KOBELT

Kobelt 7181M *Steering Station*

Owner's Operation, Installation & Maintenance Manual

NOTES:

RECORD DATA BEFORE INSTALLATION FOR FUTURE REFERENCE	
Model #:	
Serial #:	
Date of Purchase:	
Date of Installation:	

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1 INTRODUCTION

1.1 CONTACT

Kobelt Manufacturing Co. Ltd.		Sales Tel:	+1-604-572-3935
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Surrey, British Columbia		Email:	sales@kobelt.com
Canada, V3W 0A6		Website:	www.kobelt.com

This document is intended to clearly present comprehensive product data and provide technical information to assist the end user in design applications. Kobelt reserves the right, without notice, to change the design, or construction, of any products and to discontinue or limit distribution of any products. Kobelt also reserves the right to change, or update, without notice, any technical information contained within this document.

Kobelt recommends that customers visit our website to check for updates to this Manual. Once a product has been selected for use, it should be tested by the user to ensure proper function in all possible applications. For further instructions, please contact our distributors or visit our website.

1.2 COMPLIANT USE

This device is only intended for use by persons trained in operating marine systems.

The installer shall:

- Only use non-defective products.
- Check the safety of operation and the condition of the device before each use.
- Verify that the product is operational at all times and keep it in good working conditions.

Only Kobelt Manufacturing Co. Ltd. Authorized Dealers or Authorized Technicians are to repair Kobelt products.

1.3 COPYRIGHTS & TRADEMARKS

2 SAFETY

2.1 SAFETY ALERTS

Throughout this manual, the following symbols are used to alert the user to special instructions concerning a service or operation that may be hazardous if performed incorrectly or carelessly. The associated risk levels are stated below.

⚠ DANGER	This symbol indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	This symbol indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	This symbol indicates a hazardous situation, which if not avoided, could result in minor or moderate injury.
NOTICE	This symbol informs the reader of events not related to personal injury but which there is a risk of damage to property or equipment.
SAFETY INSTRUCTIONS	This symbol informs the reader of safety-related instructions or procedures.

2.2 NOTICE TO INSTALLER

Disregarding the following safety measures can result in an accident, causing severe injury to personnel and damage to material assets.

- Only use the product as directed in this manual.
- Never put the product into service if there is evidence of visible damage.
- Never put the product into service before fully completing installation and commissioning.
- Do not perform any modifications to the product.
- Only use authentic Kobelt spare parts.
- Observe all local regulations, directives, and laws during the installation of this product.
- All installation, commissioning, and maintenance work must be conducted by qualified personnel. (For the purpose of this manual, qualified personnel are people who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.)
- Observe all specifications in this manual. If these guidelines are not followed and damage occurs, the warranty will be voided.

2.3 PRODUCT HAZARDS

⚠WARNING	**Equipment Starts Automatically:** The Kobelt Steering Controller valve outputs are controlled remotely and/or through a control loop. They may be driven unintentionally through improper closed loop feedback and or unintentional operator commands. Ensure all power sources are disconnected or locked out prior to performing system maintenance or repair.
⚠WARNING	**Disconnect Power:** Turn off power at distribution panel before beginning installation to protect installer from electrical hazards.
⚠WARNING	**Voltage and Power Compatibility:** Confirm that the power and voltage requirements of the system are compatible. Ensure that the voltage drops from cabling is within the specifications of the product. If voltage drops are excessive the system could fail due to low voltage conditions resulting in abnormal behavior and or loss of function.
⚠CAUTION	**Voltage and Current Compatibility:** Confirm that the power source is compatible with the maximum voltage and current ratings of is product variant. Failure to do so could result in damage or fire.

2.4 SCOPE

This manual covers the installation, configuration, operation, and maintenance of the Kobelt steering station only. Instructions on the steering controller or digital helm can be found in their respective manuals (MNL-6300-0100 and MNL-6301-0100). Information on electric and hydraulic systems present on the vessel requires knowledge not covered within this document.

Information of any Autopilot interfacing to the Kobelt Steering System is not covered within this manual.

⚠WARNING	The Kobelt Steering System is designed to connect to a correctly installed and commissioned hydro-mechanical steering gear.

3 TERMINOLOGY AND DEFINITIONS

Before proceeding with the configuration and operation of the Kobelt Steering System, it is important for the user to become familiar with the terminology and basic functions used throughout this manual.

Station	Physical locations around the vessel where steering controls are located. Some common station locations include: • the Main Bridge, • the Fly Bridge, • a bow or aft station, • port or starboard wing stations, • the Engine Room.
FFU	Full follow up. A mode of control where the controller will move the rudder to the **Rudder Order** position from the FFU lever
RFU	Rudder feedback unit. An angular position measurement device, connected to the rudder to provide a **Rudder Angle** signal to the controller.
RAI	Rudder angle indicator. Receives a signal from an RFU to display to the operator the current **Rudder Angle**
PID	Proportional-integral-derivative. A control method employed for rudder positional control.
CAN	Controller Area Network. A digital communication protocol employed by the Kobelt steering controller.

4 PRODUCT DESCRIPTION

4.1 SYSTEM OVERVIEW

The Kobelt Steering System is a configurable, electro-hydraulic steering control system for marine vessels. The system is comprised of a minimum of one steering controller and one to six steering stations. The system is interconnected by the KNet network for communications and power. The Kobelt steering system controls one or two directional solenoid valves for a single rudder, or two independent rudders. The valve outputs may be configured as on-off type, or proportional control.

Commands are accepted at the steering station that is in control and transmitted digitally to the steering controller to act upon. The steering controller takes the command and moves the steering gear to the desired position during full follow up operation or in the desired direction during FFU lever operation. An RFU is used by the controller to measure the rudder angle so that it can continually position the rudder to the desired rudder order during full follow up operations.

The Kobelt steering system is capable of;

- Position control of one (1) rudder or mechanically coupled rudders with;
  - Variable-speed control via a proportional valve, with redundancy, or
  - Single-speed control via solenoid valve, with redundancy, or
  - Two-speed control via two solenoid valves, without redundancy.
- Position control of two (2) independent rudders with;
  - Variable-speed control via two proportional solenoid valves
  - Single-speed control via two on-off solenoid valves
  - Electronic tie bar capability.
- Up to six (6) Steering Stations, each with a control panel and one or more input devices.
  - Stations and controller communicate over our KNet Network
  - Based on, but not compatible with, the NMEA 2000 standard.

⚠WARNING	The System is not NMEA 2000 compatible and needs to be isolated from any onboard NMEA 2000 network.

4.2 STEERING STATION OVERVIEW

The steering station is the operator interface to the steering gear. The steering station takes operator control inputs and relays them to the steering controller to drive the steering gear. The figure below identifies the key features of the steering controller referenced in this manual.

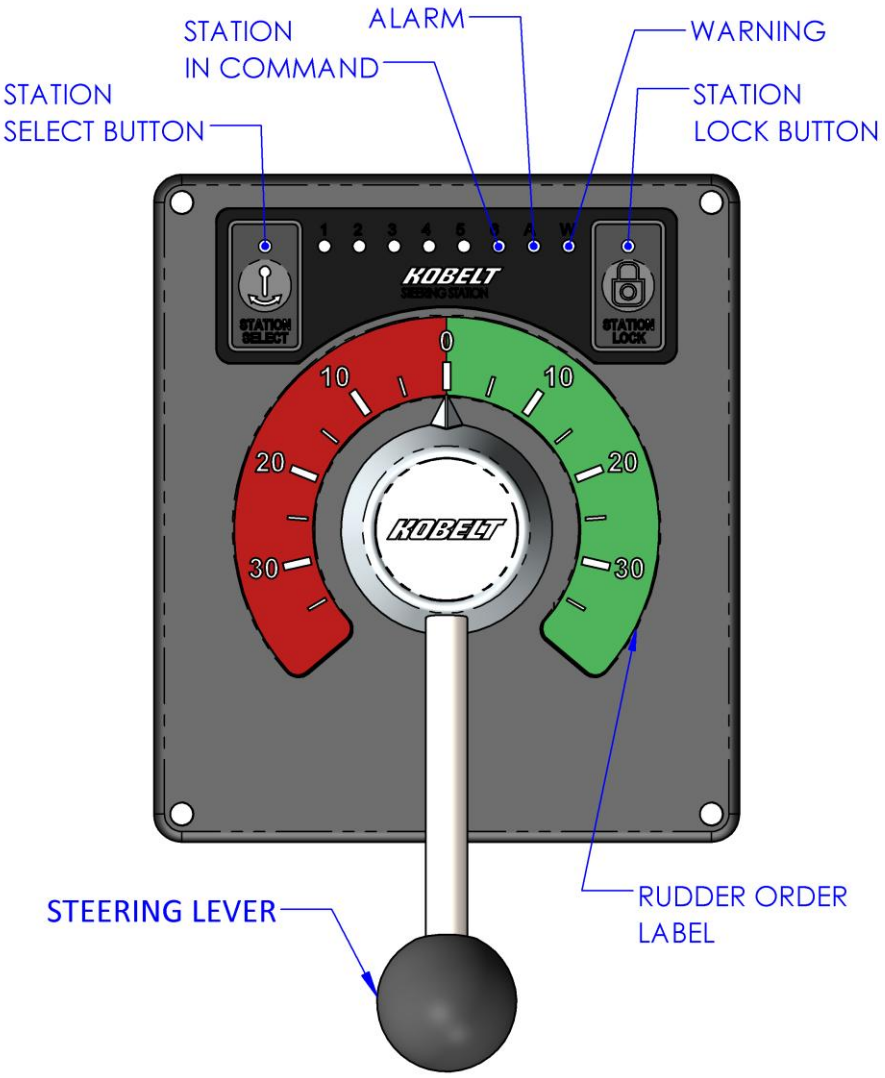


Figure 1: Front Overview

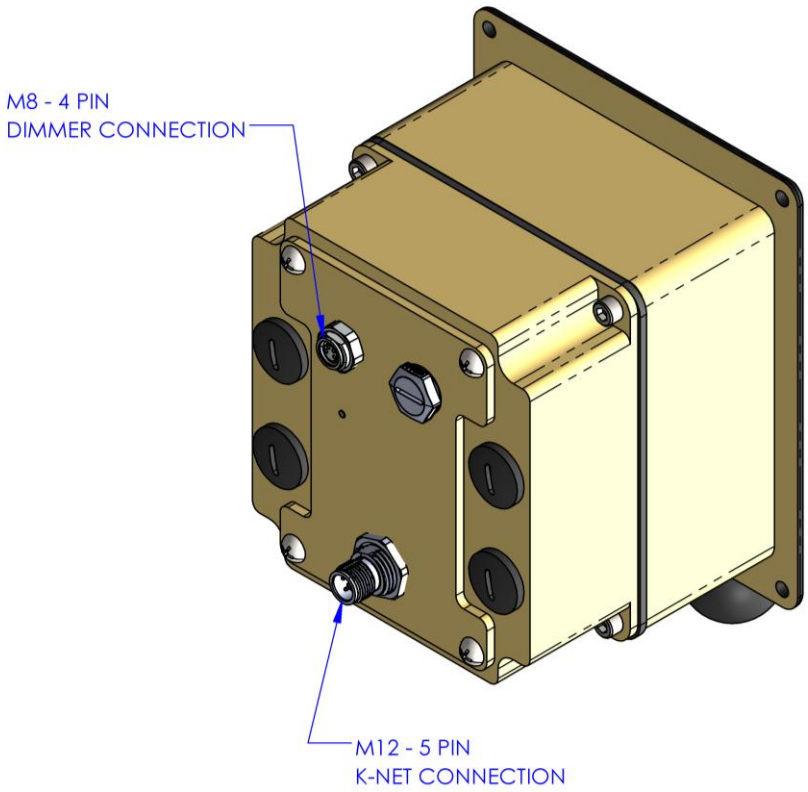


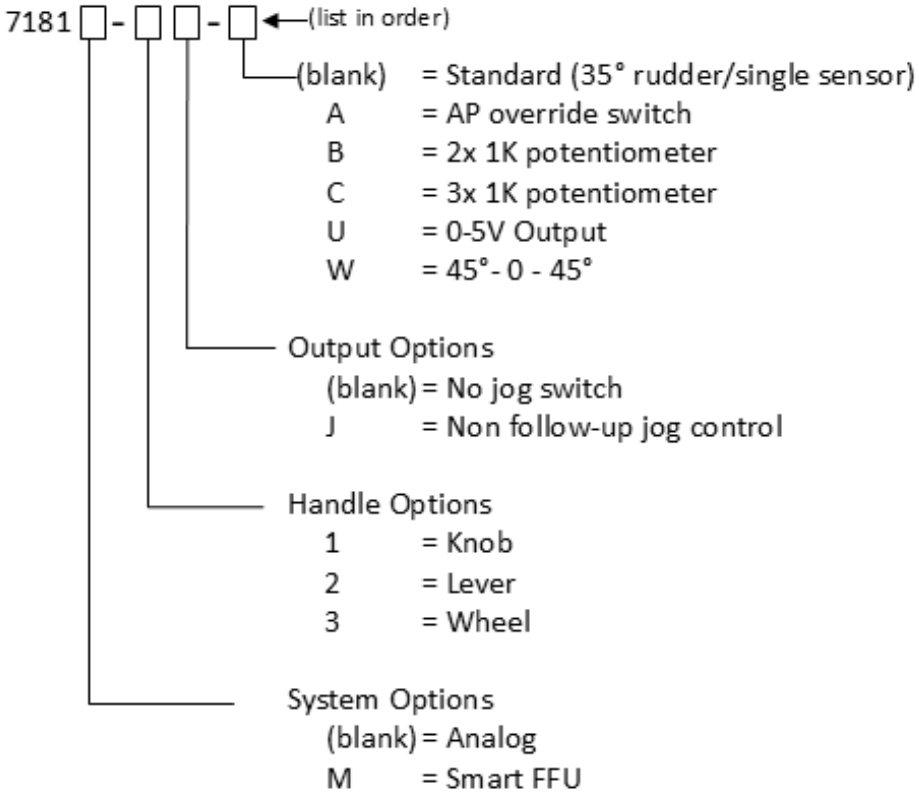
Figure 2: Back Overview

4.3 TECHNICAL SPECIFICATIONS

Table 1: Technical Specifications Station Controller

ELECTRICAL	
POWER REQUIREMENT	24VDC / 200mA
CONNECTORS	1x KNET (M12 – 5 PIN / CODE-A) 1x Secondary Sensor (M8 – 4 PIN / CODE-A) 1x Dimmer Input (M8 – 4 PIN / CODE-A)
MECHANICAL	
PHYSICAL DIMENSIONS (L x W x H)	Refer pg. 27
MOUNTING DIMENSIONS (L x W)	Refer pg. 27
PRODUCT WEIGHT	2.90 kg [6.3 lbs]
EMC	
EMMISIONS	TO IEC 60945
IMMUNITY	TO IEC 60945
FINISH	POLYESTER POWDER COAT TEXTURED BLACK

4.4 MODEL CODE KEY



5 INSTALLATION

5.1 RECEIPT

Upon receipt of the device ensure that the model number and serial number are noted in the table on page 2 of this manual. The serial number can be found in the location noted at right.

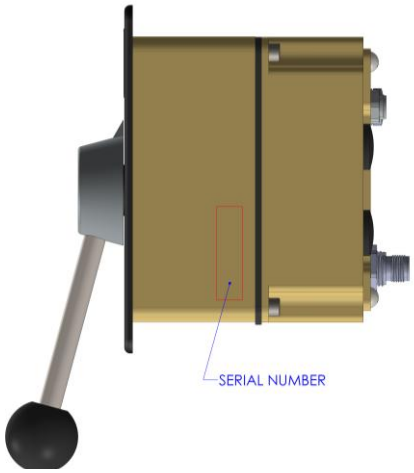


Figure 3: Serial Number Location

5.2 MECHANICAL

The Full Follow Up (FFU) Control Station should be mounted:

- With sufficient room for the handle to swing fully to both extreme conditions
- On a horizontal or angled dash surface
- With the external electrical cables protected from potential damage

The FFU station must be mounted on a flat surface with a maximum roughness of ra = 125 micro-inches [500 μm]. The mounting surface must have the following minimum thickness to prevent excessive flexing:

Steel consoles:	0.19 inches [4.8 mm]
Aluminum consoles:	0.27 inches [6.8 mm]

The FFU Station is equipped with (4) four mounting holes for #10 [M5]. Use #10 or M5 sealing screws or bonded sealing washers to prevent water ingress below the dash. Tighten the fasteners to 23 in-lbs [4 Nm] with an anaerobic thread locker such as Loctite 243.

⚠WARNING	Station 1 can override the station locks at another station. It is recommended that this station should be in the main bridge or the machine room depending on emergency procedures.

5.3 ELECTRICAL

The back of the steering station contains the electrical connections for wiring the steering system (see diagram below).

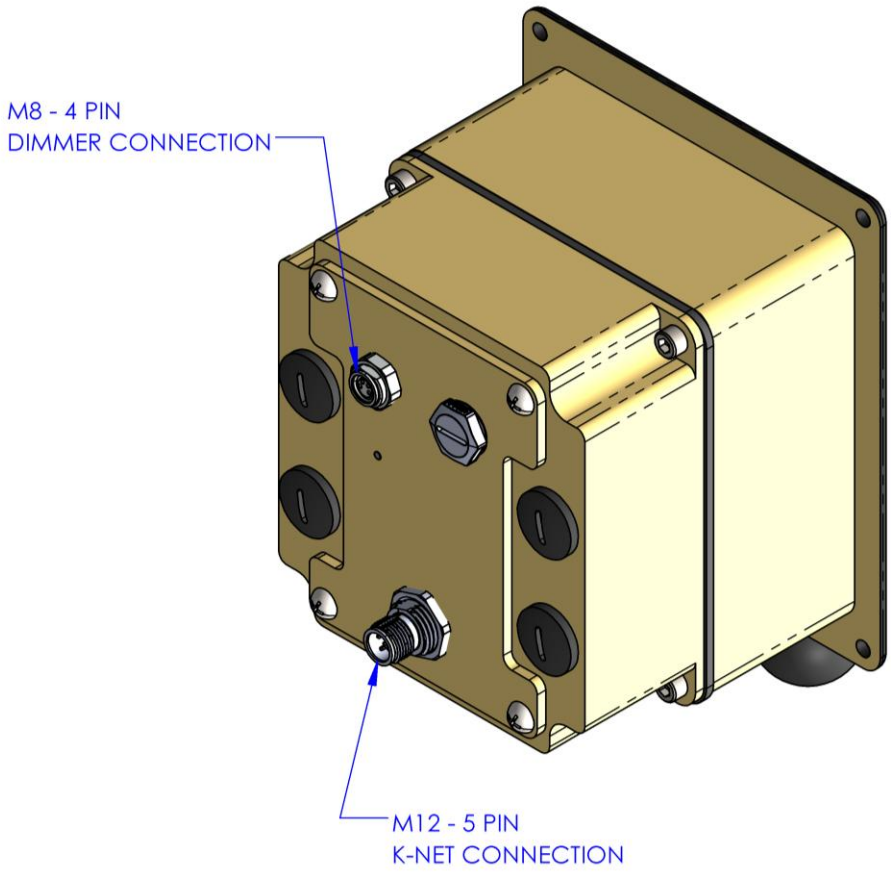


Figure 4: Steering Station Connections

5.3.1 KNet Connection

Connection to the network requires a M12-5-pin drop cable. Reference user manual MNL-6300-0100 for instruction on the KNET cabling and connection.

5.3.2 Dimmer Connection

The steering station is supplied with an M8 4-pin connector at the rear for connection to the dimmer.

Table 2: Dimmer Connector

M8 Pin #	Color	Pin Type	Function
1	Brown	Power	+5V supply for Hall sensor
2	White	-	Not connected
3	Blue	Signal	0.15-4.85V signal to dimmer
4	Black	Common	0V reference

5.3.3 EMC installation guidelines

Shielded cables shall be utilized when connecting FFU levers to the Kobelt steering stations. The cable shield shall be grounded at the station and from there bonded with the vessel to ensure proper EMC compliance.

NOTICE	The user is responsible for implementing the above recommendations. Failure to do so will result in the system not complying with IEC 60945 EMC regulations.

6 COMMISSIONING

6.1 CONFIGURATION

Prior to commissioning and operating the steering system, the controller must be configured for the steering topology of the vessel.

⚠WARNING	System configuration must be completed prior to commissioning the vessel and calibration. If reference menu pictures do not match, please download the latest manual version at www.kobelt.com.

Configuration of the steering station is accomplished at the steering controller. Reference manual MNL-6300-0100 for configuration instructions.

6.2 CALIBRATION

Once the steering system has been properly configured for the vessel, the lever must be calibrated.

⚠WARNING	Calibration of the system should be performed while dockside. Upon completion of calibration all systems should be tested to ensure proper function. Calibration at sea should only be performed in the event of an emergency or by trained personnel.
⚠CAUTION	Calibration and Adjustment should only be performed once wiring of the system has been validated.

After wiring has been checked and validated, power on the system, including the steering HPU and run through all the applicable calibration items. In this step the installer will allow the controller to map the FFU lever hard-over port, midship and hard-over starboard inputs.

6.2.1 FFU Calibration

Every FFU lever at every station, if present, must be calibrated before operation of the vessel. A three-point calibration process is required. To perform this process, enter configuration mode in the controller by following the menu sequence below:

- *Main Monitoring Screen -> Passcode -> Setup Selection Screen -> Setup*

Once the system enters calibration mode, follow the steps below:

Step 1: Press the Station Select button at the current station.

Step 2: The Station Lock light will blink once. Move the FFU lever to the center position. The Station Lock light will blink once. Press the Station Lock button.

Step 3: The Station Lock light will blink twice. Move the FFU lever to the extreme port position. The Station Lock light will blink twice. Press the Station Lock button.

Step 4: The Station Lock light will blink three times. Move the FFU lever to the extreme starboard position. The Station Lock light will blink three times. Press the Station Lock button. The SL light will then turn off.

If no calibration errors are detected, then the FFU calibration is complete for this station. Repeat the process for every FFU steering station.

NOTICE	The FFU Calibration is from configured Port End-stop to configured Starboard end-stop. Any error in configuring the end-stops, or in this calibration will cause an error in the steering system controls.

NOTICE	If the 0 position is not calibrated correctly errors will be present when using the FFU position.

⚠WARNING	After completion of all calibration activities, the calibration should be verified by moving the rudder through the full range of motion with a FFU. Ensure that the rudder does not move past the desired virtual end-stops.

6.3 FUNCTIONAL TEST

Before commencing with sea trials, a series of basic function tests must be performed to ensure proper rudder movement. Follow the test steps below.

⚠WARNING	The Function Test should be carried out while the vessel is still at dock and before it is taken out to sea and after installation has been completed.

6.3.1 FFU Control

At each station equipped with a 7181M FFU lever, confirm that;

1. Moving the lever to 15 degrees port moves the rudder to 15 degrees port.
2. Moving the lever to 15 degrees starboard moves the rudder to 15 degrees starboard.
3. Move the lever to maximum port and confirm that the rudder stops before engaging the travel limit switches.
4. Repeat for the starboard side.

7 OPERATION

The Kobelt digital steering station has various function buttons and LEDs. Reference section 4.2 and section 7.1 for identification of the operator interface elements.

7.1 OPERATOR INTERFACE

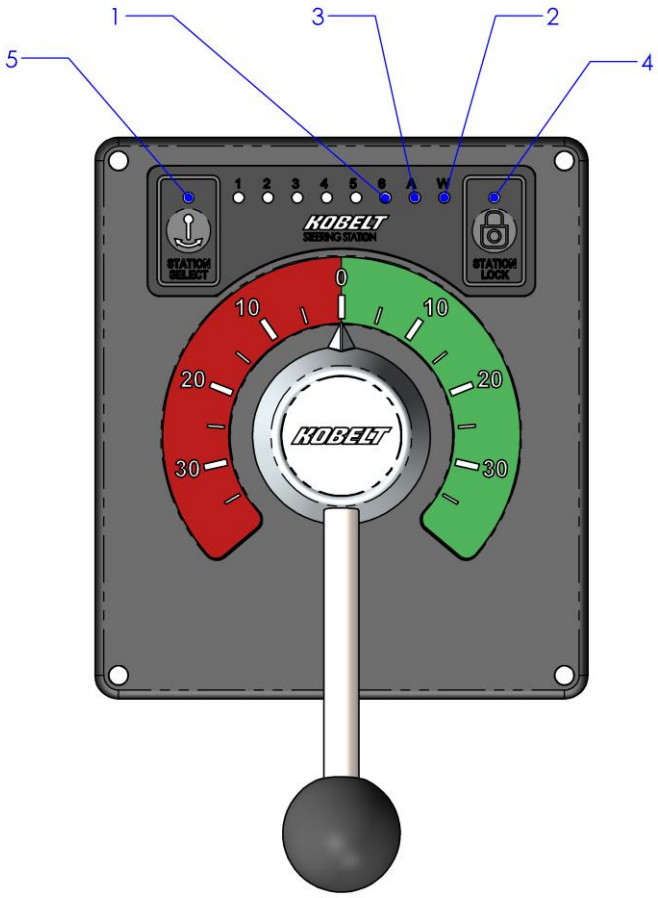


Figure 5: Station Graphics

Table 3: Station HMI Overview

#	Name	Colour	Description
1	Active Stations (1 through 6)	Green	LED will be ON to show which station is active
2	Warning	Yellow	Solid ON or flashing if there is a warning
3	Alarm	Red	Solid ON or flashing if there is an alarm
4	Station lock	Red	Solid ON if stations are locked
5	Station Select	Green	Solid ON if the station is selected, or flashing in the FFU alignment process

7.2 STATION LOCK BUTTON

- Pressing the **Station Lock** button from the active Station locks the steering system control to the current active station and does not allow other stations to assume control. After station lock is enabled, the Station Lock LED will be ON solid at all the online stations.
- The button has no effect at inactive stations. Pressing this button at an inactive station will result three beeps and flashes of the switch LED, to indicate denied request.
- Pressing the **Station Lock** button from the active Station again will unlock all steering stations.
- Station #1 (main bridge station) has over-ride authority.
    - holding **Station Lock** button for 3 seconds deactivates station lock engaged from another steering station.
- Station locks are automatically removed whenever the active station goes into a faulted (inoperable) state.

7.3 STATION SELECT BUTTON

- Pressing the Station Select button will place the steering system under the control of rudder orders generated by the FFU lever.
- If pressing the Station Select button from another station, control will transfer to the requesting station unless
    - the requesting station does not have a functioning FFU lever, then control stays with the previous station.
- Station ID#1 will enter FFU Mode after power up if station #1 does not have a functioning smart helm or jog lever.
    - If station #1 does not have a functioning FFU lever, then an alarm will be tripped, and control must be taken at another station.

7.3.1 FFU Lever Alignment

If the Lever Alignment parameter has been set during configuration (see MNL-6300-0100, section 6.1) then the FFU Lever must be set close to the current Rudder Angle to assume control with the FFU lever.

⚠WARNING	If the steering system is not configured to enforce lever alignment, then the Rudder Order may suddenly change by a large amount when the station is transferred causing erratic rudder movement.

During lever alignment operations:

- The Station Select Mode indicator starts flashing.
- The operator moves the FFU lever to the current rudder angle.
- If the FFU lever is **NOT** aligned with the rudder within **10 seconds,** then the station transfer request is cancelled.
    - In this case, the control remains with the previous station.

7.4 ALARM INDICATORS

When the steering system is not configured to interface with an external alarm system the steering controller will perform some basic alarm management. There are three levels of faults monitored by the steering system:

i. Alarms,
ii. Warnings and
iii. Cautions.

Only alarms and warnings are indicated by the flashing Alarm or Warning Indicators combined with the internal buzzer.

The user can find specific information on the fault by accessing the fault monitoring screen (see manual MNL-6300-0100, sections 9.1.10 & 9.1.11) on the steering controller.

8 MAINTENANCE

8.1 PREVENTATIVE MAINTENANCE

- Every Sailing
  - Functionally test FFU lever.
  - Review alarm log.

8.2 RECOMMENDED SPARE PARTS

As a minimum Kobelt recommends the following spare parts are on hand:

Table 4: Recommended Spares

RECOMMENDED SPARES		
QTY	ITEM	KOBELT PART #
1	FFU Steering station	7181M-2

To purchase spare parts Contact Kobelt for list of parts numbers available

9 TROUBLESHOOTING

In the event of an abnormal operation, the user can find specific information on the fault by accessing the fault monitoring screen (see manual MNL-6300-0100, sections 9.1.10 & 9.1.11) on the steering controller.

If it is not possible to locate or eliminate the problem using this section, or if the fault is still present, switch off the device and contact Kobelt Manufacturing Co. Ltd. technical support department.

⚠WARNING	The user must not attempt to repair the unit themselves. It is strongly recommended that any required service work on a Kobelt unit be performed by a factory authorized service representative. Please contact the nearest Kobelt authorized distributor for assistance. Any repairs performed by 3rd party may null and void any warranty or type approvals

10 REVISION HISTORY

Table 5: Revision History

Document Revision	Release Date	ECN	By	Revision Summary
A	2026-05-01	-	MW	• Initial release

11 WARRANTY

Kobelt Manufacturing Co. Ltd. (“Kobelt”) warrants the Products and Parts manufactured by Kobelt to be free from defects in workmanship or material and that said products are designed mechanically and functionally to perform to specifications.

This warranty is effective providing:

- The equipment is used within the intended operating conditions and in accordance with Kobelt recommendations
- The equipment is installed according to equipment diagrams, specifications, and recommendations which Kobelt has provided

This warranty becomes invalid if the factory supplied serial number has been removed or altered on the product. This warranty does not cover cosmetic damage or damage caused by an act of God, accident, misuse, abuse, negligence, or modification of any part of the product. This warranty does not cover damage due to improper operation or maintenance, connection to inappropriate equipment or attempted repair by anyone other than an authorized Kobelt representative.

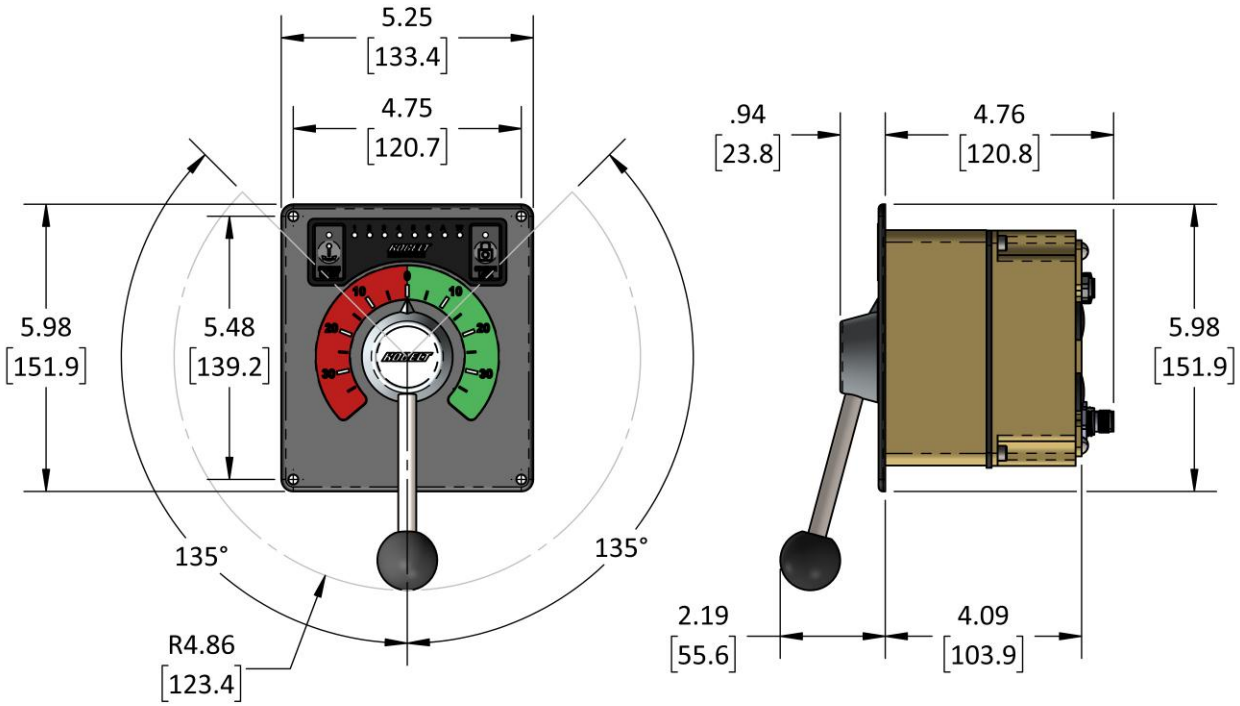
Upon identification of a potential issue or defect with a Kobelt Product or Part, the Warranty Applicant (“Applicant”) must immediately contact Kobelt and describe the issue in writing, by letter, fax, email or other electronic conveyance. Kobelt will then assess the cause of the defect and determine warranty applicability and appropriate remediation.

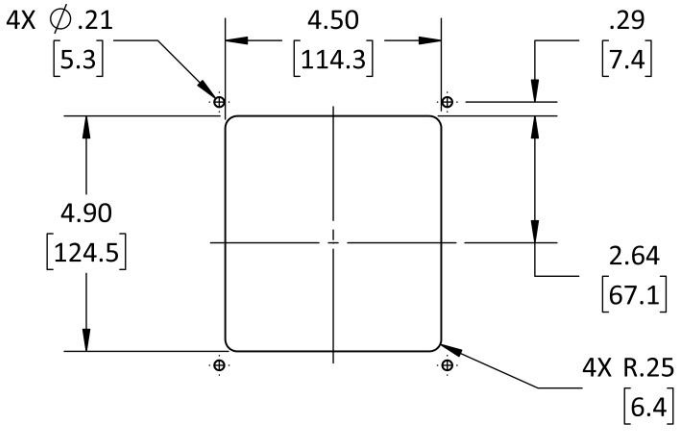
If any part is found to be defective, Kobelt will replace said part FOB the Kobelt factory provided that any such defective part is returned by the Buyer with freight and applicable forwarding charges prepaid by the Buyer. Kobelt’s sole obligation to the Applicant will be to repair or replace the defective part with same or similar product, to a maximum value of the list price of the product or part. The Kobelt warranty does not cover labour charges, travel, or any other associated expenses.

All Products and Parts manufactured by Kobelt, are subject to a warranty against manufacturer’s defects in materials or workmanship for a period of two (2) years from the date of purchase.

Kobelt will be responsible for all Products or Parts sold by Kobelt but manufactured by 3rd party manufacturing companies. However, these products and parts are subject to applicable 3rd party warranties and may not be the same as the Kobelt warranty.

APPENDIX A: INSTALLATION DIMENSIONS





"CUT-OUT" DIMENSION

APPENDIX B: PARTS LIST

7181M-2

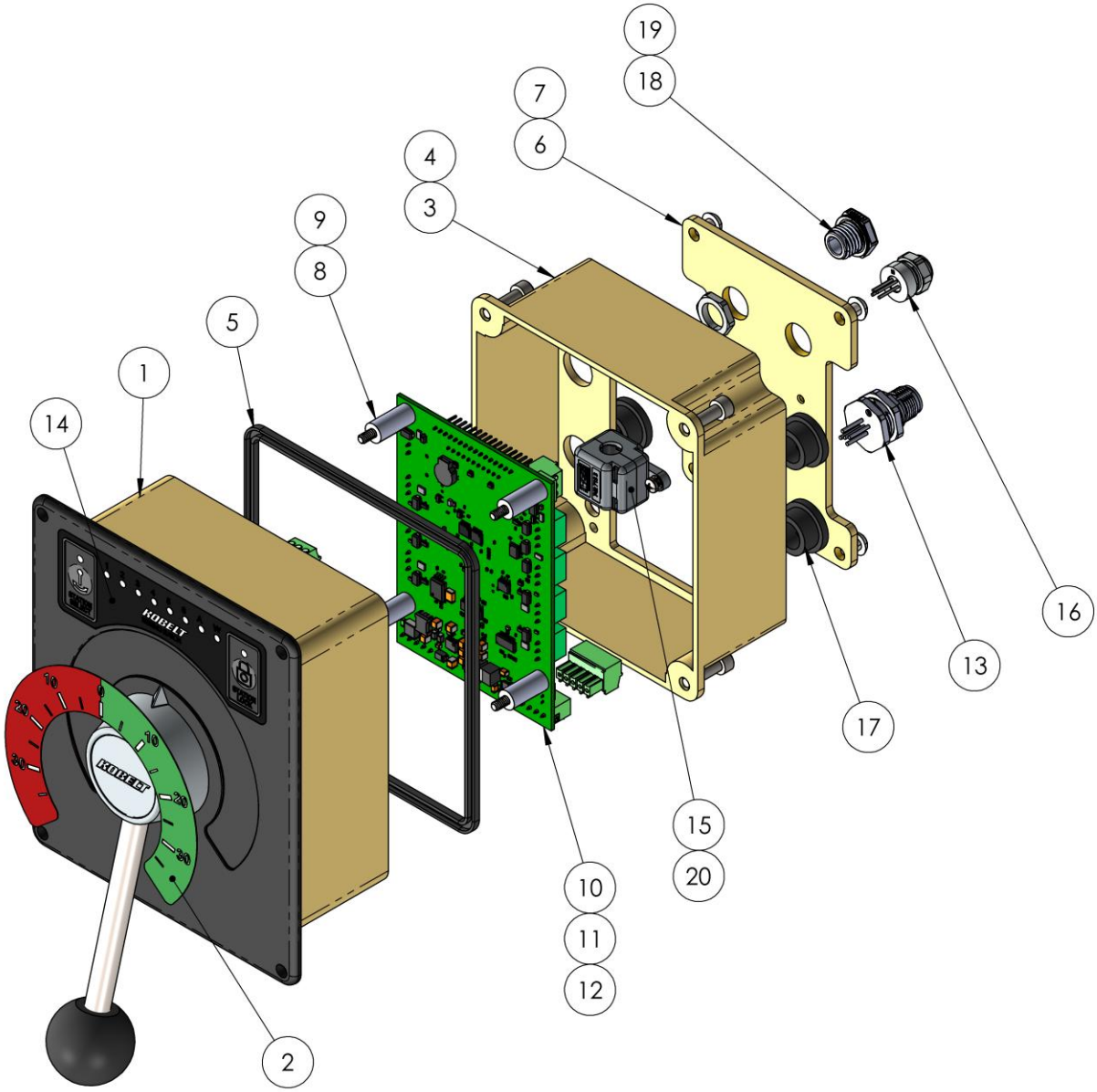


Table 6: 7181M-2 Bill of Materials

ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	7181M-2-SUB	FFU SUBASSEMBLY; MM2 SYSTEM
2	1	LABEL-35	LABEL; 7181 35 DEG FFU LEVER
3	1	7181-0002	COVER
4	4	1002-0810	SCREW, SOCKET HD, 10-24 X 5/8, 18-8SS
5	1	7171-0026	SEAL 70 DURO E.P.D.M.
6	1	7181-0111	COVER; 2X M12 + M16
7	4	1010-0804	RND HD PHILIPS MS, 10-24 X 1/4, 18-8
8	4	1044-0611	SPACER; #6 X 5/16OD X 11/16 LG / NYLON
9	4	1012-0616	SCREW, MACHINE, PAN HD PHILLIPS, 6-32 X 1, SS
10	1	6505-3001-PCA1	BOARD ASSEMBLY; CONTROL HEAD / MM2 SYSTEM
11	1	6009-4105	CONNECTOR, PLUG, PHOENIX, 3.5MM, 5POS, STRAIGHT
12	1	6009-4103	CONNECTOR, PLUG, PHOENIX, 3.5MM, 3POS, STRAIGHT
13	1	6009-4132	CONNECTOR - PLUG; M12 - 5 PIN / CODE A / REAR PANEL MOUNTING / PRE-WIRED
14	1	6012-0027	MEMBRANE; FFU STATION
15	1	6004-5002	FERRITE; 165 OHM / 8MM
16	1	6009-4153	CONNECTOR - RECEPTICLE; M8-4 POSITION / A-CODE / IP67 / M12 HOUSING
17	4	6001-0311	PLUG - CABLE GLAND; M16 X 1.5/ IP68 / BLACK
18	1	6001-0312	PLUG; M12X1.5 / NYLON
19	1	6001-0288	PANEL NUT; M12 / PLATED BRASS
20	1	1012-0403	SCREW, PAN HD, PHL, 4-40 X 3/16, 18-8

7181M-2-SUB

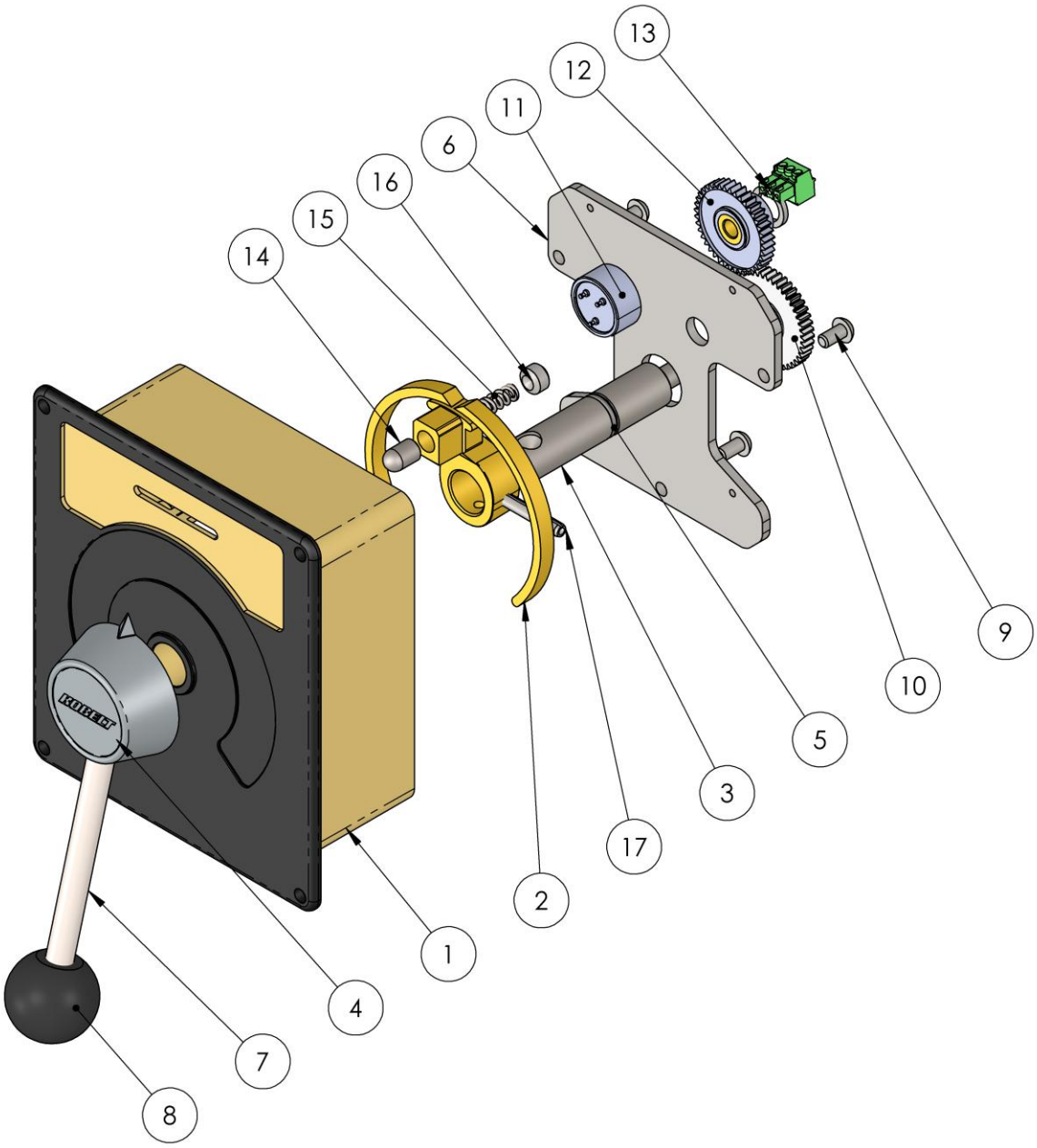


Table 7: 7181M-2-SUB Bill of Materials

ITEM	QTY.	PART NUMBER	DESCRIPTION
1	1	7181-0101-BT	HOUSING; TEXTURED BLACK FINISH
2	1	7181-0009	CAM
3	1	7171-1008	SHAFT, STARWHEEL
4	1	7171-0004-K	HUB (CHROME PLATED)
5	1	1101-0014	O-RING, 2-014, 1/2IN X 1/16IN, NBR70
6	1	7181-0110	BRACKET - SMART FFU LEVER;
7	1	7171-0006	HANDLE
8	1	2030-0001	HANDLE KNOB, SPHERICAL, BLACK
9	3	1010-0806	SCREW, RND HD PHL, 10-24 X 3/8, 18-8 SS
10	1	YPB-3244-5	SPUR GEAR -DELRIN; 32DP/ 44T / 20DEG / 0.313 BORE / 0.188W/STYLE B / BRASS INSERT
11	1	6011-0118	ASSEMBLY; ROTARY POSITION SENSOR W/ PHOENIX CONNECTOR
12	1	YPB-3240	SPUR GEAR - DELRIN, 40T, 32DP, 1/4" BORE, B STYLE
13	1	6639-0001	SHIM WASHER, 10MM X 2MM, AISI 304
14	1	2012-0007	DETENT PLUG
15	1	1201-0003	SPRING, COMPRESSION, 0.25 DIA X .50 LG
16	1	1016-1204	SET SCREW - SKT; CP PT, 3/8 UNC X 1/4, 18-8
17	1	1024-0818	SPRING PIN, 3/16 X 1 1/8, SS

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