Marine Satellite Systems and Services

TVRO Manual

R-Series | S-Series | DS-Series

07.12.18 ID: 0116

EPAK® TVRO Serial Number

The serial number (standard format: XY12345) will be required for all service requests regarding this product.

You can find the serial number of your EPAK TVRO system both engraved on the chassis of the antenna (Figure 1) and on the delivery note sent to you with the system.

Figure 1 - *Serial number on antenna*

Contents

1 Introduction

EPAK® TVRO series are digital satellite tracking systems for digital television reception made for maritime applications.

Once the connection to a satellite is established, the system will stay connected due to a 360° high-speed tracking system. That guarantees a non-stop reception of your favourite television channels while the vessel is anchored or even while cruising in open seas with rough conditions.

From small vessels up to super yachts, no matter whether sailing or motor yachts, EPAK TVRO series are eminently suitable for all types of vessels.

Depending on the satellite footprints for the respective region, a suitable reflector size should be chosen. The EPAK TVRO series features dishes with 45 cm (18"), 60 cm (23.6") and 90 cm (35") in diameter. Due to its direct servo drive system, the satellite system is capable of tracking in horizontal and vertical directions and in case of the DS-Series also in polarization angle (skew). With the built-in GPS module, the satellite system is capable to calculate the needed skew and elevation angle for the desired satellite.

In order to accomplish the utmost and most dynamic tracking accuracy of the satellite, EPAK developed the patented EBF tracking sensor, which interacts with various high-tech components to reach a unique performance. The satellite system is protected by a UV-resistant and maritime climate proof radome.

EPAK is always anxious on high tracking stability, prime quality, easy handling and easy maintenance, in order to provide an unlimited reception of your favourite television channels, just like at home.

The reception of channels in different regions depends on the footprints of the satellites. It can be affected by rain, snow, dense clouds and extreme movement, thus there is no warranty for the reception of certain channels.

Model	Single	Twin	Quattro	Bands EU
R4 / S4	✓	✓		4
R6 / S6	✓	✓	✓	4
DS6 / DS9 / DS13 Pro			✓	4

1.1 Safety Recommendations

- The allowable power voltage for the antenna unit has to be between 12 V DC and 36 V DC and the overload protection should be rated at minimal 5 A and maximal 7.5 A.
- The mounting minimal distance from the antenna unit to other radiation sources, e.g. radar equipment or other transmitting antennas is 2.5 m (8 ft).
- If the satellite antenna is not installed below the radar antenna, simultaneous operation of both systems may damage the satellite antenna.
- Do not use the control unit outdoors.
- During a thunderstorm, disconnecting all cables which are connected to the antenna is recommend.
- If the negative pole of the antenna unit's power supply voltage has no connection to the ship's ground (protective earth), the antenna unit's ground point should be connected directly to the ship's ground (protective earth).
- After the installation is completed, all other electronic systems, i.e. GPS, Radar, VHF, FM, AM etc., should be tested for full functionality while the antenna is turned on.
- Do not turn the antenna on before the radome is fitted correctly. The electronics can be damaged by the reflected sun.
- Do not touch the rotary joint.
- Do not open the sealed electronic box, as this will void the warranty.

2 Installation

Plan the entire installation first to avoid mistakes or damages to the boat or TVRO system. Please read the installation instructions carefully before starting the installation.

2.1 System Components

Each TVRO system is supplied with the following components:

Antenna Unit


Control Unit


4 Mounting Screws (M8)


Manual and Software Tools

TVRO Quickstart


Programming Cable

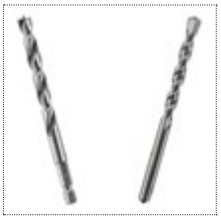
2.2 Installation Overview

The installation work has to be done in the following order:

- ✓ Select location.
- ✓ Check the mounting surface for stability.
- ✓ Check cable path.
- ✓ Check the position of power distributor.
- ✓ Drill holes and lay cable.
- ✓ Install antenna unit.
- ✓ Seal all the installation openings to make them waterproof.
- ✓ Connect cables.

For the installation the following additional tools are required:


Electric Drill; Screwdriver


One 4 mm and One 8.5-9 mm Drill Bits


Hexagon Socket Screw Key Size 6 and 4


13 mm Screw Wrench

2.3 Selecting Location

The best location for the TVRO system is a raised position on your vessel, to provide the needed unobstructed view from the antenna to the satellite with the respective elevation angle.

For the best picture quality and to preserve the antenna, please observe the minimum safety distance of 2-3 m (8-12 ft) to radar equipment and other transmitting antennas. This includes mobile communication units as well.

If there is a radar, the ideal location to mount the antenna is outside the radar's beam pattern. Please note that a strong mounting surface is needed. Avoid direct waves and water on the radome. For further details see chapters 2.4 – 2.9.

The following illustrations show the importance of a proper location for the antenna unit.

Bad location: in such a situation is very likely to incur a wide blind spot.

Good location: by setting the antenna back, the obstacle is overcome.

Best location: when possible, place the antenna on the top of the boat.

2.4 Mounting Surface

A horizontal, solid, steady and flat surface has to be ensured. The weight of the antenna unit can be 12 kg (26.5 lbs) up to 56 kg (123.6 lbs) (depending on the model) and must not be confronted with punctual material stressing. The surface has to be strong enough to carry the antenna unit, even during the most challenging maritime conditions.

2.5 Planning Cable Paths

Before starting the installation, please check which walls are suitable and if existing openings can be used for the cables.
The control unit should be placed as close as possible to the receiver. The cable length should not exceed 3 m and the cable must be double shielded satellite coax cable.

Please note, that all cable openings have to be sealed.

2.6 Power Supply

The antenna unit can be connected directly without a converter to any vessel's power supply net of 14-32 V DC. The circuit fuse should be rated for minimal 5 A and maximal 7.5 A .

Please ensure that the power distributor is non-active while working on the vessel's supply in order to not short circuit the system.

If the negative side of the antenna unit's supply voltage has no connection to the boat ground (protective earth), make sure a potential compensation between boat ground and the ground point of the antenna unit is made.

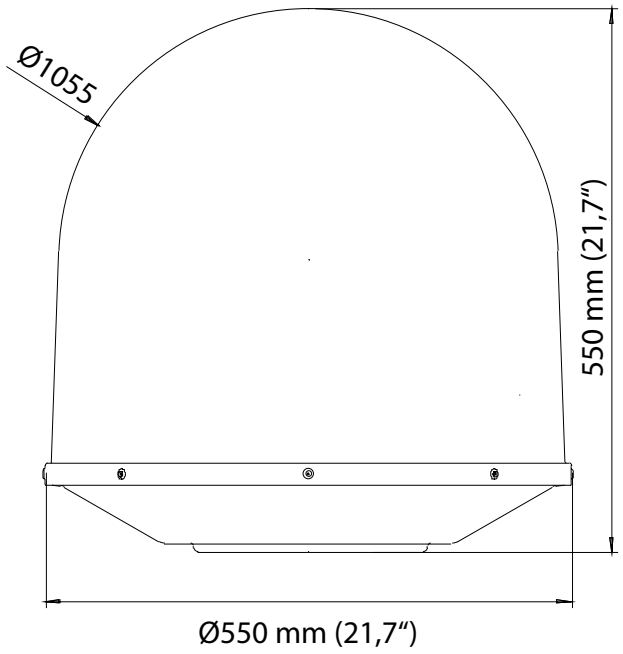
2.7 Drillings

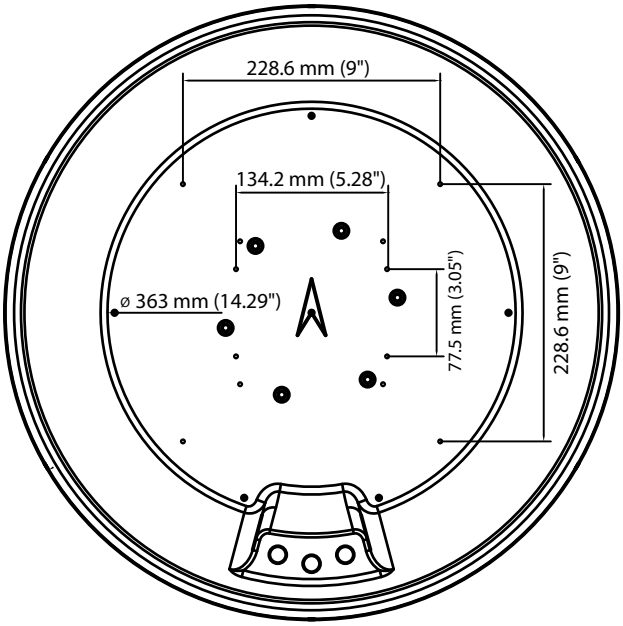
For an ideal mounting of the antenna all possible drilling patterns are prepared with a pre-drilled hole of 2 mm in the bottom of the radome.

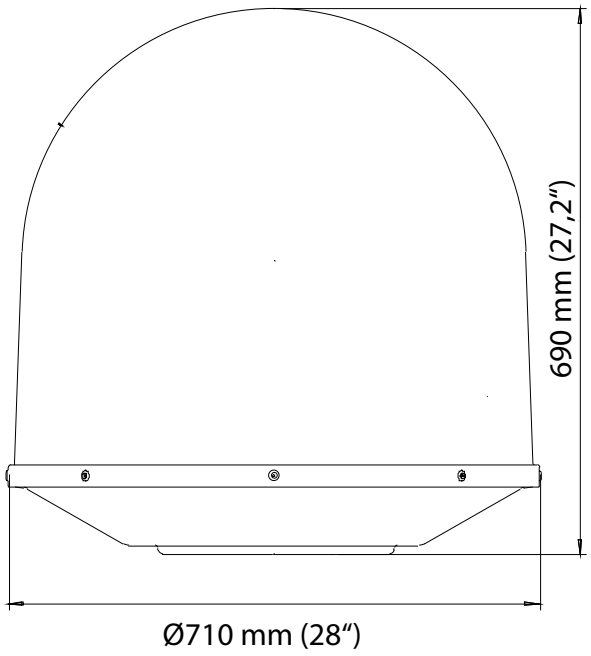
Please refer to the included template for the drilling measurements. The drillings shall have a diameter of Ø 8.5 – 9 mm for the included M8 screws. It is recommended to start with a smaller hole, using a Ø 3.5 – 4 mm drill to avoid any damage to the mounting surface. To mount the antenna, only use the included M8 mounting screws.

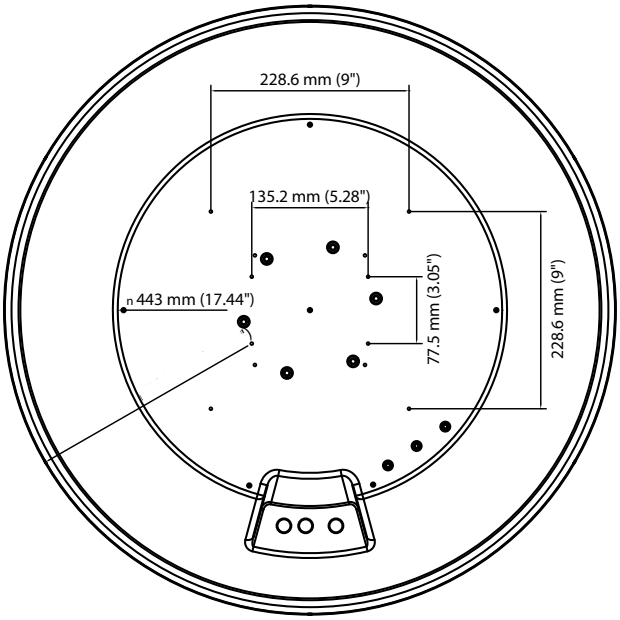
For a good and steady mounting of the antenna the drilling pattern 228.6 mm x 228.6 mm is recommended. For the drilling picture 134.2 mm x 77.5 mm you will find tapped holes at the bottom plate of the antenna, so no nuts are necessary.

2.7.1 Dimensions and Drilling Patterns for R-Series and S-Series

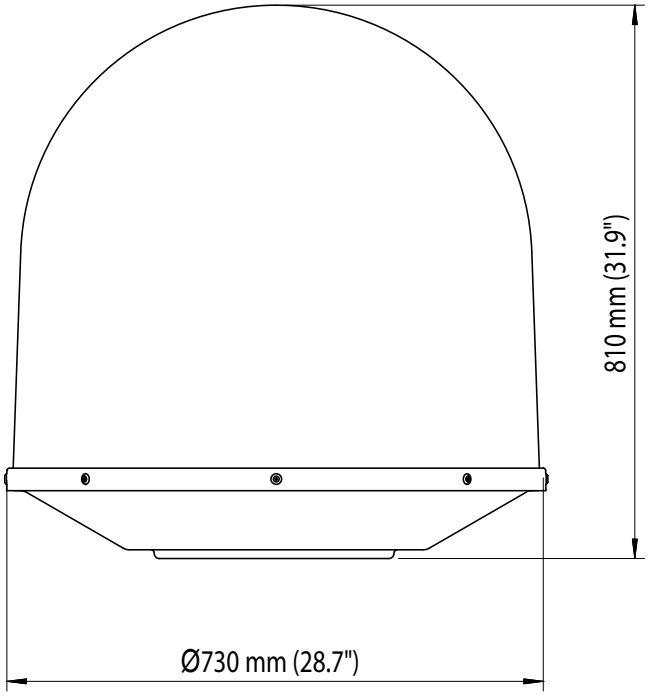


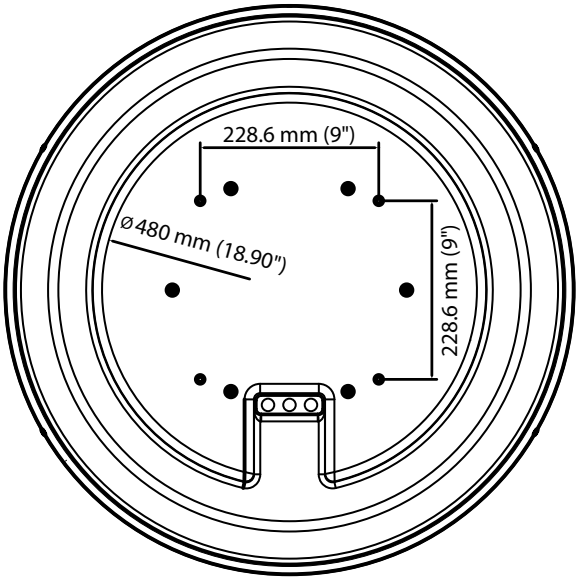


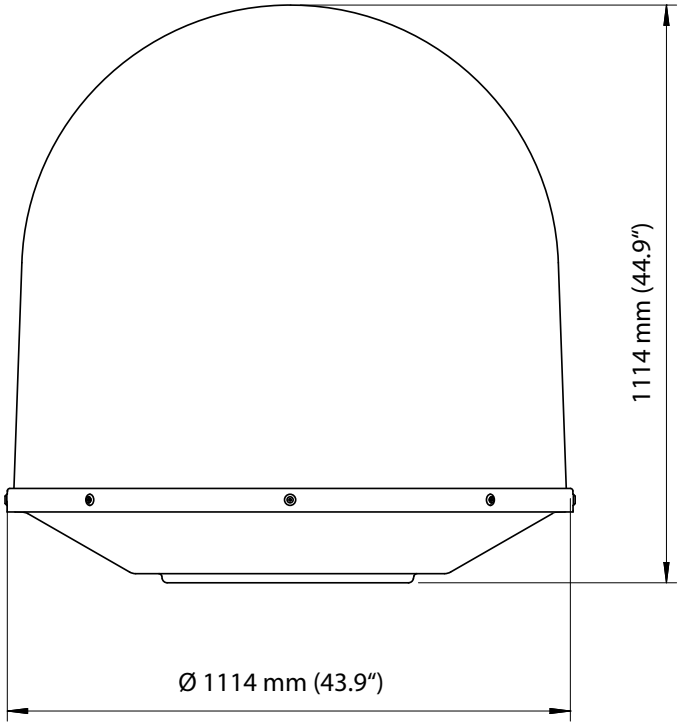


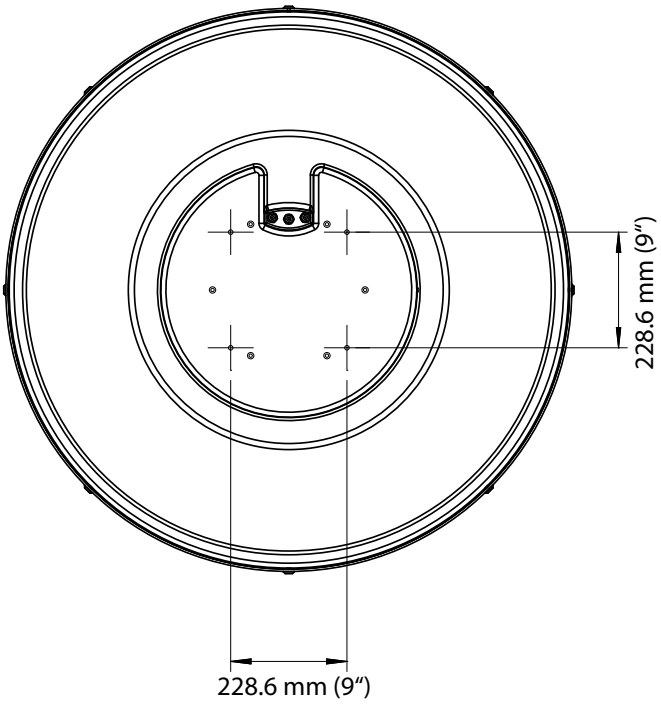


2.7.2 Dimensions and Drilling Patterns for DS-Series









2.8 Mounting the Antenna Unit

The antenna unit has to be mounted on a solid and steady surface. Make sure that all cable lengths are sufficient. The antenna unit must have a clear line of sight to the satellite and there should be no interfering fields (especially mobile communication antennas) nearby. Place the antenna unit on the pre-drilled holes and fasten it with the included screws and washers. The screws have to be mounted in from below through the base plate of the radome.

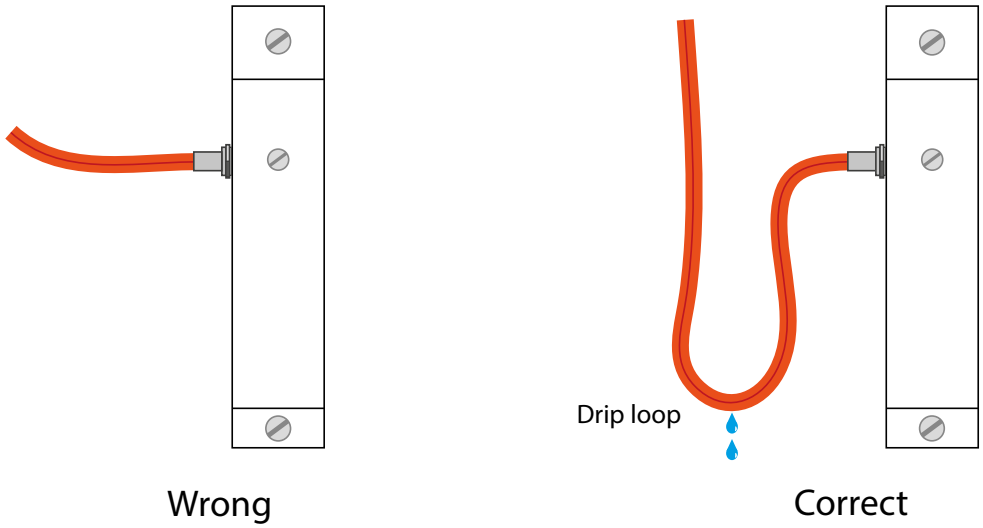
Close all drilled holes with waterproof sealing material to avoid any water penetration.

2.9 System Cable Connections

Break the circuit on which you are working in order to avoid a short circuit of the system.

- The antenna cable must be connected to the control unit and the antenna unit (double shielded satellite coax cable).
- The power supply cable must connect the power distributor to the antenna unit.
- The receiver cable must connect the control unit to the receiver (double shielded satellite coax cable).

See system overview and Illustration details, chapter 7.4 at the end of the manual.
Lead the cable through the drilled holes and seal it with waterproof sealing material. Furthermore, drip loops should precede the entry point from the exterior to avoid any water penetrating.



Find a suitable location for all units within cable lengths. The control unit should be placed nearby the receiver. Be sure that the display of the control unit can be easily read and the buttons are accessible. Also, allow room for the cables behind the control unit.

The antenna unit is separated from the power supply network/system by the control unit and only has electric power when the control unit is turned on.

3 Antenna Operation

3.1 Control Elements

The EPAK® TVRO system is operated by the control unit. See below for a short overview of the key functions:

- ⏻ Turns the antenna on or enters standby-mode.
- ↻ Browses between available menus and sets up or cancel the current process.
- ✔ Selects or confirms display messages.

In standby-mode, hold ✔ pressed while using ↻ to scroll through available data, as the serial number, counter operation time and software versions.

3.2 Preparing the Receiver

All EPAK® TVRO systems can be operated with any commercial receiver for digital television reception. Only the LNB-type in the setup menu of the receiver has to be set to "Universal" (LOF 9,75/10,6 GHz). If you want several satellite positions, the DiSEqC ™ function for an automatic satellite switch has to be activated (not valid for Quattro antennas).

To program your receiver, please refer to the respective user's manual.
For every satellite at least one program must be preprogrammed in the receiver to control the satellite position of the antenna unit by means of the TV picture quality. If not, pre-program the receiver by using an already installed satellite system.

Some receivers allow to turn off the power supply of the antenna's LNB. Activate this option in order to lower the power consumption of the antennas during standby-mode (of your receiver).
In case several receivers are simultaneously connected to the antenna, both receivers must have identical DiSEqC™ settings, i.e. both active or inactive.

3.3 Powering the Antenna On and Off

By pressing ⏻ the initialization starts. The initialization phase is finished when Setup is displayed (if no satellites are stored). If the antenna was aligned to a stored satellite before the antenna was turned off, it will try to regain that satellite. Press ⏻ again to return to the standby-mode.

The antenna is not power supplied if the control unit is in standby-mode.

3.4 Adjusting Setup Parameters

Modifications can only be made within the setup menu. In the main menu only the blinking functions can be selected.

1. Turn the control unit on. The display shows `Init` (blinking), meaning initialization is in progress.
2. After the initialization is completed, you are in the main menu with `Setup` blinking on the display. If the antenna was aligned to a stored satellite before the antenna was turned off, it will try to regain that satellite. To cancel this process press repeatedly ↻ until you get `Setup` blinking on the display.
3. The display should show `Tracking`. Press ✔ to select or press ↻ to continue at point 5.
4. By default `Tracking` is preset to `On`. Switch between `On` and `Off` with ↻. With `Off`, tracking is deactivated (see chapter 4.1). With `On`, tracking is activated and the antenna will stay aligned with the satellite automatically. Press ✔ to select.
5. The display shows `Tracking`. Press ↻ to go to `FastScan` mode. Press ✔ to select or ↻ to continue at point 7.
6. By default `FastScan` is preset to `On` . Switch between `On` and `Off` with ↻ (see chapter 6.3). With `On`, Fastscan is activated i.e. the antenna is running a satellite signal check to avoid transients . Press ✔ to select (it is not recommended to change the settings for Fastscan in Europe).
7. The display shows `FastScan`. Press ↻ to go to `LNB Type`. Press ✔ to select or press ↻ to continue at point 9.
8. The display will show the default setting `lin 0`. By pressing ↻ you can change the LNB settings. Press ✔ to select. The display will return to `LNB Type`.
   (This is only relevant in band-tracking mode for premium line antennas).

Only R-Series & S-Series antennas:

Please consider that the LNB type is preset to `lin 0`. The LNB mounting plate allows a modification of the skew, which can be adjusted to the location.

In addition to the changes of the control unit, the skew (polarization angle) at the LNB and the Matrix PCB have to be changed accordingly (see chapter 6.1.2).
Reception of circular polarized satellites will require a circular LNB type.
To change this, go to Setup menu and select `LNB type`. Press ↻ until the display shows Circular and press ✔ to select.

9. Press repeatedly ↻ to go to `quit` and press ✔ to leave the setup menu.

Press ⏻ to turn on the control unit. The display shows Init for initialization. After the initialization is completed, the display alternates between scanning and Sat X (X represents the last shown storage position).

If the antenna was aligned to a stored satellite before the antenna was turned off, the antenna will scan for the stored satellite. The system will now compare the satellite to the stored one (checking appears on the display). If the check is successful, the display will briefly show complete and then return to Sat X.

The antenna will compensate the movement of the boat to maintain its connection to the satellite (provided that the tracking function is active - On in the setup menu -, see chapter 3.4).

If you wish to select a different satellite, press ↻ repeatedly until the desired satellite position appears and confirm with ✔.

If no satellite is stored, the display will show Setup (blinking). In order to add new satellites see chapter 5.1.

If the recovery for the satellite takes more than 1 minute, even though there is a free line of sight to the satellite, or if, after several times of finding the right satellite, the display shows Upd Sat alternating with the actual satellite number. This means that the satellite database has to be updated (see chapter 5.2).

The menu item Upd Sat is not shown when the tracking function is deactivated (see chapter 4.1).

If, after the search of the satellite, the display shortly shows complete and afterwards Sat X without a picture on the TV, there are two possible reasons:

1. The satellite service provider has changed the transponders or it is the wrong satellite. In order to proof that the right satellite has been found, try to switch to other programs on the receiver. If all other programs are in their usual places, you need to reprogram your receiver for the program which has changed. Please refer to the manual of the receiver.
2. US only: In case no program can be received, try to turn Off the FastScan function (see chapter 6.3).

When changes are made, return to Sat X and press ✔ for the recovery. If the recovery of the satellite takes longer than 4 minutes and after some time the display shows scanning alternating with Sat X and there is a free line of sight, then the requested satellite could not be found.
In this case it is recommended to delete the satellite position as shown in chapter 5.3, search and restore it again, as shown in chapter 5.1.

If the antenna loses the signal from the satellite (due to a passing boat, buildings on shore, bridges or superstructures on the boat), the display will show blocked for the duration of the missing satellite reception.
Depending on the situation, the recovery of the satellite connection will start automatically. The display alternates between scanning and Sat X.

4.1 Deactivating and Activating the Tracking Function in Harbours

If the boat is in the harbour, the tracking function can be deactivated to stop the tracking.

1. Press ↻ repeatedly until the display blinks. You are in the main menu.
2. To go to the setup menu, press ↻ repeatedly until the display shows Setup (blinking), then press ✔. The display should read Tracking.
3. Press ✔ to select and press ↻ to switch between On and Off. The tracking function must be in Off position to be deactivated (In order to turn it on again, select the On position). Confirm with ✔.
4. The display returns to Tracking. Press ↻ repeatedly until the display shows quit. Confirm with ✔. The display returns to Setup.

While the tracking function is deactivated, the movement of the boat can no longer be compensated.
To activate the tracking function see above point 3.

5.1 Adding New Satellites

In order to add a new satellite to the list stored in the control unit, it first has to be searched and saved. This process has to be done while staying in harbour, in calm waters and steady weather conditions.

To identify the desired satellites, you will need a satellite receiver with preprogrammed (at least one) channels and frequencies from the satellite to be added. Based on the current global position and the satellite's orbital position, the antenna will calculate the correct elevation and skew angles and perform a scan in all directions.
For each found satellite the antenna will stop and ask whether the correct satellite was found. To verify that the right satellite was found, check whether your satellite receiver has reception on the preprogrammed channel.

For each new satellite, the following step-by-step guide has to be repeated. You can store up to four satellites.

1. Make sure the preprogrammed satellite receiver is connected to the antenna/multi switch and your TV.
2. Change to a channel which allows you to identify the correct satellite.
3. On the control unit go to the setup menu by pressing ↻ repeatedly until the display shows `Setup` (blinking), then press ✔ and the display shows `Tracking`.
4. Press ↻ repeatedly until `New Sat` appears on the display. Press ✔ to select. For two seconds `Search ?` appears and changes to `Sat X`.

> `New Sat` only appears if free satellite storage positions are available. In case all storage positions are occupied, the less required ones have to be deleted first (see chapter 5.3).

5. Next, you can choose between the two different tracking modes: band-tracking and channel-tracking.

> Band-tracking uses the complete RX bandwidth of the satellite for tracking. This method is more susceptible to interfering signals in the same frequency regime than channel-tracking but is more robust against changes in the frequency spectrum.

> Channel-tracking: this is the recommended tracking mode. Only well defined frequency ranges are used for satellite tracking and interfering signals are filtered out.

- Band-tracking: press ✔ to select band-tracking. `ScnBand?` appears and changes to `Band 1` after two seconds. Continue with step 6.
- Channel-tracking: press ↻ to scroll through the list of preconfigured satellites and confirm by pressing ✔. Next, the antenna is checking for GPS data. If it didn't receive any GPS information yet, the display shows `Wait GPS` until the GPS coordinates are determined.

> R-series & S-series antennas only: for these two antenna types, the LNB skew and tracking matrix has to be adjusted by hand. Based on the GPS coordinates, the skew angle is calculated and printed to the display: `turn LNB` is interchanging with `lin X`, where `X` is the skew angle. Confirm with ✔ when you are done.

The display changes to `Band 1`. Continue with step 6.

6. In this menu the frequency band in which the satellite will be searched has to be selected. The following bands are recommended for the respective satellites. For more information about the frequency bands cf. *table 5.1*. Confirm with ✔.

Recommendation
Astra 19,2° East = `Band 3`
Hotbird 13,0° East = `Band 3`
Astra 28,2° East = `Band 3`
Sirius 4,8° East = `Band 3`

7. The display messages now alternates between `New Sat` and `Search ?`. Proceed with ✔ or cancel by pressing ↻.
8. Next, the display shows `scanning`, indicating that the antenna is searching for satellites. You can interrupt this process by

pressing ↻ and you will get back to the setup menu.

9. If a satellite is found, the scanning mode is stopped and `checking` appears on the display for a few seconds. If the signal is strong enough, the display shows `Sat. ok?` (blinking). Otherwise the antenna continues searching and `scanning` appears on the display.
   Check whether the satellite receiver gets a signal and the TV shows the selected channel. In case there is no picture or the wrong TV channel is displayed, proceed with searching by pressing ↻. Continue this procedure until the desired channel is shown. Then press ✔ to confirm.

   If the tracking system has scanned the whole area without finding a satellite, the display shows `scanning` alternating with `complete`. Confirm with ✔. You are back in the main menu with `Setup` blinking. Before restarting the search mode (see point 1) check if there is a clear view to the satellite, if the selected channel on the receiver is correct (possibly change to another channel) and if the respective satellite can be received in this area. In case no satellite is found, repeat the search in another frequency band (see step 6).

10. `Save as?` is briefly shown and a list of available storage positions is displayed. Use to choose between `Sat. 1` and `Sat. 4` and confirm with ✔. Confirm the next dialogue `save?` by pressing ✔ or cancel with ↻.
11. After that, `saving..` (blinking) is displayed for approximately 10-20 seconds. All necessary information to recover the satellite are now automatically stored. After that, the display briefly shows `checking`.

    While the data is being stored, the ship must not move, a permanent clear view to the satellite must be guaranteed and the antenna unit must not be turned off. In case a failure occurs and the data is not memorized correctly, the display shows `ErrSave` and the search has to be repeated.

12. When the data is saved, the display shows `complete` for a brief moment and the system automatically begins to track the stored satellite (the display shows `Sat. X` where `X` is the storage position). Now the ship can be moved and tracking and quality of reception can be tested.

Table 5.1

Band	LO Frequency	Polarisation
Band 1	10700 MHz – 11700 MHz	Vertical low
Band 2	10700 MHz – 11700 MHz	Horizontal low
Band 3	11700 MHz – 12750 MHz	Vertical high
Band 4	11700 MHz – 12750 MHz	Horizontal high

5.2 Update the Satellite Database

Use the update function in the case that the display reads `Upd reco`. This message appears when the satellite data needs to be updated.

The satellite's fingerprint depends on the location of the antenna. If the vessel is located in the outer regions of the satellite's footprint or the antenna is too far away from the position where the data was stored originally, the fingerprint changes and an update of the database is recommended.

1. To go to the Setup menu, press ↻ repeatedly until the display shows `Setup` (blinking), then press ✔. The display reads `Tracking`.
2. Press ↻ repeatedly until `UpdSat.` appears.

   The menu item `UpdSat.` is not shown if the tracking function is deactivated (see chapter 4.1).

3. The display interchanges between `Sat. X` (storage position of current satellite) and `UpDate`.
4. Press ↻ to cancel or ✔ to confirm.
5. If you choose to cancel, the display shows `cancel` for a brief moment. If you chose confirm, the display alternates between `updating` and `checking`.
6. After the data is updated , the display shows `complete` for a brief moment and the system returns to normal operation. If the update was not successful the display shows `ErrSave` and the system returns to the menu item `UpdSat.`. In this case, please repeat the process.

5.3 Delete Stored Satellites

To delete stored satellite positions, the following steps must be completed:

1. Go to the Setup menu by pressing ↕ repeatedly until the display shows `Setup` (blinking), then press ✔. The display reads `Tracking`.
2. Press ↕ repeatedly until `Del Sat` appears and confirm with ✔.
3. The display reads `Sat X`, where `X` is the first satellite storage position to be deleted. Press ↕ to choose the satellite to be deleted and confirm with ✔.
4. The display alternates between `Sat X` and `Delete`. Press ✔ to confirm or ↕ to cancel.
5. If you choose confirm the display reads `complete` for a brief moment. If you choose cancel, the display shows `cancel`.
6. In both cases, the display will return to `Del Sat`. If no further satellites are available for deletion, the display shows `Tracking`.

If there are more satellites in the system you wish to delete, press ✔ and repeat from point 3. If you want to leave the menu, repeatedly press ↕ until `quit` appears, then press ✔. The display shows `Setup` (blinking).

5.4 Selection of Stored Satellites

5.4.1 Automatic Selection of Satellites (only for Single and Twin antennas)

For an automatic selection of satellites, the receiver must be DiSEqC™ capable. Make sure that all satellites in the DiSEqC™ menu of the receiver and of the antenna unit are stored under the same number (cf. *table 5.2*). In case your receiver does not support DiSEqC™, please go to chapter 5.4.2.

Table 5.2

Satellite	DiSEqC™ position	ACU storage position
Astra 19,2° East	PosAOptA	`Sat 1`
Hotbird 13,0° East	PosAOptB	`Sat 2`
Astra 28,2° East	PosBOptA	`Sat 3`
Sirius, 4,8° East	PosBOptB	`Sat 4`

To activate the AutoSat function press ↕ repeatedly until the display shows `Auto Sat` (blinking) and confirm with ✔. Now the antenna control unit will automatically switch to the respective satellite positions programmed on the receiver.

After enabling the AutoSat function, the antenna will scan for the currently selected satellite and the display will change between `scanning`, `checking`, `complete` and `Sat X`.

If the selected satellite is not stored in the antenna unit, the display interchanges between `Sat X` (the selected storage position) and `noData`. In this case, check the receiver parameters and store the satellite in the antenna unit, meaning that the search mode has to be started again (see chapter 4).

If AutoSat is not available in the menu of the antenna control unit, this feature is either not supported by the receiver or not activated. Refer to the receivers manual or search for the setting DiSEqC™ 1..4 (or similar).

If a DiSEqC™ position is requested by the receiver which is not stored on the antenna control unit, `no Data` is displayed. In this case, check the receiver parameters or search and store the missing satellite in the control unit (see chapter 5.1).

5.4.2 Manual selection of satellites

For selecting a satellite manually, please proceed as follows:

1. Press ↕ repeatedly until the display shows `Sat X` (blinking), where `X` is the satellite storage position.
2. Select between the storage positions `1` and `4` by pressing ↕. Only satellites which have been already stored are shown. Confirm with ✔.

The display alternates between `scanning` and `Sat X`, where `X` is the desired storage position. After the satellite is found, the display will continue to show `Sat X`.

6.1 Skew Adjustment (Only for R and S Series)

6.1.1 Calculating the Skew Angle

In order to calculate the skew angle it is possible to use various free programs and applications. Some of them can be found at www.dishpointer.com, www.smw.se, satbeams.com/footprints, www.satlex.us/en/azel_calc.htm. The following information is needed:

- The position of the satellite.
- The longitude of your position.
- The latitude of your position.

Once the skew is calculated, it must be stored in the Control Unit (see chapter 6.1.2), as well as adjusted mechanically at the dish (see chapter 6.1.3).

6.1.2 Electronical Adjustment of the Polarisation Angle (LNB-type)

To change the LNB-type, please proceed as follows:

1. To go to the setup menu, press ❮❯ repeatedly until the display shows Setup (blinking), then press ✔. The display reads Tracking.
2. Press ❮❯ until LNB Type appears and confirm with ✔.
3. The display will show the default setting lin 0, which is valid for Europe. By pressing ❮❯ you can change the LNB settings. The skew angle can be selected in 10° steps. Enter the previously calculated value (rounded to the nearest step) and confirm with ✔. The display will return to LNB Type.

The skew angle of the LNB and the matrix have to be changed to the same value (see point 6.1.3).

The integrated GPS module is able to calculate the right polarization and elevation angle of the desired satellite (only available in channel-tracking mode) and it is able to inform about differences (within the menu New Sat.) between the adjusted and the calculated settings.

Reception of circular polarized satellites will require a circular LNB type. To change this, go to the setup menu and press ❮❯ repeatedly until the display shows LNB Type. Confirm with ✔ and then press ❮❯ until the display shows circular. Confirm the selection with ✔.

4. Press ❮❯ repeatedly until quit appears. Press ✔ to confirm and Setup (blinking) appears.

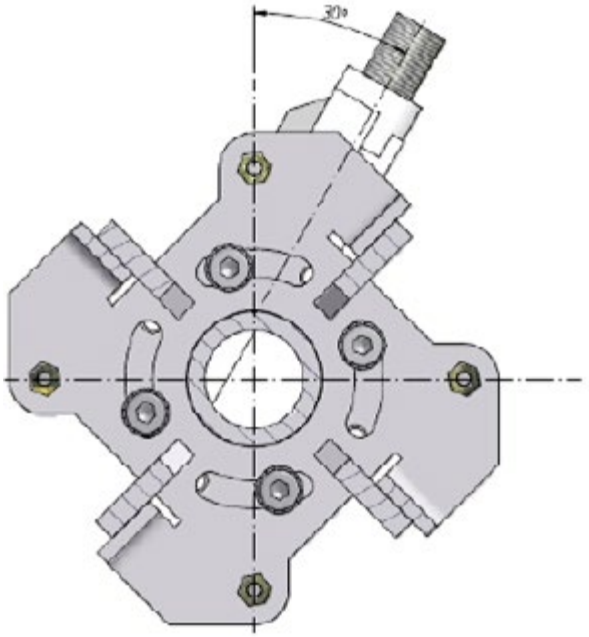
Now you are back in the main menu and can switch to other satellites by pressing ❮❯ or make adjustments in the setup menu by pressing ✔.

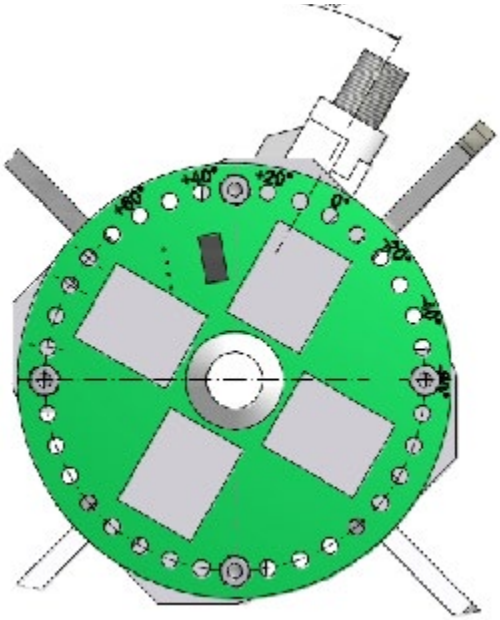
For circular polarized satellite signals, no mechanical adjustment of the LNB and the matrix is needed.

6.1.3 Mechanical Adjustment of the Polarisation Angle

In order to change the mechanical adjustment of the polarisation angle (LNB and matrix PCB), please proceed as follows:

All holes on the Matrix PCB are set every 10 degrees. Please use the hole which is nearest to the calculated value for the 12 o'clock position and keep in mind that the "Heading of the LNB" and the "Zero degree Line" of the PCB do match. Please refer to the picture shown on this page.





6.2 System Information

In order to obtain some system information as the serial number of the antenna, operation time counter and software versions of the antenna unit and control unit, please proceed as follows:

1. Turn the control unit on to start the initialization.
2. After the initialization is completed enter standby-mode by pressing ⏻.
3. To obtain the system information hold ✔ while scrolling trough the data with ❮❯.
4. After releasing ✔ the display returns to standby-mode.

6.3 Fastscan Function

While the Fastscan function is activated, the antenna is running a satellite signal check to avoid transients. If satellites with small amounts of channels weren't found, please deactivate the Fastscan function. To deactivate Fastscan function, proceed as follow:

1. To go to the Setup menu, press ❮❯ repeatedly until the display shows `Setup` (blinking), then press ✔.
2. Press ❮❯ repeatedly until `FastScan` appears and confirm with ✔.
3. Press ❮❯ repeatedly until `Off` appears and confirm with ✔. Now the Fastscan function is deactivated.

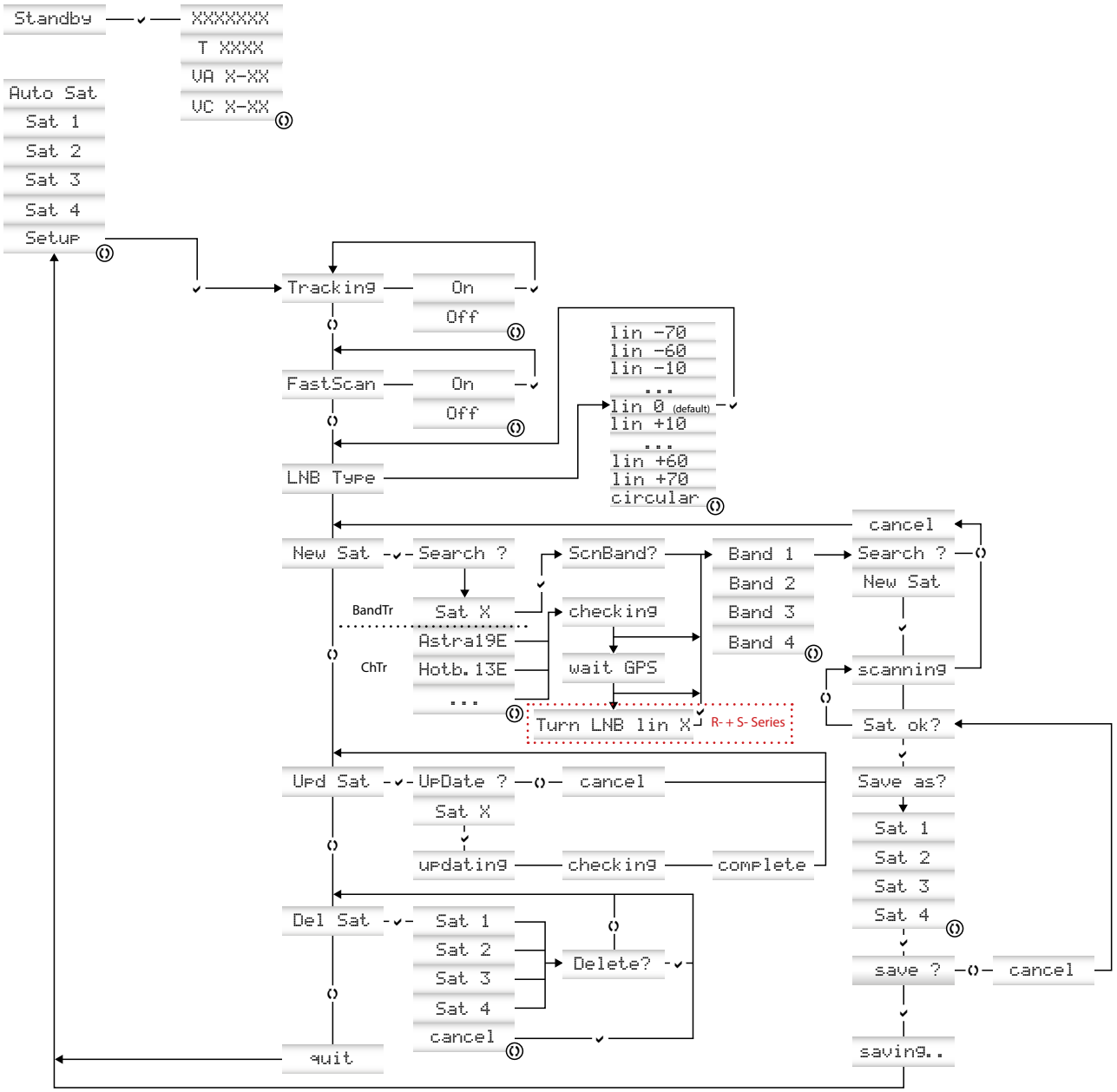
7.1 Maintenance

The EPAK TVRO system is easy to maintain. The following instructions are sufficient to sustain an optimal performance of the antenna unit:

- Clean the radome once a month using fresh water and a mild detergent to remove dirt and salt deposits.
- Do not detach the radome.
- Do not clean the radome with a high-pressure washer or high pressured water from a hose.
- Check cable connections to be tight and free of corrosion. Clean the cables regularly.

The radome has a protective layer of UV-stabilized and maritime climate-proof coating.
Do not apply any additional paint, wax, preservative, solvent, chemicals or adhesive labels. Do not use alcohol or dilution or similar products to clean the radome. Any kind of additional coating will void warranty claims. In case any solvent comes in contact with the radome by accident, rinse the area immediately with water and, if necessary, with a mild detergent. A guarantee for UV and colour stability as well as fracture strength can only be given within the warranty of the supplier / dealer.

7.2 Menu Structure



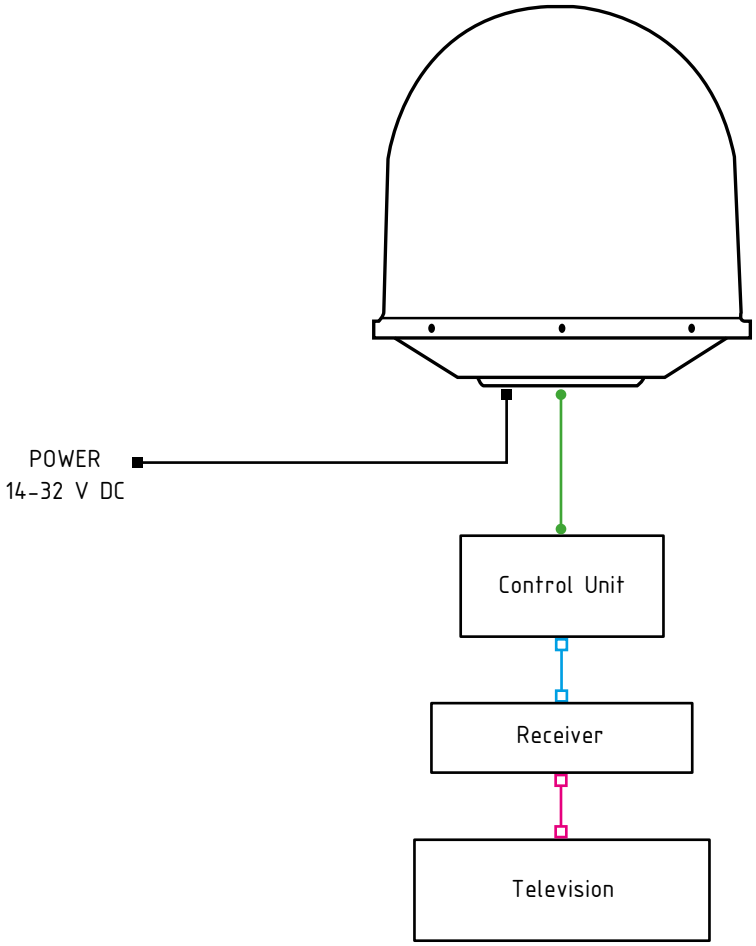
7.3 Troubleshooting

Display	Problem	Solution
no dish	Control unit cannot communicate with E-Box	• Check antenna to control unit cable • Check antenna unit's power supply (12V ..36V) • Test rotary joint for fault
Standby	Antenna has no power OR antenna could not find satellite for 15 mins.	• Check the error message seen before (LowVsup or No dish) • Recheck antenna's power supply
ErrorCom	Communication error with antenna unit	• Turn unit off and after 3 seconds on again
LowVsup	Power supply too low (< 11.5 Volt)	• Check if power supply connection to antenna unit is too low (<11.5V) (loose cable..) or any voltage drop • Check if voltage supply is continuous or it drops/varies sometimes • Check for high resistance/load • Check voltage on slip ring • If there is sufficient voltage & low load, then the E-Box is faulty
no Data	The satellite position requested by the receiver in AutoSat mode is not stored in antenna unit	• Check the DiSEqC™ adjustment of the receiver • Add satellite and store position (see chapter 5.1)
Err HR Err HW	Read / Write error of horizontal unit	Turn the unit off and on again. In case the error reoccurs, call for technical assistance. In case of errors regarding limit switches: Check all moving parts for non-blocking functionality. Err ULS / Err LLS: • Check lose cable connection • fault in sensor, plug or cable -> exchange sensor / cable • Magnet is missing or screw is not correctly positioned -> check using limit switch tester
Err VR Err VW	Read / Write error of vertical unit	
Err SR Err SW	Read / Write error of signal processing unit	
Err PR Err PW	Read / Write error of polarisation unit	
Err VCO	Error during satellite inspection	
Err EEP	Error during storage	
Err IIC	Error in internal communication	
Err Trck	Error in tracking module	
Err ULS Err LLS	Error in upper / lower limit switch	
Err ELS Err WLS	Error in eastern / western limit switch	
Err Comp	Compass error	
Err Save	Error while saving satellite	• Repeat search and store. Make sure the boat is not moving and has no blockage • Try to save the satellite in different scan-bands • If issue persists, after multiple retries, then replace E-Box
Err Skew	Cable connection from E-Box to Skew-Box may be defective	• Check the connection between E-Box and Skew-Box
Wait GPS	Antenna is waiting for valid GPS data OR Problem with GPS reception at current location	• GPS signal is jammered by another signal source • GPS receiver is defective
<Short!>	There is a short circuit in the connection between control unit and antenna	• Check RX cable connection to antenna and rotary joint inside the antenna
scanning alternating with complete	No receivable satellite signal in the entire search range OR LNB defective OR LNB cable is defective	• Check for line-of-sight issues • Check, by using footprint cards (e.g. www.satbeams.com), whether the boat is inside the coverage area (footprint) • Check antenna to control unit cable • Check power to LNB • Verify tracking frequencies
update reco	Saved satellite data is not completely similar to the real data measured by the antenna	• Update the stored satellite or delete and make new setup
Blocked	No reception of the stored satellite	• Check for line-of-sight issues
No Data	Saved satellite data is not completely similar to the real data measured by the antenna	• Read the current frequencies via progsoft and verify if a valid frequency is present for the current scnband. If not, try to make a new setup with another scnband. • Verify latest frequencies via lyngsat and reprogram antenna

7.4 System Overview

7.4.1 Single User on Single Antenna

One receiver has unlimited access to all channels of all 4 bands. It can switch antenna on/off as well as select another satellite.



Cable type:

RG6 - double shielded satellite coaxial cable (75 Ohm) with F-plugs at both ends

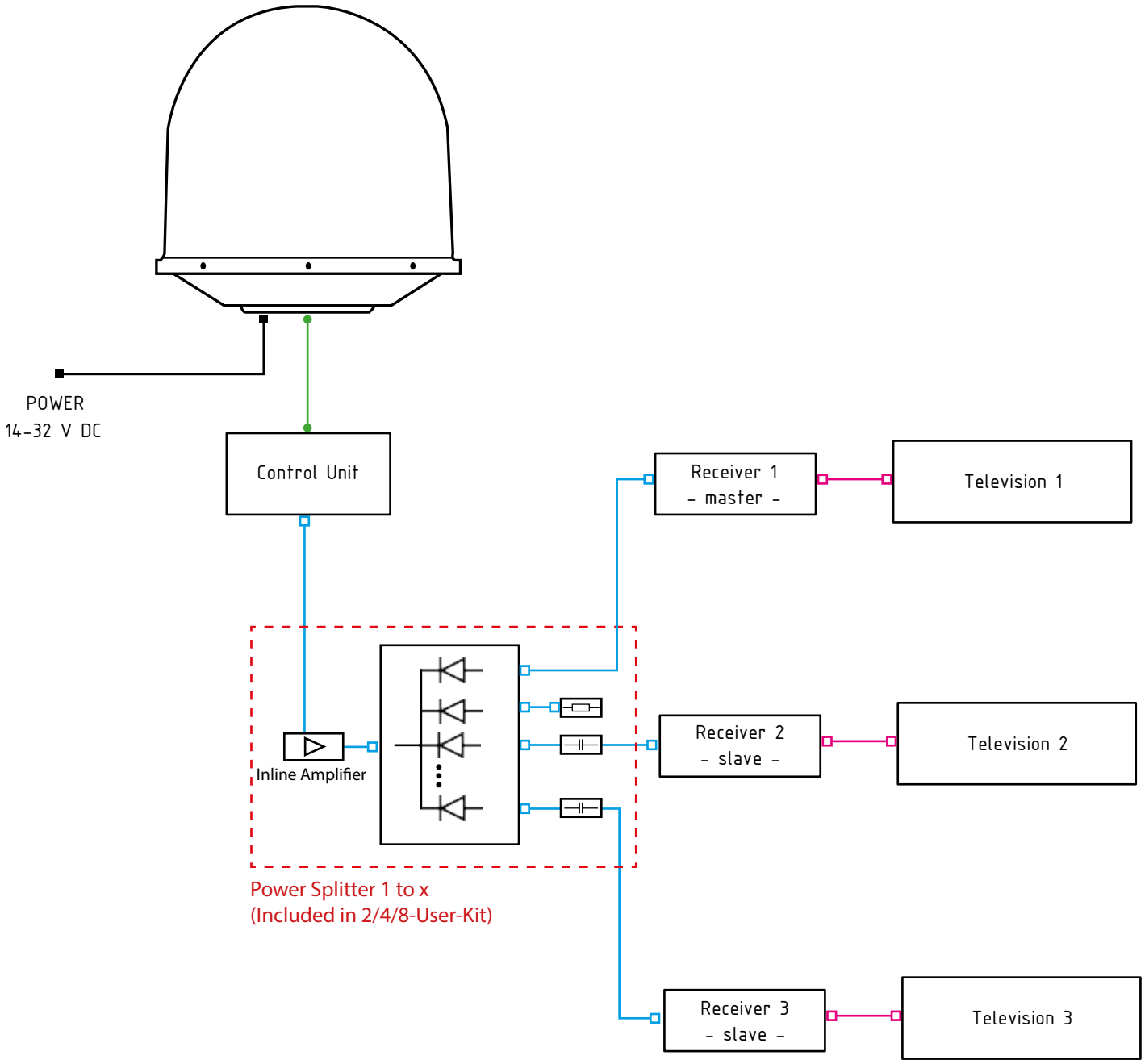
Standard power cable - min. 2x 1.5 sqmm

Standard coaxial cable for television commissioning

AV cable (HDMI or SCART) for television commissioning

7.4.2 Multi Users on Single Antenna

The master receiver has complete access to all channels of all 4 bands. It can switch the antenna on/off as well as select another satellite. All slave receivers have access to all TV channels from the band at the satellite selected by the master receiver.



Cable type:

RG6 - double shielded satellite coaxial cable (75 Ohm) with F-plugs at both ends

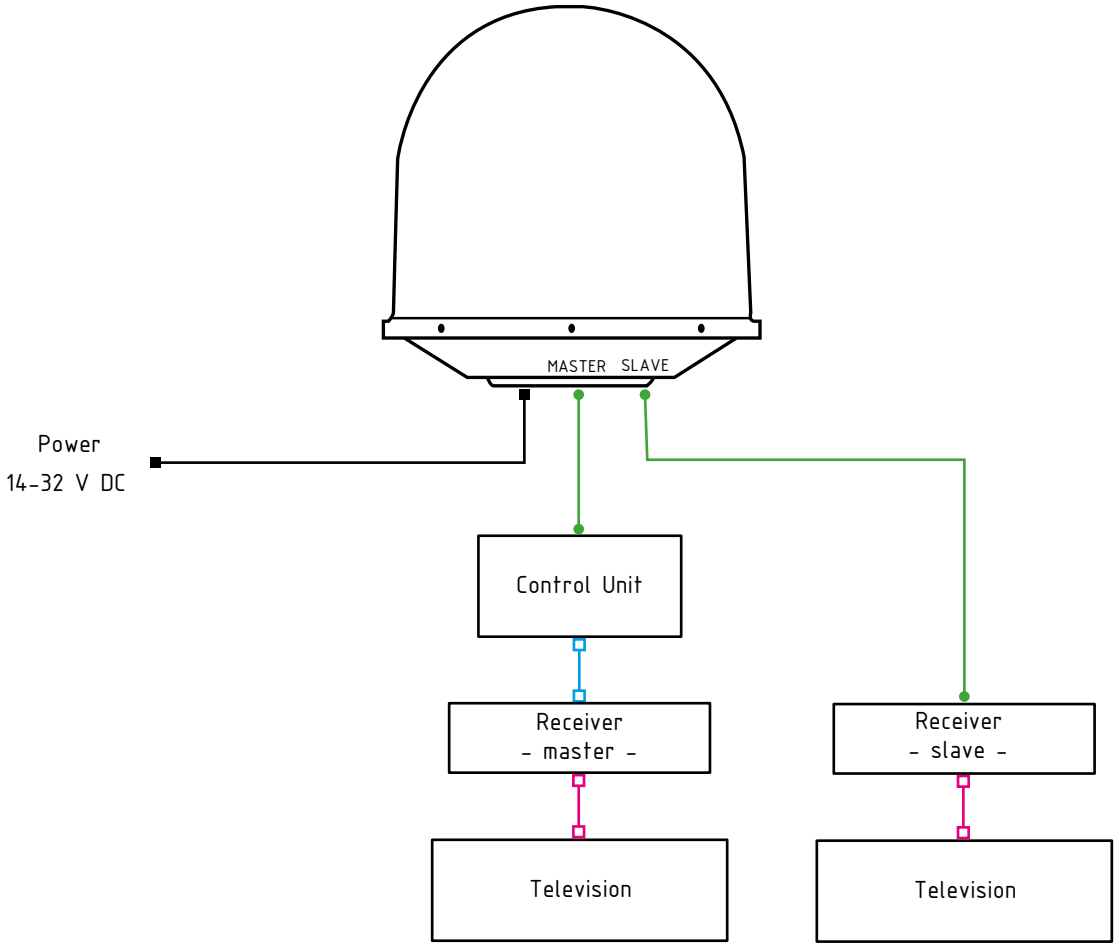
Standard power cable - min. 2x 1.5 sqmm

Standard coaxial cable for television commissioning

AV cable (HDMI or SCART) for television commissioning

7.4.3 Two Users on Twin Antenna

Both receivers work independently and have complete access to all TV channels from all 4 bands. Both can switch the antenna on/ off. Only the master receiver can select another satellite.



Cable type:

RG6 - double shielded satellite coaxial cable (75 Ohm) with F-plugs at both ends

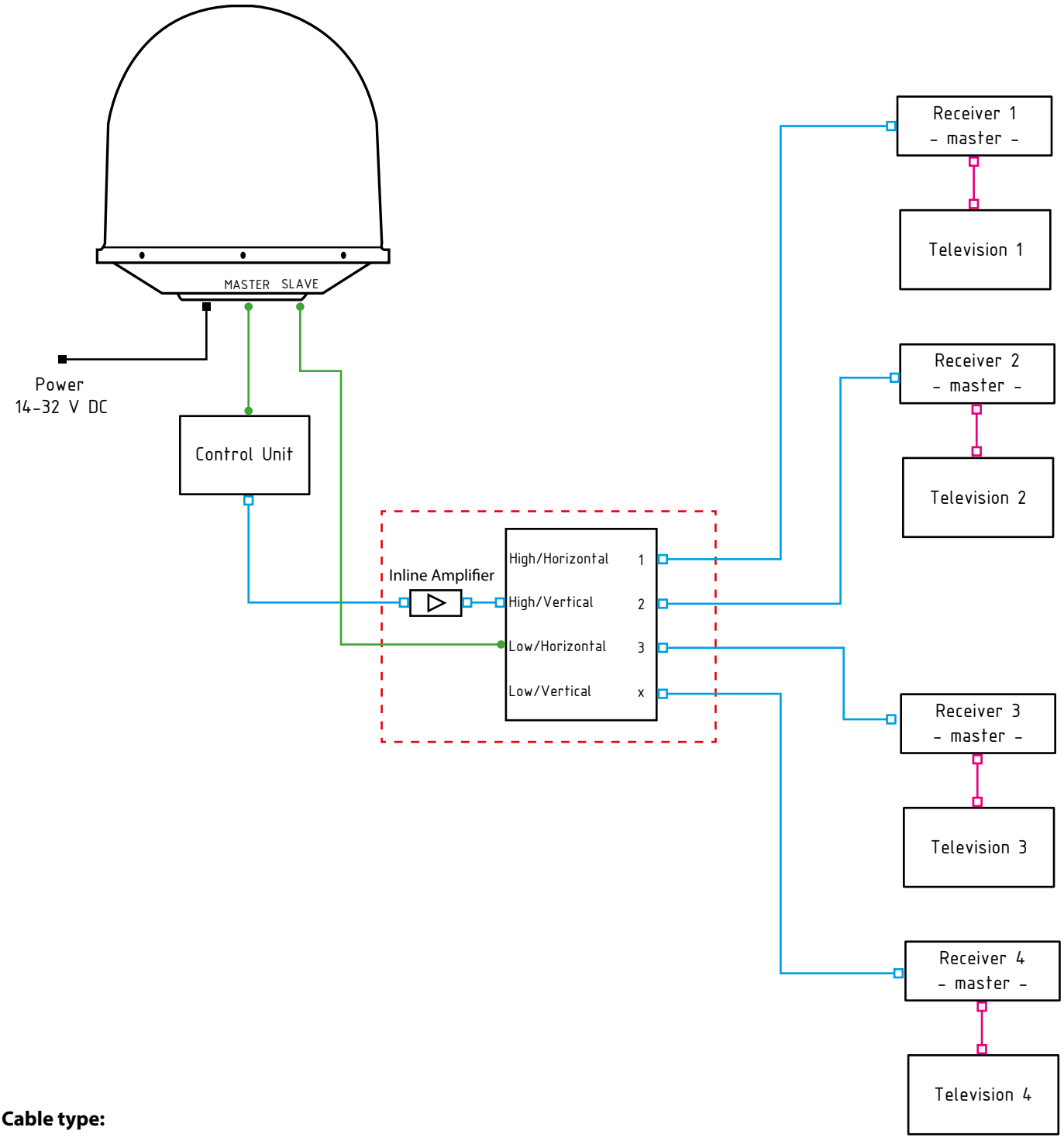
Standard power cable - min. 2x 1.5 sqmm

Standard coaxial cable for television commissioning

AV cable (HDMI or SCART) for television commissioning

7.4.4 Multi Users on Twin Antenna

All receivers work independently and have complete access to all TV channels from two of the four bands. They can switch the antenna on/off. Only the Control Unit can select another satellite.

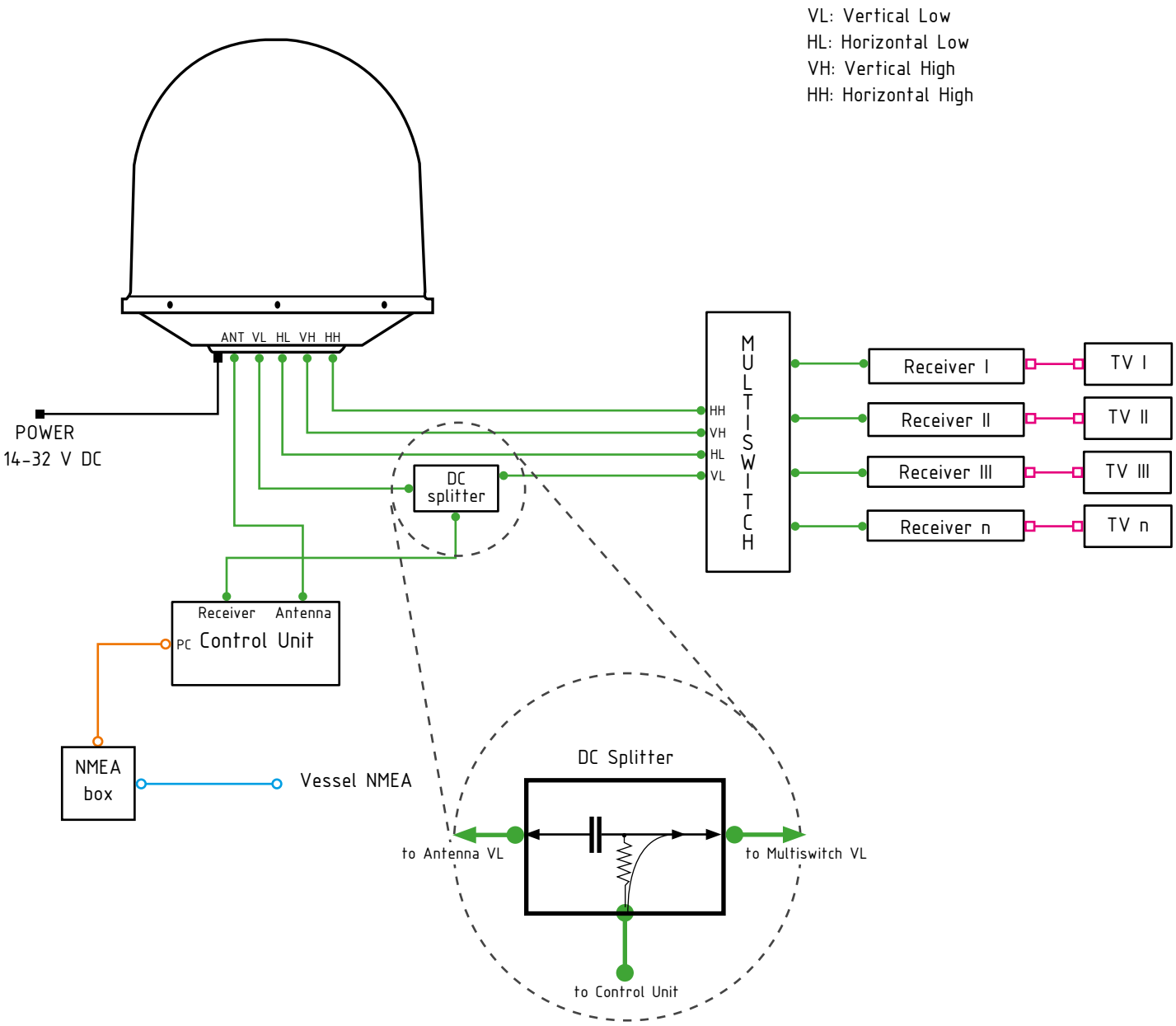


Cable type:

- RG6 - double shielded satellite coaxial cable (75 Ohm) with F-plugs at both ends
- Standard power cable - min. 2x 1.5 sqmm
- Standard coaxial cable for television commissioning
- AV cable (HDMI or SCART) for television commissioning

7.4.5 Multi Users on Quattro Antenna

All receivers work independently and have complete access to all TV channels of all 4 bands. They can switch the antenna on/off. Only the Control Unit can select another satellite.



Cable type:

	RG6 - double shielded satellite coaxial cable (75 Ohm) with F-plug at both ends
	AV cable (HDMI or SCART) for television commissioning
	RS422/RS232 (Twisted wire or 9 Pin Sub-D)
	Standard power cable - min. 2x 1.5 sqmm
	Interconnecting cable (provided along with the NMEA Box)

Power supply control unit: Mount a DC splitter in the VL path after the multi switch and connect CU via an RG6 cable

7.5 Elevation Angles

Area	Sirius (5°E)	Hotbird (13°E)	Astra (19°E)	Turksat (42°E)
Antalya	39°	43°	45°	47°
Athens	41°	44°	45°	45°
Balaton	31°	34°	35°	36°
Barcelona	42°	40°	39°	33°
Batumi	28°	39°	36°	40°
Berlin	29°	30°	30°	24°
Bordeaux	38°	33°	34°	29°
Bornholm	26°	36°	27°	25°
Burgas	36°	27°	40°	40°
Constanta	34°	37°	39°	39°
Copenhagen	26°	26°	26°	24°
Cork	28°	26°	24°	19°
Corsika	41°	41°	40°	36°
Crete	45°	48°	49°	49°
Crimera	30°	34°	36°	38°
Cyprus	40°	45°	47°	50°
Düsseldorf	31°	31°	30°	23°
Edinburgh	25°	24°	23°	19°
Gdansk	26°	27°	28°	26°
Gibraltar	46°	43°	40°	33°
Hamburg	29°	29°	28°	22°
Helsinki	19°	21°	21°	21°
Istanbul	36°	39°	41°	42°
Kiel	27°	27°	27°	25°
Leipzig	30°	31°	31°	25°
Lisbon	42°	39°	36°	28°
Majorca	44°	43°	41°	35°
Malta	47°	48°	48°	44°
Marseilles	40°	39°	38°	33°
Munich	34°	35°	34°	27°
Naples	42°	43°	42°	39°
Palermo	45°	45°	45°	41°
Plymouth	29°	28°	26°	21°
Rhodes	41°	45°	47°	48°
Riga	24°	26°	27°	26°
Rome	41°	41°	41°	38°
Rotterdam	30°	30°	30°	25°
Sardinia	43°	43°	42°	38°
Split	35°	38°	39°	40°
Stockholm	21°	22°	22°	21°
Stuttgart	34°	34°	33°	26°
Thessaloniki	39°	41°	42°	41°
Trondheim	18°	18°	18°	16°
Venice	37°	37°	37°	34°
Wilhelmshaven	28°	28°	27°	25°

7.6 Technical Specifications

7.6.1 Technical Specification R-Series

R4

Feed Subsystem	
Reflector diameter	45 cm (17.73")
Minimum E.I.R.P.	49 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Single or Twin
Frequency	10.7 - 12.75 GHz
Antenna gain	32.8 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	12°/s (each axis)
Azimuth range	Unlimited
Elevation range	+5° to +85°
Skew movement	Manual
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit or via receiver (DiSEqC™ V1.0 command)
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	20-40 VA
Dimensions and Weight	
Radome (D x H)	55 cm x 55 cm (21.67" x 21.67")
Weight (incl. radome)	12 kg (26.46 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	58 cm x 58 cm x 71 cm - 17 kg (22.83" x 22.83" x 27.95" - 37.4 lbs)

R6

Feed Subsystem	
Reflector diameter	60 cm (23.6")
Minimum E.I.R.P.	46 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Single or Twin or Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	35.6 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	12°/s (each axis)
Azimuth range	Unlimited
Elevation range	+5° to +85°
Skew movement	Manual
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit or via receiver (DiSEqC™ V1.0 command)
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	20-40 VA
Dimensions and Weight	
Radome (D x H)	71 cm x 69 cm (27.95" x 27.19")
Weight (incl. radome)	16 kg (35.27 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	78 cm x 78 cm x 101 cm - 22 kg (30.71" x 30.71" x 39.76" - 48.4 lbs)

7.6.2 Technical Specification S-Series

S4

Feed Subsystem	
Reflector diameter	45 cm (17.73")
Minimum E.I.R.P.	49 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Single or Twin
Frequency	10.7 - 12.75 GHz
Antenna gain	32.8 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	40°/s (each axis)
Azimuth range	Unlimited
Elevation range	+5° to +85°
Skew movement	Manual
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit or via receiver (DiSEqC™ V1.0 command)
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	20-40 VA
Dimensions and Weight	
Radome (D x H)	55 cm x 55 cm (21.67" x 21.67")
Weight (incl. radome)	12 kg (26.46 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	58 cm x 58 cm x 84 cm - 17 kg (22.83" x 22.83" x 33.07" - 37.4 lbs)

S6

Feed Subsystem	
Reflector diameter	60 cm (23.6")
Minimum E.I.R.P.	46 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Single or Twin or Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	35.6 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	40°/s (each axis)
Azimuth range	Unlimited
Elevation range	+5° to +85°
Skew movement	Manual
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit or via receiver (DiSEqC™ V1.0 command)
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	20-40 VA
Dimensions and Weight	
Radome (D x H)	71 cm x 69 cm (27.95" x 27.19")
Weight (incl. radome)	16 kg (35.27 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	78 cm x 78 cm x 88 cm - 22 kg (30.71" x 30.71" x 39.64" - 48.4 lbs)

7.6.3 Technical Specification DS-Series Evo

DS6

Feed Subsystem	
Reflector diameter	60 cm (23.6")
Minimum E.I.R.P.	46 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	35.6 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	30°/s (each axis)
Azimuth range	Unlimited
Elevation range	-10° to +90°
Skew movement	Automated -120° to +120°
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 30 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	30-80 VA
Dimensions and Weight	
Radome (D x H)	73 cm x 81 cm (28.74" x 31.88")
Weight (incl. radome)	35 kg (77.16 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	78 cm x 78 cm x 101 cm - 43 kg (30.71" x 30.71" x 39.76" - 94.8 lbs)

DS9

Feed Subsystem	
Reflector diameter	90 cm (35.4")
Minimum E.I.R.P.	43 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	35.6 dBi @ 11.75 GHz
Position acquisition	Internal GNSS (GPS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 2.5 - 10 MHz
Drive Subsystem	
Tracking technology	EPAK® Evo: Electronic Beam Forming (EBF-Gyro) + 3D Rate Gyro + 3D inertial + GNSS
Maximum tracking speed	30°/s (each axis)
Azimuth range	Unlimited
Elevation range	-10° to +90°
Skew movement	Automated -120° to +120°
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	2-axis plus skew
Miscellaneous	
Lock on time	Typ. 30 sec
Satellite acquisition	Completely automated by SatFingerprint technology
Satellite positions	Up to 4 freely programmable active positions / Preconfigured database
Satellite selection	Manually via Control Unit
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	14-32 V DC
Power consumption	30-80 VA
Dimensions and Weight	
Radome (D x H)	111 cm x 114 cm (43.7" x 44.9")
Weight (incl. radome)	56 kg (123.46 lbs)
Shipping dimensions	
Box type	Wooden box
Dimensions - gross weight	126 cm x 126 cm x 137 cm - 180 kg (49.57" x 49.57" x 54.02" - 396 lbs)

7.6.4 Technical Specification DS-Series *Pro*

DS6 *Pro*

Feed Subsystem	
Reflector diameter	60 cm (23.6")
Minimum E.I.R.P.	46 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	36.3 dBi @ 12.5 GHz
Position acquisition	Internal GNSS (GPS / Glonass / Galileo / Beido / QZSS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 0.5 - 50 MHz
Drive Subsystem	
Tracking technology	Twin RF tracking receiver + 6D inertial + GNSS (NMEA input optional)
Maximum tracking speed	50°/s (each axis)
Azimuth range	Unlimited
Elevation range	-15° to +120°
Skew movement	Automated -120° to +120°
Cross level range	-45° to +45°
Maximum ship motion	• Roll ±40° @ 6 sec • Pitch ±30° @ 6 sec • Yaw ±15° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	3-axis + auto skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by DVB-S2 & SatFingerprint technology
Satellite positions	Customizable through webinterface or control panel
Satellite selection	Manually via Control Unit or through web interface
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	48 V DC (supplied by ACU)
Power consumption	160 VA
Dimensions and Weight	
Radome (D x H)	73 cm x 81 cm (28.74" x 31.88")
Weight (incl. radome)	50 kg (110.23 lbs)
Shipping dimensions	
Box type	Cardboard box
Dimensions - gross weight	78 cm x 78 cm x 101 cm - 43 kg (30.71" x 30.71" x 39.76" - 94.8 lbs)

DS9 *Pro*

Feed Subsystem	
Reflector diameter	90 cm (35.4")
Minimum E.I.R.P.	43 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	39.5 dBi @ 12.5 GHz
Position acquisition	Internal GNSS (GPS / Glonass / Galileo / Beido / QZSS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 0.5 - 50 MHz
Drive Subsystem	
Tracking technology	Twin RF tracking receiver + 6D inertial + GNSS (NMEA input optional)
Maximum tracking speed	50°/s (each axis)
Azimuth range	Unlimited
Elevation range	-15° to +120°
Skew movement	Automated -120° to +120°
Cross level range	-45° to +45°
Maximum ship motion	• Roll ±30° @ 6 sec • Pitch ±20° @ 6 sec • Yaw ±8° @ 6 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	3-axis + auto skew
Miscellaneous	
Lock on time	Typ. 30 sec
Satellite acquisition	Completely automated by DVB-S2 & SatFingerprint technology
Satellite positions	Customizable through webinterface or control panel
Satellite selection	Manually via Control Unit or through webinterface
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	48 V DC (supplied by ACU)
Power consumption	160 VA
Dimensions and Weight	
Radome (D x H)	111 cm x 114 cm (43.7" x 44.9")
Weight (incl. radome)	75 kg (165.35 lbs)
Shipping dimensions	
Box type	Wooden box
Dimensions - gross weight	126 cm x 126 cm x 137 cm - 197 kg (49.57" x 49.57" x 54.02" - 434.31 lbs)

DS13 *Pro*

Feed Subsystem	
Reflector diameter	130 cm (51.18")
Minimum E.I.R.P.	40 dBW
LNB	Universal Linear (LOF 9.75/10.6 GHz) or High-band Circular (LOF 10.75 GHz) or other LNB on request
LNB type	Quattro
Frequency	10.7 - 12.75 GHz
Antenna gain	43.1 dBi @ 12.5 GHz
Position acquisition	Internal GNSS (GPS / Glonass / Galileo / Beido / QZSS)
Tracking receiver	Internal, 950 - 2150 MHz; BW 0.5 - 50 MHz
Drive Subsystem	
Tracking technology	Twin RF tracking receiver + 6D inertial + GNSS (NMEA input optional)
Maximum tracking speed	35°/s (each axis)
Azimuth range	Unlimited
Elevation range	-20° to +115°
Skew movement	Automated -120° to +120°
Cross level range	-45° to +45°
Maximum ship motion	• Roll ±35° @ 9 sec • Pitch ±25° @ 9 sec • Yaw ±15° @ 12 sec
Ship motion (for stabilization accuracy tests)	• Roll ±30° @ 10-12 sec • Pitch ±20° @ 8-10 sec • Yaw ±8° @ 15 sec
Motion system	3-axis + auto skew
Miscellaneous	
Lock on time	Typ. 20 sec
Satellite acquisition	Completely automated by DVB-S2 & SatFingerprint technology
Satellite positions	Customizable through webinterface or control panel
Satellite selection	Manually via Control Unit or through web interface
EPAK® Diversity-Kit compatible	✓
Operating temperature	-20°C to 55°C
Storage temperature	-30°C to 85°C
Power Specifications	
Power supply	48 V DC (supplied by ACU)
Power consumption	Up to 180 VA (supplied by ACU)
Dimensions and Weight	
Radome (D x H)	153 cm x 168 cm (60.24" x 66.14")
Weight (incl. radome)	120 kg (264 lbs)
Shipping dimensions	
Box type	Wooden box