

PRODUCT CATALOGUE



SEC
MEASURING & MONITORING EQUIPMENT

SHOYO ENGINEERING CO., LTD.

Ensuring Marine Safety with Measurement Technology

We want to build your confidence in us.

Since its establishment in 1976, SHOYO ENGINEERING CO., LTD. has been a professional manufacturer of measuring instruments for ships.

From the beginning, we have been working on the development and manufacture of shaft horsepower meters, and have been working hard to deliver products with excellent accuracy and durability to customers at reasonable prices.

The shaft horsepower meter is used in many ships because of the confidence of our customers and it still remains our mainstay.

As the environmental regulations in the marine industry, including global warming countermeasures, are becoming stricter, marine equipment is also required to have functions that contribute to environmental countermeasures. Among them, the role of measuring and monitoring equipment including shaft horsepower meter is very important, and its importance is also increasing in the international standard ISO.

Going forward, as a specialized manufacturer of measurement equipment, we will constantly pursue measurement accuracy and safety, and will continue to strive to provide products that satisfy our customers.

Company Profile

Company	SHOYO ENGINEERING CO., LTD.
Representative	Kimio Sasada
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URL	https://www.shoyo-e.co.jp
Establish	March, 1976
Capital	Yen 99.4 mio

Company History

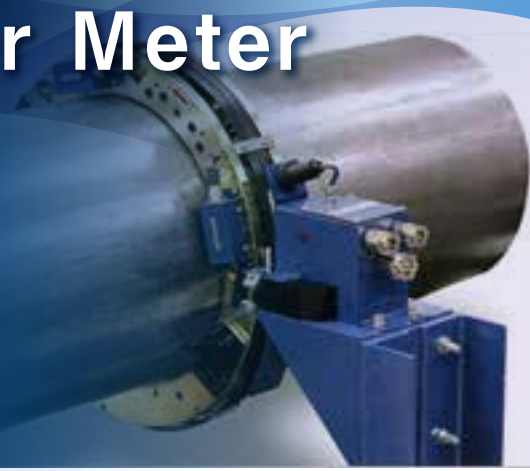
1976 / 03	Established a company in Yokohama City for the purpose of developing and manufacturing marine measuring equipment.
1981 / 12	Developped the shaft Horsepower meter for angle control of CPP(Controllable-pitch Propeller)
1984 / 04	Developped the shaft horsepower meter with the measuring function of Fuel consumption
1986 / 01	Developped the shaft thrust load meter
1990 / 11	Transfer Head office to Ayase-city, Ohgami
1992 / 06	Developped the combustion pressure monitoring system
2011 / 06	Completion of new office and transfer Head Office to Ayase Fukaya Naka
2020 / 09	Merged by Nakashima Propeller Co., Ltd.



SEC Shaft Horsepower Meter

What is shaft horsepower meter? :

A shaft horsepower meter is an instrument that measures the transmitted horsepower supplied from the engine to the propeller on a vessel by measuring the torsion of the rotating shaft.

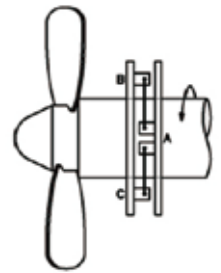


SEC Shaft Horsepower Meter

Metal strip vibration method

The principle of measurement is a method for detecting shaft torque using the fact that the vibration frequency changes in proportion to the change in tension.

Two sensors are installed between the detection rings mounted on the shaft, and the metal strip stretched inside the sensor changes the distance between the fulcrums due to the torsion of the shaft, increasing the tension between AB and decreasing between AC. The amount of each change is reflected in the natural frequency of the sensor strip.



The distance between the fulcrum of the sensor strip changes due to the torsion of the sensor strip .

A-B → Increase A-C → Decrease

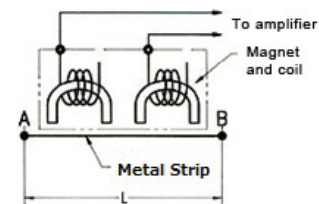
$$\text{Tension} \propto \text{change amount of A-B (A-C)} \propto \text{Hz}^2$$

High Sensitivity Displacement sensor

A high sensitivity displacement sensor with a minimum resolution of 0.05 microns detects the extremely small amount of shaft twist that occurs between only 70mm of the shaft.

The metal strip stretched between point A and point B continuously vibrates at the natural frequency determined by the tension of the metal strip. The vibration is caused by the excitation force of the magnet coil and the amplifier.

Distance "L" between the ends A and B changes in accordance with changes in shaft torsion. Accordingly, the tension of the strip and this causes the natural frequency, which depends on the tension, to change.



High Accuracy

Sensor sensitivity determination accuracy : +/-0.15%

Perfect Reproducibility

Sensor sensitivity characteristics are semi-permanently unchanged

High Durability

Metal strip used for sensors has excellent repeated stress characteristics

Composition of SEC Shaft Horsepower Meter

SEC shaft horsepower meter is basically composed of a detector ring attached on the intermediate shaft, a contactless power supply unit that supplies the power to vibrate the metal strip of the torsion sensor and to transmit the sensor signal, and the data processing unit that calculate and display Shaft horsepower and shaft torque based on the shaft speed signal and the sensor signal.

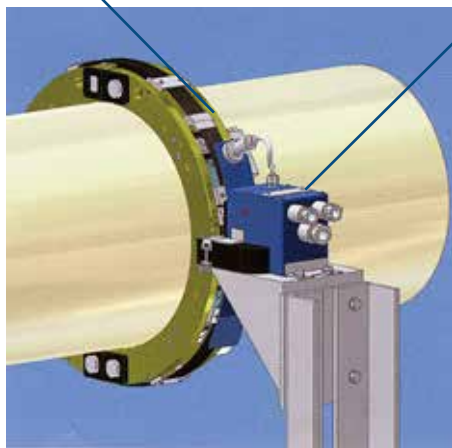
The SEC shaft horsepower meter can also be installed on the service vessel. For in-service vessels, installation at the port of call is also available.

Detector Ring

- Tolerance of dimension of detector ring : +/-0.5%
- Measuring shaft diameter Minimum 50mm~Max. 1000 mm
- Available to install in narrow space (Shaft length 200mm or more)
- Installation space on the shaft 160mm + Service space (About 50mm)
- Available to installed on the high-speed of shaft rotating vessel

Contactless Power Supply Unit

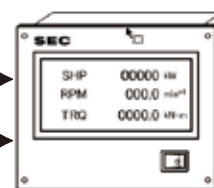
- Power supply to the sensor by the non-contact
- Transmission of the sensor signal by wireless
- Available Power supply voltage AC100~220V
- Attached Speed detector sensor (Proximity sensor or infrared photo sensor)



[Detecting parts]
Engine room

Shaft Torque

Shaft speed



[Display parts]
ECR

Data Processing Display Unit

- **SE104CN:** only display SHP(kW), Shaft Speed (min^{-1}), Torque(kNm)
- **SE207CN:** can be display a performance curve, the related FO consumption and the other performance data
- Automatic input of zero point
- Selectable of the sampling time (0.1/1/5sec)(20msec is option)
- Available to communicate with the external devices
- Specification customizable upon request

Data Processing Display Unit

The horsepower (kW) is calculated based on the sensor signal and rotation signal sent from the detection part of the shaft horsepower meter, and the data is displayed.

We have two lineups: **a standard type (SE104CN)** that displays only the shaft horsepower meter data, and **an extended type (SE207CN)** that integrates external signals such as fuel flow rate and ship speed and processes and displays them along with horsepower-related data.

SE104CN 4.3 inches LCD Monitor

Feature

- Improved operability with touch panel
- Output signal type selectable from analog, RS422/485
- Display items can be specified arbitrarily
- Brightness and font color can be changed

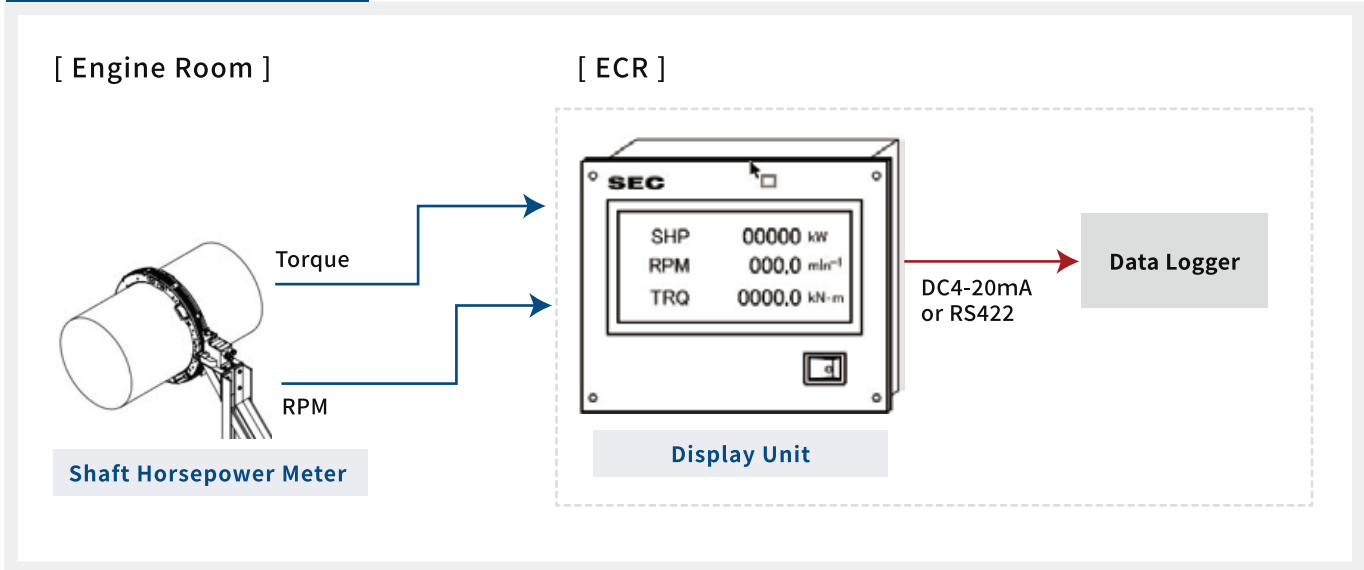
Display Items

- Shaft Horsepower (kW)
- Shaft Speed (min-1)
- Shaft Torque (kNm)
- Shaft Trust (Nm)*option
- Total Power (MWh)*option



Dimension : W=168mm H=123mm D=272mm
Weight : 3.5kg

Configuration example



SE207CN

7 inches LCD Monitor



Dimension : W=310mm H=136mm D=343mm / Weight : 6.8kg

Feature

- Improved operability with touch panel
- Output signal type selectable from analog, RS422/485
- Equipped with external input/output ports (8 analog channels, 8 serial ports)
- Operating point displayed on ship characteristic curve (cubic curve)
- Twin shafts measurable
- Available to integrate with fuel-related data
- Available to link with Ship Performance Monitor

Display Items

※ example for the case of M/E fuel related signal input

Propulsion data

- SHP(kW)
- RPM(min-1)
- Torque(kNm)
- Thrust(Nm)

Fuel related data

- M/E Fuel Flow(ltr/h)
- M/E Fuel Consumption(kg/h)
- M/E Fuel Temperature(°C)

Performance data

- SFOC(gkW.h)
- Overall ship performance(kg/nm)
- Hydrodynamic Performance(m/kWh)
- Ship Speed(knot)

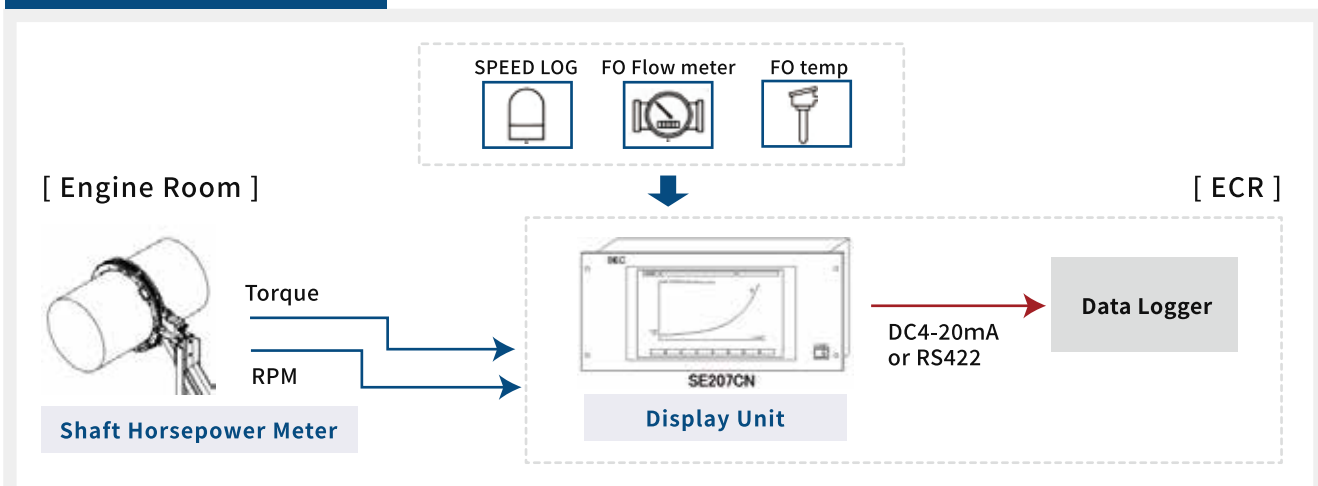


Propulsion screen



FO related screen

Configuration example



Comparison table of Data Processing Display unit

● : Standard op : option

Model type		SE104CN		SE207CN		
Monitor type		4.3 Inches Touch Panel		7 inches Touch Panel		
Dimension		W168 x H123 x D272		W310 x H136 x D343		
Available shaft number		single shaft		Twin shaft		
Indication Items	Instant (5sec ave)	Shaft Horsepower	●		●	
		Shaft Speed	●		●	
		Shaft Torque	●		●	
		Shaft Thrust	op	10sec ave	op	10sec ave
	Auto Average	Shaft Horsepower	●	1~1500min (by min)	●	1~1500min (by min)
		Shaft Speed	●	1~1500min (by min)	●	1~1500min (by min)
		Shaft Torque	●	1~1500min (by min)	●	1~1500min (by min)
		Shaft Thrust	op	1~1500min (by min)	op	1~1500min (by min)
	Manual Average	Shaft Horsepower	●	Max 90days (by min)	●	Max 90days (by min)
		Shaft Speed	●	Max 90days (by min)	●	Max 90days (by min)
		Shaft Torque	●	Max 90days (by min)	●	Max 90days (by min)
		Shaft Thrust	op	Max 90days (by min)	op	Max 90days (by min)
	Related FO consumption		-	-	op	customizable
	Performace Data		-	-	op	customizable
	Accumulated SHP		op	Max 8 digits	op	Max 8 digits
	Accumulated RPM		-	-	op	Max 10 digits
Other Accumulation data		-	-	op	customizable	
Performace Curve		-	-	●		
Input/Output Signal	Sensor Signal	SHP CH1/CH2	●		●	
		THT CH1/CH2	op	Displayed only with thrust connection	op	Displayed only with thrust connection
		REV (pulse)	●		●	
		TEMP	-		op	
	Output signal	DC4-20mA	8CH	0.1/1/5sec selectable *20sec option	12CH	0.1/1/5sec selectable *20sec option
		Dry contact	2CH		4CH	
		Relay	op	2CH	op	2CH
	Input signal	DC4-20mA	-		8CH	8CH
		FO pulse	-		6CH	6CH
		Ship speed pulse	-		1CH	1CH
FO temp PT100		-		6CH	6CH	
Serial Input/Output		4 port	output (*2 port for the remote display)	8 port	Input/output by RS422 or 485 (*3 port for the remote display)	
Other	Brightness adjustment		●		●	
	RGB adjustment		●		-	
	Power Supply Voltage		multi		multi	

SEC Shaft Horsepower Meter for temporary use

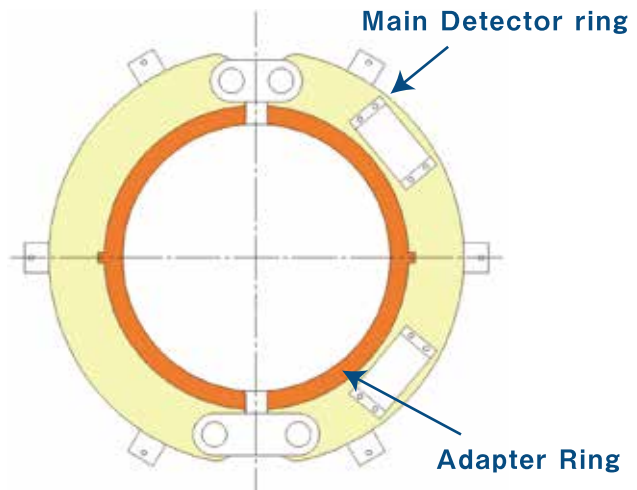
SEC shaft horsepower meter can be used for the temporarily measurement at sea trial.

By combining an adapter ring with the main ring, the measurements can be made on multiple ships with different shaft diameters.

Rental is also available for measurement only during sea trial.

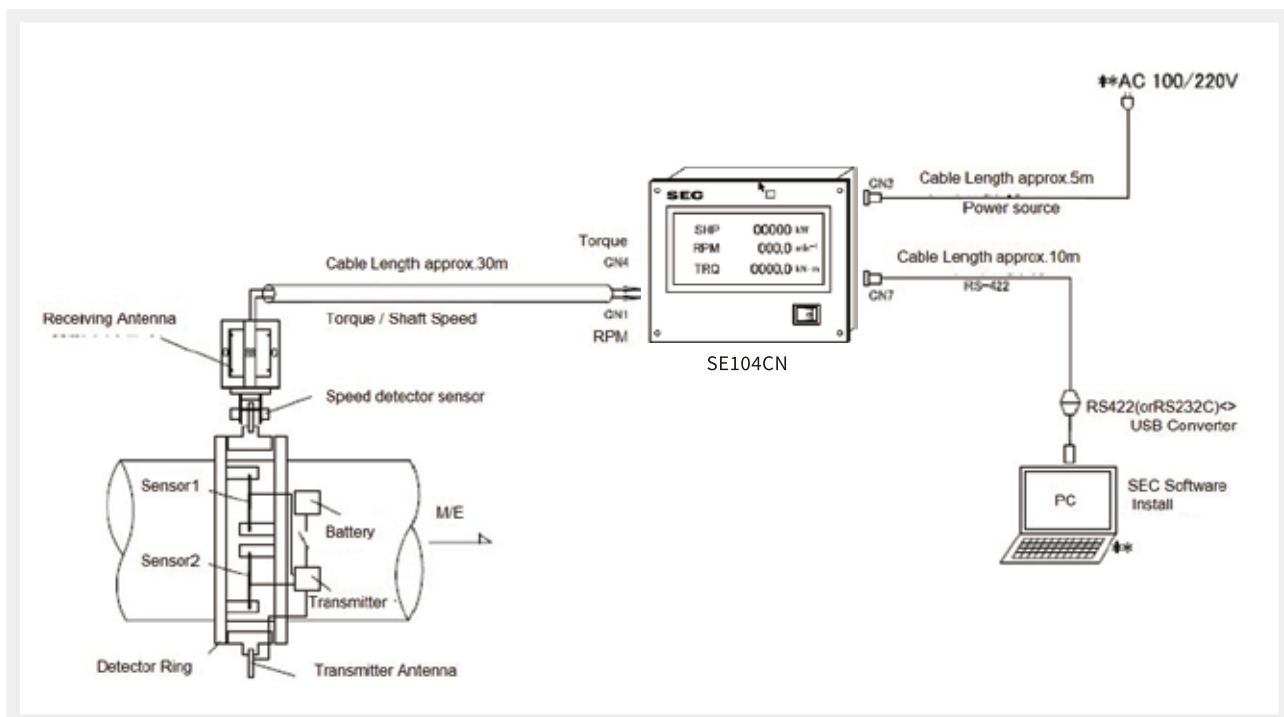
Feature of temporary use

- ▶ Measurable on multiple ships by changing the adapter ring in the range of shaft diameter +/- 35mm
- ▶ Sensor driven by battery (9V battery)
- ▶ Easy mounting of antenna unit
- ▶ Data logging is possible with SEC dedicated software
- ▶ Data sampling according to ISO15016: 2015 (1 second instant) is possible



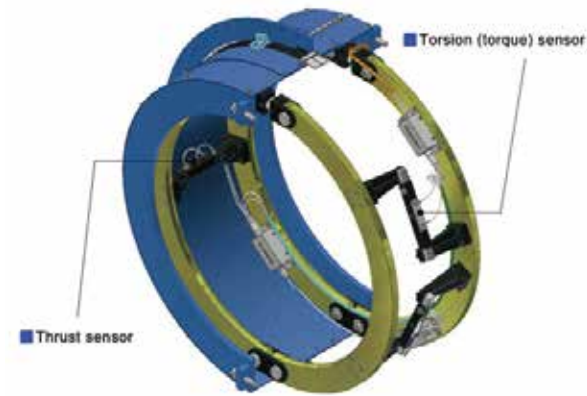
Shaft Horsepower Meter for temporary use

System configuration sample



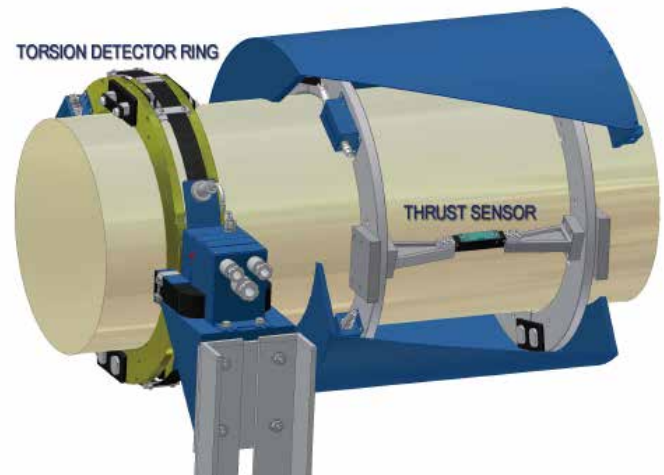
Combined type

Measure the torsion and compressive strain on a single detector ring



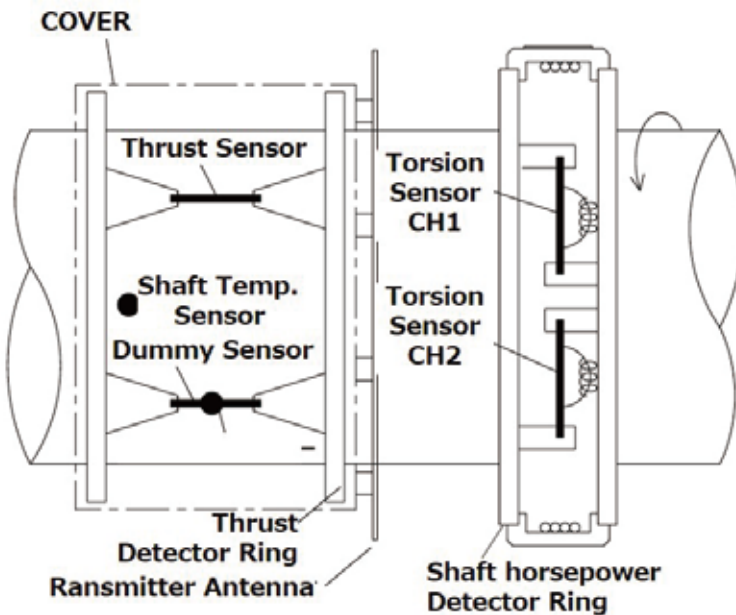
Separate type

Measure the shaft horsepower and shaft thrust load with the separate detector ring.



Temperature correction type

Add the temperature correction feature to the separate type and measure with the higher accuracy.



The linear expansion coefficient between the metal strip of the thrust sensor and the shaft is very similar, but if there is a temperature difference between them, a measurement error will occur. Therefore, a temperature sensor is equipped each on the shaft and the sensor strip, and the sensor strip vibration frequency is corrected from the resulting temperature difference.

Measuring accuracy and Installation space

Type	Measuring accuracy	Installation space
Combine type	+0.5%, -2.5% or under	500~600mm (incl. service space)
Separate type	+0.5%, -1.5% or under	1,100~1,200mm (incl. detector ring of shaft horsepower meter and service space)
Temperature correction type	+0.5%, -0.5% or under	1,100~1,200mm (incl. detector ring of shaft horsepower meter and service space)

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