

RUDDER ANGLE INDICATOR SYSTEM

RAI-M series

SEAFIRST ENGINEERING CO

45-16, Ga Um Dong, Chang Won, Kyong Nam Korea

Tel : 82 55 267 1645

Fax ; 82 55 266 1646

<http://www.seafirst.co.kr>

Seafirst Rudder Angle Indicator (RAI-M) System consists of a Rudder Angle Sensor, Distribution Box and Rudder Angle Indicator. This system (RAI-M) is capable of operation up to 15 Seafirst Rudder Angle Indicators in total.

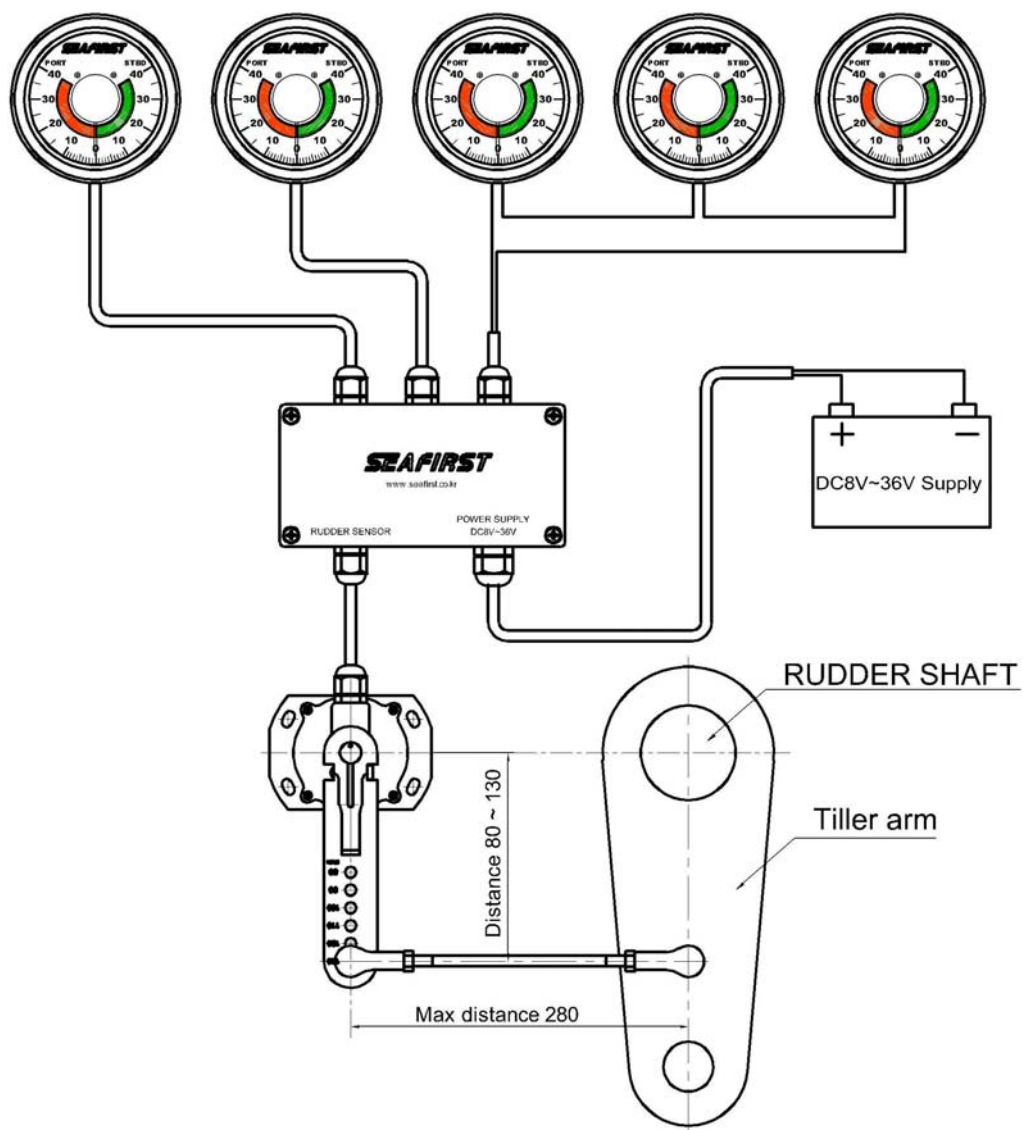


Figure 1 : Installation

- Rudder Angle Indicator : DSR-104, DSR-104P
- Rudder Angle Sensor : DSR-110
- Distribution Box : DSR-106

RUDDER ANGLE SENSOR

- 1) Rudder Angle Sensor is installed in the stern of the vessel, close to tiller arm.
- 2) A mounting base may have to be fabricated by installer to position the rudder angle sensor properly.
- 3) Mount the linkage supplied with the rudder angle sensor at 90 degree from tiller arm like Figure 2. Bolt the ball joint to the tiller arm.
- 4) The rudder angle sensor arm is same height "A" as the rudder tiller arm "A" like Figure 2.
- 5) "B" dimension should be same like Figure 2

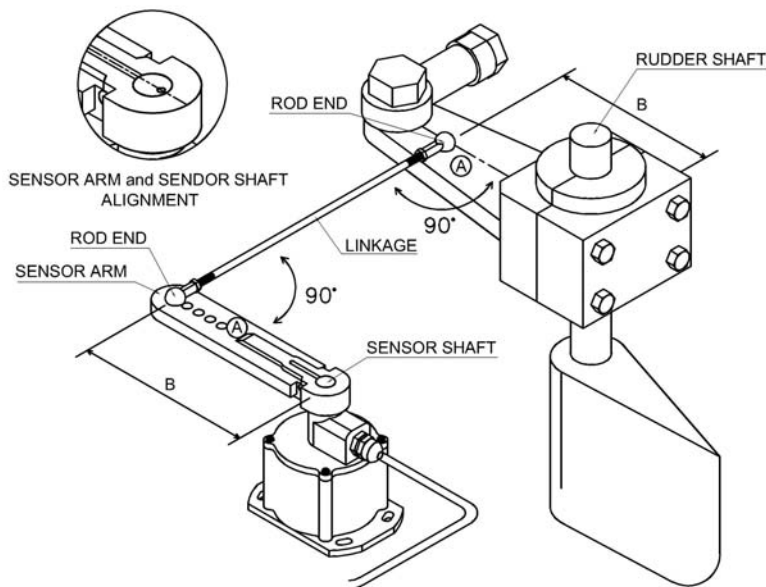


Figure 2 :
Installation of Rudder Angle Sensor

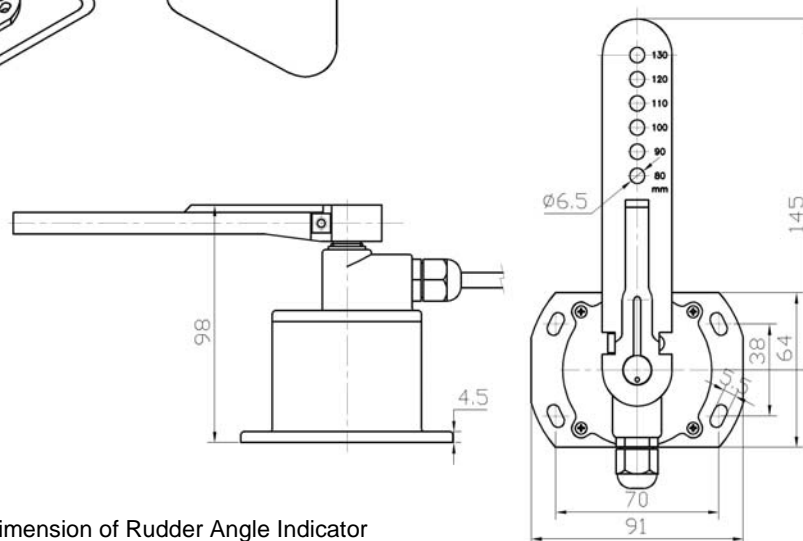


Figure 3 : Dimension of Rudder Angle Indicator

If the locking screw in the rudder angle sensor arm has been loosened, or the arm removed from the rudder angle sensor, re-attached the arm and check the potentiometer centering. When the rudder is dead ahead, the electrical resistance between the black wires and the white, the black wires and the red wires should be equal. The potentiometer can also be centered mechanically by aligning the notch on the sensor shaft. See Figure 2. Be careful to check the installation for any mechanical obstructions or binding of the linkage, and correct it now, before it becomes a problem.

The rudder angle sensor is supplied with 5 meter of shield cable. Run the cable from the rudder angle sensor towards the distribution box, ensuring that it is protected by a hose or conduit wherever it passes through fish or cargo holds, or any other area where it could be damaged.

DISTRIBUTION BOX

Remove the cover from the distribution box. Mount the box in any convenient dry location using four screws through the holes (4.5mm diameter). The “ O” ring seal and cable glands are splash and drip proof when properly compressed. Make the connections to the distribution box by threading cables through the appropriate size watertight glands, then stripping the insulation and inserting the cooper wires into the terminals as shown in Table1. Twist the stranded wires tightly and insert them into the terminal socket, being careful that no strands miss the opening and touched on another wires or circuit components. Use a small screwdriver to depress the wire clamp inside the terminal socket. After each wires has been connected, tighten the cable glands.

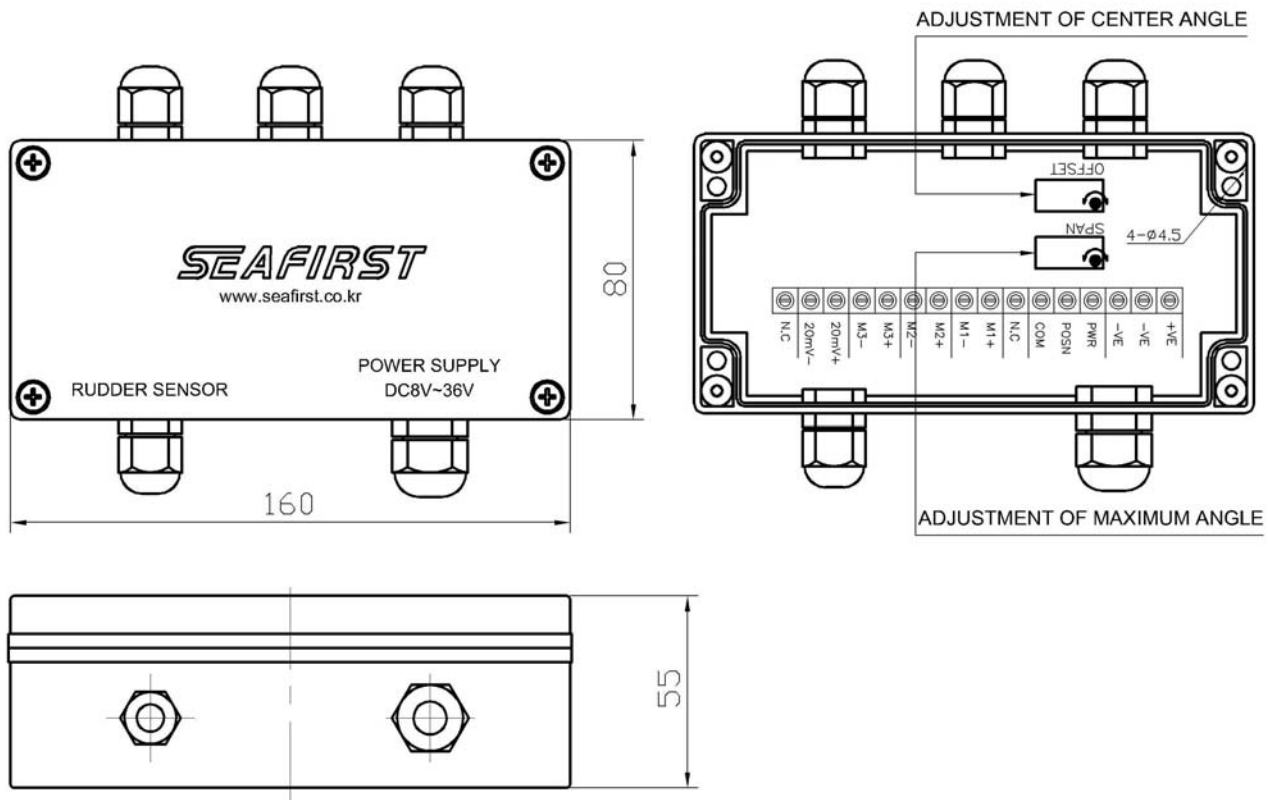


Figure 4 : Dimension of Distribution box

DISTRIBUTION BOX

Table 1 : Distribution box connection table :

Terminal #	PCB label	Wire
1	+ VE	Positive (8VDC to 36VDC)
2	- VE	Negative Group (8VDC to 36VDC)
3	- VE	No connection
4	PWR	Rudder Angle Sensor White wire (+5 Volt Power)
5	POSN	Rudder Angle Sensor Black wire (Wiper Position)
6	COM	Rudder Angle Sensor Red wire (Common Ground)
7	N.C	No Connection
8	+ M1	Indicator Group 1 (positive/signal)
9	- M1	Indicator Group 1 (Negative/return)
10	+ M2	Indicator Group 2 (positive/signal)
11	- M2	Indicator Group 2 (Negative/return)
12	+ M3	Indicator Group 3 (positive/signal)
13	- M3	Indicator Group 3 (Negative/return)
14	+ 20mV	20millivolts per degree output (positive)
15	- 20mV	20millivolts per degree output (return)
16	N.C	No connection

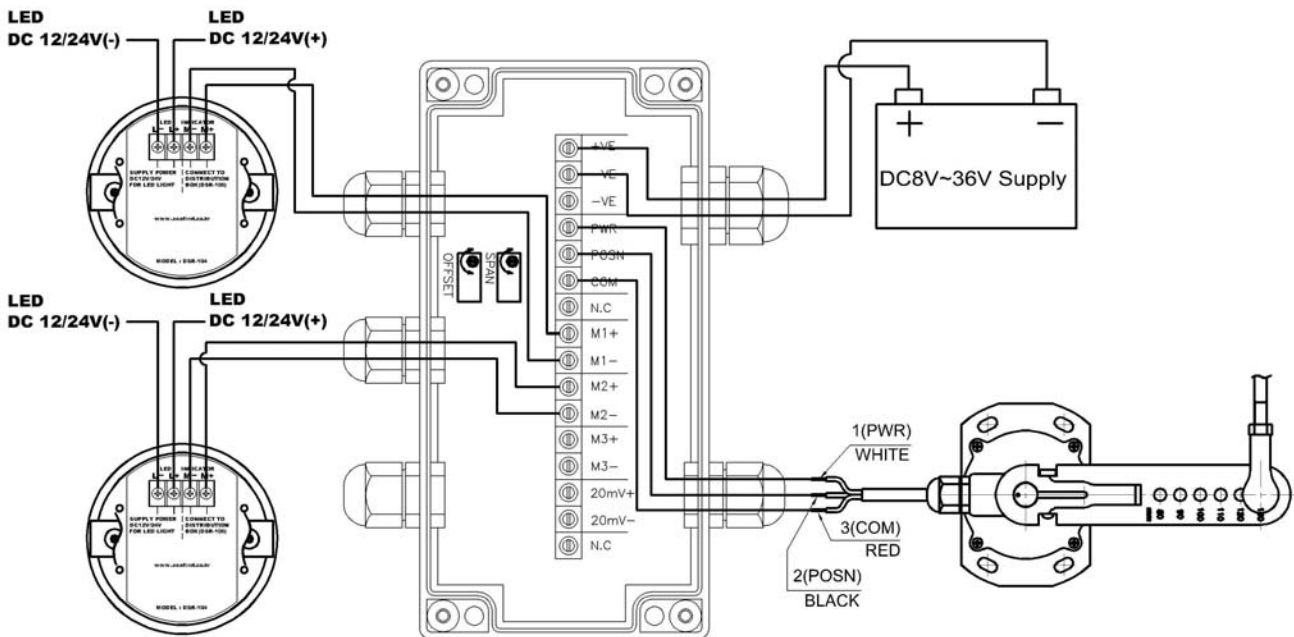


Figure 5 : Example of Wiring.

Rudder Angle Indicator

DSR 104 indicator by itself can be mounted simply by drilling 86mm hole and securing with supplied mounted bracket.

DSR-104P indicator is supplied with SS plate. Bolt on 4 holes on the plate.

Figure 6 : DSR-104

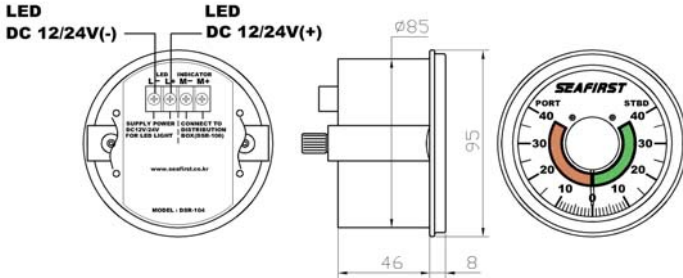
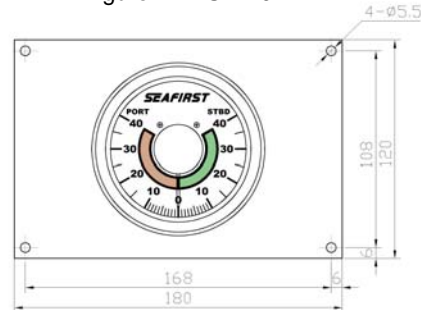


Figure 7 : DSR-104P



Up to 15 Rudder Angle Indicators can be wired to the three sets of terminals in the distribution box labeled +M1/-M1, +M2/-M2 and +M3/-M3 but with a few minor restrictions :

- At least one rudder angle indicator must be connected to the terminal +M1/-M1
- To connect an indicator to M3, M2 terminal must have an equal number of indicators as M3.
- No more than 5 rudder angle indicators can be connected in series.

For example

- For one indicator installation, connect the indicator to M1.
- For two indicators installation, connect the indicator to M1 and M2 each.
- For three indicators installation, connect the indicator to M1, M2 and M3 each.
- For four indicators installation, connect two indicators in series to M1. One indicator to M2 and one indicator to M3.
- For five indicators installation, connect three indicators in series to M1. One indicator to M2 and one indicator to M3.
- For ten indicators installation, connect four indicators in series to M1. three indicator in series to M2 and three indicators in series to M3.

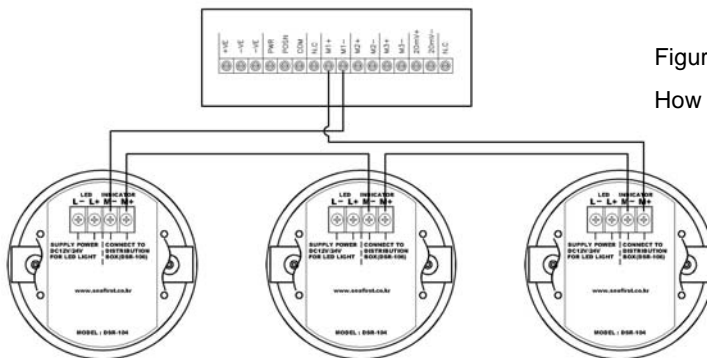


Figure 7 :
How to make a connection in series

After wiring the rudder angle sensor, Rudder Angle Indicators and power supply and then checking that all wiring conforms to what is shown in Table 1, switch on the master switch or breaker supplying power to the rudder angle indicator system.

Move the rudder to determine if the rudder angle indicators move in the correct direction.

- 1) If all rudder angle indicators move the wrong direction, reverse the white and red wires coming from the rudder angle sensor to the distribution box terminals.
- 2) If one group (M1, M2 or M3) of indicators goes in the wrong direction, reverse the wires going to that group's respective terminals in the distribution box.
- 3) If any one Rudder Angle Indicator is going the wrong direction, reverse the wires going to the indicator's own terminals.
- 4) If any Rudder Angle Indicator differ in readings, check the connection rules given previously. Rudder angle indicator of the same type and wired in series should agree to within three degrees as verified from the factory final tests.

ADJUSTMENTS :

Move the rudder to the " dead ahead " position. If the " deal ahead is precisely known and the Rudder Angle Indicator is off, adjust the length of linkage by rotating the ball joints on the both ends of the linkage.

Move the rudder to hard over port and starboard and check the indication is as expected.

Two factory pre-calibrated trim controls are provided on the distribution circuit board

- The offset control allows some adjustment of the " dead ahead " rudder indication, making it easier to adjust the system while on sea trials. If the indication is more than 10 degree off, adjust the rudder angle sensor linkage rather than the offset trim control.
- The span control allows some adjustment of the Rudder Angle Indicator indication at the hard over rudder position. This system is calibrated at the factory to be accurated within 3 degree if installed as per instruction. If the Rudder Angle Sensor linkage geometry is not correct (rudder tiller arm and rudder angle sensor arm are not equal in height, parallel or linkage rod is not 90 degrees when centered), indication of the hard over positions will be off. It is better to correct the linkage but, if this is not possible, the span control can be used. Making a large correction for the linkage problem by using the span control can introduce errors in indication at the half deflection position and unequal indication at the hard over position.