Installation Manual

KONGSBERG

SpotTrack

Relative positioning system

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Installation Manual

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Document history

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Rev. 8.0	March 2021	Modified section “Setting the parameters for network communication”. Added message Fanbeam MDL without checksum. Minor changes.

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. The user must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.
Kongsberg Seatex disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Comments

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism.
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About this manual

Purpose of manual

This installation manual provides you with the necessary information to carry out the mechanical and electrical installation of the SpotTrack system on a vessel.

For information about the operation of this product, refer to the *SpotTrack Operator manual*, see *References* on page 86.

Target audience

This manual is intended for electrical and mechanical workers at a ship yard or system integrator company for installation and configuration of this system.

Maintenance purposes

This installation manual is also intended as reference material for the maintenance personnel. Keep this manual for later use.

SpotTrack

System description

SpotTrack is primarily used as a reference system for relative positioning in DP operations. The SpotTrack Sensor Unit is a robust motion stabilised rotating laser sensor which measures range and bearing to one or several reflectors installed on the target platform or vessel. Automatic wave motion stabilisation provides optimum target lock. The onboard Control Unit allows for easy configuration and monitoring of the SpotTrack system.

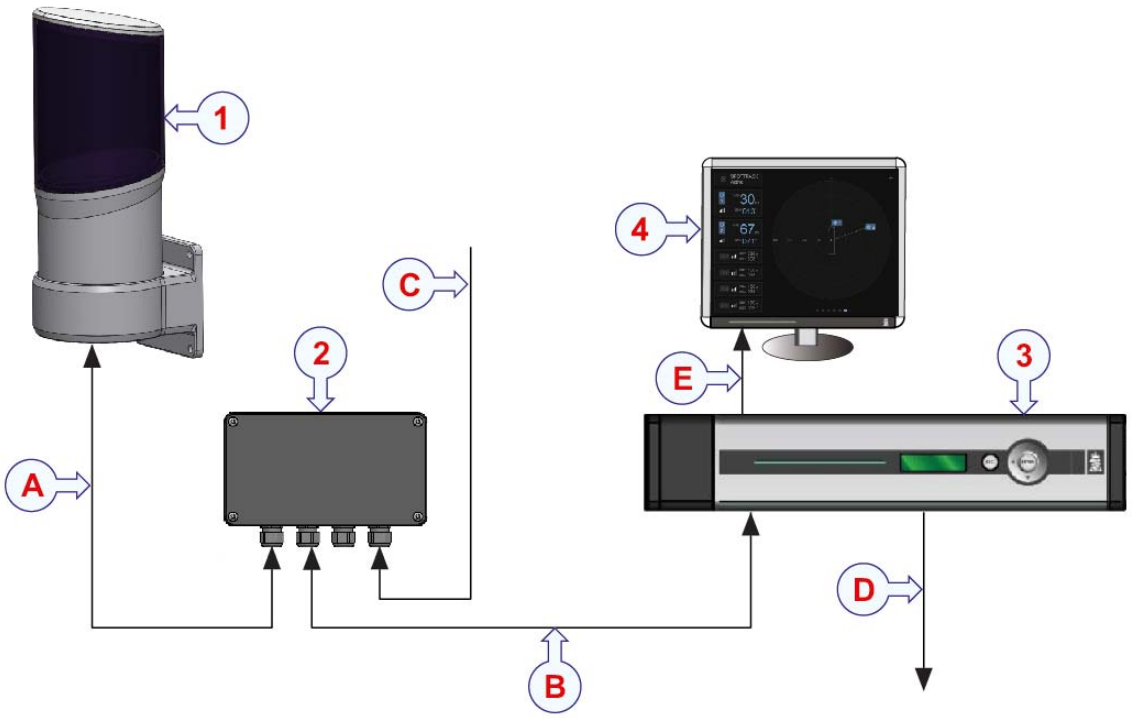
SpotTrack is a true multi-target sensor with advanced tracking algorithms for true target recognition preventing lock on false reflections.

SpotTrack is capable of reflector tracking in close-by operations by utilising roll and pitch stabilisation. SpotTrack has a wide vertical field of regard which keeps track of targets even at high elevation angles.

The SpotTrack system is easy to install and operate. All moving parts are enclosed within the sensor housing. The mechanical wear due to harsh weather conditions is thus kept at a minimum.

System diagram

A system diagram for a standard SpotTrack system.



Main units

1 Sensor Unit with mounting bracket

2 Junction box (field)

3 Control Unit

4 Monitor (not included in standard delivery)

Interfaces and power

A Power and Ethernet cable (pigtail) between sensor and junction box, 3 m

B Ethernet cable between junction box and Control Unit

C Power cable from junction box to power supply, 12 to 35 V DC (at the input of the junction box)

D Data cable from Control Unit to DP, RS-422

E VGA cable between Control Unit and monitor

The power cables for the Control Unit and the monitor are not shown.

A monitor is attached to the Control Unit via an SVGA connector. Recommended screen resolution is 1280 x 1024 pixels. Single touch monitors are supported if connected via USB or serial port.

A mouse is the recommended interaction unit, but keyboard support is also fully implemented.

System units

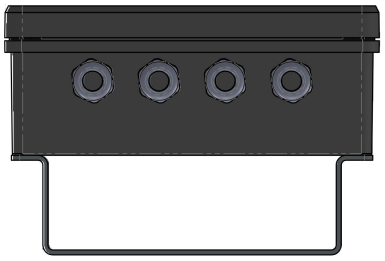
This system comprises the following main units.

Sensor Unit

The Sensor Unit is a robust motion stabilised rotating laser sensor which measures range and bearing to one or several retro-reflective targets installed on the target platform or vessel. All moving parts are enclosed within the sensor housing.

Junction box (field)

The junction box is an interface from the pigtail from the Sensor Unit (carrying both Ethernet and power to the sensor) to the separate Ethernet/power cables to the Control Unit and the power supply.



Control Unit

The Control Unit runs the SpotTrack application software and logs sensor data.

The unit is designed to fit standard 19-inch racks and is typically installed on the bridge or in the instrument room. The unit comprises the following main parts:

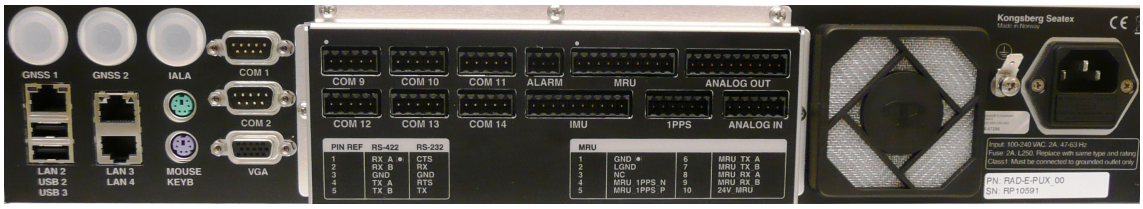
- Compact flash card
- Hard disk
- Serial I/O board, Ethernet and computer main board
- Power supply

The power on/off switch, LAN port and USB connection are located under the lid on the left part of the front panel.

The rear panel of the unit contains communication interface ports for interfacing to external sensors. These ports are individually galvanically isolated.

Note

The USB ports are not compatible with USB 3 devices.



SpotTrack accessories

Transportation box

The Sensor Unit is delivered in a specially designed transportation box. Keep the transportation box for later use.

Protection cover

Protect the Sensor Unit with the protection cover when the system is not in use.

Cleaning kit

A cleaning agent and cloth are provided in order to clean the Sensor Unit window.

Scope of supply

Standard parts provided

- SpotTrack Sensor Unit

  Including 3–metre pigtail cable
- SpotTrack sensor transportation box (please keep this box for later use)
- SpotTrack sensor protection cover (please keep this cover for protection purposes when the system is not in use)
- SpotTrack sensor mounting bracket

  Including mounting kit.
- Control Unit
- Junction box (field)
- Power cable
- Sensor power kit

  Including patch panel, fuse, 1–metre patch cable, power supply and 19–inch DIN rail.
- Keyboard with trackball
- Single prism (commissioning target)
- Cleaning kit
- End user documentation

Additional required items

These items are not provided in a standard delivery.

- Monitor
- Ethernet cable
- Data cable
- VGA cable

Product restrictions

Restrictions in guarantee

Changes or modifications to the product not explicitly approved by Kongsberg Seatex AS will void the guarantee.

The liability of Kongsberg Seatex AS is limited to repair of this system only under the given terms and conditions stated in the sales documents. Consequential damages such as customer's loss of profit or damage to other systems traceable back to this system's malfunctions, are excluded. The warranty does not cover malfunctions of the system resulting from the following conditions:

- Incorrect power connection.
- The Control Unit and the Sensor Unit housing have been opened by the customer.

Safety regulations

The laser radiation levels of the SpotTrack sensor have been classified in accordance with IEC 60825-1:2014.

The Sensor Unit is a class 1 laser device under normal operation and reasonably foreseeable single-fault conditions. This means that the sensor is eye safe under all conditions of normal use.

During service, stationary emission can be enabled by the use of specialized software. In this case the sensor is a Class 3R laser device, which is not unconditionally eye-safe.

Location of apertures: Window when cover is on, transmitter lens when cover is off.

Operation of this equipment will not imply any risk for high voltages, explosions or exposure to gas or any chemical and mechanical hazard.

WARNING

The Sensor Unit cover shall not under any circumstances be removed.

Caution

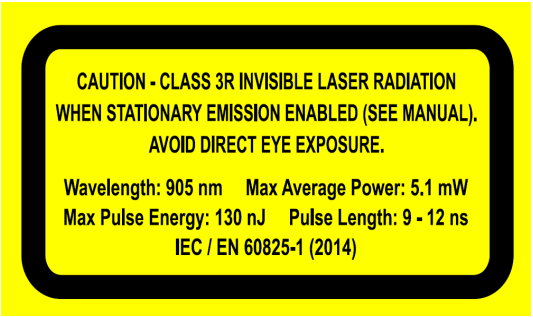
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

General safety guidelines must be followed when working in mast and on deck.

Product labels

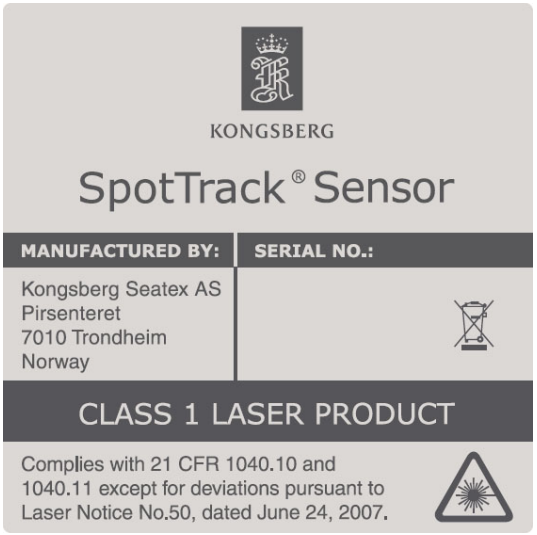
Label under the sensor cover

The product information and panel warning label and the hazard triangle are located under the cover, on the base of the unit.



Labels on the sensor cover

The "Class 1 laser product" label is located on the cover.



Support information

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- **E-mail address**: km.support.seatex@km.kongsberg.com

- **Website**: http://www.kongsberg.com

Preparations

Installation drawings

Installation drawings for the SpotTrack system units are provided in this document.

Related topics

- *Drawings* on page 62

Necessary tools and equipment

Equipment

- RJ-45 plug

Tools

- RJ-45 plug mounting tool

SpotTrack Sensor Unit

The Sensor Unit is shipped in a specially designed transportation container. Keep the Sensor Unit within the container until everything is ready for installation of the unit in the mounting bracket. Keep the sensor protection cover in place until the sensor has been mounted.

Note

After the installation, please save the transportation container. The Sensor Unit must be shipped in this container for service or repair to maintain the warranty.

Worker skills

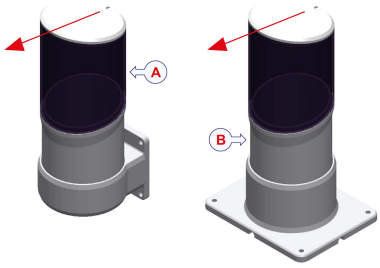
Trained electrical workers.

Location of the system parts

Sensor Unit

When installing the Sensor Unit, consider the following:

- The Sensor Unit must be mounted in an upright position.
- The Sensor Unit must have free line of sight in the operational zones which the SpotTrack system shall cover.
- Do not place the Sensor Unit in the "beam" of the vessel's radar(s).
- Do not place the Sensor Unit close to the ship's funnel.
- Place the Sensor Unit with the mounting bracket reference point facing directly towards the bow of the vessel. Correct for any deviation in the operating software.



A Sensor with vertical mounting bracket

B Sensor with horizontal mounting bracket

The arrow on the illustration points towards the bow of the vessel.

Related topics

- *Sensor Unit reference point* on page 19
- *Setting the mounting bracket parameters* on page 50
- *Installing the Sensor Unit* on page 22
- *Sensor Unit dimensions* on page 63

Junction box (field)

When installing the junction box, consider the following:

- The junction box can be placed on a wall or a rail.
- Make sure that the location is within the length of the 3–metre sensor cable.
- Provide for a minimum of 100 mm below the connectors.

Related topics

- *Installing the junction box (field)* on page 24
- *Junction box (field) dimensions* on page 66

Control unit

When installing the Control Unit, note the following:

- The unit is designed for indoor installation. Avoid locations with heavy vibrations, strong electronic fields (close to transformers), excessive heat.
- The unit has an internal fan and requires free airflow from the rear and out to the sides. It is recommended that ventilation or air conditioning is provided in order to keep the ambient operating temperature around +20 °C. The best location is typically in the instrument room or on the bridge mounted on 19–inch rails in a rack or console with good ventilation.
- It is recommended that the area around the unit is kept free from dust and static electricity.
- All connections to the unit are on the rear side and available space for cable connections and service must be provided.

Related topics

- *Installing the Control Unit* on page 35
- *Control Unit dimensions* on page 67

Monitor

When installing the monitor, consider the following:

- The unit is designed for installation in an indoor environment and for operation within the temperature range. The best location is typically on a table in the instrument room or on the bridge mounted close to the Control Unit.
- The Control Unit and the monitor should be mounted close to each other to reduce the length of the VGA cable.
- It is recommended that the area around the unit is kept free from dust and static electricity.

Related topics

- *Installing the monitor* on page 41

Reflectors

The SpotTrack system is able to track reflectors of different type, strength and location simultaneously. To ensure optimal accuracy and tracking, the following should be considered when mounting the reflectors.

- The reflectors should be placed with a horizontal separation of minimum 5 metres.
- The reflectors which shall be used in the operation should be located with a separation in bearing of minimum 5 degrees.
- The reflectors which shall be used in the operation should be located in approximately the same height if you take into consideration the bearing of the approaching vessels. A separation in elevation less than 50 % of the separation in bearing.
- The reflectors should not be located close to reflective surfaces, such as reflective signs.

- The reflector type and size should be chosen based on expected operating range. A prism, or prism cluster, is recommended for distances larger than 200 metres.

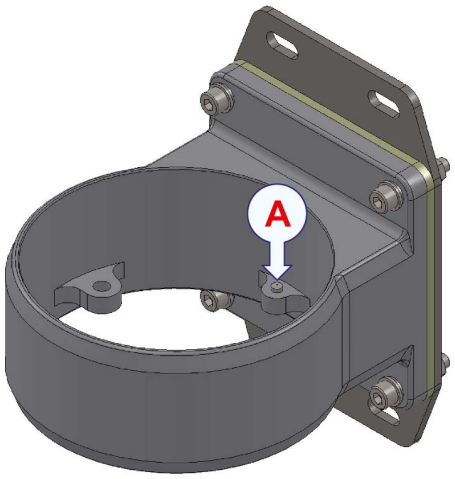
Related topics

- *Installing the single prism* on page 31
- *Installing the prism cluster* on page 33
- *Prism cluster dimensions* on page 68
- *Single prism holder dimensions* on page 70

Sensor Unit reference point

The system data regarding range, distance and inclination are measured with reference to a specific point (orientation pin) in the mounting bracket. This is the sensor Origo.

Offsets have to be established between the sensor reference point and the vessel reference point.



A Sensor mounting bracket reference point (orientation pin)

Related topics

- *Setting the mounting bracket parameters* on page 50

Measuring the mounting bracket orientation

This procedure explains how to measure the mounting bracket orientation relative to the vessel heading.

Note

This procedure should be performed only when the vessel is at dock.

Procedure

1 Place a test reflector in a known location on the vessel.

2 Calculate the correct bearing from the bracket to the test reflector from vessel drawings.

3 Adjust the mounting bracket orientation until the measured bearing matches the calculated bearing within 0.1 degrees.

The measured bearing is most accurately observed in the reflector **History view**.

It is of great importance that the mounting bracket orientation is correct. An error in the mounting bracket orientation will give an error in the sensor measurement depending on the distance to the reflector.

The table shows error in position measurement for different combinations of mounting bracket orientation error and distance to reflector.

Error in bracket orientation/Range	50 m	100 m	300 m	500 m	1000 m
0.1 degr	0.09 m	0.17 m	0.52 m	0.87 m	1.75 m
0.5 degr	0.44 m	0.87 m	2.62 m	4.36 m	8.73 m
1.0 degr	0.87 m	1.75 m	5.24 m	8.73 m	17.45 m
3.0 degr	2.62 m	5.23 m	15.70 m	26.17 m	52.34 m

If the vessel position is stationary, the error will not be visible on the DP system even if the heading is changed. If the vessel has a linear velocity relative to the reflector, the error will show up as drift when compared to other reference systems on the DP.

To verify the bracket mounting angle, move the vessel towards or away from the reflector without changing vessel heading. If the SpotTrack sensor is drifting away from the other reference systems, it is likely because of an error in the bracket mounting angle. Note that a drifting gyro can also cause this kind of error.

Note

If the sensor is removed from the mounting bracket, the bracket mounting angle must be measured again.

Related topics

- *Setting the mounting bracket parameters* on page 50
- *Checking the reflector history* section in the SpotTrack operator manual, see *References* on page 86.

Measuring the mounting bracket location

Procedure

1 Calculate the bracket location from the vessel drawings.

The accuracy should be within 1 metre. The bracket location does not affect the accuracy of the sensor measurements.

Related topics

- *Setting the mounting bracket parameters* on page 50

Rack requirements

If the product is delivered without a rack, the Control Unit must be installed in a rack which is already in place on site. Consider the following to determine whether your rack is suitable for the Control Unit installation.

- The rack must be securely mounted to the floor.
- The rack must be a standard 19–inch rack.
- The minimum depth of the rack must be 600 mm.
- The rack should have air inlet on top and bottom or ventilation splits on the sides. The Control Unit has ventilation on the sides. Forced ventilation may be required if the rack contains several electronic modules.
- The rack must be mounted in such a way that the minimum cable bends (at the rear side) are not exceeded.
- The rack must be connected to a grounded outlet.

Related topics

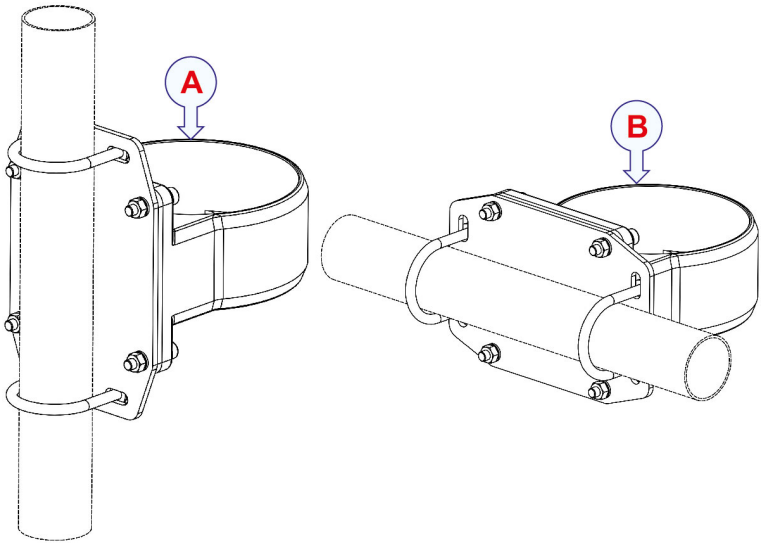
- *Installing the Control Unit in the rack* on page 35

Installing the Sensor Unit

This chapter describes the standard installation of the Sensor Unit with the mounting bracket and the junction box.

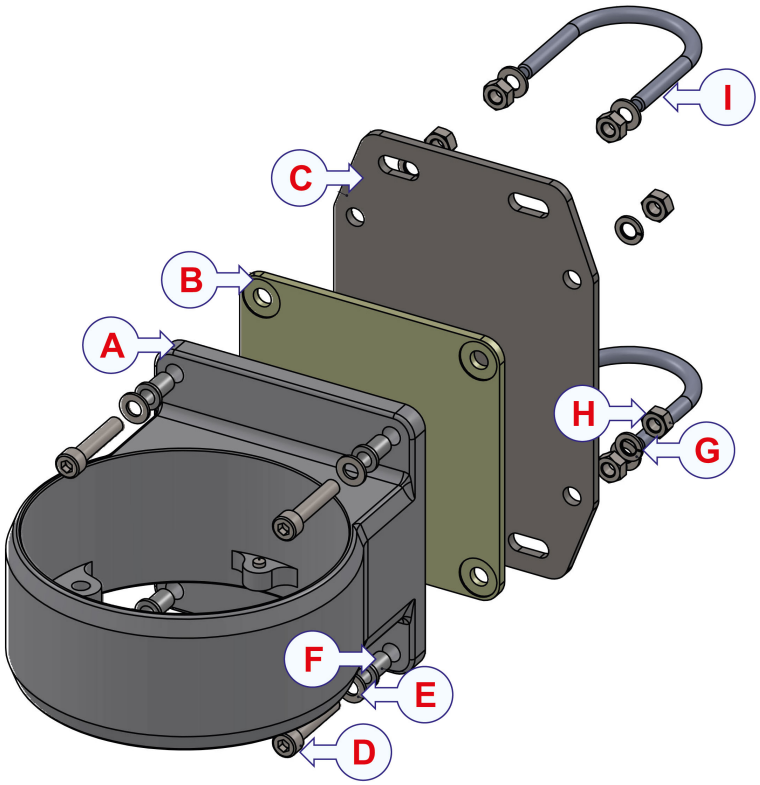
Installing the wall mounting bracket

The mounting bracket can be installed both on a mast and on a rail by rotating the bracket 90 degrees. The mounting bracket kit includes all items necessary to install the bracket.



A Mast mounting

B Rail mounting



A Wall mount bracket
B Insulation plate
C Mounting plate
D DIN 912 M8 x 1 x 40 A4
E Washer DIN 125 – A 8.4
F Skiffy insulator (insulation sleeve)
G Spring washer DIN 128 – A8
H Hexagon nut ISO 4032 – M8 – W – N
I Clamp Ø 63 – M8

Procedure

1. Find a suitable location for the sensor.
2. Fasten the bracket to a mast, pole or rail with clamps/U bolts.
3. Place the clamps on the mast or rail and insert the clamps in the mounting plate bracket slot.
4. Insert the washers and nuts.
5. Insert the insulation plate.
6. Insert the wall mount bracket.
7. Insert the washers and nuts.
8. Fasten the nuts firmly.

If the bracket is to be mounted on a wall, the mounting plate and clamps/U bolts are not needed.

Note

The bracket shall be isolated from the vessel ground. Make sure that the screw insulators are used.

Related topics

- *Mounting bracket, wall, dimensions* on page 64

Installing the Sensor Unit

Keep the Sensor Unit in the transportation container until it is ready to be installed.

Procedure

1. Thread the pigtail cable through the bracket.
2. Place the Sensor Unit in the bracket.

   Note

   Make sure that the orientation pin in the mounting bracket fits into the opening for the orientation pin at the bottom of the Sensor Unit.
3. Fix the sensor to the bracket with three M8 x 30 mm hex head bolts/washers.
4. Remove the sensor protection cover.

Keep the transportation container and the sensor protection cover for later use. For example if the Sensor Unit has to be shipped back to the manufacturer or for storage purposes.

Note

It is recommended to cover the sensor with the sensor protection cover when the sensor is not in use.

Related topics

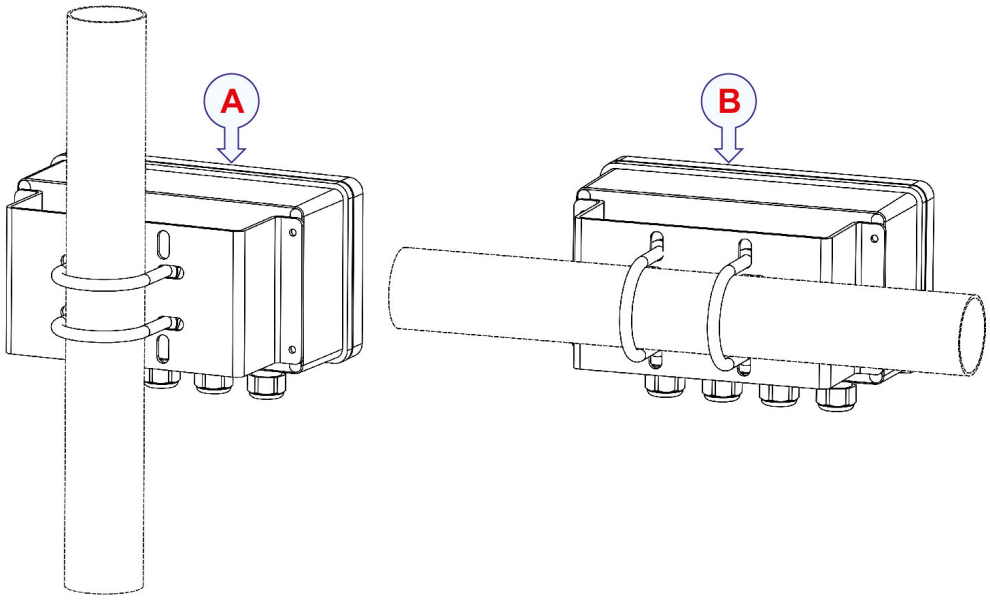
- *Sensor Unit dimensions* on page 63

Installing the junction box (field)

The mounting bracket is pre-installed on the junction box. Mounting is possible on 2–inch and 3–inch rails, either horizontally or vertically.

Note

Installation in weather protected areas is generally recommended. When it is required to install junction boxes where they may be exposed to a salt mist atmosphere and thereby risk of corrosion, it is strongly recommended to protect the fastening screws with suitable grease lubricant or copper paste. The screws must be fully covered but avoid any grease or paste on the gasket.



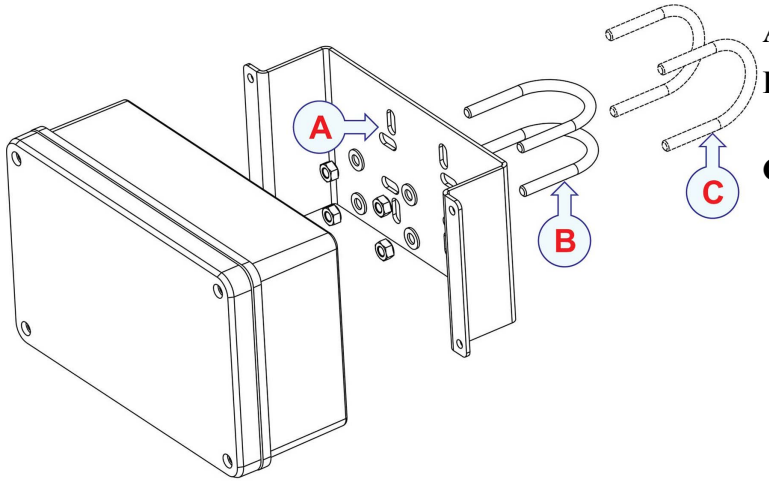
A Mast mounting

B Rail mounting

Procedure

1 Find a suitable mounting location for the junction box. The maximum distance from the Sensor Unit is 3 metres.

2 Place the U-bolts on the pole or rail and insert the U-bolts in the bracket slots. The slots can accommodate both sizes in both vertical and horizontal directions.



A Mounting bracket slot

B Mounting on vertical rail

C Mounting on horizontal rail

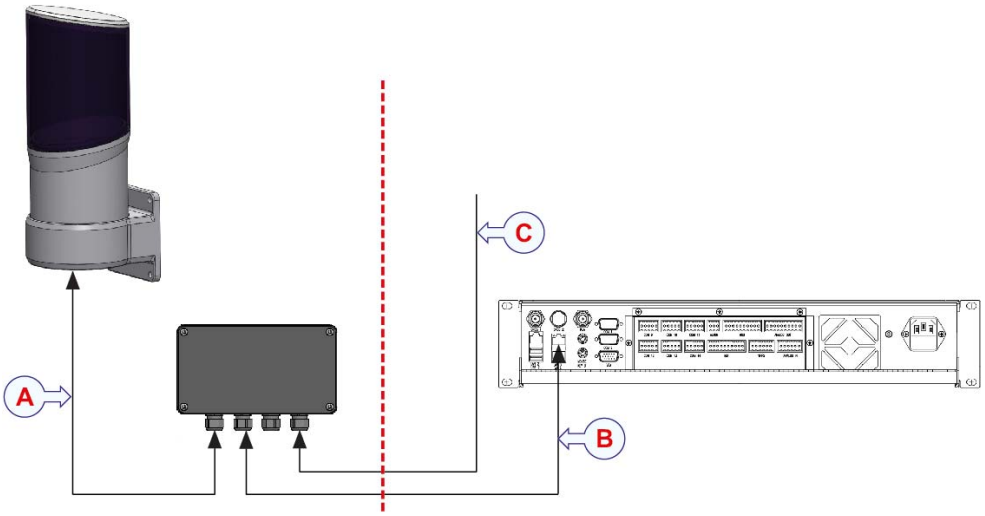
3 Insert the washers and fasten firmly with self-locking nuts.

Alternatively the junction box can be mounted to a wall. For wall mounting, remove the mounting bracket and mount the junction box by use of the four mounting holes inside the box.

Related topics

- *Junction box (field) dimensions* on page 66

Cables



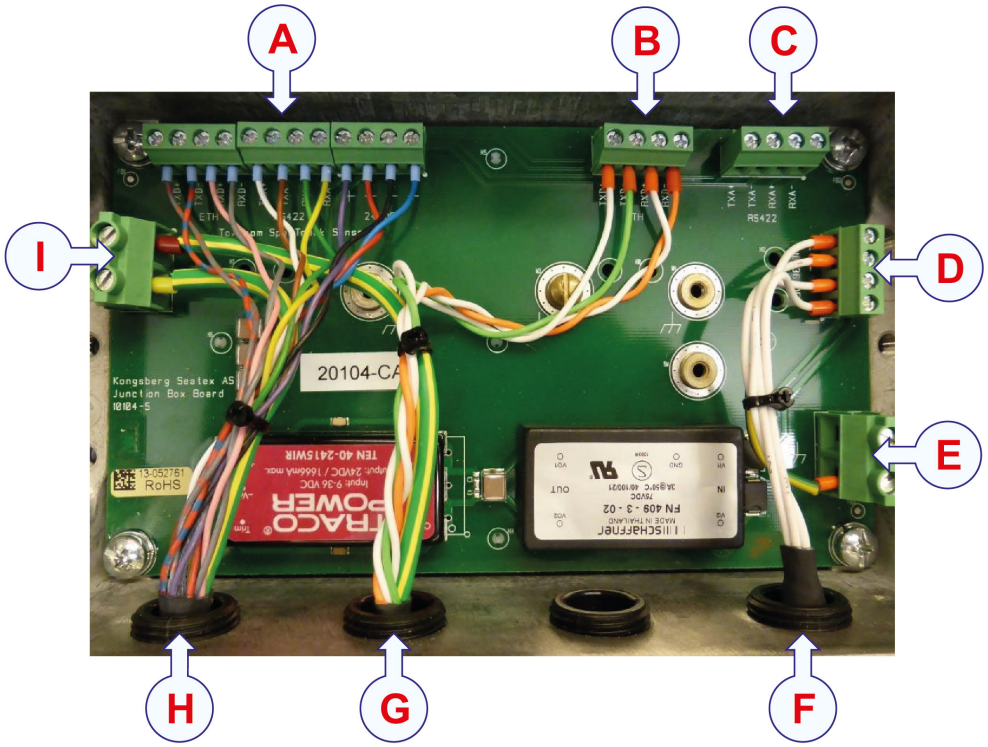
A SpotTrack cable with pigtail connector, 3 m

B Junction box to Control Unit cable, Ethernet cable

C Power cable, 12 to 35 V DC

Junction box (field) connections

The junction box connections are illustrated. The RS-422 connector in the junction box is not used.



A Sensor Unit connections

B Ethernet connections

C RS-422 – not used

D Power cable connections

E Ground

F Power cable

G Ethernet cable

H Sensor Unit cable

I Ground

Cable from Sensor Unit to junction box (field)

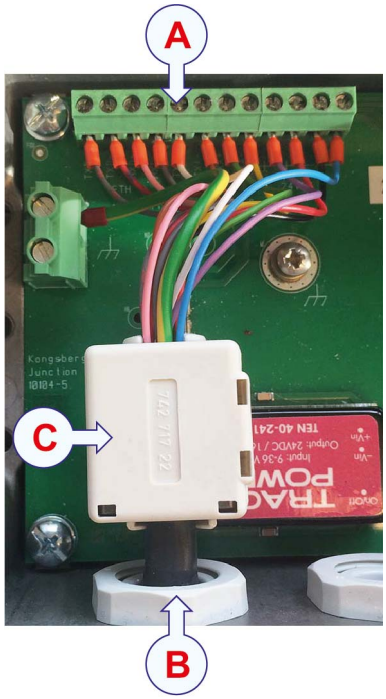
This cable is already connected to the Sensor Unit and must be connected to the junction box.

Sensor Unit to junction box (field) cable wiring

In the junction box, connect the sensor pigtail connector as illustrated.

Note

The ferrite included shall be clamped on the pigtail at the inside of the junction box.



A Sensor Unit connections

B Sensor Unit cable

C Ferrite

Signal	Colour
0V (-)	Blue
0V (-)	Black
24V (+)	Red
24V (+)	Purple
PORT_RXA_RX-	Yellow
PORT_RXA_RX+	Green
PORT_TXA_TX-	Brown
PORT_TXA_TX+	White
ETH_RXD-	Grey
ETH_RXD+	Pink
ETH_TXD-	Red/blue
ETH_TXD+	Grey/pink

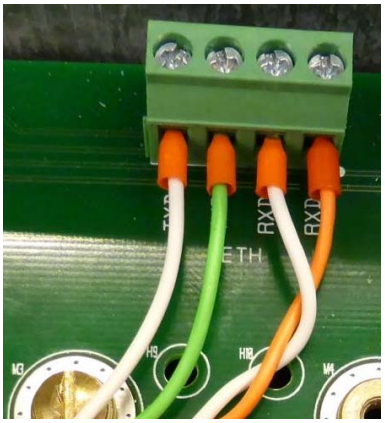
Cable from junction box (field) to Control Unit

Cable specifications

Type	Draka ToughCat7_S_FTP or similar

Junction box (field) to Control Unit cable wiring

In the junction box, connect the Ethernet cable as illustrated.



Signal	Colour
ETH_RXD-	Orange
ETH_RXD+	Orange/white
ETH_TXD-	Green
ETH_TXD+	Green/white

Related topics

- Contol Unit end of cable, see *Cable from junction box (field) to Control Unit* on page 39

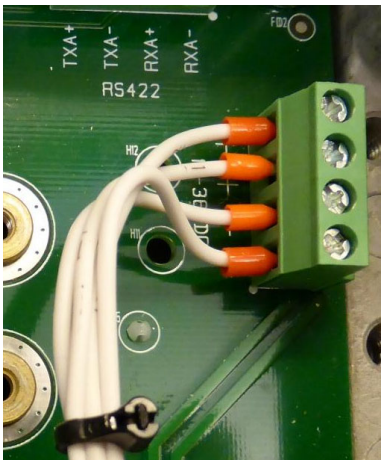
Cable from junction box (field) to DC power source

Cable specifications

Type	Draka TI (I) 250V, Shipline, 1 Quad 0.5 mm^2, halogen free or similar cable for exposed maritime use

Cable from junction box (field) to DC power source wiring

In the junction box, connect the power cable as illustrated.



Signal	Wire no.
0V (-)	3
0V (-)	4
24V (+)	1
24V (+)	2

The other end of the power cable is connected to a 24 V DC power source which is able to deliver at least 40 W.

Connecting the junction box (field) to ground

The junction box must be connected to ground. Connect from the screw available at the back of the junction box to vessel ground.

Note

All cable shields shall be connected to ground in the junction box only.

Installing the single prism

A single prism is included in the delivery for measuring the mounting bracket orientation.

The single prism consists of:

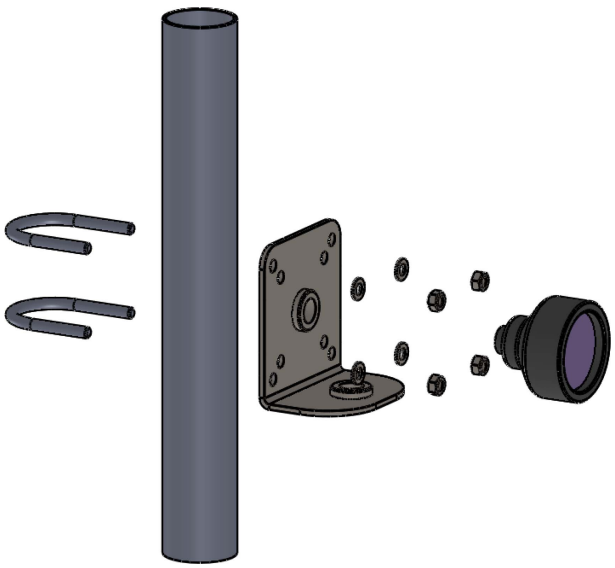
- The prism
- The prism mounting bracket
- A U-bolt kit with screws and washers

Procedure

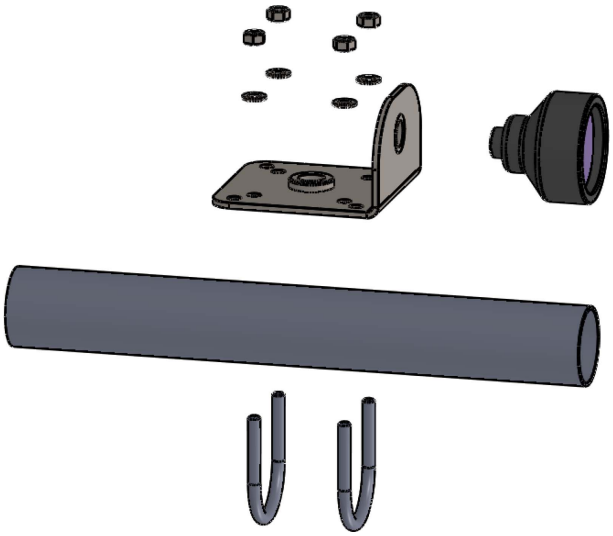
1 Screw the prism onto the mounting bracket.

2 Attach the mounting bracket with the prism to a mast or rail with the provided U-bolts.

Mast mounting



Rail mounting



3 Remove the protection cap from the prism prior to use.

Related topics

- *Single prism holder dimensions* on page 70

Installing the prism cluster

This chapter describes the installation of the prism cluster delivered by Kongsberg Seatex AS. The prism cluster is not a part of the standard delivery.

The SpotTrack prism cluster is delivered in a suitcase consisting of:

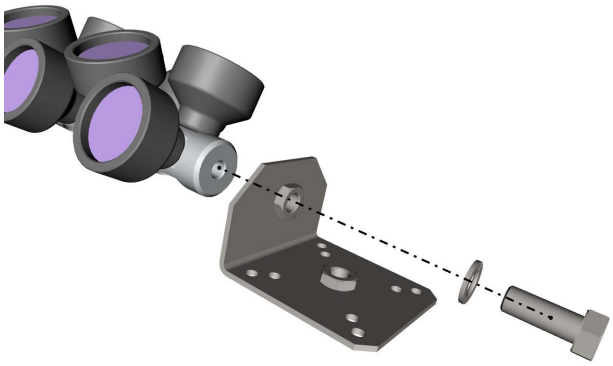
- The prism cluster
- The mounting bracket
- An M16 x 35 screw with washers
- A U-bolt kit with screws and washers

Important

Keep the transportation suitcase for storage, transportation or return purposes. Store the prisms with the protection cap on.

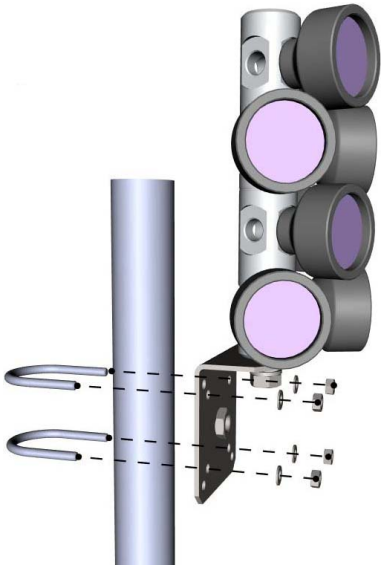
Procedure

1 Attach the mounting bracket to the prism cluster using the provided M16 x 35 screw.

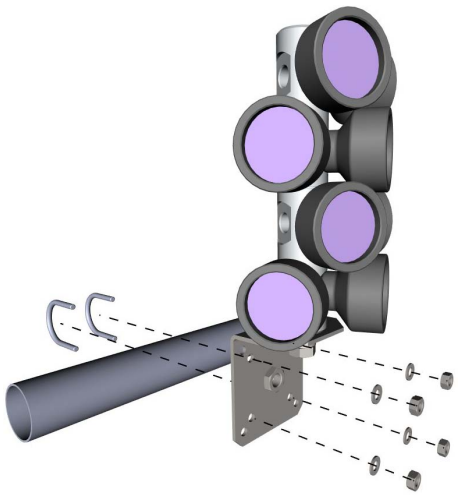


2 Attach the prism cluster with the mounting bracket to a mast or rail with the provided U-bolts.

Mast mounting



Rail mounting



3 Remove the protection caps from the prisms prior to use.

Related topics

- *Prism cluster dimensions* on page 68

Installing the Control Unit

This chapter describes the installation of the Control Unit in a 19–inch rack or cabinet with cabling and interfaces. The system can be delivered with or without a rack.

Note

The Control Unit has a plastic film on top to protect from transport scratches. This film must be removed before operation as the plastic film will reduce the heat transfer from the unit and thus cause temperature increase inside the unit.

Installing the Control Unit in the rack

The unit is a 2U unit designed to fit 19" racks. It is typically installed on the bridge or in the instrument room.

Context

Context The SpotTrack system can be delivered with or without a rack. If the product is delivered with a rack, the rack units are pre-installed in the rack. If your product is delivered with these units pre-installed, you only have to do the cabling.

A cable strain relief bracket is delivered. The cable strain relief bracket allows for flexibility in the cables without putting stress on the vulnerable points on the cable.

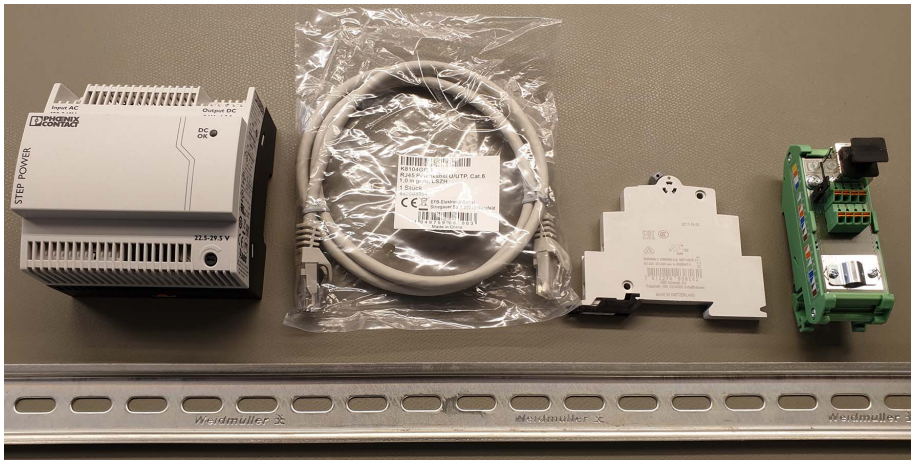
Important

If you have a rack-mountable keyboard in your system, make sure that you have enough space in the rack for the keyboard. A rack-mountable keyboard and mouse will require 1U space in the rack.

Install the Sensor Unit power kit in the rack together with the Control Unit. The power kit consists of:

- DIN rail
- Power supply
- Cable
- Fuse

- Patch panel



Procedure

1. Find a suitable place for the unit. Typically on the bridge or in the instrument room.
2. Remove any plastic film from the unit.
3. Place the unit on rails or shelves in the 19–inch rack. This to ensure that the unit is supported at the rear.
4. Fasten the unit with four screws in the front. Minimum 10 cm free space is needed behind the unit for connection of cables.
5. Install the DIN rail in a suitable place close to the Control Unit.
6. Mount the power supply, the fuse and the patch panel on the DIN rail.
7. Install the AC power cable into the power plug at the rear of the unit and into a suitable grounded power outlet.
8. The power supply chassis must be grounded to vessel ground.

Interfaces

Front interfaces Control Unit

The power switch, LAN 1 and USB 1 are located behind the lid to the left on the front panel. Push lid on left side to open.

Note

The USB port is not compatible with USB 3 devices.

Connector	Type	Connected to
LAN 1	RJ-45 – 10/100 Mbit/s	Reserved for support
USB	USB	For software upgrade and data logging

LED indicators Control Unit

At the front of the Control Unit there are four light emitting diodes (LED). The LED to the left indicates power and software status. The other LEDs have for the moment no function and will always be turned off.

LED indications

- The LED to the left indicates power and software status.
  - During start-up the indicator to the left appears red.

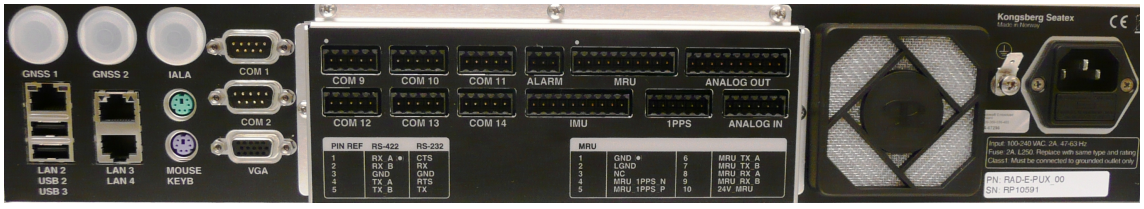
  - When the software is up and running, the indicator turns green.

Rear interfaces Control Unit

The rear panel of the unit contains communication interface ports for interfacing to external equipment.

Note

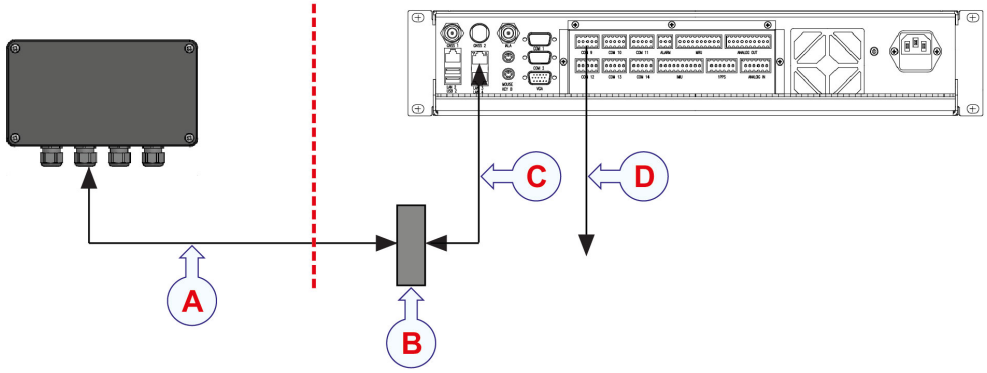
The USB ports are not compatible with USB 3 devices.



Connector	Type	Connected to
LAN 2	RJ-45 – 10/100/1000 Mbit/s	User configurable
USB 2	USB	User configurable
USB 3	USB	User configurable

Connector	Type	Connected to
LAN 3	RJ-45 – 10/100/1000 Mbit/s	Junction Box field (Junction Box inhouse, Fanbeam)
LAN 4	RJ-45 – 10/100/1000 Mbit/s	User configurable
Mouse	PS/2	Mouse
Keyboard	PS/2	Keyboard
COM 1	9–pin DSub male, RS-232	User configurable
COM 2	9–pin DSub male, RS-232	User configurable
VGA[1]	HD15 female	Monitor
COM 9 to COM 14	5–pin terminal, RS-422	User configurable
ALARM	3–pin terminal, relay	Not used in this system
MRU	10–pin terminal, RS-422	Not used in this system
IMU	10–pin terminal	Not used in this system
1PPS	6–pin terminal	Not used in this system
ANALOG OUT	10–pin terminal	Not used in this system
ANALOG IN	6–pin terminal	Not used in this system
100 to 240 V AC	Power	Input of 100 to 240 V AC

Cables



A Junction box (field) to patch panel, Ethernet cable

It is recommended to terminate the CAT7 cable to the Phoenix FL-PP-RJ45-SC patch panel.

B Patch panel

C Patch panel to Control Unit cable, patch cable

Use a shielded patch cable with RJ-45 connector in both ends.

D Cable from Control Unit to DP

1. Note that VGA output connector on Processing Unit provides + 5 V on pin 9 of VGA connector. When KVM switches are used this could cause a problem, if so, use a VGA cable without pin 9 connected.

Serial cable

Cable from junction box (field) to Control Unit

Junction box (field) end of cable

Refer to the section *Cable from junction box (field) to Control Unit* on page 29 for a description of the wiring in the junction box for the Ethernet cable.

Control Unit end of cable

1 Mount the Phoenix FL-PP-RJ45-SC patch panel on a suitable place close to the Control Unit.

2 Connect the CAT7 cable on the terminal blocks on the patch panel according to the table.

Cable colour code	Terminal block no.
Orange/white	1
Orange	2
Green/white	3
Blue	4
Blue/white	5
Green	6
Brown	7
Brown/white	8

3 Use a shielded patch cable to connect from the RJ–45 connector on the patch panel to the RJ–45 connector at back of the Control Unit.

4 Connect the RJ-45 connector to the LAN 3 port at the back of the Control Unit.

Related topics

- *Cable from junction box (field) to Control Unit* on page 29

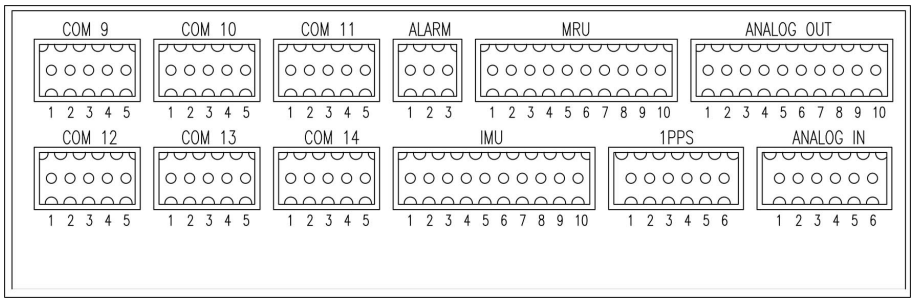
Cable from Control Unit to DP

Cable specifications

Type	02 x 2-00.50 mm² FRZH (Flame retardant, zero halogen) Shielded 90 °C 250 V

Serial cable from Control Unit to DP wiring

The serial ports COM 9 to COM 14 are as default configured to RS–422, and any of these can be configured to be an output to the DP.



Pin no.	RS-422 signal
1	RX_A
2	RX_B
3	GND
4	TX_A
5	TX_B

Installing the monitor

Installing a standard monitor

A monitor is required to configure and operate the SpotTrack system.

Context

The display is not part of the standard delivery. You can buy the display from Kongsberg Seatex AS or a local supplier.

Procedure

1. Identify the best mounting location for the display. The screen must be easy to see for the vessel operator.
2. Connect the monitor to the connector labelled VGA at the rear panel of the Control Unit.
3. Connect the monitor power cable to a power socket.

Installing a touch screen monitor

A monitor is required to configure and operate the SpotTrack system.

Context

The display is not part of the standard delivery. You can buy the display from Kongsberg Seatex AS or a local supplier.

The SpotTrack system supports single-click touch screen user interaction when a supported touch screen monitor is connected to the Control Unit.

Procedure

1. Identify the best mounting location for the display. The screen must be easy to see for the vessel operator.
2. Connect the display to the connector labelled VGA at the rear panel of the Processing Unit.
3. Connect the monitor power cable to a power socket.

Result

You have now connected the monitor to the Control Unit and afterwards you must connect the USB cable or serial cable which communicates the touch commands to the Control Unit and enable allocation of serial port.

These touch screen monitors are supported:

- Winmate Communication (Marine Bridge Systems Display)
- ISIC (Duramon)
- Hatteland Display (Series 1 Maritime Multi Display (MMD))

Winmate Communication monitor

The Winmate Communication monitor uses a USB cable to communicate touch commands to the Control Unit.

Procedure

1 Connect the USB cable from the touch screen monitor to a USB port at the rear panel of the Control Unit.

ISIC and Hatteland Display monitors

The ISIC and Hatteland Display monitors use a serial cable to communicate touch commands to the Control Unit.

For these monitors a Windows service has to be enabled to allocate serial port COM1 on the Control Unit as the serial line is used to communicate touch commands from the monitor.

Procedure

1 Connect the serial cable from the touch screen monitor to the COM 1 port at the rear panel of the Control Unit.

2 After powering up the system, open the **Windows Task Manager** with the **Ctrl+Alt+Del** keys.

3 Select the **File** menu →**New Task**.

4 Type `services.msc` and press **Enter**.

5 In the service list, locate the **MT7 Serial Search Service**.

6 Right-click the service and select **Properties**.

7 Change the **Startup type** from Disabled to **Automatic**.

8 Select **OK** and close the service list dialog box.

9 Reboot the Control Unit from the **System** menu →**Tools** →**Reboot**.

Interfacing to MRU

The SpotTrack sensor is capable of using data from a Motion Reference Unit (MRU) for improved motion compensation and target tracking in heavy sea conditions. The variables roll, pitch, yaw and heave are all used to improve performance if they are available from the MRU.

The MRU configuration is done using the MRC+ application and a laptop, see the *MRU Installation Manual* in *References* on page 86 for details.

4th generation MRU settings

A 4th generation MRU is recognized by its blue colour and serial number below 20000. The MRU must be connected to the **MRU** serial port on the Control Unit.

General settings

These general settings are compatible with default settings on the Control Unit.

- Serial interface with baud rate **57600** and signal **RS-422**.
- Interval **20 ms**.

Specific settings for MRU H, MRU 4, MRU 5, MRU 5+ and MRU 6

- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)**, **105(PosMonD)**, **65(Yaw)** as float.

  (Requires MRU software version 3.55 or newer).
- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)**, **105(PosMonD)** as float.

  (If the MRU software version is older than 3.55).
- Monitoring point = sensor mounting bracket reference point.
- Heave filter type **Hydrographic survey**.
- See the *MRU Installation Manual* for configuration of heave filter **period** and **damping**.

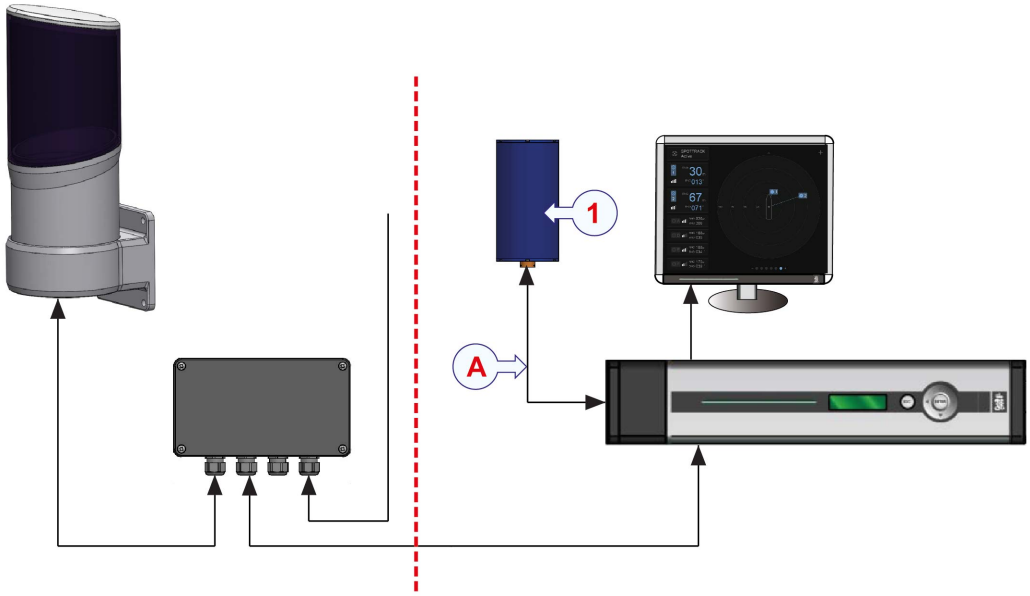
Specific settings for MRU Z (MP arm <10 m), MRU 3 (MP arm <20 m)

- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)**, **105(PosMonD)** as float.

- Monitoring point = sensor mounting bracket reference point.
- Heave filter type **Hydrographic survey**.
- See the *MRU Installation Manual* for configuration of heave filter **period** and **damping**.

Specific settings for MRU D, MRU Z (MP arm >10 m), MRU 2, MRU 3 (MP arm >20 m)

- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)** as float.



1 MRU sensor unit

A Cable from MRU sensor unit to MRU port on Control Unit

Related topics

- *Sensor Unit reference point* on page 19

5th generation MRU settings

A 5th generation MRU is recognized by its gray colour and serial number above 20000. The MRU must be connected to the SpotTrack network (CU and sensor) via a dedicated switch. This switch is not delivered by Kongsberg Seatex AS. Alternatively, the MRU can be connected directly to the Control Unit via Ethernet or the **MRU** serial port.

General settings, MRU connected to Ethernet port on Control Unit

If the MRU is connected to an Ethernet port on the Control Unit, the following general settings are compatible with default settings on the sensor and the Control Unit.

- Reconfigure MRU IP address from default to:
  - **192.168.2.210** if connected via a switch to LAN 3
  - **192.168.3.210** if connected directly to LAN 4

- Ethernet interface, UDP broadcast to remote port **7551**.
- Interval **20 ms**.

General settings, MRU connected to MRU serial port on Control Unit

If the MRU is connected to the MRU serial port on the Control Unit, the following general settings are compatible with default settings on the Control Unit.

- Serial interface **COM 1** with baud rate **57600** and signal **RS-422**.
- Interval **20 ms**.

Specific settings for MRU E, MRU H, MRU 3 (MP arm <20 m), MRU 5, MRU 5+

- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)**, **326(PosMp1_D)**, **65(Yaw)** as float.

  (Requires MRU software version 5.02.01 or newer).
- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)**, **326(PosMp1_D)** as float.

  (If the MRU software version is older than 5.02.01).
- Location **Monitoring Point 1**.
- Monitoring point = sensor mounting bracket reference point.
- Heave filter type **Hydrographic survey**.
- See the *MRU Installation Manual* for configuration of heave filter **period** and **damping**.

Specific settings for MRU 3 (MP arm >20 m)

- Output **MRU normal** with token **36** and variables **63(Roll)**, **64(Pitch)**, **65(Yaw)** as float.

  (Requires MRU software version 5.02.01 or newer).
- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)** as float.

  (If the MRU software version is older than 5.02.01).

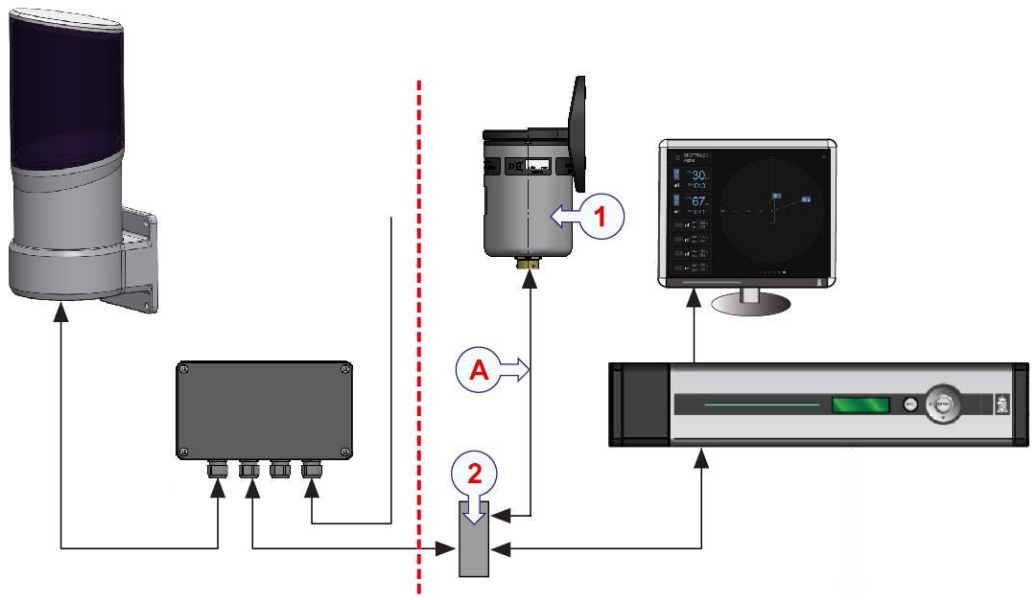
Specific settings for MRU D, MRU 2

- Output **MRU normal** with token **35** and variables **63(Roll)**, **64(Pitch)** as float.

Note

If heave is used and the SpotTrack sensor is to be used in several mounting brackets on the vessel, the MRU has to be reconfigured with correct monitoring point when the sensor is moved to a new bracket. Alternatively, different UDP output channels with different monitoring points and remote UDP ports may be defined for each of these brackets. Then, if the sensor is moved to another bracket, the SpotTrack sensor can be configured to read the correct UDP port.

Recommended version with net switch is illustrated.



1 MRU sensor unit

2 Net switch

A Cable from net switch to MRU sensor unit

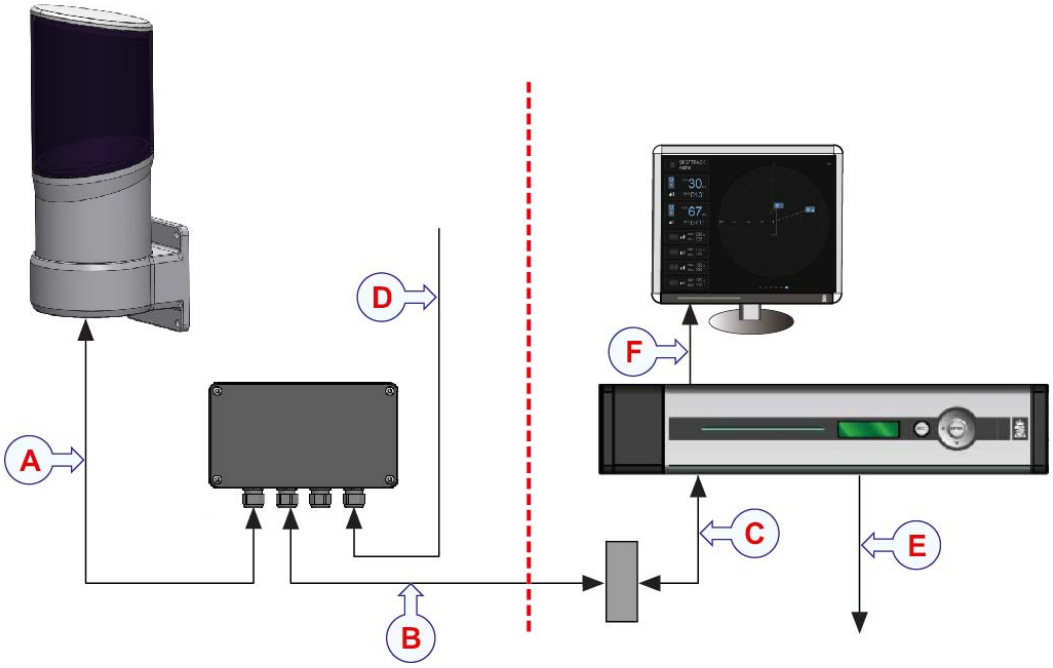
Related topics

- *Sensor Unit reference point* on page 19

Cable layout and interconnections

Cable plan

Cable plan for the standard SpotTrack system.



Related topics

- *SpotTrack system drawing* on page 72

List of cables

List for cables for the standard SpotTrack system.

A — SpotTrack Sensor Unit to junction box (field)

A 3–metre power and Ethernet cable. The cable is attached to the Sensor Unit.

B — Junction box (field) to patch panel

An Ethernet cable. Draka ToughCat5e_S_FTP, Draka ToughCat7_S_FTP or similar can be used. This cable is not by default delivered by Kongsberg Seatex AS.

C — Patch panel to Control Unit

A shielded patch cable, CAT5e or better. This cable is included in the sensor power kit delivered by Kongsberg Seatex AS.

D — Junction box (field) to power supply

A power cable. Draka TI(I) 250 V, Shipline, 1 Quad 0.5 mm^2, halogen free or similar cable for exposed maritime use. This cable is not by default delivered by Kongsberg Seatex AS.

E — Control Unit to DP

A serial cable. Type 02 x 2-00.50 mm^2 FRZH (Flame retardant, zero halogen) Shielded 90 °C 250 V. This cable is not delivered by Kongsberg Seatex AS.

F — Control Unit to monitor

A standard VGA cable. This cable is not delivered by Kongsberg Seatex AS.

Configuration

This chapter describes the parameters which have to be set before the SpotTrack system can be put to use.

Select the **System menu** button,  , in the top right corner of the **Main** view to open the **System** menu. When the **System** menu is displayed, this button changes to a **Close** button,  . Select the **Close** button to close the **System** menu.

Selecting configuration parameters

There are three ways to select a configuration parameter:

- Selecting a button directly
- Selecting from a drop-down menu
- Editing in text boxes

Displaying the keypad

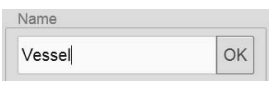
If you do not use a mouse and keyboard you can select to display a keypad on the screen for entering values.

1 Select the **System** menu →**Settings** →**Display**

2 Select **Display keypad** ON or OFF.

Editing in text boxes

Select the **Pencil**  next to the box to modify the value. Select **OK** when the correct information is entered.



Setting the mounting bracket parameters

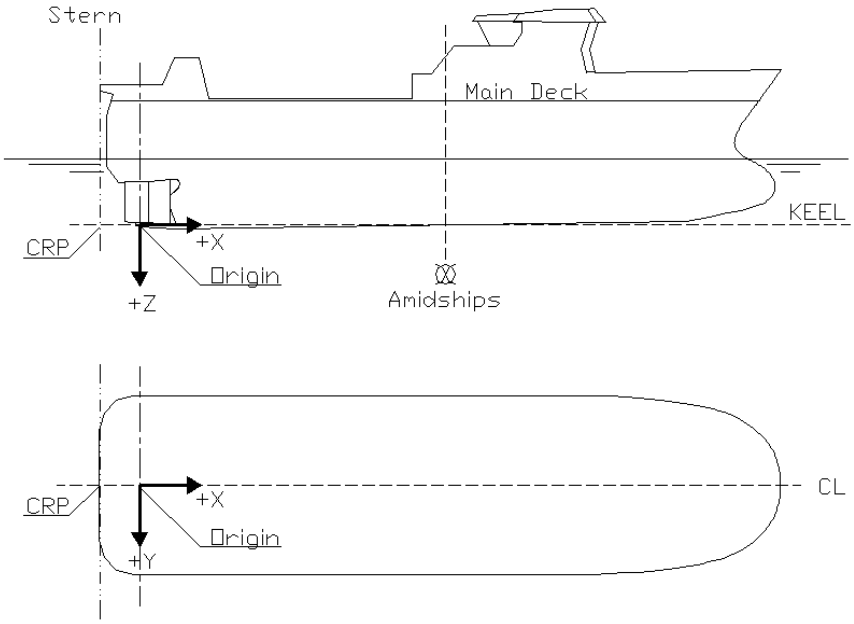
All point locations in the configuration refer to the survey origin. The location of the origin is defined using distance from stern, center line and keel (often referred to as the CRP).

Note

The coordinate reference point (CRP) is defined to be in the intersection between stern, longships centre line and keel. In case the keel is not parallel with the base line, the reference for CRP is where the keel crosses the vertical section amidships.

The mounting bracket orientation relative to the vessel heading has to be defined.

The mounting bracket location is entered relative to a survey reference point (Origin). The origin is defined relative to CRP (Coordinate Reference Point). The location along the X axis (centre line) is positive towards the bow. The location along the Y axis is positive towards starboard, and the location along the Z axis is positive downwards.



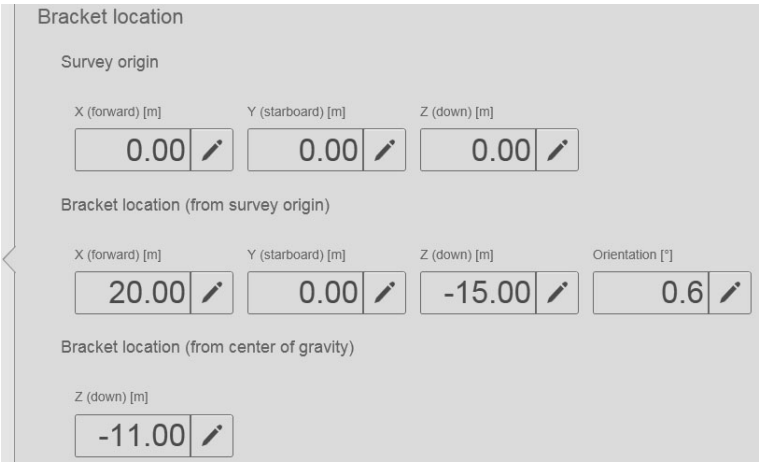
Procedure

1 Select the **System menu** button in the upper right corner of the **Main** view.

2 Select **Settings →Bracket**.

3 Locate the **Survey origin** text boxes. Type the survey origin coordinates.

In case a survey report is not available, the coordinates can all be 0.00.



4 Locate the **Bracket location** text boxes. Type the mounting bracket orientation in degrees (-180 to 180) relative to the vessel heading in the **Orientation** text box.

For example, when the mounting bracket orientation is directly starboard, type 90.

5 Type the bracket location values into the corresponding text boxes.

6 Type the vertical bracket location from the centre of gravity into the text box.

7 Close **Settings** when finished.

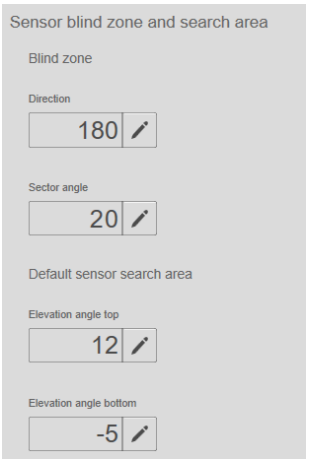
Related topics

- *Measuring the mounting bracket orientation* on page 19
- *Measuring the mounting bracket location* on page 20

Setting the blind zone

Walls or other large items on the vessel may cause reflections that are of no interest to the SpotTrack operator. In this case, a blind zone shall be defined for the sensor.

The Sensor Unit blind zone is measure relative to the Sensor Unit/bracket.



Procedure

1 Select the **System menu** button in the upper right corner of the **Main** view.

2 Select **Settings →Sensors**.

3 Type the wanted **Direction** and **Sector angle** for the blind zone.

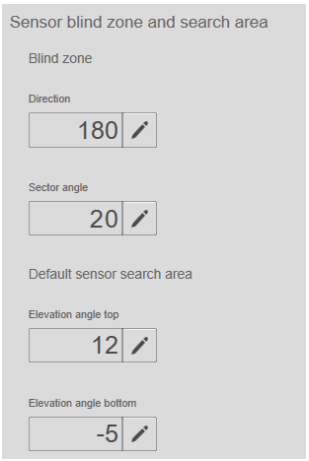
Example 1 Blind zone

A 20-degree blind zone appears behind the sensor. Then enter 180 as **Direction** and 20 as **Sector angle**.

4 Close **Settings** when finished.

Setting the sensor search area

The sensor's vertical search sector has to be defined. No reflector will be found or tracked outside this area. The values configured here are the values used when resetting the search area to default during operation.



Procedure

1 Select the **System menu** button in the upper right corner of the **Main** view.

2 Select **Settings →Sensors**.

3 Type the wanted **Elevation angel top** and the **Elevation angle bottom**.

4 Close **Settings** when finished.

Related topics

- See section on *Changing the sensor search area* in the *SpotTrack operator manual*, *References* on page 86.

Setting up the DP interface

The **DP interface settings** controls output from the SpotTrack system to a DP.

Context

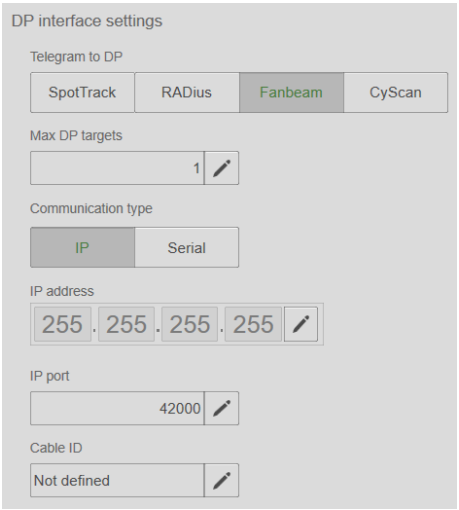
Note

*The default serial communication parameters are 9600 baud, no parity, 8 data bits and 1 stop bit. This can be modified in the **Advanced Configuration SpotCore** application. Please contact Customer Support for directions on how to change these parameters if needed.*

Note

The Fanbeam MDL message without checksum has to be chosen through the Advanced Configuration SpotCore application. Select Root –> Communications –> DataIf –> TelegramOutput –> TelegramOut1. Set the value of the Output field to 7. To make it clear which telegram is selected, write Fanbeam MDL message without checksum in the Description field.

Procedure

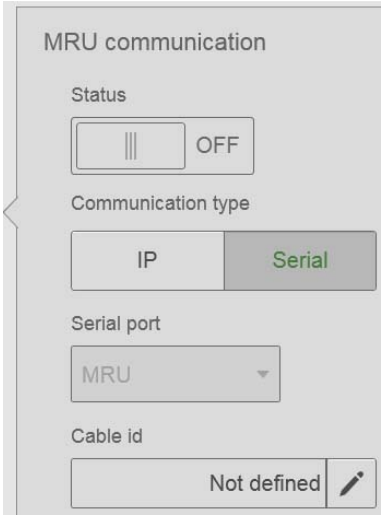


1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →DP**.
3. Select the desired telegram output by selecting the corresponding button under **Telegram to DP**.
4. Set the maximum number of reflectors in the **Max DP targets** text box.
5. Select the desired communication type (IP or Serial) by selecting the corresponding button under **Communication type**.
6. If **Serial** is selected, select the desired COM port from the drop-down list. The displayed port names correspond to the labels at the rear of the Control Unit.
7. If **IP** is selected, enter the desired IP address. Then select the designated **IP port** in the range 1024 to 65535.

8. The **Cable ID** box is optional, intended for installation documentation.
9. Close **Settings** when finished.

Setting up the MRU

The MRU port has to be defined if an MRU sensor unit is connected. The **Status** ON/OFF button either enables or disables reading of MRU data.



Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →MRU**.
3. Select the wanted communication type, **IP** or **Serial**.
4. If **IP** is selected, type the MRU port used for the current SpotTrack sensor location.
5. If **Serial** is selected, select serial port from the drop-down list.
6. Close **Settings** when finished.

The **Cable ID** box is optional, intended for installation documentation.

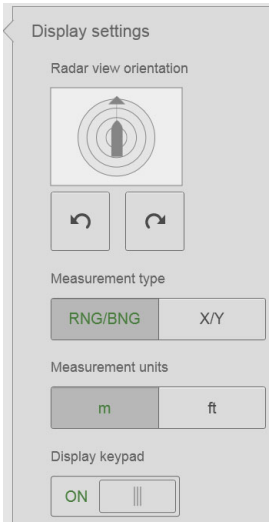
Setting up the display

The orientation of the vessel in the **Radar** view can be changed in steps of 90 degrees by selecting the **Left** or **Right** arrows.

The measurement types which can be selected are **RNG/BRG** (range and bearing) or **X/Y** (cartesian coordinates relative to vessel heading). When measurement type **X/Y** (cartesian coordinates) is selected, the absolute value is displayed. Sign is indicated with AFT/FWD or PRT/STB.

The measurement units which can be selected are **m** (metres) or **ft** (feet).

If you use a touch screen, setting **Display keypad** to ON will enable an on-screen keypad for number entry.



Selecting Radar view orientation

You can select the orientation of the **Radar** view to 4 different orientations. This can be done to fit how the display is installed on the vessel.

Procedure

1. Select **System menu**, +, **→Settings →Display**
2. Select the **Right** or **Left** arrow to change the vessel orientation in steps of 90 degrees.

Selecting measurement type

The SpotTrack system supports presentation of the distance to reflectors in both polar and cartesian coordinates.

Context

The **Transponder list** reflects how the measurement types are presented.

Note

*The **Radar** view is not affected by this setting.*

Figure 1 Measurement type RNG/BNG

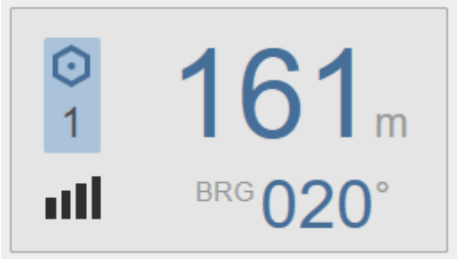
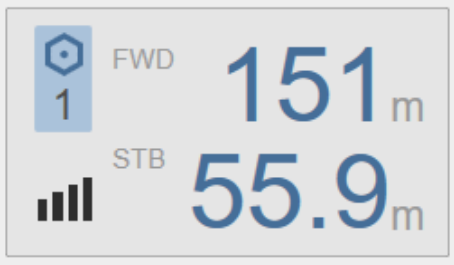


Figure 2 Measurement type X/Y



Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →Display**.
3. Select **RNG/BRG** to select range and bearing as measurement type or select **X/Y** to select cartesian coordinates relative to vessel heading as measurement type.

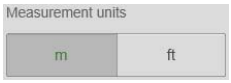
Selecting measurement unit

You can select which measurement unit you want to use in the display.

Procedure

1. Select **System menu**, +, **→Settings →Display**

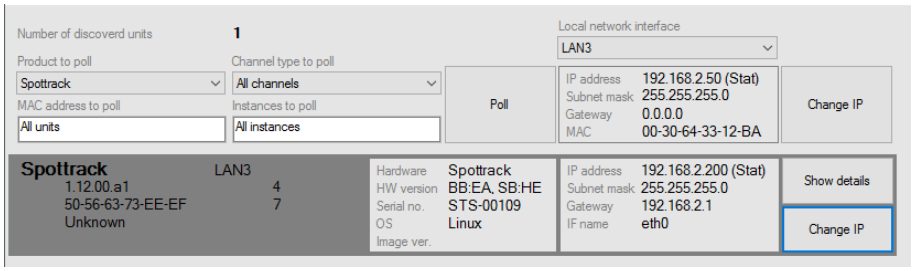
2 Select **m** to select metres as measurement unit or select **ft** to select feet as measurement unit.



Setting the parameters for network communication

Setting the SpotTrack sensor IP address

The Sensor Unit IP address must be set manually for the Sensor Unit to communicate with the Control Unit.



Procedure

1 Select the **System menu** button in the upper right corner of the **Main** view.

2 Select **Tools →Network discovery**.

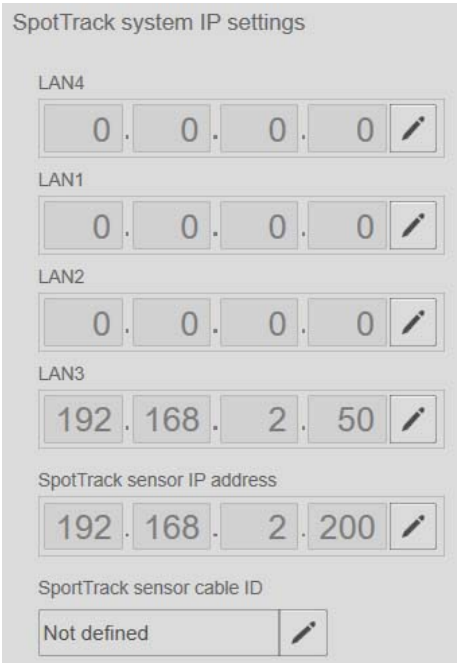
3 Select **Poll** and the sensor should show up in the list.

4 Select **Change IP** to the sensor IP address.

The default sensor IP address is **192.168.2.200**. When the sensor is installed, change this address to **192.168.2.201**. This is to avoid IP address conflicts if another sensor is connected to the network.

Connecting the Control Unit to the SpotTrack sensor

The Control unit IP address (LAN 3) is read-only and shows the IP address of the network interface through which data are received on the Control Unit.



The **SpotTrack system IP address** to which the Control Unit connects, can be changed if required. In the figure, a manually selected address is indicated. The LED in the **Active** button on the **System** menu will light up when successfully connected to the SpotTrack sensor. The default sensor IP address is: **192.168.2.200**.

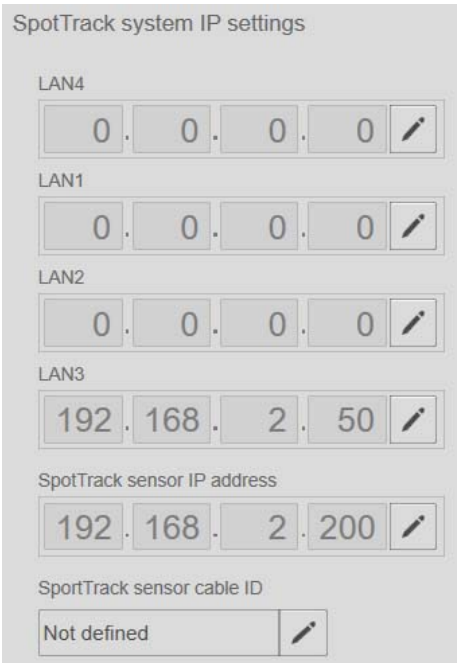
The **SpotTrack sensor cable ID** box is optional, intended for installation documentation.

Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →Network**.
3. For LAN 3, type the SpotTrack sensor IP address.
4. The **Cable ID** box is optional, intended for installation documentation.
5. Close **Settings** when finished.

Setting up the Control Unit for remote connection

The LAN 4 network port on the Control Unit is used for K-IMS communication for remote maintenance and support with a direct connection to a K-IMS router. The default IP address is: 172.20.35.50.

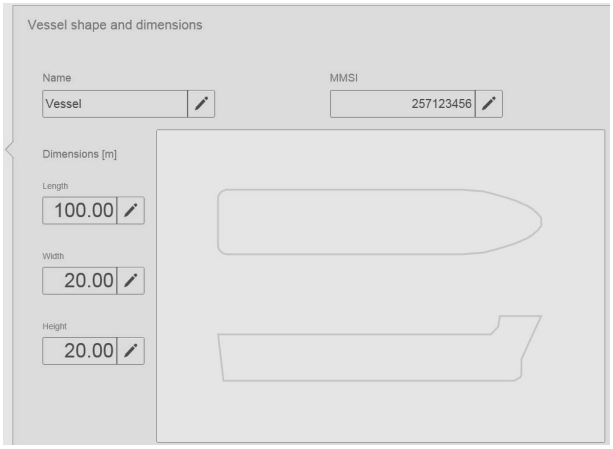


Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →Network**.
3. For LAN 4, type the K-IMS router IP address.
4. Close **Settings** when finished.

Setting vessel shape and vessel dimensions

Under **Vessel** you can enter a vessel name, a vessel MMSI and vessel dimensions for a correct scaling of the vessel image in the **Radar** view.



Entering vessel name and MMSI

Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Settings →Vessel**.
3. Select the **Pencil** to modify the value.
4. Type the vessel name and a vessel MMSI.
5. Select **OK** to confirm.

Entering vessel dimensions

Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select the **Settings →Vessel**.
3. Select the **Pencil** to modify the value.
4. Type the value for **Length**, **Width** and **Height**.
5. Select **OK** to confirm.

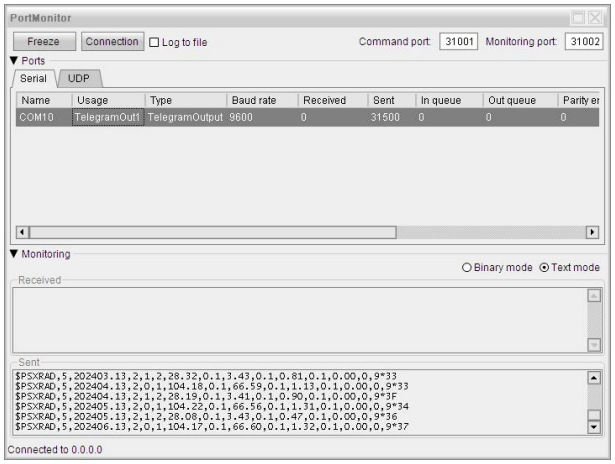
Verifying data communication

Tools holds the diagnostic tools. Under **Diagnostics** you will find the **Port Monitor** tool. This is an advanced tool used to diagnose how data are transported in the SpotTrack system.

Displaying sensor raw data

Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select **Tools →Diagnostics →Port Monitor**.
3. Serial interfaces are displayed in the **Serial** tab and IP interfaces in the **UDP** tab.
4. Select the desired interface, then observe that received and sent information through that interface is displayed in the lower windows.
5. To avoid displaying non-ASCII characters, select **Text mode**. **Binary mode** is the default.
6. Select **Freeze** to stop updating the data. Then, select **Unfreeze** to continue updates.



Checking the system functionality

A functional test can verify if the system works as intended.

Procedure

1. Place a test reflector in a known location on the vessel

2 Calculate the correct range and bearing from the mounting bracket to the test reflector from vessel drawings

3 Read the measured range and bearing to the test reflector from the SpotTrack **Reflector list**.

4 Check the measured values against the calculated values.

Checking the sensor serial number, product and software version

Select **About** under **Settings** to see the SpotTrack serial number, the product version and the software version installed on the system.

Replacing or moving the sensor

Note

If the sensor is replaced with a new one, or moved to another location on the vessel, it has to be re-configured.

These settings have to be re-configured if the sensor is replaced or moved:

- The mounting bracket orientation.
- The blind zone.
- The mounting bracket location.
- The MRU UDP if an MRU sensor is connected.

Note

If the sensor is replaced, a full software upgrade from a USB stick is recommended to ensure that the software versions on the SpotTrack sensor and the Control Unit are compatible

Related topics

- *Setting the mounting bracket parameters* on page 50
- *Setting the blind zone* on page 51
- *Setting up the MRU* on page 54

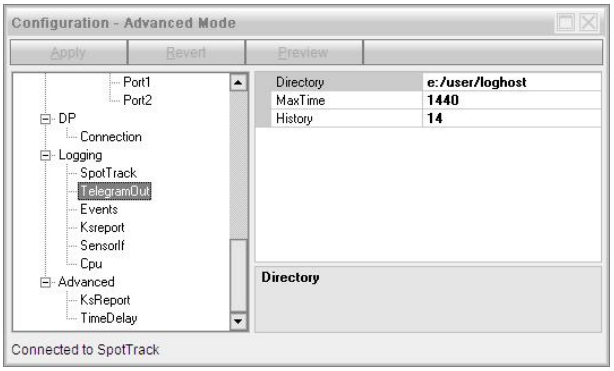
Automatic logging

The SpotTrack Control Unit will automatically log data that may serve as documentation or help to diagnose the cause of possible problems.

There are 6 categories of log files. All of these have a **History** variable, defining the maximum age of the log files created.

Each file has a length of **MaxTime** minutes.

The default logging interval is 21 days.



Changing the log length

Procedure

1. Select the **System menu** button in the upper right corner of the **Main** view.
2. Select the **Tools →Advanced Configuration SpotCore**.
3. Locate **Root→Logging** and select the wanted log category.
4. Modify the **History** and **MaxTime** values.
5. When finished, select **Apply** and confirm changes before closing the application.

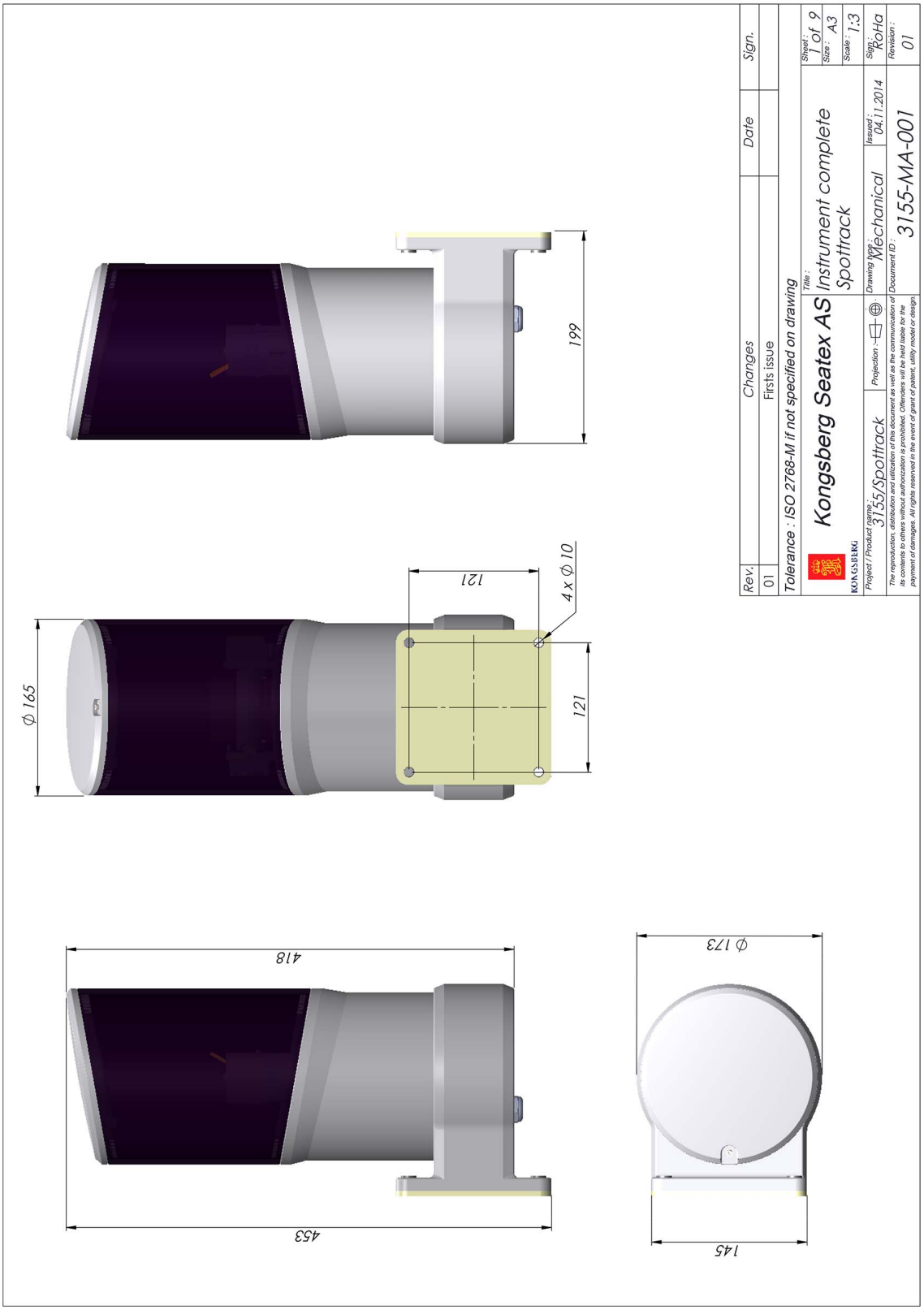
Drawings

This chapter contains outline drawings showing mechanical dimensions of the Sensor Unit, the mounting bracket, the junction box and the Control Unit.

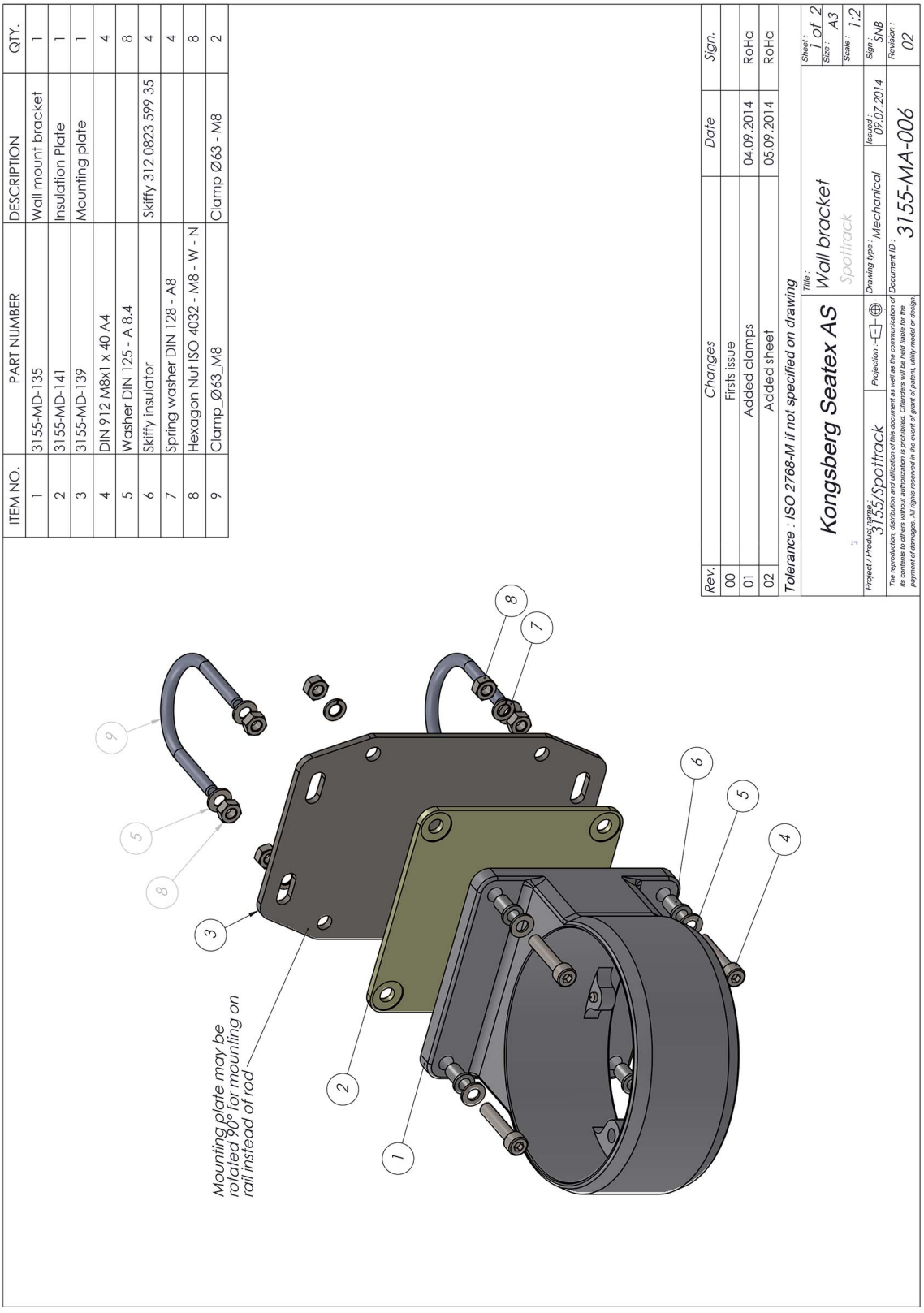
Note

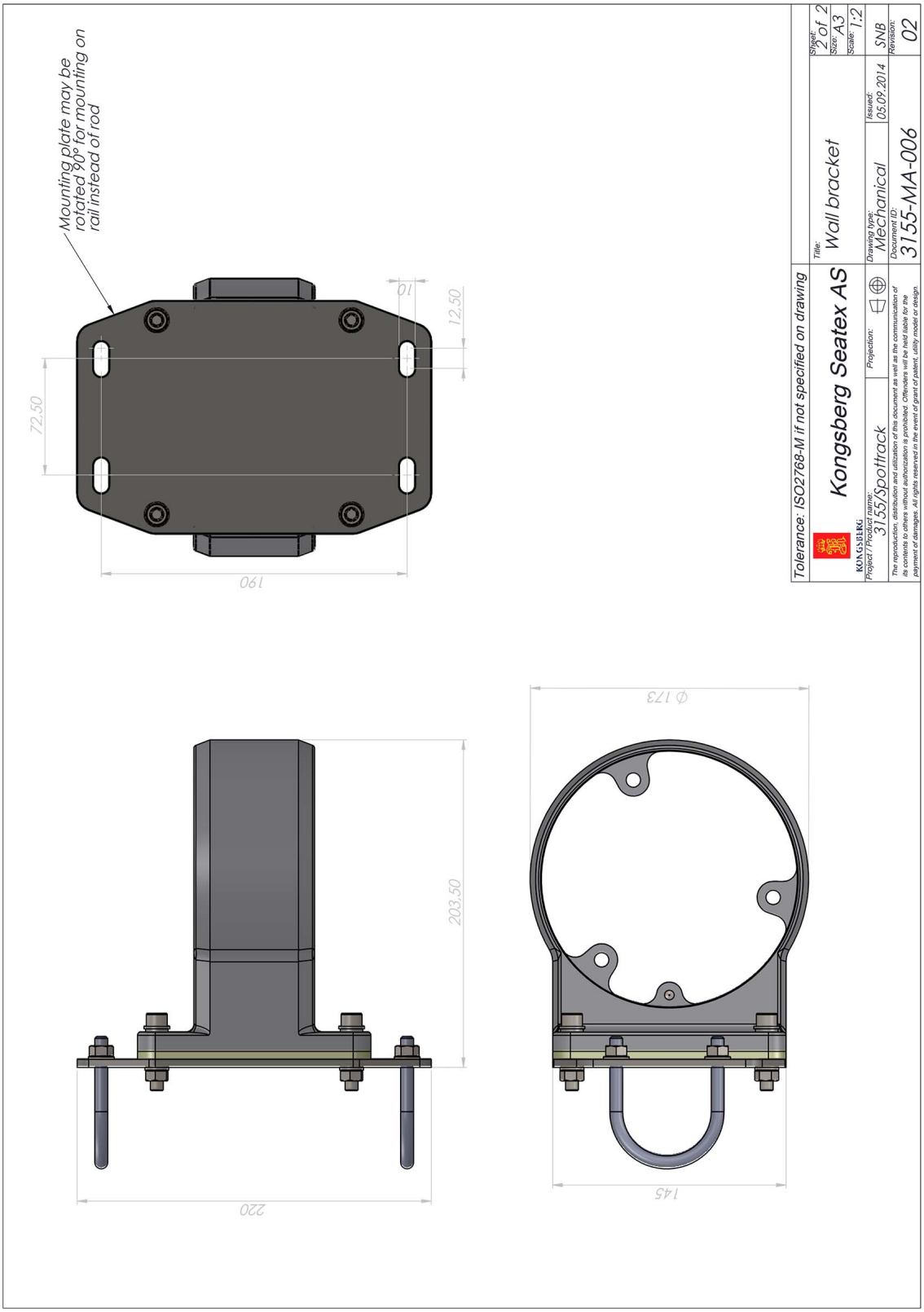
The drawings are not to scale. To-scale drawings are available on request.

Sensor Unit dimensions



Mounting bracket, wall, dimensions




Mounting plate may be rotated 90° for mounting on rail instead of rod
72,50
10
12,50
190
203,50
220
Ø 173
145
Tolerance: ISO2768-M if not specified on drawing
Kongsberg Seatex AS
KONGSBERG
Project / Product name: 3155/Spotlrack
Projection:
Title: Wall bracket
Drawing type: Mechanical
Document ID: 3155-MA-006
Sheet: 2 of 2
Size: A3
Scale: 1:2
Issued: 05.09.2014
SNB
Revision: 02
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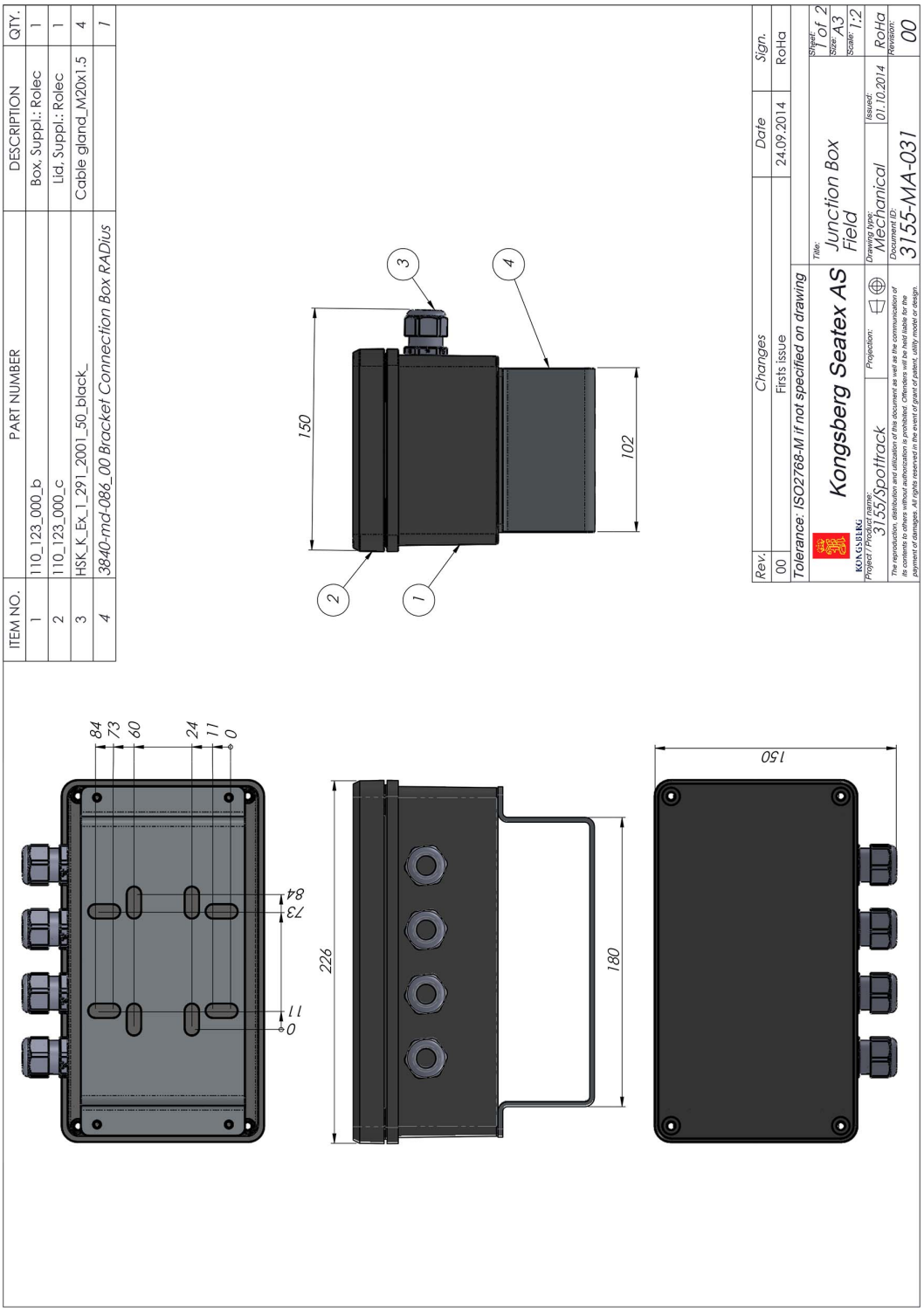
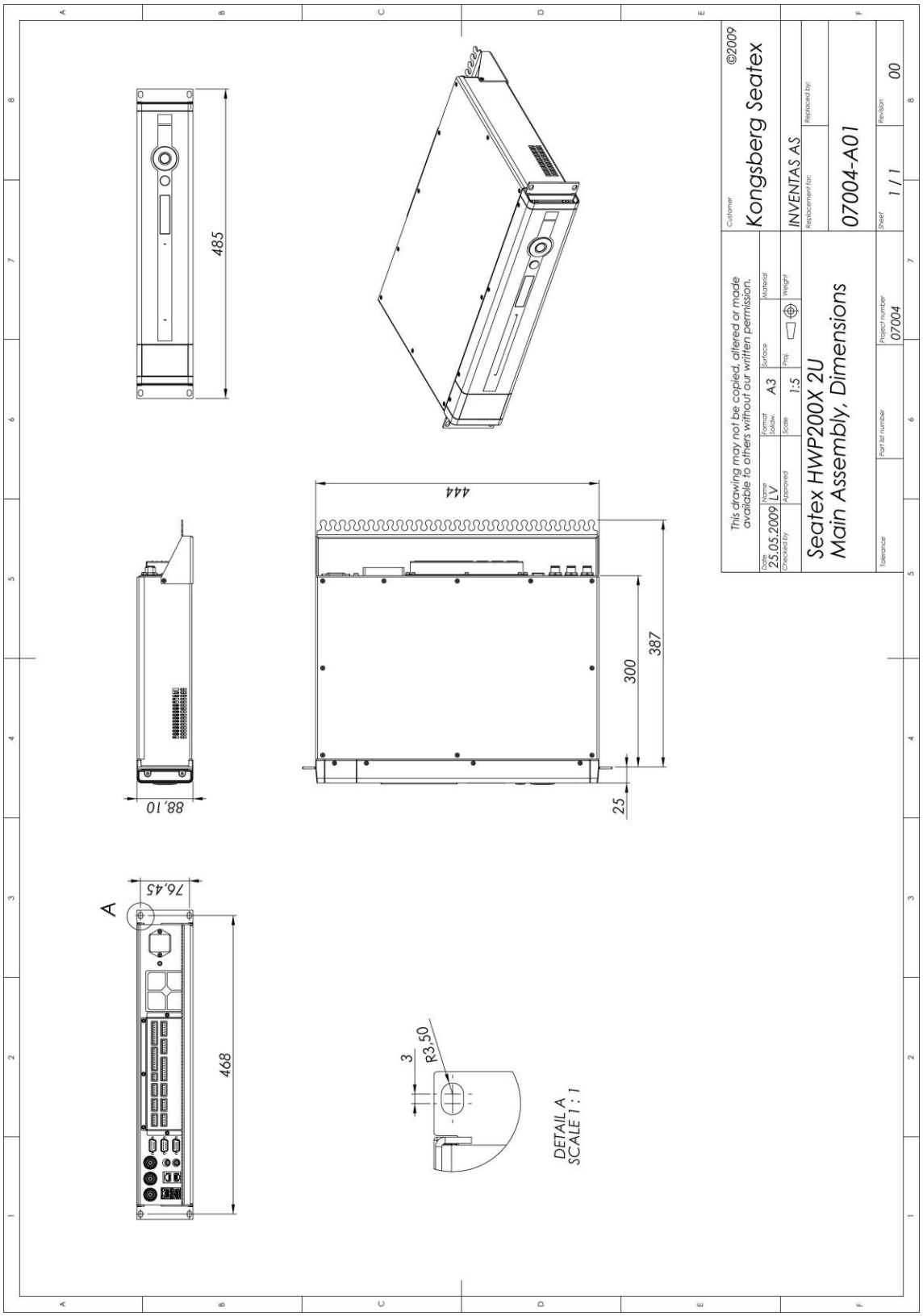
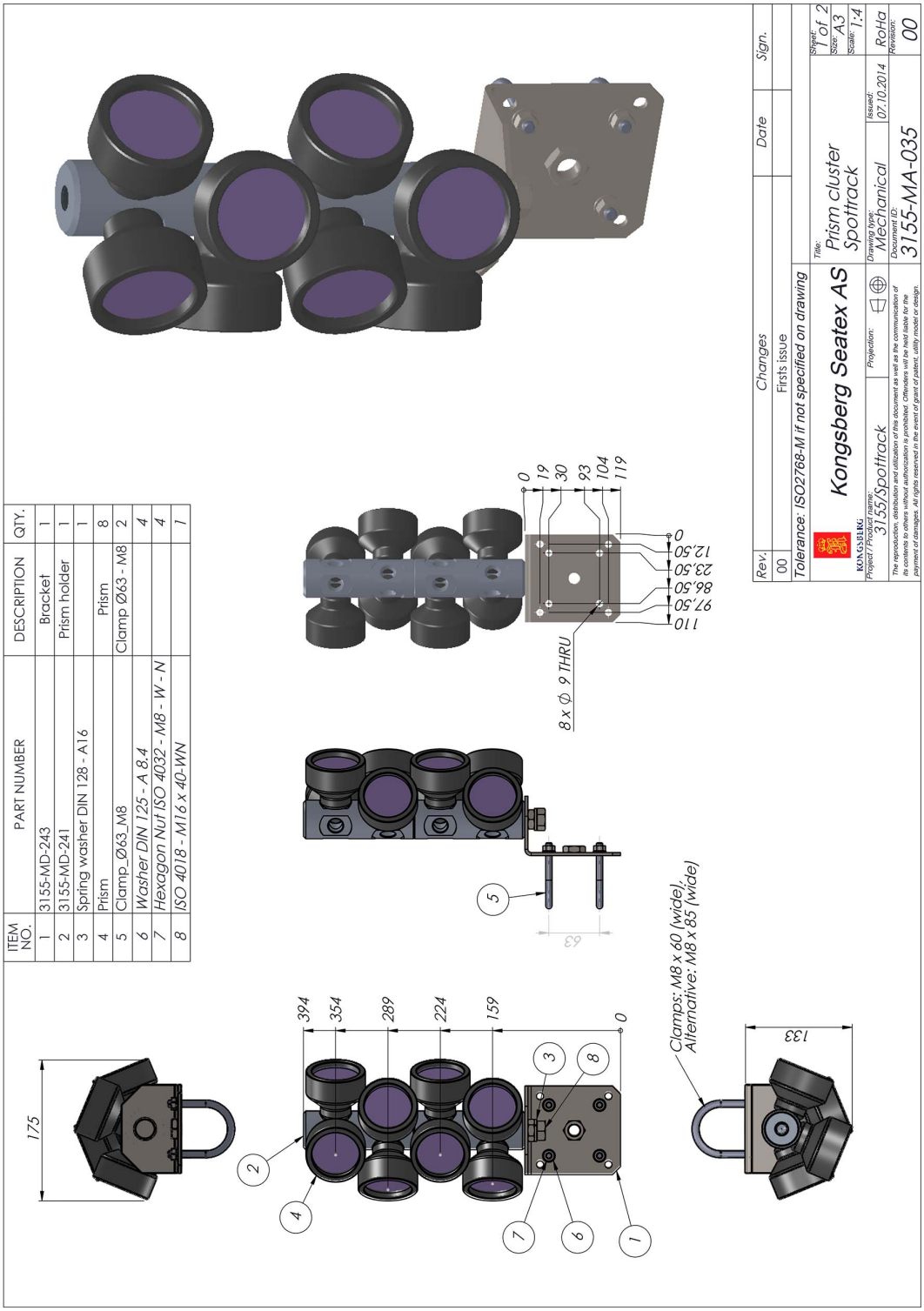
Junction box (field) dimensions

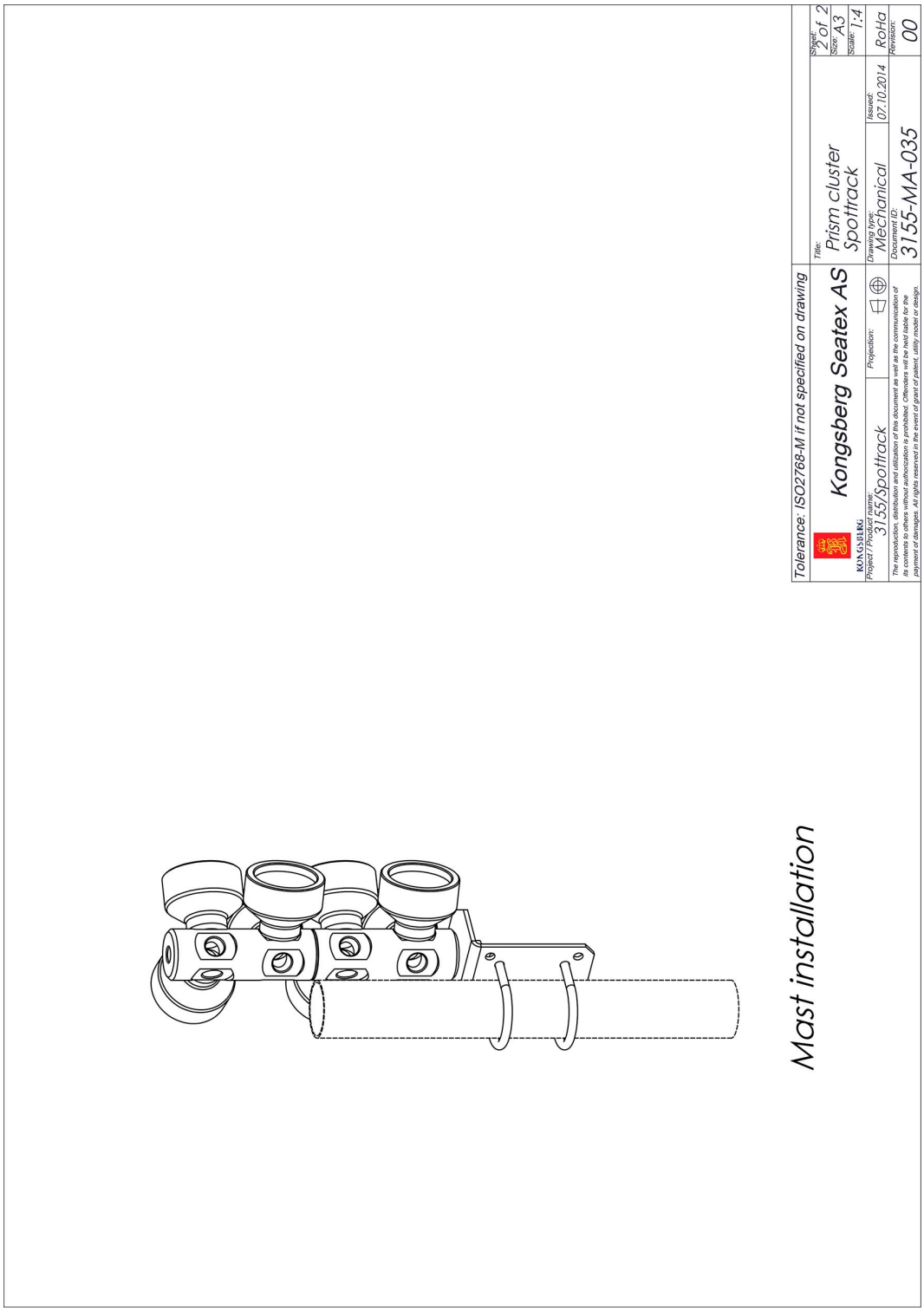


Control Unit dimensions



Prism cluster dimensions




Tolerance: ISO2768-M if not specified on drawing
KONGSBERG
Kongsberg Seatex AS
Project / Product name:
3155/Spottrack
Projection:
Title:
Prism cluster
Spottrack
Drawing type:
Mechanical
Issued:
07.10.2014
Document ID:
3155-MA-035
Sheet:
2 of 2
Size: A3
Scale: 1:4
RoHa
Revision:
00
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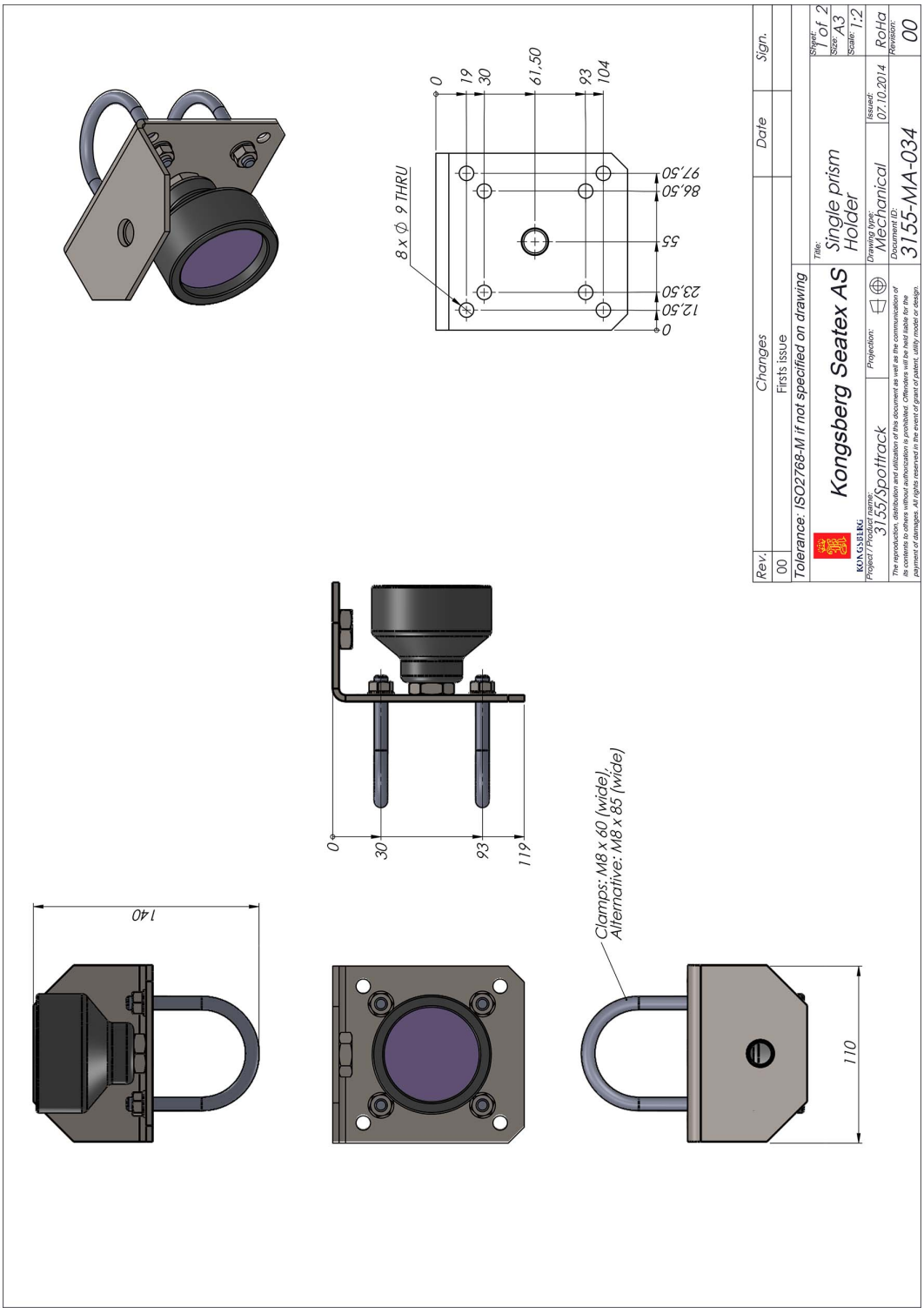
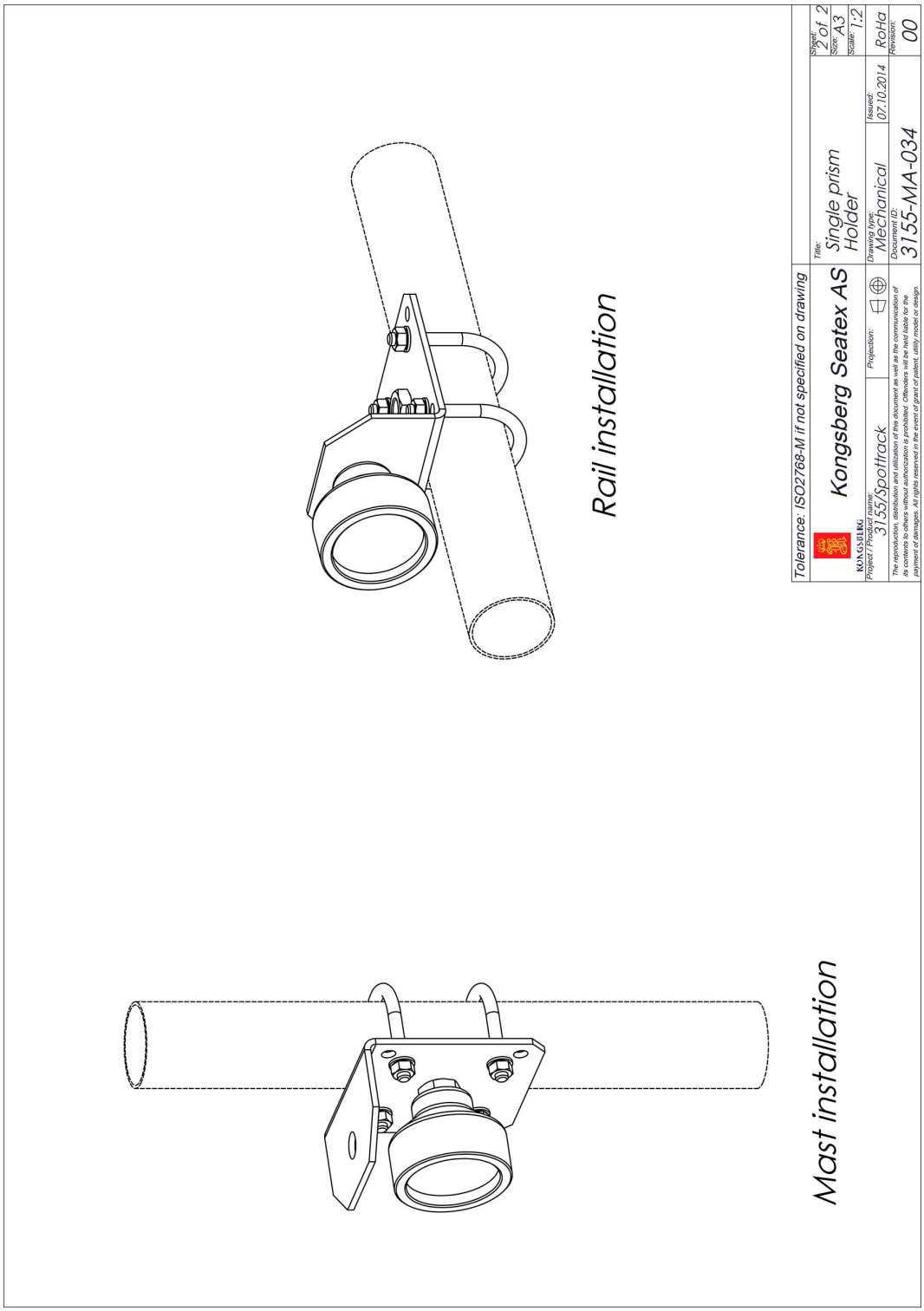
Mast installation

Single prism holder dimensions




Rail installation
Mast installation
Tolerance: ISO2768-M if not specified on drawing
KONGSBERG
Kongsberg Seatex AS
Project / Product name:
3155/Spottrack
Projection:
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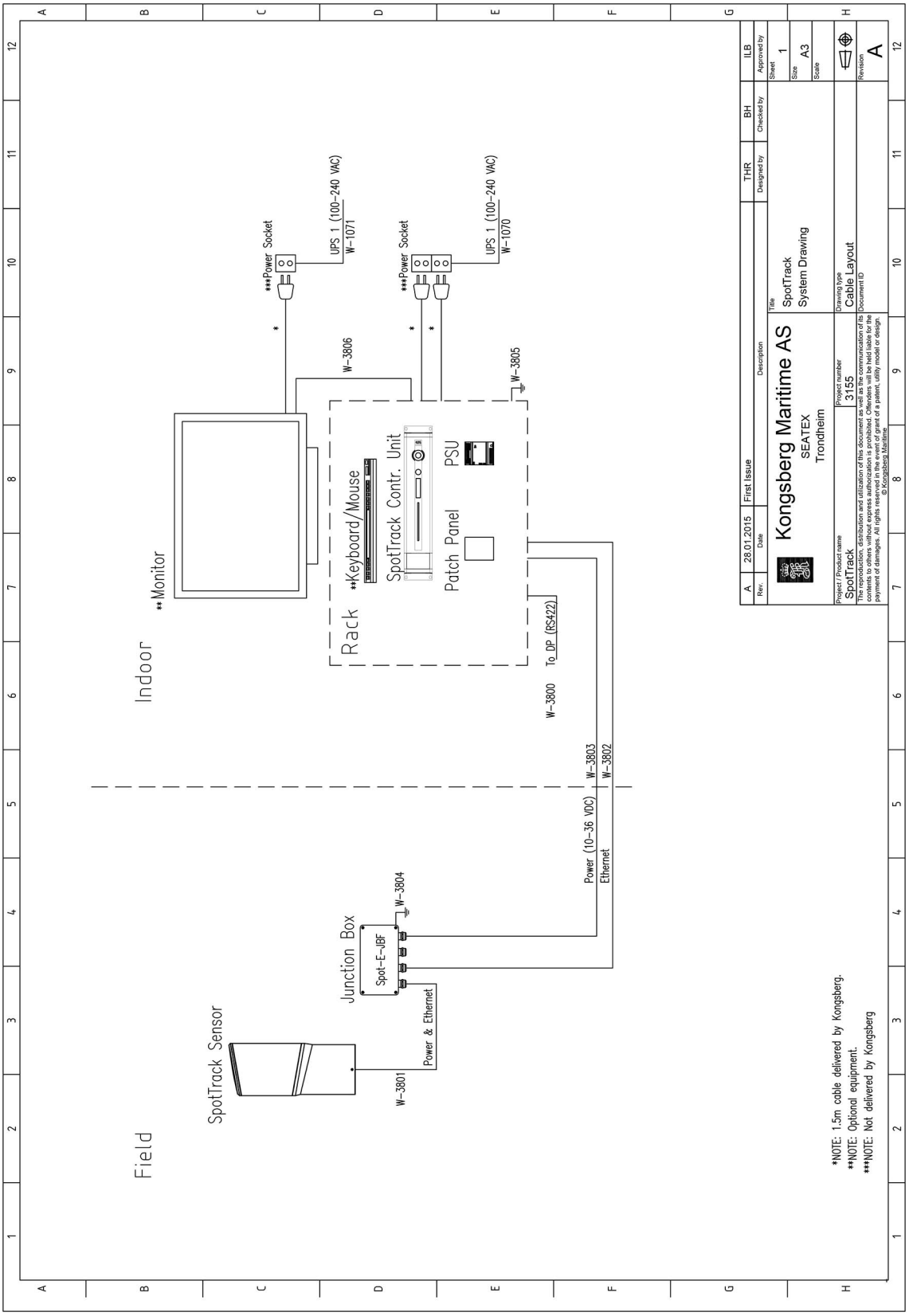
Title:
Single prism Holder
Drawing type:
Mechanical
Document ID:
3155-MA-034
Issued:
07.10.2014
Sheet:
2 of 2
Size: A3
Scale: 1:2
RoHa
Revision:
00

SpotTrack system drawing



Technical specifications

Performance specifications

Laser classification	Eye Safe Class 1 IEC 60825
Laser wavelength	905 nm
DP range prism reflector	10 to 1500 m[2]
DP range tape reflector	10 to 350 m[3]
Horizontal pos. accuracy (2 σ)	1 m @ 1000 m range
Bearing accuracy (2 σ)	1 mrad
Vertical angular accuracy (2σ)	0.2º
Vertical angular coverage forward	-40º to 60º
Vertical angular coverage aft	-26º to 54º
Horizontal angular coverage	360º
Scanning frequency	1 Hz

Weights and outline dimensions

Sensor Unit

Type	Spot-E-Sensor_01
Circumference	Ø 173 with vertical bracket
Height	453 mm
Weight	6 kg

2. Depending on reflector type, size and atmospheric conditions.
3. Depending on reflector type, size and atmospheric conditions.

Control Unit

Height	88.1 mm (2U)
Width	485 mm (19")
Depth	Min 357 mm (including connectors on rear panel) and max 412 mm (including cable relief bracket)
Weight	5.4 kg

Junction box (field)

Type	Spot-E-JBF_01
Length	226 mm
Width including connectors	150 mm
Height without bracket	90 mm
Height with bracket	150 mm
Weight including bracket	2.5 kg

Power specifications

Sensor Unit

Type	Spot-E-Sensor_01
Input voltage	24 V DC +/- 1 V, supplied by the junction box
Power consumption	Max. 30 W

Control Unit

Voltage	100 – 240 V AC, 50/60 Hz
Power consumption	Max. 60 W
Batteries	None, connection to uninterruptible power supply (UPS) recommended

Junction box (field)

Type	Spot-E-JBF_01
Voltage	12 to 35 V DC
Power consumption	Max. 3 W

Environmental specifications

Sensor Unit

Operating temperature range	-25 °C to +55 °C
Storage temperature range	-40 °C to +70 °C
Operating humidity	100 %
Storage humidity	90 %
Enclosure material	Anodised aluminium and hard coated acrylic
Enclosure protection	IP 66
EMC compliance	IEC 60945/EN 60945

Control Unit

Enclosure material	Aluminium
Operating temperature range	-15 °C to +55 °C [4]
Recommended operating temperature	Room temperature (+20 °C)
Storage temperature range	-20 °C to +70 °C [5]
Operating humidity	Max. 95 % non-condensing
Storage humidity	Less than 55 %
Ingress protection front	IP 42
Ingress protection rear	IP 21
Electromagnetic compatibility (immunity/emission)	IEC 60945/EN 60945
Vibration	IEC 60945/EN 60945

Junction box

Type	Spot-E-JBF_01, Spot-E-JBF-Fan, Spot-E-JBI-Fan
Enclosure material	Aluminium
Operating temperature range	-25 °C to +70 °C
Storage temperature	-25 °C to +70 °C
Ingress protection	IP 66

4. Operating temperature up to +55 ºC for 10 hours.
5. Recommended long term storage temperature range between +5 to +35 ºC.

Cable specifications

Recommended cables.

Power and Ethernet cable

Type	Lapp, Unitronic, FDCP, 6 x 2 x 0.25 mm^2
Connectors	Pigtail and Molex 12–pin

Ethernet cable

Type	Draka ToughCat7_S_FTP or similar

Power cable

Type	Draka TI (I) 250V, Shipline, 1 Quad 0.5 mm^2, halogen free or similar cable for exposed maritime use

Serial cable

Type	02 x 2 – 00.50 mm^2, FRZH (Flame retardent, zero halogen), shielded, 90 °C, 250 V

VGA cable

Type	Standard VGA cable

External interfaces

Sensor Unit

Serial ports	1 RS-422
Ethernet/LAN	1

Control Unit

Serial ports	6 non-dedicated isolated ports, RS-232 or RS-422 [6] Isolated COM1 and COM2, 9-pin DSub, RS-232
Baud rate	Up to 115 200 bytes/sec
LAN	4 Ethernet ports
USB	3 ports, 1 in front and 2 in rear

6. Number of serial ports may be expanded by using a serial port extender.

Product safety specifications

Sensor Unit

Electrical safety compliance	IEC 61010-1/EN 61010-1
Eye safety compliance	IEC 60825

Control Unit

Electrical safety (LVD)[7]	IEC 61010-1/EN 61010-1

Compass safe distance

Observe the physical distance to the compass if you place the Control Unit on the bridge as a stand-alone unit. These measurements apply to the unit mounted in a 6U rack.

Standard compass	• 200 cm – non-energized • 280 cm – non-energized after magnetisation • 200 cm – energized and operating
Other compass	• 130 cm – non-energized • 190 cm – non-energized after magnetisation • 130 cm – energized and operating

Note

If the unit is placed in a larger rack, please observe the compass safe data for that specific rack. If no such data are available, the compass safe distance is 5 metres.

Telegram types

SpotTrack message

Format

```
$PSXST,n,rrrr.rr,a.a,bbb.bb,s.ss,SS*cc
```

1 **n** = Reflector DP ID

2 **rrrr.rr** = Horizontal distance in meters, decimal centimeters

7. This equipment is intended for professional use only.

3 **a.a** = Distance accuracy estimate. Set fixed to 0.1

4 **bbb.bb** = Bearing to reflector 000.00 to 359.99 degrees

5 **s.ss** = Bearing accuracy estimate. Set fixed to 0.05

6 **SS** = 09 – Valid Status

7 ***cc** = Computed checksum

8 **<cr>** = Carriage return

9 **<lf>** = Line feed

Example 2 SpotTrack message

$PSXST,1,0156.89,0.1,028.23,0.05,09*62

$PSXST,2,0906.41,0.1,079.25,0.05,09*64

PSXRAD message

Format

```
$PSXRAD,I,hhmmss.ss,nn,ss,id,rrrr.rr,aa.a,bbb.bb,ss.ss,±vv.vv,
ff.f,±dd.dd,sn,S*cc<cr><lf>
```

Format description

1 **I** = ID for sensor unit, default set to 5

2 **hhmmss.ss** = Time of position hour, minutes, seconds (local SpotTrack time — time since last boot

3 **nn** = Number of reflectors reported to DP

4 **ss** = Sequence number (multiple reflectors), range 0 – (number of reflectors reported to DP –1)

5 **id** = Reflector DP ID

6 **rrrr.rr** = Horizontal distance in meters, decimal centimetres

7 **aa.a** = Horizontal distance accuracy estimate. Set fixed to 0.1

8 **bbb.bb** = Bearing to reflector 0.00 to 359.99 degrees

9 **ss.ss** = Bearing accuracy estimate. Set fixed to 0.05

10 **±vv.vv** = Vertical angle to reflector (-90.0 - +90.0), the + sign is omitted when positive

11 **ff.f** = Vertical angle accuracy estimate. Set fixed to 1.0

12 **±dd.dd** = Not used

13 **sn** = Not used

14 **S** = 9 – Valid Status

15 ***cc** = Computed checksum

16 **<cr>** = Carriage return

17 **<lf>** = Line feed

Example 3 PSXRAD message

$PSXRAD,5,000516.27,2,0,1,70.80,0.1,14.87,0.1,0.41,0.1,0.00,0,9*05

$PSXRAD,5,000516.27,2,1,2,260.10,0.1,58.97,0.1,-2.29,0.1,0.00,0,9*15

Fanbeam MDL message

Standard telegram with checksum.

Format

```
nn rrrr.rr bbb.bb cc<cr><lf>
```

Format description

1 **nn** = Reflector DP ID

2 **rrrr.rr** = Horizontal distance in meters, decimal centimetres

3 **bbb.bb** = Bearing to reflector 000.00 to 359.99 degrees

4 **cc** = Computed checksum

5 **<cr>** = Carriage return

6 **<lf>** = Line feed

Example 4 Fanbeam MDL message

01 0070.80 014.87 14

02 0260.10 058.97 14

Fanbeam MDL message without checksum

Standard telegram without checksum.

Format

```
nn rrrr.rr bbb.bb <cr><lf>
```

Format description

1 **nn** = Reflector DP ID

2 **rrrr.rr** = Horizontal distance in metres, decimal centimetres

3 **bbb.bb** = Bearing to reflector 000.00 to 359.99 degrees

4 **cr** = Carriage return

5 **lf** = Line feed

Example 5 Fanbeam MDL message without checksum

01 0070.80 014.87

02 0260.10 058.97

CyScan Kongsberg message

Format

```
$PGNKM,n,rrrr.rr,a.a,bbb.bb,s.ss,SS*cc<cr><lf>
```

Format description

1 **n** = Reflector DP ID

2 **rrrr.rr** = Horizontal distance in meters, decimal centimetres

3 **a.a** = Distance accuracy estimate. Set fixed to 0.1

4 **bbb.bb** = Bearing to reflector 000.00 to 359.99 degrees

5 **s.ss** = Bearing accuracy estimate. Set fixed to 0.05

6 **SS** = 09 – Valid Status

7 ***cc** = Computed checksum

8 **<cr>** = Carriage return

9 **<lf>** = Line feed

Example 6 CyScan Kongsberg message

$PGNKM,1,0156.89,0.1,028.23,0.05,09*61

$PGNKM,2,0906.41,0.1,079.25,0.05,09*67

Detailed interface descriptions

RS-422 A and B signal definition

According to the following standard the signal state definitions are:

- IEC 61162-1. The idle, marking, logical 1, OFF or stop bit states are defined by a negative voltage on line A with respect to line B. The active, spacing, logical 0, ON or start bit states are defined by a positive voltage on line A with respect to line B. It should be noted that the above A with respect to B levels are inverted from the voltage input/output requirements of standard UARTs and that many line drivers and receivers provide a logic inversion.

With reference to the table showing the pin layout for the serial ports on the rear panel screw terminals, note that the separate GND (ground) pin for each port is isolated from the chassis and shall act as a common signal intended to be connected between the talker (-TX) and the listener side (RX) of other equipment, for example the corresponding isolated GND (ground) pin or common pin. The purpose of the common signal is to increase the reliability of the hardware transmission. It must not be connected to the chassis or the cable screen. This applies to both sides of a connection. The cable screen shall be connected to the equipment chassis on one side only, preferably talker side, -TX.

COM 1 and COM 2

COM 1 and COM 2 at the rear of the Processing Unit are 9-pin DSub male and have the following pin layout.

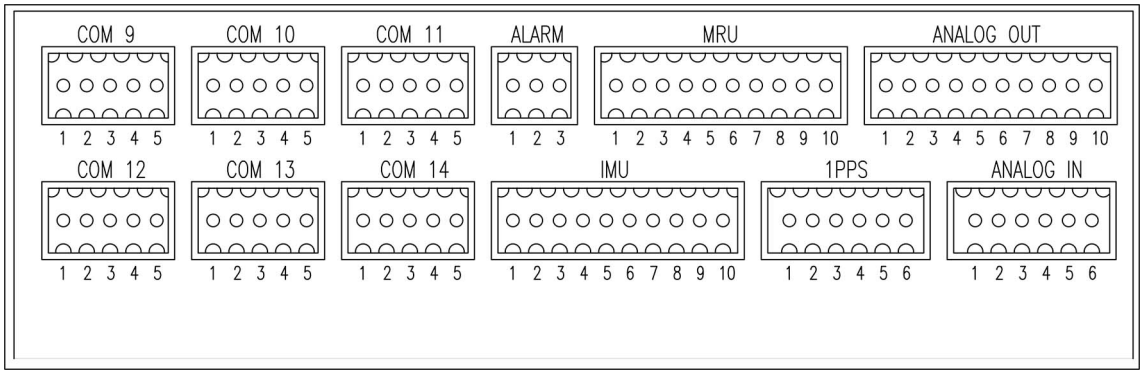
Pin no.	RS-232	Pin no.	RS-232
1	DCD1	6	DSR1
2	RXD1	7	RTS1
3	TXD1	8	CTS1
4	DTR1	9	RI1
5	GND		

Note

COM 1 and 2 are not as accurate with regard to timing as COM 9 to 14 and are not recommended used for timing critical outputs.

Connector board

The illustration shows the screw terminal pin layout on the connector board at the rear of the Control Unit.



Serial lines

This system communicates with external equipment through the RS-422 serial input and output lines.

Table 1 Pin layout of serial input/output lines

Pin no.	RS-422 signal
1	RX_A
2	RX_B
3	GND isolated
4	TX_A
5	TX_B

Ethernet connection

The Control Unit has the possibility to input and output data on individually configurable network ports. The format and update rate are configured for each port in the **SpotCore Configuration** view.

- **LAN 1 in the front**. This is a service port and has less capacity (10/100 Mbps) than the other LANs. For direct connection to a PC you might need a crossover cable instead of a straight-through cable. The pin wiring for the different cable configurations is according to the table.

Straight-through			Crossover			
Signal	**Pin no.**		**Signal**	**Pin no.**	**Pin no.**	**Signal**
TX+	1		TX+	1	3	RX+
TX-	2		TX-	2	6	RX-
RX+	3		RX+	3	1	TX+
RX-	6		RX-	6	2	TX-

Note

The pins 4, 5, 7 and 8 are not used.

- **LAN 2, 3 and 4 at the rear.** These local area networks (LAN) are of high capacity (10/100/1000 Mbps) and are of type auto crossover and auto-negotiation. Below is the pin wiring for these LANs connected to different network capacities:

10/1000 or 100/1000 Mbps Ethernet				1000/1000 Mbps Ethernet		
Pin no.	**Signal**	**Description**		**Pin no.**	**Signal**	**Description**
1	TX_DA+	Transceive data +		1	BI_DA+	Bi-directional pair +A
2	TX_DA-	Transceive data -		2	BI_DA-	Bi-directional pair -A
3	RX_DB+	Receive data +		3	BI_DB+	Bi-directional pair +B
4				4	BI_DC+	Bi-directional pair +C
5				5	BI_DC-	Bi-directional pair -C
6	RX_DB-	Receive data -		6	BI_DB-	Bi-directional pair -B
7				7	BI_DD+	Bi-directional pair +D
8				8	BI_DD-	Bi-directional pair -D

To connect the unit network, use twisted pair (TP) cable with RJ-45 connectors.
To comply with the IEC 60945 standard, shielded (screened) cable has to be used.
Recommended cable type is CAT-5e. Category 5e cable is an enhanced version of

Category 5 that adheres to more stringent standards. It is capable of transmitting data at speeds of up to 1000 Mbps (1 Gigabit per second). The maximum length of the cable which can be used is 100 metres (328 ft).

EU conformity declaration

KONGSBERG

EU DECLARATION OF CONFORMITY

Manufacturer's name: **Kongsberg Seatex AS**

Manufacturer's address: **Havnegata 9, N-7010 Trondheim, Norway**

declares that the product:

Product: **SpotTrack**

Product items:
- **Spot-E-Sensor**
- **Spot-E-JBF**

is in conformity with the **EMC directive 2014/30/EU** and **Low Voltage Directive 2014/35/EU**,

using relevant sections of the following product standards:

EMC: **IEC/EN 60945: 2002**

Electrical safety: **IEC/EN 61010-1:2010**

Test references
EMC report: E13276.00; issued by Nemko AS.
Safety reports:
- Report: KSX-2014-2-Spot; issued by Kongsberg Seatex AS
- Report Number: MTk5P06816-1rev1; issued by SP Technical Research Institute of Sweden.

Further, the product is compliant to RoHS Directive **2011/65/EU** with reference to standard **EN 50581:2012**.

Supplementary information
The product was tested in its normal configuration.

Date and signature
2018-07-05

Arne Rinnan, CTO

Equipment handling

Inspection

Carry out an inspection of the equipment immediately after the units have arrived at their destination. Check for physical damage, water intrusion or other mishandling.

Should there be any damage to the equipment, please notify the manufacturer immediately. Refer to on page for contact information.

Sensor Unit handling

The Sensor Unit is a delicate instrument and must be handled with care.

The Sensor Unit is shipped in a specially designed transportation container. Keep the Sensor Unit within the container until everything is ready for installation of the unit in the mounting bracket. Keep the sensor protection cover in place until the sensor has been mounted.

Note

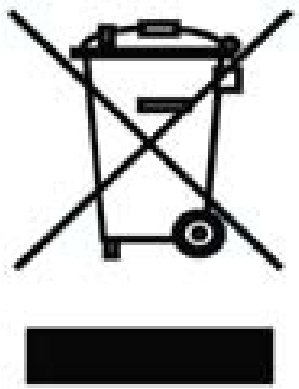
After the installation, please save the transportation container. The Sensor Unit must be shipped in this container for service or repair to maintain the warranty.

It is recommended to keep the protection cover over the Sensor Unit when the unit is not in use.

Safety

Operation or troubleshooting of this equipment will not imply any risk for high voltages, explosions or exposure to gas. The equipment complies with IEC 61010-1/EN 61010-1 standards regarding product safety and IEC 60945/EN 60945 standards on electromagnetic compatibility (immunity/radiation) and vibration.

Disposal



All electrical and electronic components have to be disposed of separately from the municipal waste stream via designated collection facilities appointed by the government or local authorities. The correct disposal and separate collection of your old appliance will help prevent potential negative consequences for the environment and human health. It is a precondition for reuse and recycling of used electrical and electronic equipment. For more detailed information about disposal of your old appliance, please contact your local authorities or waste disposal service.

The equipment may be returned to Kongsberg Seatex AS if there is no local WEEE (Waste Electrical and Electronic Equipment) collection. The equipment is marked with this pictogram.

References

Reference documents

1 *SpotTrack Operator manual*, Kongsberg Seatex AS

2 *MRU Installation manual*, Kongsberg Seatex AS

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