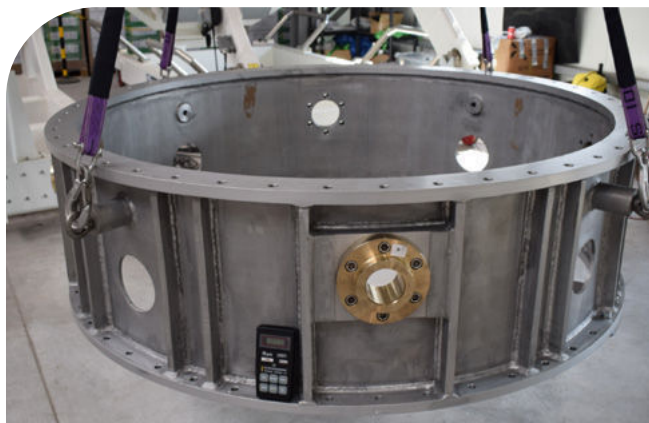
- UNDER DEVELOPMENT
- SPACECRAFT MGSE
- ADAPTERS
- LIFTING DEVICES
- PAYLOAD AND PANELS MGSE
- AUXILIARY MGSE

SCT – Spacecraft Container (SCTC –Transport Container, TSC – Transport and Storage Container)
CB – Clamp Band
VIS – Vertical Integration Stand
MPT – Multi Purpose Trolley

- SHA – Spacecraft Handling Adapter
- VTA – Vertical Transport Adapter
- TTA – Thermal Test Adapter
- PPA – Physical Properties Test Adapter
- HLA – Horizontal Lifting Adapter
- HLD – Horizontal Lifting Device
- VLD – Vertical Lifting Device
- SPHD – Spacecraft Panels Handling Device
- PLD – Payload Lifting Device

Product guide

MGSE Adapters



○ Horizontal Lifting Adapter (HLA)

Adapter supporting S/C during the lifting operations in horizontal position.

Adapter system	1666-MVS
SWL	2500 kg
Mass	470 kg
Material	AA 7075 + AA 6061
Surface treatment	Anodized
Mission	EUCLID



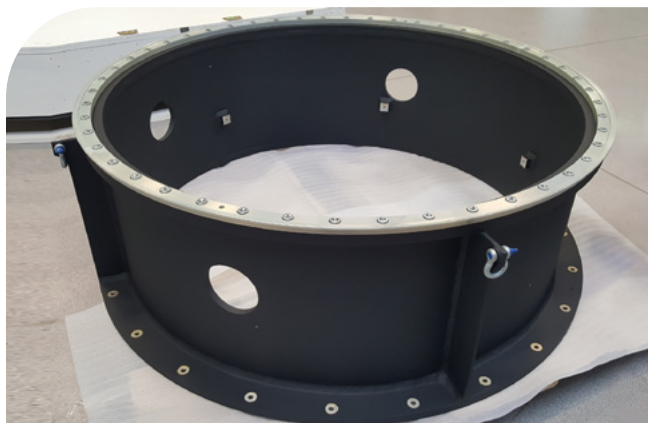
○ Spacecraft Handling Adapter (SHA)

Adapter supporting S/C during the handling operations in vertical position.

Adapter system	1666-MVS
SWL	2500 kg
Mass	93 kg
Material	AA 7075 + AA 6061
Surface treatment	Anodized
Mission	EUCLID

Product guide

MGSE Adapters



○ Thermal Test Adapter (TTA)

Adapter supporting S/C during the thermal vacuum tests.

Adapter system	1666-MVS
SWL	150 kg to 2500 kg
Mass	206 kg
Material	AA 7075 + AA 6061
Surface treatment	Black painted, Anodized
Mission	EUCLID



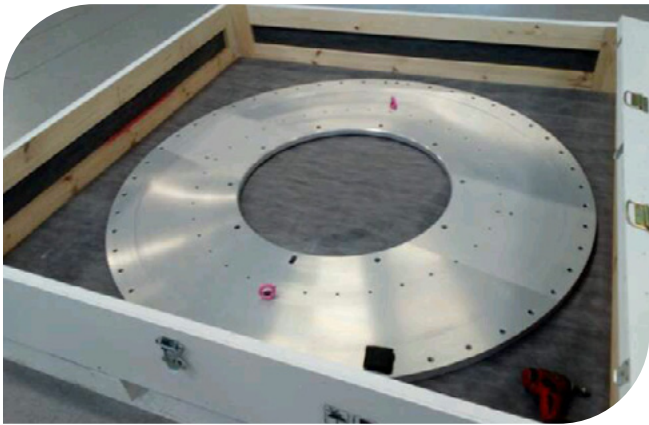
○ Vibration Test Adapter (VTA)

Adapter supporting S/C during the vibration tests.

Adapter system	1666-MVS
SWL	2500 kg
Mass	1720 kg
Material	AA 7075 +1.4301/S355J2H
Surface treatment	White painted, Anodized
Additional info.	Eigen-frequency >140 Hz

Product guide

MGSE Adapters



○ Physical Properties Test Adapter (PPA)

Adapter supporting S/C during the physical measurements in vertical, with maximum inclination about 35 deg.

Adapter system	1666-MVS
SWL	2500 kg
Mass	100 kg
Material	AA 7075 + AA 6061
Surface treatment	Anodized
Mission	EUCLID

Product guide

MGSE Lifting devices



○ Vertical Lifting Device (VLD)

Lifting device in vertical position of S/C with remote hook position control system.

SWL	2500kg
Mass	1800kg
Dimensions	3.8 m x 2.5 m x 1.1 m
COG adj. capabilities	in two axis (+/- 150 mm in both axis)
Additional info.	Remote + Manual control
Mission	EUCLID



○ Horizontal Lifting Device (HLD)

Lifting device for S/C in horizontal position with remote hook position control system.

SWL	2500 kg
Mass	2500 kg (3500 kg with trolley)
Dimensions	2.78 m x 2. m x 2.83 m (4.4 m x 2.2 m x 2.76 m with trolley)
COG adj. capabilities	in two axis (+/- 500 mm transverse, +/- 100 mm lateral)
Additional info.	Remote + Manual control
Mission	EUCLID

Product guide

MGSE Lifting devices



○ Spacecraft Panels Handling Device (SPHD) Payload Lifting Device (PLD)

Handling device for spacecraft panels with manual hook position system.

SWL	150 kg
Mass	216 kg
Dimensions	2.6 m x 0.5 m x 0.8 m
COG adj. capabilities	in two axis (+/- 200 mm transverse, +/- 100 mm lateral)
Additional info.	Manual adjustment
Mission	EUCLID



○ Adjustable Lifting Device (ALD)

SWL	3314 kg
Mass	3388.5 kg
Dimensions	3625 x 5111 x 1113 mm
COG adj. capabilities	+/- 300 mm in X axis, +/- 50 mm in Y axis; both with +/- 150 mm margin
Additional info.	Remote + Manual control
Mission	PLATO

Product guide

MGSE Lifting devices



Unit Crane Tool

Device which is used to rotate ELT's telescope M2 and M3 Units from horizontal to vertical position and later to lift them during installation process.

SWL	13200 kg
Mass	5818 kg
Dimensions	4951 x 4605 x 10837
Additional info.	One device designed to operate with both mirror units.
Mission	ESO Extremely Large Telescope



Transport Container

Transport container used for safe transportation of FLORIS PFM HW instrument in ISO 5 conditions. Composed of Internal and External Container form which Internal one is filled with nitrogen.

SWL	192,5 kg (Internal Container) 436 kg (External Container)
Mass	221,4 kg (Internal Container) 502,2 kg (External Container)
Dimensions	1440 x 1562 x 735 (Internal Container) 2204 x 2028 x 1473 (External Container)
Additional info.	Equipped with nitrogen purging system, ISO 5 cleanliness level, built in damping system
Mission	FLEX FLORIS

Product guide

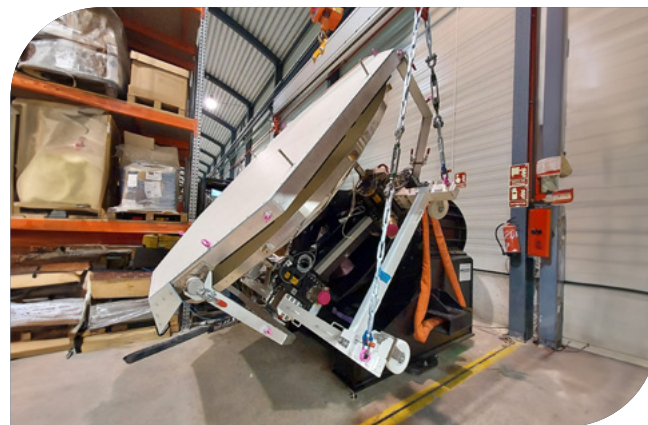
MGSE Lifting devices



○ M2 and M3 Cradles

Devices used internally by Sener for assembly and tests of M2 and M3 Units for ELT telescope.

SWL	13200 kg (M2 Cradle) 12480 kg (M3 Cradle)
Mass	5995 kg (M2 Cradle) 6035 kg (M3 Cradle)
Dimensions	7570 x 6990 x 2160 (M2 Cradle) 7130 x 6550 x 2605 (M3 Cradle)
Additional info.	Equipped with lifters which give possibility to lift it from ground and rotate along Y-axis
Mission	ESO Extremely Large Telescope



○ M5 Subunit Handling Tool

Device used for integration of M5 Unit with ELT's telescope structure.

SWL	2497,5 kg
Mass	227 kg
Dimensions	1467 x 2444 x 470
Additional info.	Gives possibility to rotate mirror subunit from horizontal configuration to tilted at angle 37.5deg
Mission	ESO Extremely Large Telescope

Product guide

Spacecraft MGSE



○ Clamp Band (AIT CB)

The AIT Clampband serves as the Interface between the AIT-Adapters and the LVA ring of the S/C. It supports the complete S/C during integration, test and transportation.

Adapter system	1666-MVS and others
SWL	8500 kg
Mass	55 kg
Dimensions	1.7 m x 1.8 m x 0.12 m
Material	Stainless steel + AA 7075



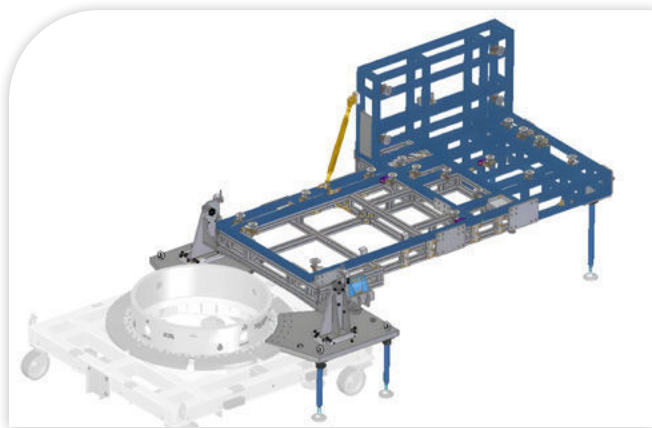
○ Vertical Integration Stand (VIS)

Structure used to ensure safe support of the spacecraft during the integration of the equipped panels of the Platform and Payload Modules on the S/C. The VIS interfaces with the S/C by means of the AIT-Adapter or with the Horizontal Lifting Adapter.

SWL	4400 kg
Mass	~2200 kg
Dimensions	4188 x 2660 x 680 mm
Material	Construction steel (S355J2) Stainless steel (1.4301)
Mission	ELECTRA

Product guide

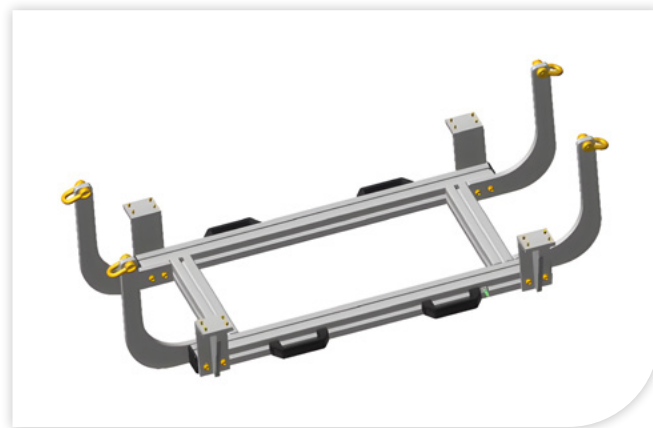
Spacecraft MGSE



○ Instrument Module MGSE (IMM)

Device used for integration and test of panel equipment without breaking the alignment between the panels.

SWL	137 kg
Mass	Up to 583 kg (depending on configuration)
Dimensions	3470x1933x1041 (depending on configuration)
Additional info.	Allows to change the orientation of group of the panels from vertical to horizontal.
Mission	BIOMASS



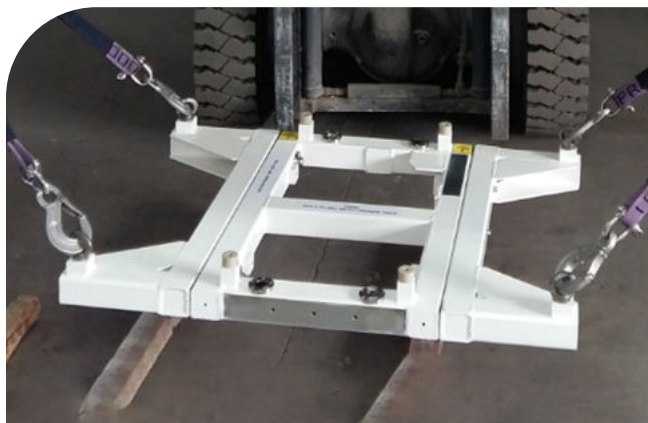
○ Panel Handling Frames (PHFs)

Set of frames dedicated to spacecraft panels to support integration and handling activities

SWL	Up to 63,5 kg
Mass	Around 20 kg (depending on version)
Dimensions	Various
Additional info.	Allows to change the orientation of panels from vertical to horizontal and are compatible with hinges for panel opening at the SC structure.
Mission	BIOMASS

Product guide

MGSE Payload and Panels



Panel Support Frames (PSF)

Frames for supporting handling, integration and transport of the S/C panels.

SWL	50 kg to 150 kg
Material	1.4301 + S355J2H
Surface treatment	White painted
Mission	EUCLID

Manipulation Integration

Tiltings

Trolleys



Support Frame

Support Frame is a movable frame which is able to support and position a payload for SC AIT activities. Support Frame enables smooth rotation of the Mounting Frame around its center axis (360 deg.), as well as elevation of the Mounting frame in the range of 1150mm.

SWL	1010 kg
Mass	1215 kg
Dimensions	5 m x 2.7 m x 0.95 m
Material	S355J2
Surface treatment	White powder painted
Additional info.	Leveling screw jacks Castor wheels Stowable structure
Mission	JUICE

Product guide

MGSE Payload and Panels



○ Horizontally and Vertically Rotating Dolly (HVRD)

Provides a safe and ergonomic support during handling and assembling operations performed at satellite panels. These operations include tilting, lifting and supporting panels in lateral and longitudinal orientation during various assembly activities.

SWL	880 kg
Mass	1960 kg
Dimensions	5280 x 3750 x 2580 mm
Material	Construction steel (S355J2H 1.7225) Stainless steel (1.4301) Bronze (CC493K)
Surface treatment	White painted, passivated
Additional info.	Control System with synchronous vertical movement of both sides. Manual movement for rotation of panels around longitudinal axis.
Mission	ELECTRA



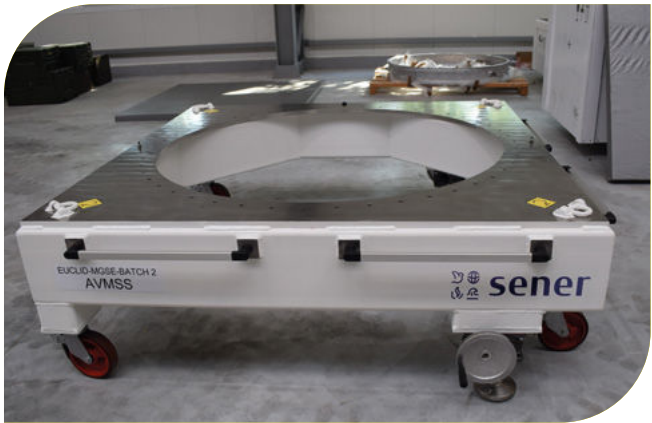
○ Multipurpose Panel Support Stand (PSS)

Device responsible for precise positioning of the spacecraft's panels in 6 DOF.

SWL	50kg to 150kg
Dimensions	2.4 m x 2.6 m x 2.15 m (small) 2.4 m x 5.6 m x 2.15 m (big)
Material	AA 7075 + 1.4301 + S355J2H
Additional info.	Linear accuracy: +/- 0.1 mm Range of movement: 50 to 650 mm Manual operation
Mission	EUCLID

Product guide

MGSE Payload and Panels



○ Avionic Module Support Stand (AVMSS)

Stand for Avionic Module integration and support.

SWL	1000 kg
Dimensions	2.2 m x 2.4 m x 0.8 m
Material	1.4301 + S355J2H
Additional info.	Leveling capabilities: 100 mm Castor wheels I/F planarity: 0.2 mm
Mission	EUCLID



○ Payload Module Hoisting Frame (PLM HF)

SWL	1625 kg
Mass	1661.6 kg
Dimensions	3882.7 x 3642.5 x 875 mm
Material	Main frame S355, I/F from stainless steel
Additional info.	Isostatic I/F to S/C; panel rotation subsystem; 1 side fully opening to provide access to S/C
Mission	PLATO

Product guide

MGSE Payload and Panels



Spacecraft Hoisting Frame (S/C HF)

SWL	2920 kg
Mass	394 kg
Dimensions	2415 x 3460 x 1211 mm
Material	Main frame S355, I/F from stainless steel
Mission	PLATO



Unit Installation Guide

Device which is used together with Unit Crane Tool to accurately position M2 and M3 units in ELT's telescope structure and match them with their interfaces.

Product guide

Auxiliary MGSE



○ Adapters/Clamp Band test jig

Additional info.

Max. lateral force: 420 kN
Max. axial force: 1950 kN
Adjustable for all sizes of launchers



○ S/C Mass Dummy

S/C Mass Dummy is multi-configuration structure to simulate mass, CoG position and connecting interfaces of SVM, PLM and entire structure. Used as testing equipment for MGSE validation during AIT activities (static load tests, functional tests of MGSE).

Additional info.

Configurations mass range:
1000 till 5000 kg.

○ Access Platform

○ Hoisting Beam

Product guide

Auxiliary MGSE



M5 Subunit Transport Container

Transport container used for safe transportation of M5 Subunit to ELT telescope.

SWL	2724,5 kg
Mass	3543 kg
Dimensions	5363 x 4150 x 2580
Additional info.	Mirror Subunit mounted on damping system, container equipped with crash absorbers on front during road transport.
Mission	ESO Extremely Large Telescope



M2 and M3 Unit Transport Containers

Transport containers used for safe transportation of M2 and M3 Units to ELT telescope.

SWL	13011 kg (M2 UTC) 9363 kg (M3 Cradle)
Mass	12157 kg (M2 UTC) 11251 kg (M3 Cradle)
Dimensions	9002x6866x3175 (M2 UTC) 9002x6866x3175 (M3 UTC)
Additional info.	Mirror Units mounted on damping system, containers equipped with crash absorbers on front during road transport.
Mission	ESO Extremely Large Telescope

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