

General Specifications

EML500

EML500 Serie Electromagnetic Log

General

The EML500 Serie electromagnetic log conforms to the technical requirements for the performance standard determined by IMO Resolution A478 (VII) and also meets type approval issued by the Transport Ministry of Japan (Type Approval No.3795).

Feature

- (1) Small size and light weight compared ordinary models.
- (2) The length of the cable between the sensor and the master unit can be extended maximum 300m by adoption of the preamplifier built into the sensor.
- (3) Full provision of various external interfaces
 - Pulse output (photocoupler/contact)
 - Digital output (NMEA0183)
 - Analog speed output
 - Alarm contact output
 - Digital input (NMEA0183 ; for back-up signals from external speed sensors such as GPS)
- (4) Reduction in the number of parts by employment of highly integrated circuits including

microprocessor, and has no moving parts, thereby achieving high reliability.

- (5) Provision of small size and light weight master indicator for indication of speed and distance, and can be operated by the master indicator;

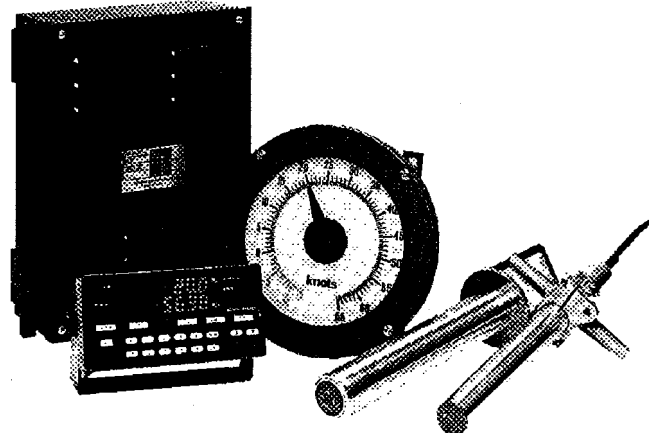
milepost calibration etc., thereby, installation

place of master indicator is not limited.

- (6) Variety of sensors available to meet various installation requirements. A dual-axis sensor can measure not only the longitudinal speed,

but also the transverse speed.

- (7) Built-in self-diagnostic function.
- (8) All indicator are able to drive by input signal (NMEA0183) from GPS.



- Transverse speed : 0~±6.5kt (for dual axis)
- Distance : 0~9999.99nm
- Direction of ship movement: 0 to 359deg., clockwise from the bow-to-stern line (fixed to 0 deg. if the resultant speed is 0.5kt or less)

□ Measuring accuracy

- Speed: ±0.15kt with respect to standard signal input (±0.25kt. or less if the measuring range is above 50kt.)
- Distance : ±0.05nm/h or ±1.0% max., which never is larger
- Direction of ship movement : ±2.5deg. max.

□ Response speed

- Variable up to 2min. for a 0 to FS-step input (0 to 90% response)

□ Restriction of the cables between each equipment

General specification

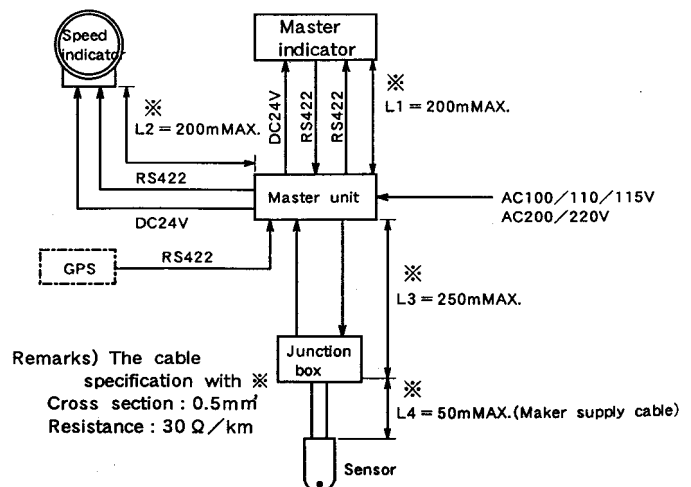
- Measurement subject : Ship's water speed and distance
- Measurement principle : Faraday's law of electromagnetic induction.

Performance specification

□ Measurement range

- Speed : -4~+20kt
- 5~+25kt
- 7~+35kt
- 8~+40kt
- 10~+50kt ※
- 13~+65kt ※

※ Additional engineering is required concerning the installation of the sensor.

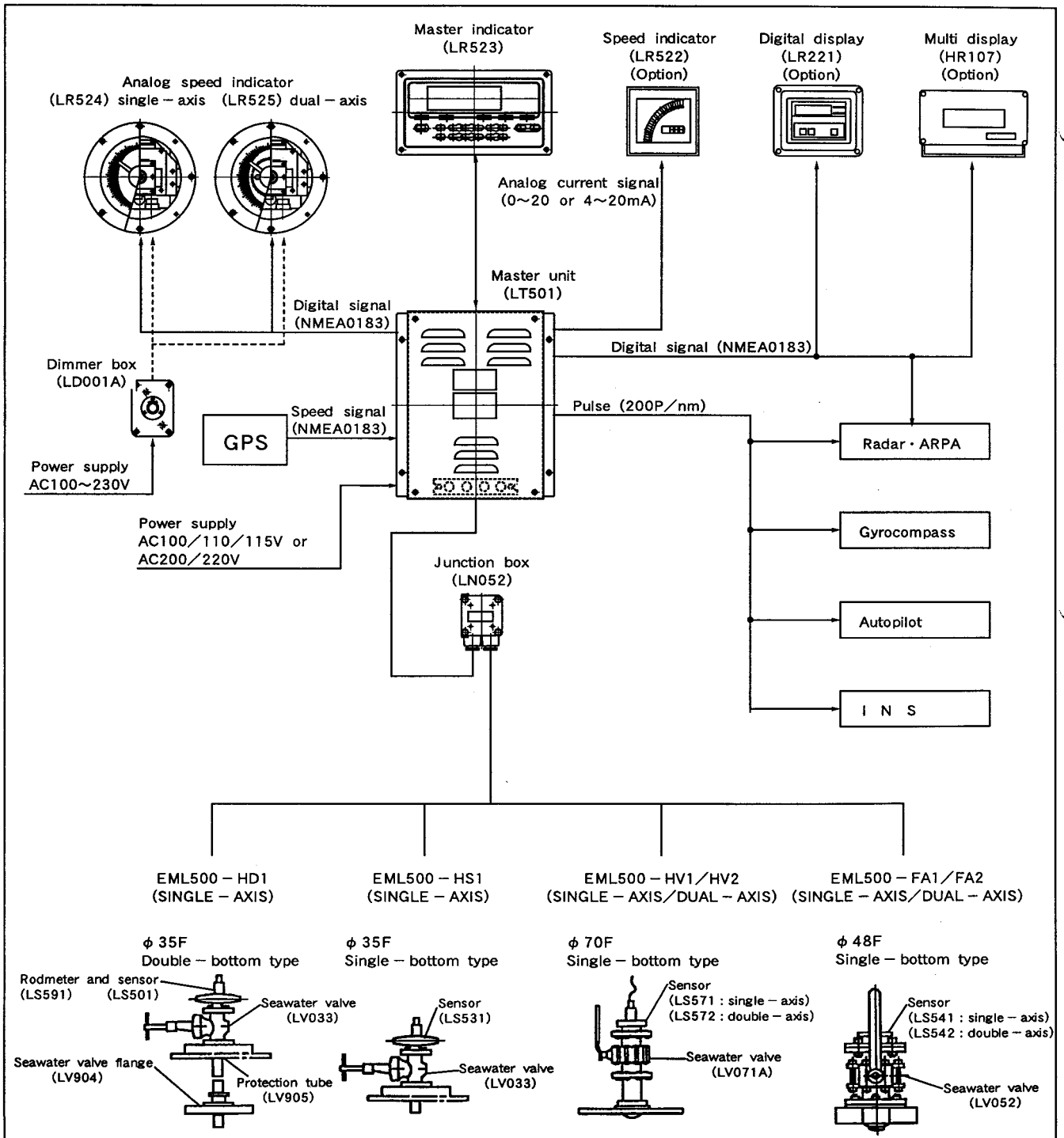


Environmental conditions

- Ambient temperature : -15 to +55°C (when operating)
: -20 to +60°C (when not operating)
- Humidity : 10 to 95% RH (no dew condensation allowed)
- Vibration : 5 to 12.5Hz ±1.6mm
12.5 to 25Hz ±0.38mm
25 to 50Hz ±0.1mm

- Noise of power source line: Not failure in the state put on the pulse 100/400nsec, 1500V during three minutes.
- Insulation resistance : at least 10Ω using a 500V megger
(Excluding electronic circuit)
- Withstanding voltage: 1500V AC for 1 min.
(Excluding electronic circuit)

SYSTEM CONFIGURATION



Component models of EML500

EML500 is composed of Master unit, Master indicator and Sea – bottom (with sensor).
And if it is necessary, combined with speed indicator and environ equipments.

Basic system models

According to type of Sensor unit, basic system model is set.

Component Models : EML500 – □□□

→ Sensor unit code

System Type TypeSys		EML500 – □□□							Remarks	
		HS1	HD1	HV1	RD1	FA1	HV2	FA2		
Product Name and Model										
Master unit LT501		○	○	○	○	○	○	○		
Master indicator LR523		○	○	○	○	○	○	○		
Speed indicator (single – axis) LR524		○	○	○	○	○				
Speed indicator (dual – axis) LR525							○	○		
Dimmer box LD001A		○	○	○	○	○	○	○		
Junction box		○	○	○	○	○	○	○		
Sensor unit	Sensor	LS531	○						φ 35 sensor with cable	
		LS501		○		○			Only sensor element φ 35	
		LS571			○					φ 70 sensor (single – axis)
		LS541					○			φ 48 sensor (single – axis)
		LS542							○	φ 48 sensor (dual – axis)
		LS572						○		φ 70 sensor (dual – axis)
	Rodmeter	LS592				○				Not including the sensor
		LS591		○						Not including the sensor
	Sensor cable LS503			○	○	○	○	○	○	
	Seawater valve	LV033	○	○						For sensors φ 35
		LV071A			○			○		For sensors φ 70
		LV052					○		○	For sensors φ 48 (including the dual – axis sensor)
		LV031				○				For sensors φ 35
	Seawater valve flange LV904			○		○				
	Protection tube	LV905		○						
		LV903				○				
	Mounting plate for seawater valve	LV902				△				
		LV902A – 1 □	△							
		LV902A – 2 □		△						
		LV902A – 3 □		△						
LV902A – 4 □				△			△			
LV902A – 5 □				△			△			
LV910						△		△		
Zinc plate	LV901 – 1 □		△		△					
	LV901 – 2 □	△								
	LV901 – 3 □				△ Note		△ Note		Note : For the flush – mounted unit (unnecessary for a protruding unit)	
Sensor installation	Installation type	Single – bottom	Double – bottom	Single – bottom	Double – bottom	Single – bottom	Single – bottom	Single – bottom		
	Standard length of protrusion	50mm	50mm	7mm or 50mm	50mm	10mm or 60mm	7mm or 50mm	10mm or 60mm		

Note : Items marked with a “△” are ordered from the shipbuilder as standard.

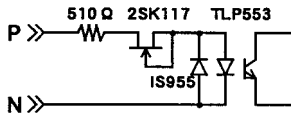
Component equipment specification

Master Unit LT501

Receives and converts speed data signals from the sensor. Then transmits the speed and distance to external devices in various signal forms.

□ Input signal

- (1) Input the detected voltage at sensor
0.242mA/knot (from sensor)
- (2) Input from GPS (for back-up by GPS)
Data format of GPS input can be set by Master indicator.
 - Transmission : Asynchronous serial data signal
 - Baud rate : 9600/4800/2400bps
 - Data form : Start bit 1 bit
Data bit 7/8 bit
Stop bit 1/1.5/2bit
Parity none/odd/even
 - Header character : 5 ASCII letter
For example) GP VBW , GP VTG
 - Position of speed data : Set data based on the location of commas.
 - Speed data receivable : Possible to receive follow-ing variable length data.
space/- X , space/- XX
space/- X.X , space/- XX.X
space/- XX.XX , space/- X.XX
 - Checksum : use/unused
 - Terminator : CR,LF/CO HEX
 - Input circuit : Photocoupler

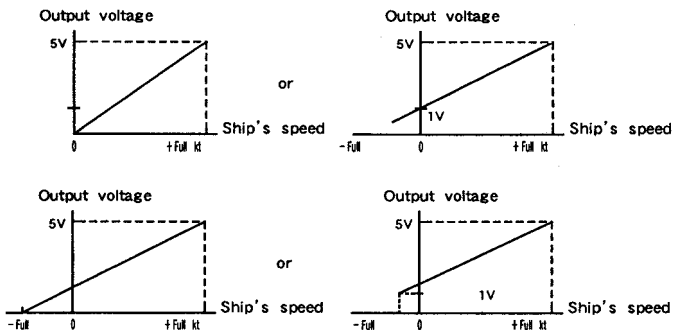


□ Output signal

(1) Analog speed signal

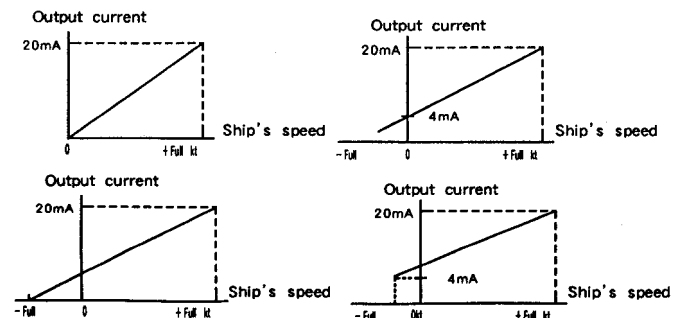
① Voltage output (2 circuits)

Output level : 0~5V or 1~5V



② Current output (4 circuits)

Output level : 0~20mA or 4~20mA



(2) Distance pulse output

① Photocoupler type (8 circuits)

Capacity: Voltage between terminals

Max. 24V

Shink current Max. 5mA

Dark current Max. 50 μA

(at 24V between terminals)

Pulse weight : 200pulse/nm

② Relay contact type (2 circuits)

Capacity : Rate load (resistance load)

DC30V 1A

AC30V 0.5A

Minimum appliciate load DC10mV 10 μA

Chattering 1msec max.

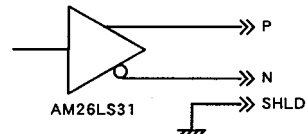
Pulse weight : 200pulse/nm

(3) NMEA0183 output (2 circuits)

- Transmission : Asynchronous serial data signal
- Baud rate : 9600/4800/2400bps *
- Transmission distance : 1.2km
- Ouitput interval : 1sec
- Data form : Start bit 1 bit
Data bit 7/8 bit *
Stop bit 1/1.5/2bit *
Parity none/odd/even *

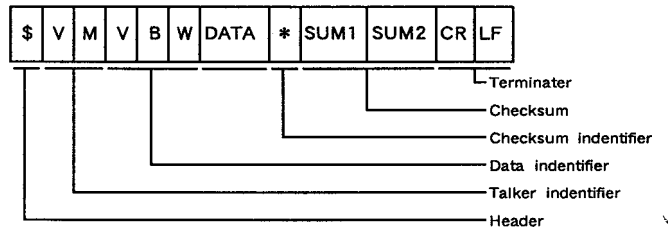
Note : Specification of mark * agree specification selected about GPS input port.

• Output circuit : Comply with EIA RS - 422 - A



• Data format (NMEA0183)

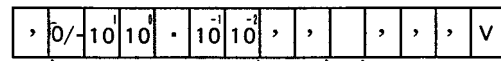
◇ VBW sentence



VM : Electromagnetic log
VBW : Water speed

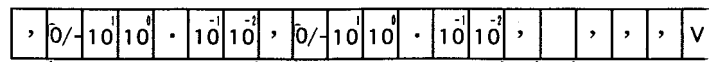
• Data block format

• for single axis



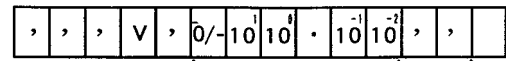
Longitudinal speed (kt) A: Valid
V: Invalid

• for dual axis



Longitudinal speed (kt) Transverse speed (kt) A: Valid
V: Invalid

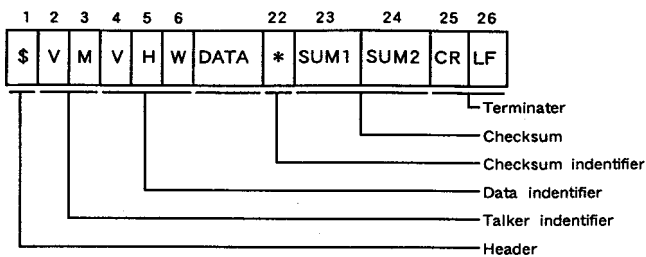
• At selected GPS



Longitudinal speed (kt) A: Valid
(Speed over the ground) V: Invalid

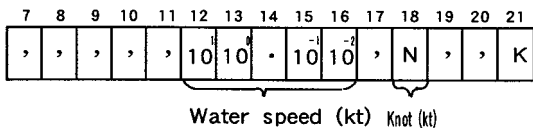
• A/V A: Valid data
V: at the system failure

◇ VHW sentence

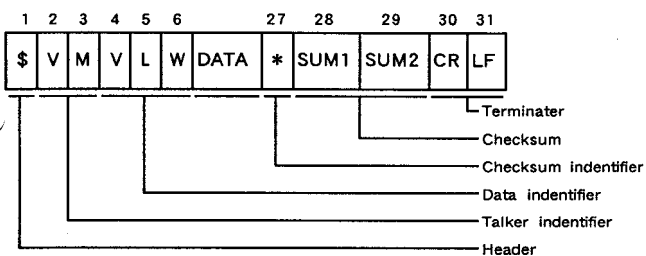


VM : Electromagnetic log
VHW : Water speed

• Data block format

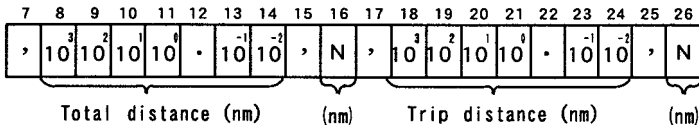


◇ VLW sentence



VM : Electromagnetic log
VLW : Water speed

• Data block format



• Checksum :

Checksum is the 8-bit exclusive-OR (no start or stop bits) of all characters in the sentence, including “,” delimiters, between but not including the “\$” and the “*” delimiters.

(4) Speed limit output (2 circuits)

• Contact specification : At state of speed limit “Close” (standard)
At state of speed limit “Open”

Selectable by Dip SW.9 - 2 (off: close, on: open)

Rate load (Resistance load) DC30V 1A
AC30V 0.5A

Maximum applicable load DC10mV 10 μA
Chattering 1msec max.

• Setting : Possible to set by Master indicator.
Possible to set higher or lower speed limit.

(5) Alarm contact output (2 circuits)

• Contact specification : In abnormal “Close” (standard)
In abnormal “Open”

Selectable by Dip SW.9 - 3 (off: close, on: open)

Rate load (Resistance load) DC30V 1A
AC30V 0.5A

Maximum applicable load DC10mV 10 μA
Chattering 1msec max.

• Failure alarm : o No voltage
o ROM/RAM error

- o Low battery (less than 2.1V)
- o A/D convertor error
- o Serial port error
- GPS input error
- Communication error between Master unit and Master indicator

□ Power supply voltage

100/110/115V AC ± 10% 50/60Hz ± 6%
or

200/220V AC ± 10% 50/60Hz ± 6%

(Can be selected by changing the jumper setting in the power supply unit.)

□ Wiring position : coaming of under or back

□ Installation : Wall or flush mounted type

□ Construction : water resist type

Master indicator LR523

Receives digital signals from the master unit, and displays the speed and distance. Both the display and operation panel are on the front of the master indicator. Set data are sent to the master unit in the form of digital signals, and placed in the memory.

□ Display function

The speed and distance are displayed with digital by LED indicator.

(1) Indication of the speed and distance

Speed : (-) □□. □ kt

Distance : □□□□. □□ nm

(2) Indication of the trip distance

Trip distance: □□□□. □□ nm

(3) Indication of the longitudinal transverse speed (for dual-axis)

Longitudinal speed : (-) □□. □ kt

Transverse speed : S/P□. □ kt

(S : right way, P : left way)

(4) Indicating of the resultant speed and direction (for dual-axis)

Resultant speed : (-) □□. □ kt

Direction : □□□ deg (relative direction)

(5) Indication of GPS speed data

It is indicated ship's speed, total distance traveled and trip distance by speed data from GPS.

(6) Indication of the alarm

The error messages detected by self diagnostic function are indicated.

□ In the first stage adjustment, manual key-in and maintenance

Possible to set manual speed, zero adjustment, milepost measurement, and also to confirm of various data.

□ Dimmer : LED lamps are added and subtracted by ▲ ▼ buttons.

□ Input signal : • Digital signal (NMEA0183)
• Input voltage DC24V

□ Wiring position : coaming of under or back

□ Installation : Desk-top, wall or flush mounted type

□ Construction : water resist type

Junction box LN052

The junction box is used for connection between sensor and master unit. And it is connected by maker supply cable and ship-builder supply cable.

- Installation : Wall mounted type
- Wiring position : Ground with water resist

Speed indicator LR524 (single-axis) / LR525 (dual-axis)

This is a large analog indicator with an outside diameter of 180mm.

The indicative variation are speed, longitudinal/transversespeed (for dual-axis) and resultant speed /direction. And the scale boards are prepared 18 kinds include each measurement range.

- Power supply : 24V DC 0.3A (7.5W)
- Capacity: 4 circuits max.

However, the fourth is necessary to have the power supply of 24V DC from external.

- Input signal : Digital signal (NMEA0183)
- Illumination : EL board
- Dimmer : Built-in or external
- Wiring position : Back part
- Installation : Desk-top, wall and flush mounted type
- Construction : Type of water resist

Dimmer box LD001A

For LR524/LR525

- Power supply : 100/110/115V AC or 200/220V AC
- Wiring position: coaming
- Installation : Wall mounted type

Digital display LR221

Selected and displayed the speed and distance by pressing "SELECT" button.

- Power supply : 100~230V AC
- Input signal : RS422
- Display form: Speed □□. □ kt, Astern - □. □ kt
Distance □□□□. □□ nm
- Display : Liquid crystal (LCD) 7 segment
- illumination : Facet illumination LED
- Dimmer : Push button (Not install external)
- Installation : Flush mount/desk-top type (bracket type)
- Wiring position : Ground with water resist (bracket type) or terminal (flush mount type)

Sea-bottom (Sensor)

- HS1 type

Using the $\phi 35$ sensor, and installed at single or double bottom of ship. Standard length of protrusion is 50mm.

Sensor: outside diameter; $\phi 35$, length; 400mm, With cable (7m/15m)

Seawater valve: 40A JIS5K gate valve

- HD1 type

Using the $\phi 35$ sensor, and installed with penetration double bottom. Seawater valve is installed on inner sea-bottom.

Sensor: outside diameter; $\phi 35$ with rodmeter (connected by connector)

Seawater valve: 40A JIS5K gate valve

Protection tube/seawater valve:

Water resist that the sensor and rodmeter go through double bottom.

- FA1/FA2 type

Using the $\phi 48$ sensor, and installed at single bottom of ship. Standard length of protrusion is 10mm or 60mm. FA2 is for dual-axis.

Sensor: outside diameter; $\phi 48$, length; 345mm (protrusion of 60mm) 295mm (protrusion of 10mm)

Seawater valve: A JIS5K ball valve

- HV1/HV2 type

Using the $\phi 70$ sensor and installed at single bottom of ship. Standard length of protrusion is 7mm or 50mm. HV2 is for dual-axis.

Sensor: outside diameter; $\phi 70$, length; 510mm (protrusion of 50mm) 460mm (protrusion of 7mm)

Seawater valve: A JIS5K ball valve

- RD1 type

With air cylinder unit for remote operation protrusion length of the sensor.

Using the $\phi 35$ sensor, and installed with penetration double bottom. Seawater valve is installed on inner sea-bottom.

Sensor: outside diameter; $\phi 35$ with rodmeter (connected by connector)

Protection tube/seawater valve:

Water resist that the sensor and rodmeter go through double bottom.

Speed indicator (For dual-axis)

Type	Code	Remarks
LR525	For EML500 (Dual-axis)
Style X 1	- F - W - Z	Flush mounted type Wall mounted type
Measurement range X 2	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6 <input type="checkbox"/> Z <input type="checkbox"/>	- 4~20knots ※1 - 5~25knots - 7~35knots - 8~40knots - 10~50knots - 13~65knots
Indication form X 2	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> Z	
Illumination X 3	- G - R - Z	Green color Orange color
Dimmer/ Power supply X 4	N 1 2 3 4 Z	None External power supply: 100~115V AC Built-in power supply: 100~115V AC ※2 External power supply: 200~230V AC Built-in power supply: 200~230V AC ※2
Wiring position X 5	1 Z	Coaming φ 25
Rule/ Name plate X 6	- 1 - 2 - 3 - Z	None/Japanese and English JG/Japanese and English JG/English
Color X 7	1 2 3 Z	YDK standard (CC24) Munsel No.2.5G7/2 Munsel No.7.5BG7/2

- (Note) ※1: Case of dual-axis, not indicated “-” speed.
 ※2: The built-in dimmer is only wall mounted type.
 1. Scale board: Scale is 0.5kt min., writing the speed value. And writing the direction value is writing per min. 5deg. and 30deg.
 2. Input signal: Meeting NMEA0183

Junction box

Type	Code	Remarks
LN052	For EML500/50
Style X 1	- W - Z	Wall mounted type
Rule/ Name plate X 2	1 2 3 Z	None/Japanese and English JG/Japanese and English JG/English
Color X 3	1 2 Z	Munsel No.2.5G7/2 Munsel No.7.5BG7/2
Ground size B X 4	1 2 3 4 5 6 Z	20a 20b 20c ※1 25a 25b 25c

- (Note) Ground A is the wiring position of the sensor cable.
 ※1: Case of the installation cable is “TTYCS-3”, please select 20c as ground size.

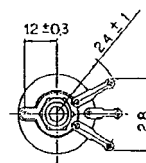
Dimmer box

Type	Code	Remarks
LD001A	For EML500 (Dual-axis)
Style X 1	- F - W - Z	Flush mounted type Wall mounted type
Rule/ Name plate X 2	1 2 3 4 Z	None/Japanese and English JG/Japanese and English JG/English DOT/English
Color X 3	1 2 Z	Munsel No.2.5G7/2 Munsel No.7.5BG7/2
Power X 4	1 2 Z	100V AC 220V AC

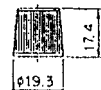
Wiring position: coaming φ 20
 Usable equipment: LR183, LR524, LR525.

Type	Code	Remarks
LD002	For EML500 (Dual-axis)
Style X 1	- F - W - Z	Inner parts only
Power X 2	1 2 Z	100V AC 220V AC
Name plate X 3	1 2 Z	Japanese English
Usable equipment X 4	1 Z	LR183, LR524, LR525

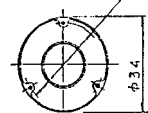
1. Variable resistor



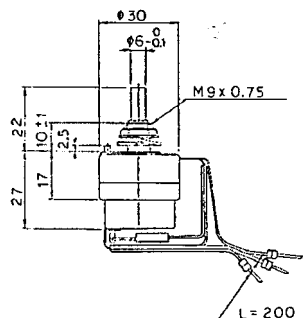
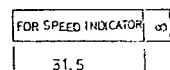
2. Knob



3. Name plate



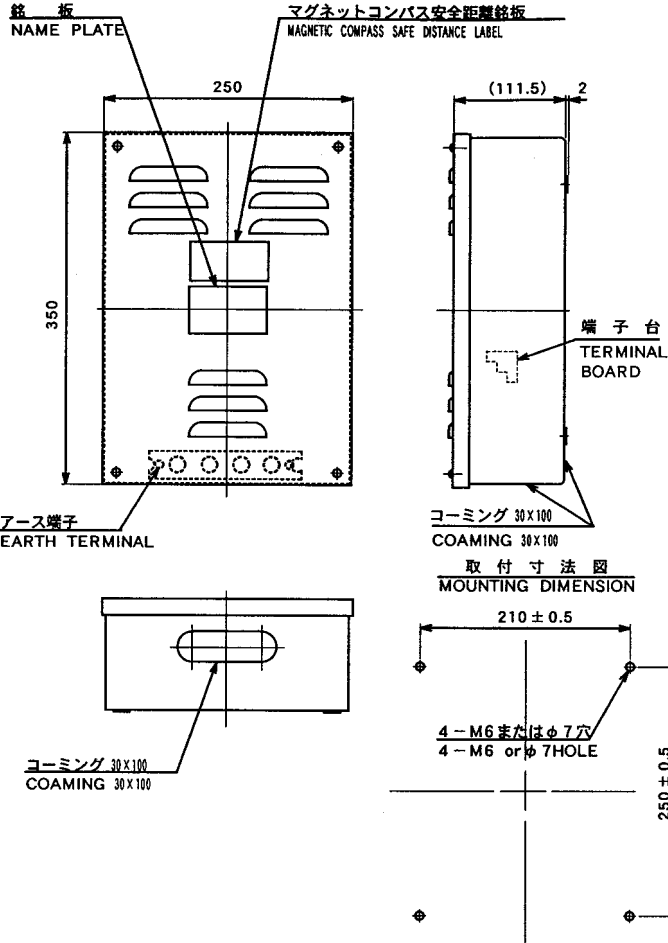
4. Name plate



Master unit

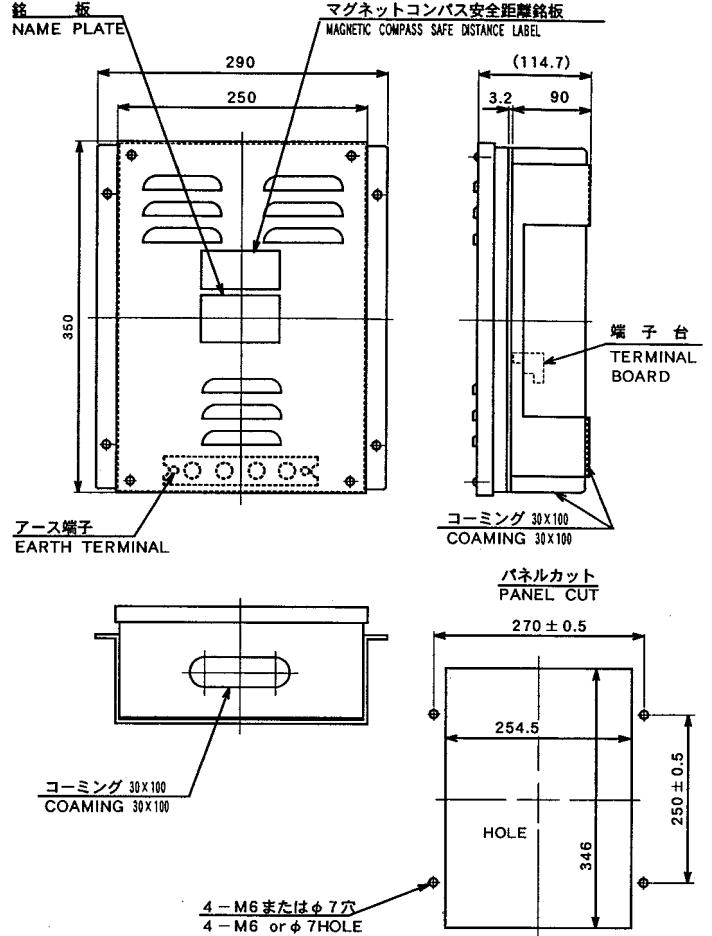
Wall-mounted type (LR501-W)

MASS : 4.9 kg



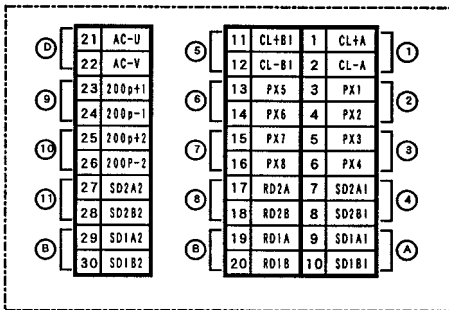
Flash-mounted type (LR501-F)

MASS : 6.4 kg



Terminal board

TB1



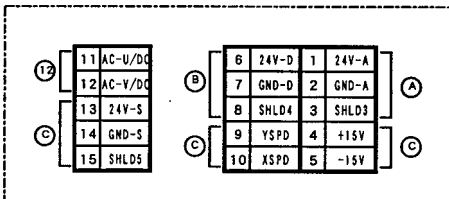
① ⑤ ⑬ ⑲ : アナログ出力
ANALOG OUTPUT
0~20mA or 4~20mA

② ③ ⑥ ⑦
⑭ ⑮ ⑱ ⑳ : フォトカプラー出力
PHOTO COUPLER OUTPUT
200Pulse / n mile

④ ⑪ : デジタル速度出力
DIGITAL OUTPUT
NMEA0183

⑧ : GPSバックアップ入力
GPS BACK UP INPUT

TB2



⑨ ⑩ : 接点出力
CONTACT OUTPUT
200Pulse/n mile

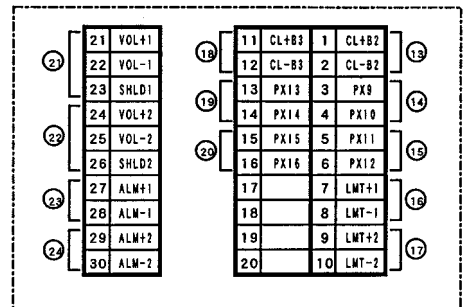
⑫ : 船内電源
SHIP'S SUPPLY

⑬ ⑰ : 警報用接点出力 速度リミット
ALARM CONTACT OUTPUT
SPEED LIMIT

⑲ ⑳ : アナログ出力
ANALOG OUTPUT
0~5V or 1~5V DC/FULL RANGE

㉓ ㉔ : 警報用接点出力 システムフェイル
ALARM CONTACT OUTPUT
SYSTEM FAIL

TB3



① : 速度指示器出力
SPEED INDICATOR OUTPUT

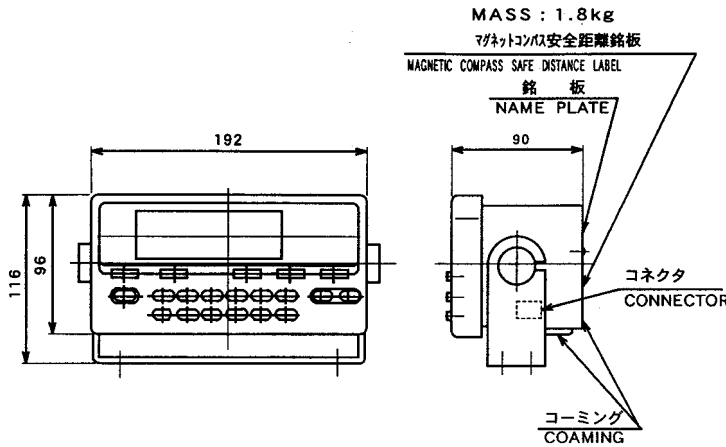
② : マスター指示器出力
MASTER INDICATOR OUTPUT

③ : 接続箱入出力
JUNCTION BOX INPUT/ OUTPUT

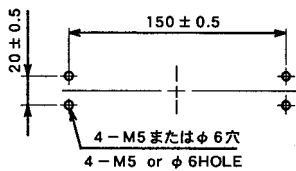
④ : AC電源出力 (AC100V)
AC POWER SUPPLY

Master indicator

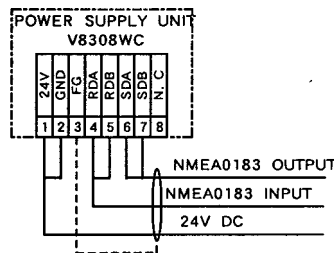
Wall-mounted type (LR523-W)



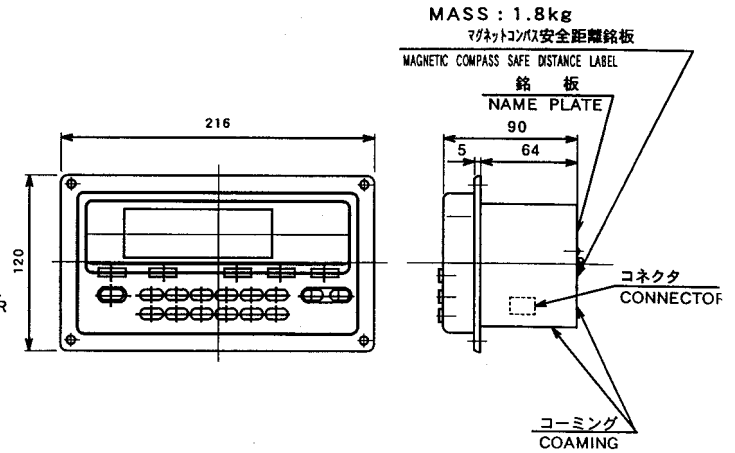
取付寸法
MOUNTING DIMENSION



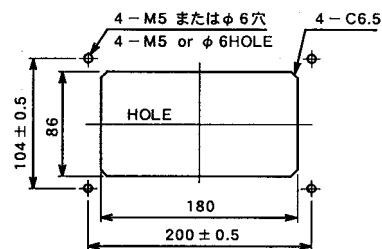
端子結線図
TERMINAL CONNECTIONS



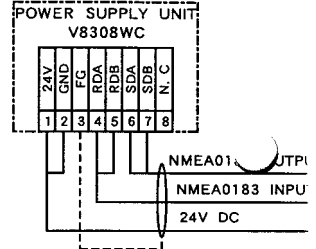
Flash-mounted type (LR523-F)



パネルカット
PANEL CUT



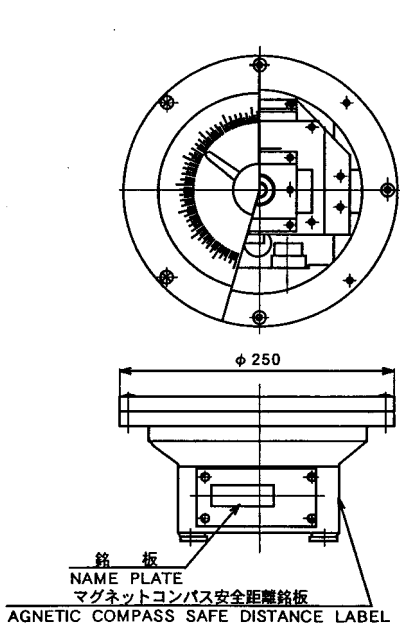
端子結線図
TERMINAL CONNECTIONS



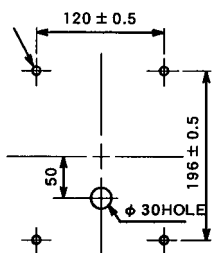
Speed indicator

Single-axis (LR524)

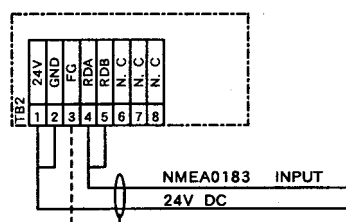
MASS : 4.1kg



取付寸法
MOUNTING DIMENSION

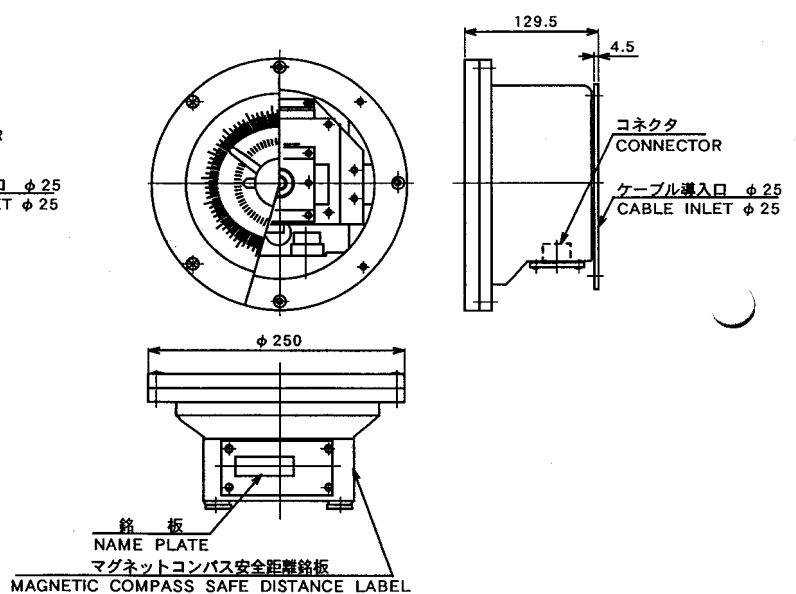


端子結線図
TERMINAL CONNECTIONS

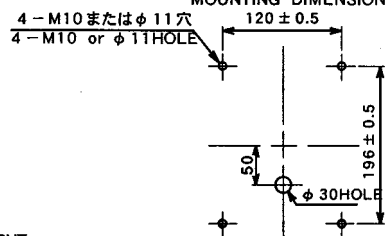


Dual-axis (LR525)

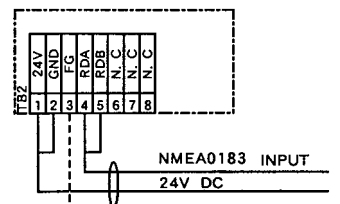
MASS : 4.1kg



取付寸法
MOUNTING DIMENSION

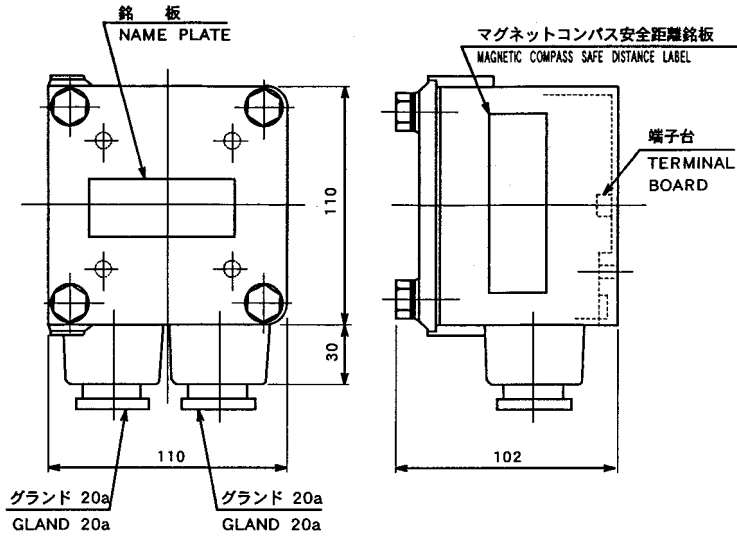


端子結線図
TERMINAL CONNECTIONS



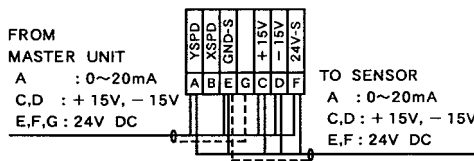
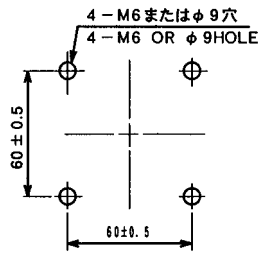
Junction box (LN052)

MASS : 0.8 kg



取付寸法
MOUNTING DIMENSION

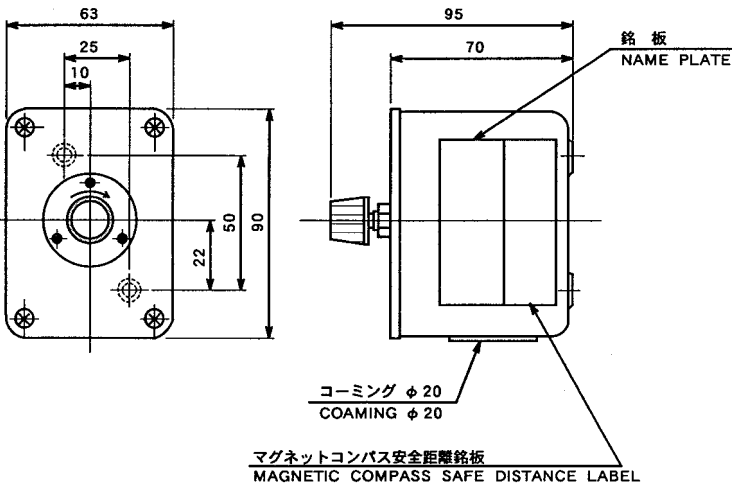
端子結線図
TERMINAL CONNECTIONS



Dimmer box

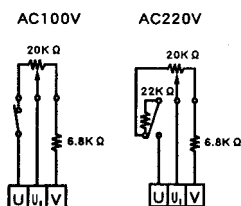
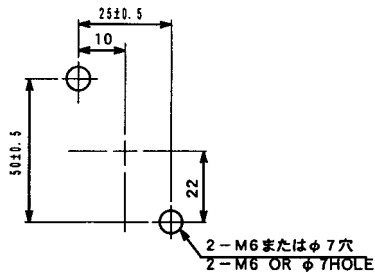
Wall-mounted type (LD001A-W)

MASS : 0.5 kg



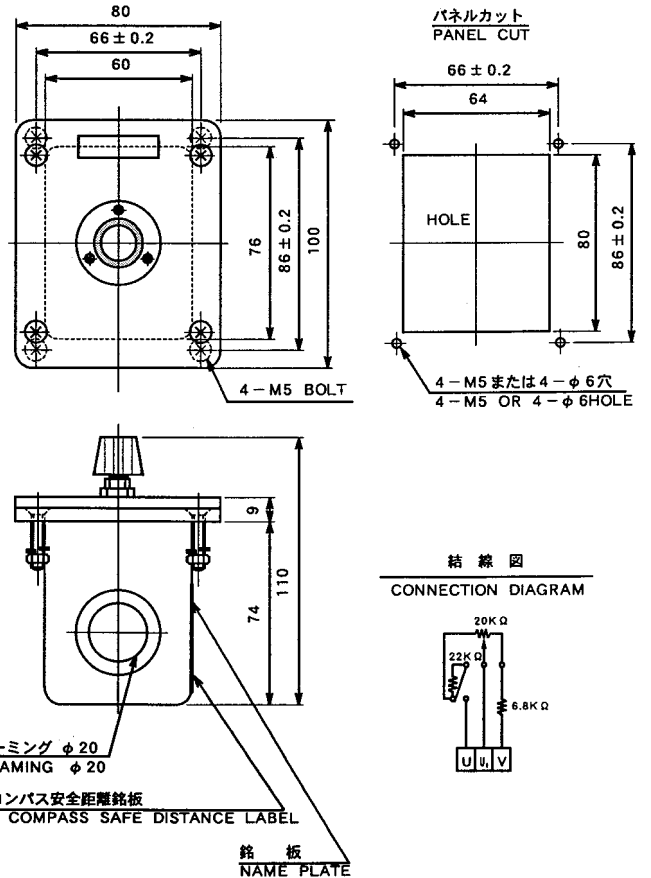
取付寸法
MOUNTING DIMENSION

結線図
CONNECTION DIAGRAM



Flash-mounted type (LD001A-F)

MASS : 0.5 kg



結線図
CONNECTION DIAGRAM

