General Specifications

CMZ900 series

GS 80B10M17E 1st

CMZ900D
GYROCOMPASS

General

A gyrocompass detects the true north by means of a fast-spinning rotor, which is suspended with no friction and is influenced by gravity and rotation of the Earth. A gyrocompass consequently indicates a ship's heading.

CMZ900 series has been type approved in accordance with International Maritime Organization (IMO) standards, resolution A.424 (XI) as well as JIS-F9602, class A standards.

- RESOLUTION A.424(XI)
  PERFORMANCE STANDARDS FOR GYRO-COMPASSES

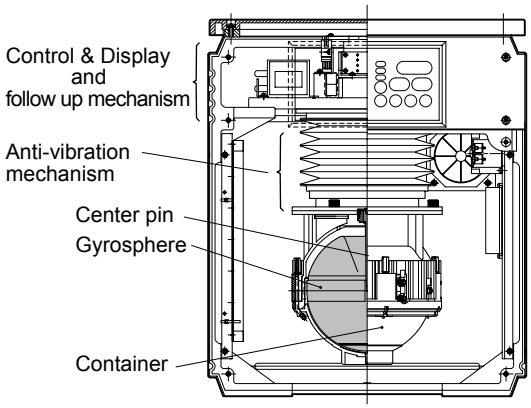
Certificate number of type approval

- JG: Under application (Gyrocompass CMZ900)
  No. 4309 (Repeater compass MKR050)
- MED: Under application
- CCS: Scheduled

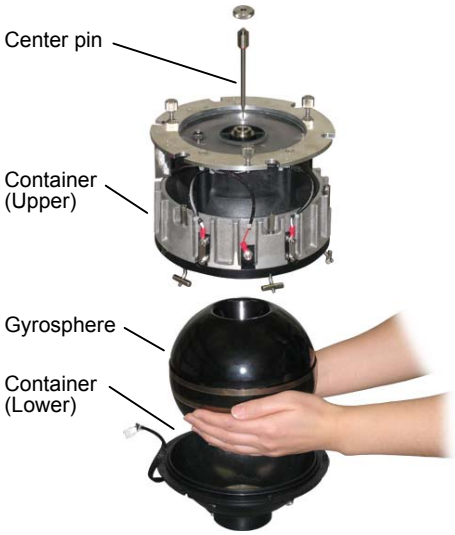
Features

1) A modular design saves the space. Master compass can be integrated in the autopilot steering stand.
2) Dual-unit model for extra reliability
3) Manual and automatic speed error correction
4) External heading sensor can back up the heading outputs.
5) Heading deviation monitoring
6) Steering mode input inhibits the unusual operation of Master compass and secure the current heading information during auto-steering mode.
7) Serial data output IEC 61162-2 (high-speed transmission)
8) A unique anti-vibration mechanism enhanced by the velocity damping effect of high viscous oil, provides superior damping of vibration and decoupling of shock at sea.
9) A small and lightweight container enhances the follow up speed. The gyrocompass reading changes smoothly and does not lag when a small ship rapidly changes course.
10) Easy maintenance and long maintenance periods
    - Titanium capsule and electrodes are employed at lower hemisphere of Gyrosphere. Purity is maintained inside of the container, and maintenance interval is then longer-dated.
    - The container is divided into two pieces at bottom when overhauled. Ship's crew can replace Gyrosphere in case of emergency.

CMZ900D GYROCOMPASS
- MKM026 Master compass
- MKC327 Control box

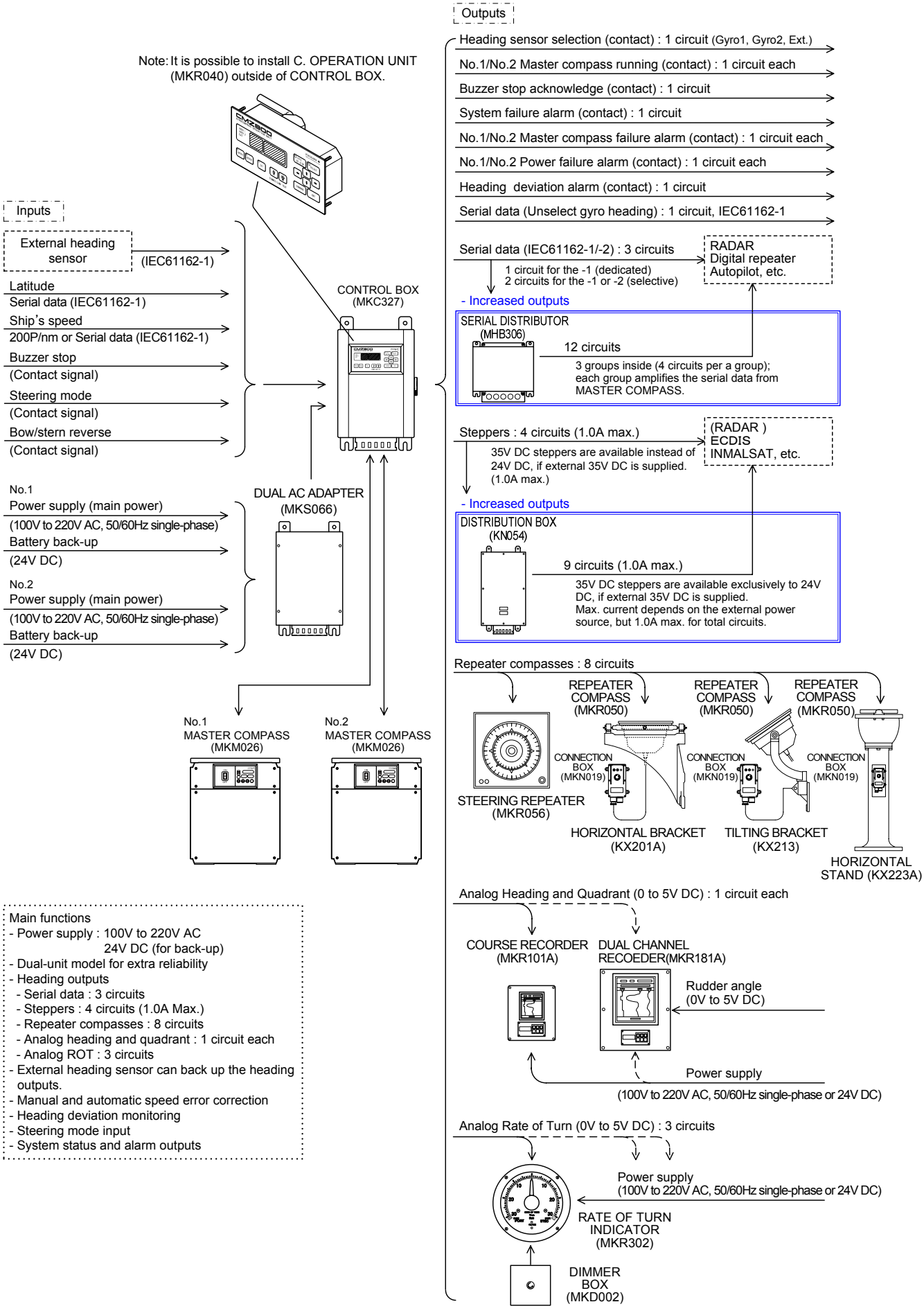


Exposure view of Master compass



Easy maintenance

System configuration diagram



Main functions
- Power supply : 100V to 220V AC
  24V DC (for back-up)
- Dual-unit model for extra reliability
- Heading outputs
  - Serial data : 3 circuits
  - Steppers : 4 circuits (1.0A Max.)
  - Repeater compasses : 8 circuits
  - Analog heading and quadrant : 1 circuit each
  - Analog ROT : 3 circuits
- External heading sensor can back up the heading outputs.
- Manual and automatic speed error correction
- Heading deviation monitoring
- Steering mode input
- System status and alarm outputs

Engineering specifications

- Power supply

Supply voltage
: 100V / 110V / 115V / 220V AC, 50/60Hz, shingle-phase
: 24V DC (20V to 30V DC) for back-up

Power consumption at AC drive
: Starting approx. 250VA
+ 12VA x number of repeater compasses (Max. 8)
: Operating approx. 200VA
+ 12VA x number of repeater compasses (Max. 8)

Power consumption at DC drive
: Starting approx. 10A
+ 0.35A x number of repeater compasses (Max. 8)
: Operating approx. 7A
+ 0.35A x number of repeater compasses (Max. 8)

- Signal inputs

- Serial data

Serial interface : IEC61162-1

This interface is provided to accept the external heading data as well as ship's speed and latitude data for the automatic speed error correction.

No. of circuits : 3 circuits
1 circuit for Ship's speed
1 circuit for Latitude
1 circuit for Ext. heading sensor

Note: Multiple data input is available from the external single talker.

Transmission convention: Serial asynchronous form

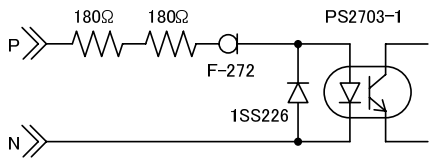
Signaling rate : 4800 bps

ID & formatter :

ID & formatter	Content
xx[1] VBW	Dual ground/water speed
xx[1] VHW	Water speed and heading
xx[1] VTG	Course over ground and ground speed
VM VSD	Water speed and heading (Yokogawa inherent)
xx[1] GGA	GPS fix data
xx[1] GLL	Geographic position, latitude/longitude
xx[1] HDT	Heading, true
xx[1] THS	True heading and status
xx[1] HDG	Heading, deviation and variation
xx[1] HDM	Heading, magnetic
xx[2] HRC	Heading/ROT (Yokogawa inherent)

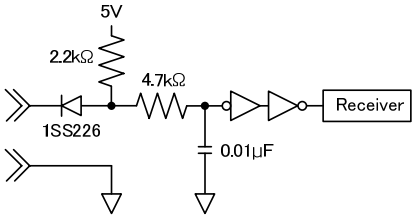
Note 1) Any Talker ID "xx" can be received.
2) Talker ID "xx" of HRC sentence is HE or HC.

Receive circuit (Typical): Photo-coupler



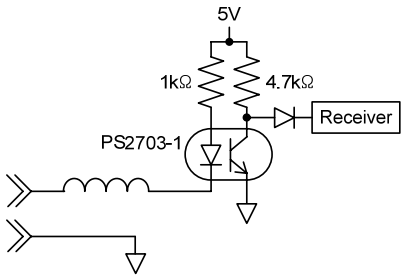
- Ship's speed (pulse input)

Data source : Ship's speed sensor
No. of circuits : 1 circuit
Pulse rate : 200 pulse/n mile
Signal format : Open collector (photo-coupler) or contact
Source voltage : 5V DC
Source current : 2mA
Receive circuit (Typical)



- Buzzer stop (contact)

No. of circuits : 1 circuit
Contact action : Momentary close to command
Source voltage : 5V DC
Source current : 5mA
Receive circuit (Typical)



- Steering mode (contact)

No. of circuits : 1 circuit
Contact action : Close and hold to continually use the current heading sensor and to inhibit the unusual operation of Master compass during auto-steering mode
Source voltage : 5V DC
Source current : 5mA

- Bow/stern reverse (contact)

No. of circuits : 1 circuit
Contact action : Close and hold to reverse
Source voltage : 5V DC
Source current : 5mA

- Signal outputs

- Repeater compasses (heading signal)

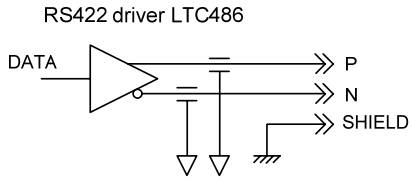
No. of circuits : 8 circuits
Electrical characteristics: RS422 (use a driver circuit equivalent to RS422A.)
Transmission convention: Serial asynchronous form
Signaling rate : 9600bps
Transmission interval : 50ms
Characters : Start bit 1 bit
Data bit 8 bit
Stop bit 1 bit
Parity bit none

ID, formatter and transmission interval:

ID & formatter	Transmission interval
HEHDT	50ms
xx[1] HRC	1s
PYDKH[2]	1s

Note 1) Talker ID "xx" of HRC is HE or HC.
2) Yokogawa inherent format

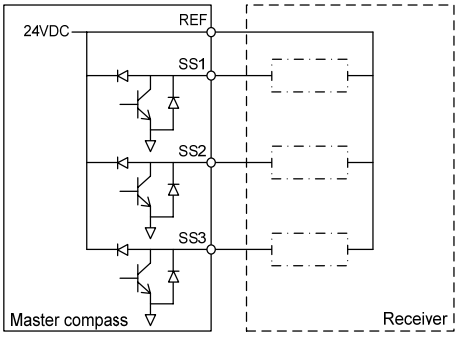
Output circuit (Typical)



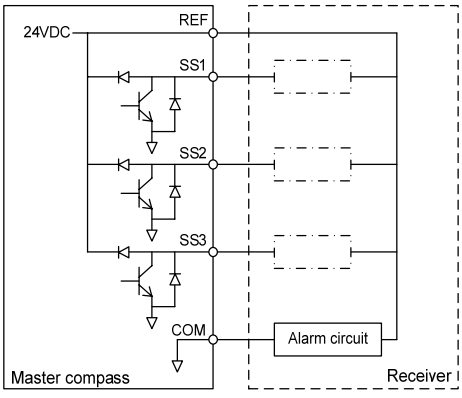
- Steppers (heading signal)

No. of circuits : 4 circuits
COM : 0V (circuit GND)
REF output voltage : 24V DC or 35V DC (Option)
REF output current : 0.3A max. or 1A max. (Option)
Output form : Open collector (3-bit gray code)
Sink current : 0.4A max. any signal line

4 wiring control circuit



5 wiring control circuit



- Serial data

Serial interface : IEC61162-1 or -2
No. of circuits : 3 circuits
1 circuit for the -1 (dedicated)
2 circuits for the -1 or -2 (selective)
Electrical characteristics: RS422 (use a driver circuit equivalent to RS422A.)
Transmission convention: Serial asynchronous form
Signaling rate and transmission interval:

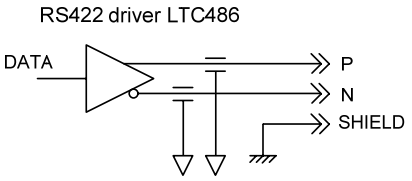
	Signaling rate	Transmission interval
IEC61162-1	4800bps	200/500/1000ms selective
IEC61162-2	38400bps	20ms

ID & formatter:

Data source		Content
Gyro	Ext. sensor	
HEHDT	xx[1] HDT[2]	Heading, true
HETHS	xx[1] THS[2]	True heading and status
-	xx[1] HDG	Heading, deviation and variation
	xx[1] HDM	Heading, magnetic
HEROT	xx[1] ROT	Rate of turn[3]
HEHRC[4]	xx[1] HRC	Heading / Rate of turn[3]

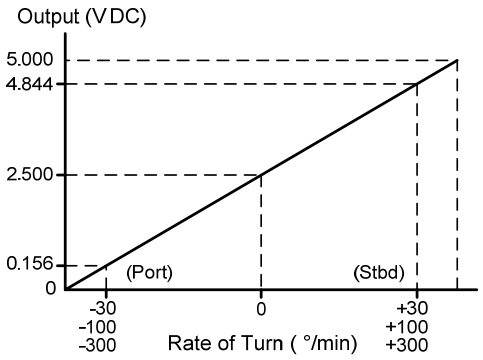
Note 1) Talker ID "xx" is subjected to the ext. sensor's ID.
2) Applied in case Transmitting Heading Device (THD) is employed as the ext. sensor.
3) Rate of turn is internally calculated (default) or transferred from the ext. sensor (selective).
4) Formatter "HRC" is Yokogawa inherent.
5) Any circuit can transmit up to 3 records as far as the transmission interval allows.

Output circuit (Typical)



- Analog Rate of Turn (ROT)

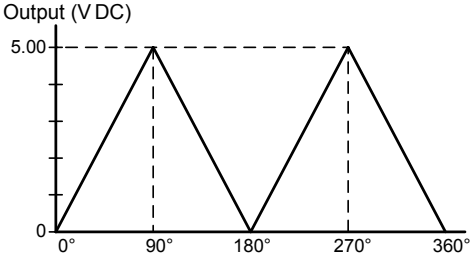
No. of circuits : 3 circuits
COM : 0V (circuit GND)
Output voltage : 0V to 5V DC
Output resolution : 2.5mV
Output impedance : 2kΩ max.
Input impedance of load : 500kΩ min.
Signal format:



- Analog heading & quadrant signal
  - No. of circuits : Heading, quadrant both 1 circuit
  - COM : 0V (circuit GND)
  - Output voltage : 0V to 5V DC
  - Output resolution : 2.5mV
  - Output impedance : 2kΩ max.
  - Input impedance of load : 500kΩ min.
  - Accuracy : ±1% (at 25 °C)
  - Signal format

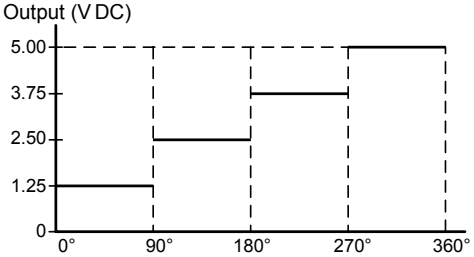
Heading signal

Output (V DC)

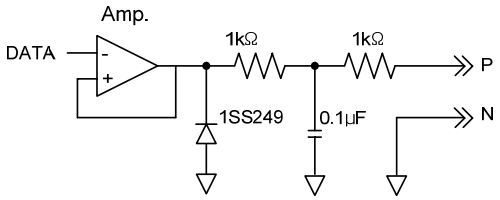


Quadrant signal

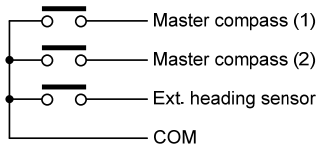
Output (V DC)



Output circuit (Typical)



- Heading sensor selection (contact)
  - No. of circuits : 1 circuit
  - Contact action : Closed and held; which represents the heading sensor to transmit
  - Electrical rating (contact): 24V DC 0.5A
  - Output circuit



- Master compass running (contact)
  - No. of circuits : 1 circuit
  - Contact action : Closed and held at a running
  - Electrical rating (contact): 24V DC 0.5A
- Buzzer stop acknowledge (contact)
  - No. of circuits : 1 circuit
  - Contact action : Momentary closed (1s) when Buzzer stop command is received (Only functional at the system failure condition)
  - Electrical rating (contact): 24V DC 0.5A
- System failure alarm (contact)
  - No. of circuits : 1 circuit
  - Contact action : Opened and held during malfunction occurs in Master compass or Control box
  - Electrical rating (contact): 24V DC 0.5A
- Master compass failure alarm (contact)
  - No. of circuits : 1 circuit
  - Contact action : Opened and held during the master compass failure occurs
- Power failure alarm (contact)
  - No. of circuits : 1 circuit
  - Contact action : Opened and held during the power interruption
  - Electrical rating (contact): 24V DC 0.5A
- Heading deviation alarm (contact)
  - No. of circuits : 1 circuit
  - Contact action : Opened and held at the excess of heading deviation
  - Electrical rating (contact): 24V DC 0.5A
- Serial data (Unselect gyro heading)

  This serial data transmits the unselect gyro heading instead of primarily selected master compass (No.1 or No.2) at choice. The format is identical to the serial data output (IEC61162-1) as already explained.

Performance specifications

1) Settling time : Within 5 hours
   (Usable accuracy in approx. 2 hours)
2) Accuracy
   - Static : ±0.25°× sec Lat. (Lat. = latitude)
   - Dynamic : ±0.75°× sec Lat. (Lat. = latitude)
3) Follow-up accuracy : 0.1° or less
4) Maximum follow-up speed : 30°/s

Environmental conditions

1) Permissible roll and pitch angle: ±40°
2) Permissible vibration
   - 0 to 8.3Hz 3mm$_{P-P}$ or less
   - 8.3 to 25Hz 0.35mm$_{P-P}$ or less
   - 25 to 50Hz 0.1mm$_{P-P}$ or less
3) Permissible ambient temperature
   - Protected equipments except Master compass : -15℃ to +55℃
   - Master compass (Operating) : -10℃ to +50℃
   - Bering repeater compass : -25℃ to +70℃
4) EMC: IEC 60945 4th edition

Paint color

- Master compass : Munsell 0.8Y 2.5/0.4 (Lamp Black)
- Control box : Munsell 0.8Y 2.5/0.4 (Lamp Black)
- Dual AC adapter : Munsell 0.8Y 2.5/0.4 (Lamp Black)

System components

This paragraph specifies, hereafter, the outline dimensions (in mm) and Model & Suffix Codes of equipment consisted in CMZ900D. The equipment is listed right and the connection diagram may be covered as far as possible.

Equipment and accessories

Model	Nomenclature	Model	Nomenclature
MKM026	Master compass	MKC327	Control box
MKR025	M. Operation unit	MKR040	C. Operetion unit
MKR026	Switch unit	MKN018	Junction unit
MKT007	Gyrosphere	MKS066	Dual AC adapter
MKZ115	Supporting liquid for installation		
MKZ512	Spare parts		

Other equipment and accessories listed right are available as a part of CMZ900D. For more detail information, another General Specifications GS80B11K03 is provided.

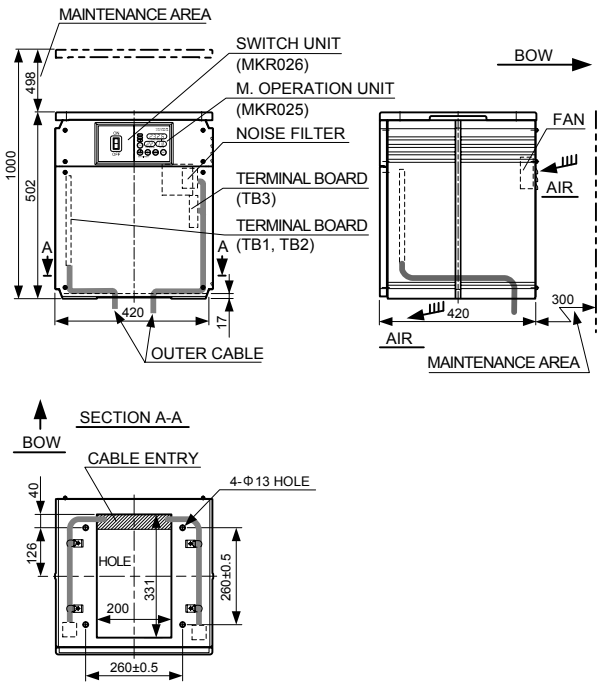
Other equipment and accessories

Model	Nomenclature	Model	Nomenclature
(Analog repeater)		(Digital repeater)	
MKR050	Repeater compass	MHR110A	Universal data display
MKN019	Connection box	MHR112	Assist monitor
KX605	Shading circle	MHR120	Universal data display
KX607	Repeater cover	MKD002	Dimmer box
MKX617	Azimuth circle	(Rate of Turn indicator)	
MKR056	Steering repeater	MKR302	ROT indicator
(Pedestal and bracket)		MKD002	Dimmer box
KX201A	Horizontal bracket	(Recorder)	
KX213	Tilting bracket	MKR101A	Course recorder
KX223A	Horizontal stand	MKR181A	Dual channel recorder
KX607A	Horizontal stand cover	(Signal distrbuter)	
		KN054	Distribution box (for steppers)
		MHB306	Serial distributor

MKM026 Master compass

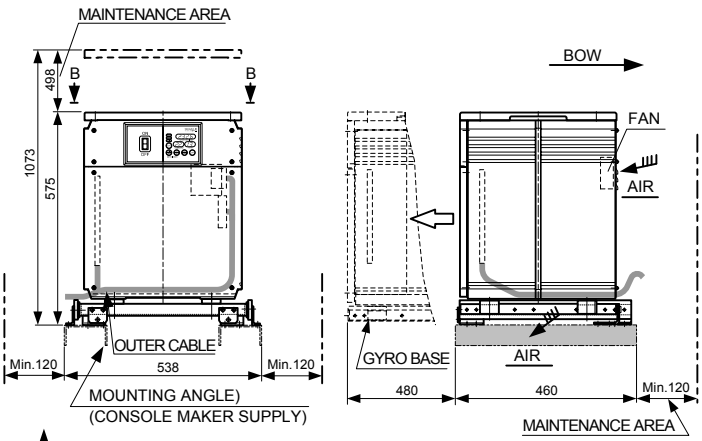
MODEL	MKM026-1
MASS	43 kg

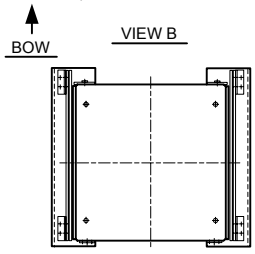
NOTE: Indraft of cable requires approx. 1m long above the bottom of master compass.



MODEL	MKM026-4
MASS	51 kg

Note: 1. GYRO BASE is fastened to MOUNTING ANGLE with bolts.
The MOUNTING ANGLE may be welded to Console.
2. Indraft of cable requires approx. 1m long above the GYRO BASE.



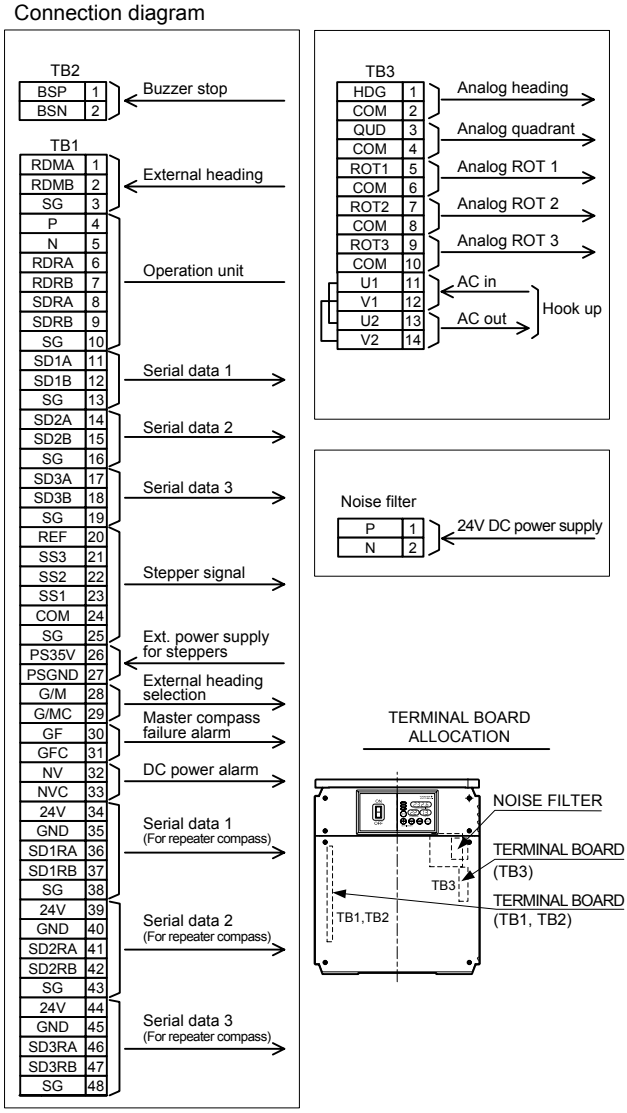


Master compass MKM026-X1···X7/option

Model	Suffix	Specification
MKM026	·····	Master compass
Style	-1	Stand alone
	-2	Built-in Pilot stand, with MKC327
	-3	Built-in Pilot stand, MKM026 only
X1	-4	Built-in Console
Paint color	0	Not applicable
X2	1	Munsell 0.8Y2.5/0.4 (LAMP BLACK)
M. Operation unit installation	0	Outside of Mastercompass
X3	1	Inside of Master compass
Switch unit installation	-0	Outside of Mastercompass
X4	-1	Inside of Master compass
Standards	0	Not applicable
	1	JG
	2	MED（wheel mark）
X5		
Name plate	1	Japanese and English
X6	2	English
Applied to	-3	CMZ900D No.1
X7	-4	CMZ900D No.2
Option	/48	4800bps Repeater compass (else 9600bps)
	/A1	Output range of ROT 30°/min
	/A2	Output range of ROT 100°/min
	/A3	Output range of ROT 300°/min
	/AC	Automatic change-over of Master compass
	/C	Chinese name plate
	/DL	Dual installation, in a Console

Note: 1) M. Operation unit (MKR025) and Switch unit (MKR026) are not included in Master compass (MKM026). Individual order must be placed for these items.
2) In case Master compass (MKM026) is built in Pilot stand, the other type of

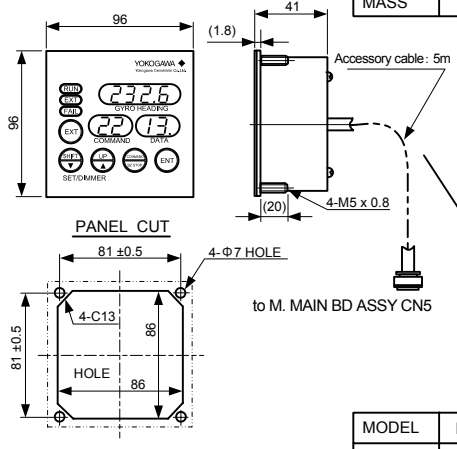
Connection diagram



TERMINAL BOARD ALLOCATION

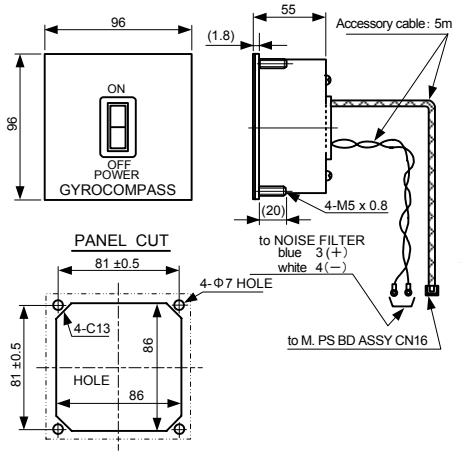
MKR025 M. Operation unit

MODEL	MKR025-3
MASS	1.4 kg

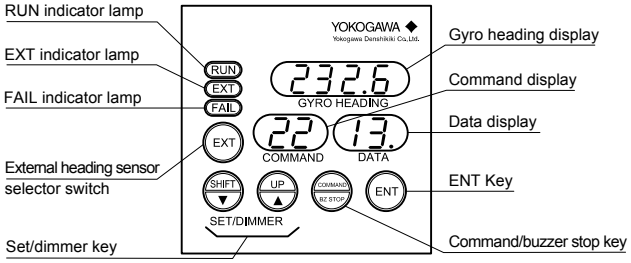


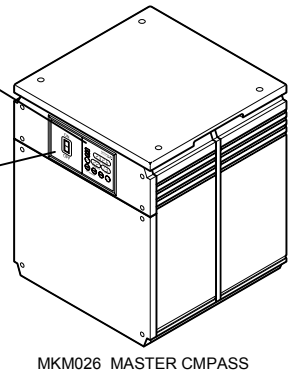
MKR026 Switch unit

MODEL	MKR026-3
MASS	1.5 kg



MKR025 M. OPERATION UNIT





MKM026 MASTER CMPASS

M. Operation unit MKR025-X1···X3

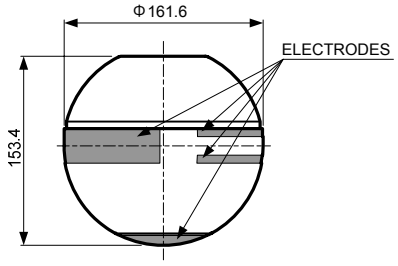
Model	Suffix	Specification
MKR025	·····	M. Operation unit
Style	-1	Built-in Master compass
	-2	Built-in Pilot stand
X1	-3	Console mount
Seat key	E	English
X2	J	Japanese
Name plate	1	Japanese & English
X3	2	English

Switch unit MKR026-X1···X3

Model	Suffix	Specification
MKR026	·····	Switch unit
Style	-1	Built-in Master compass
	-2	Built-in Pilot stand
X1	-3	Console mount
Seat key character	E	English
X2	J	Japanese
Name plate	1	Japanese & English
X3	2	English

MKT007 Gyrosphere

MODEL	MKT007-1
MASS	2.1 kg

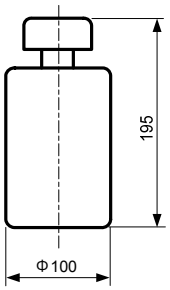


Gyrosphere MKT007-1

Model	Suffix	Specification
KT007	·····	Gyrosphere
Applied to	-1	CMZ900
X1		

MKZ115 Supporting liquid for installation

MODEL	MKZ115-1
MASS	1.2 kg



Supporting liquid for installation MKZ115-1/option

Model	Suffix	Specification
MKZ115	·····	Supporting liquid for installation (1ℓ)
Name plate	-1	English
X1		
Option	/C	Chinese name plate

MKZ512 Spare parts

Spare parts MKZ512 -X1···X3/option

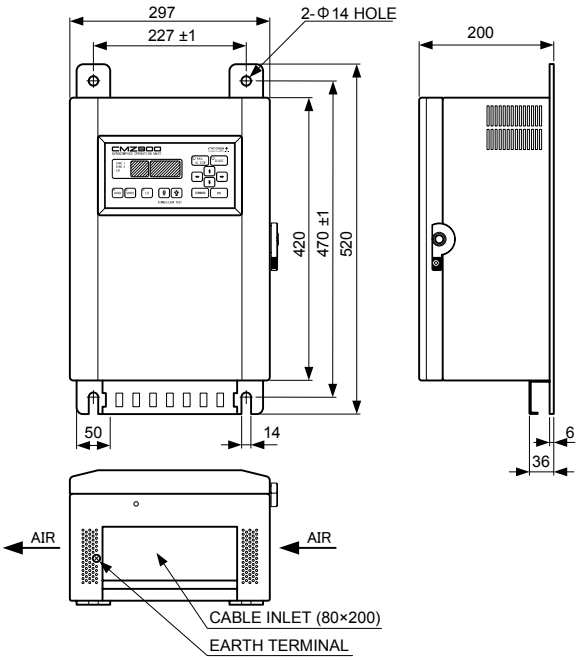
Model	Suffix	Specification
MKZ512	·····	Spare parts
Applied to	-5	CMZ900D without DC back-up
X1	-6	CMZ900D with DC back-up
Box size	B	Large (plastic made)
X2	S	Small (plastic made)
Name plate	1	Japanese and English
X3	2	English
Option	/C	Chinese name plate

Note: Content of spare parts

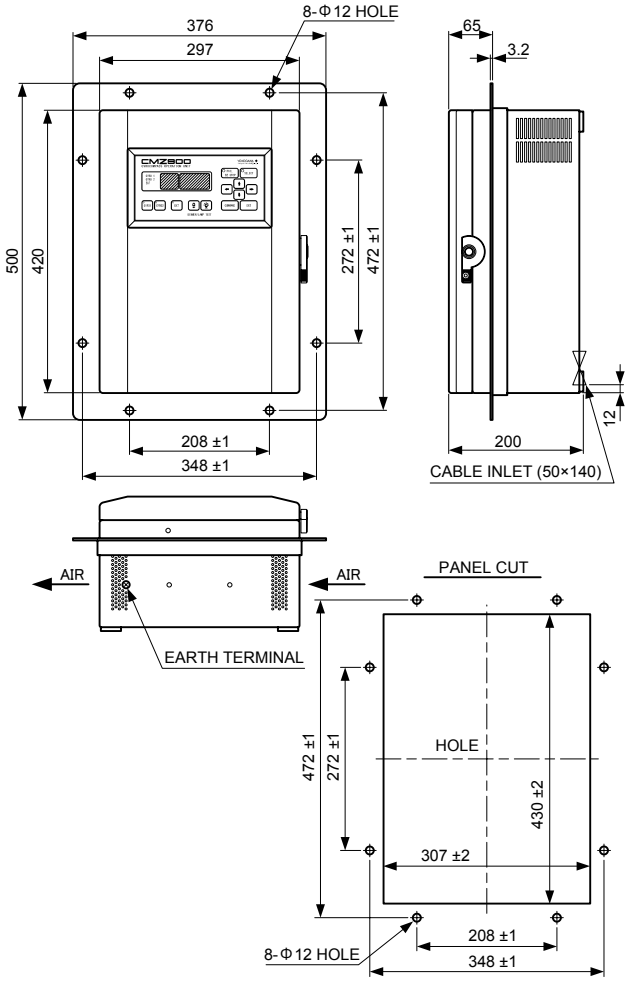
Item	CMZ900D without DC back-up	CMZ900D with DC back-up
Gyrosphere support	1 pc.	1 pc.
Container base	1 pc.	1 pc.
Injector	1 pc.	1 pc.
Meter cup	1 pc.	1 pc.
Funnel	1 pc.	1 pc.
Supporting liquid	1 litter x 2	1 litter x 2
Filter	20 pcs.	20 pcs.
Terminal screw driver	1 pc.	1 pc.
Illumination lamp	10 pcs. (28V 0.04A)	10 pcs. (28V 0.04A)
Fuse	8 pcs. (32V DC 15A)	16 pcs. (32V DC 15A)
Fuse	8 pcs. (250V AC 10A)	8 pcs. (250V AC 10A)
Fuse	24 pcs. (250V AC 2A)	12 pcs. (250V AC 2A)

MKC327 Control box

MODEL	MKC327-W1
MASS	16 kg



MODEL	MKC327-F1
MASS	16 kg

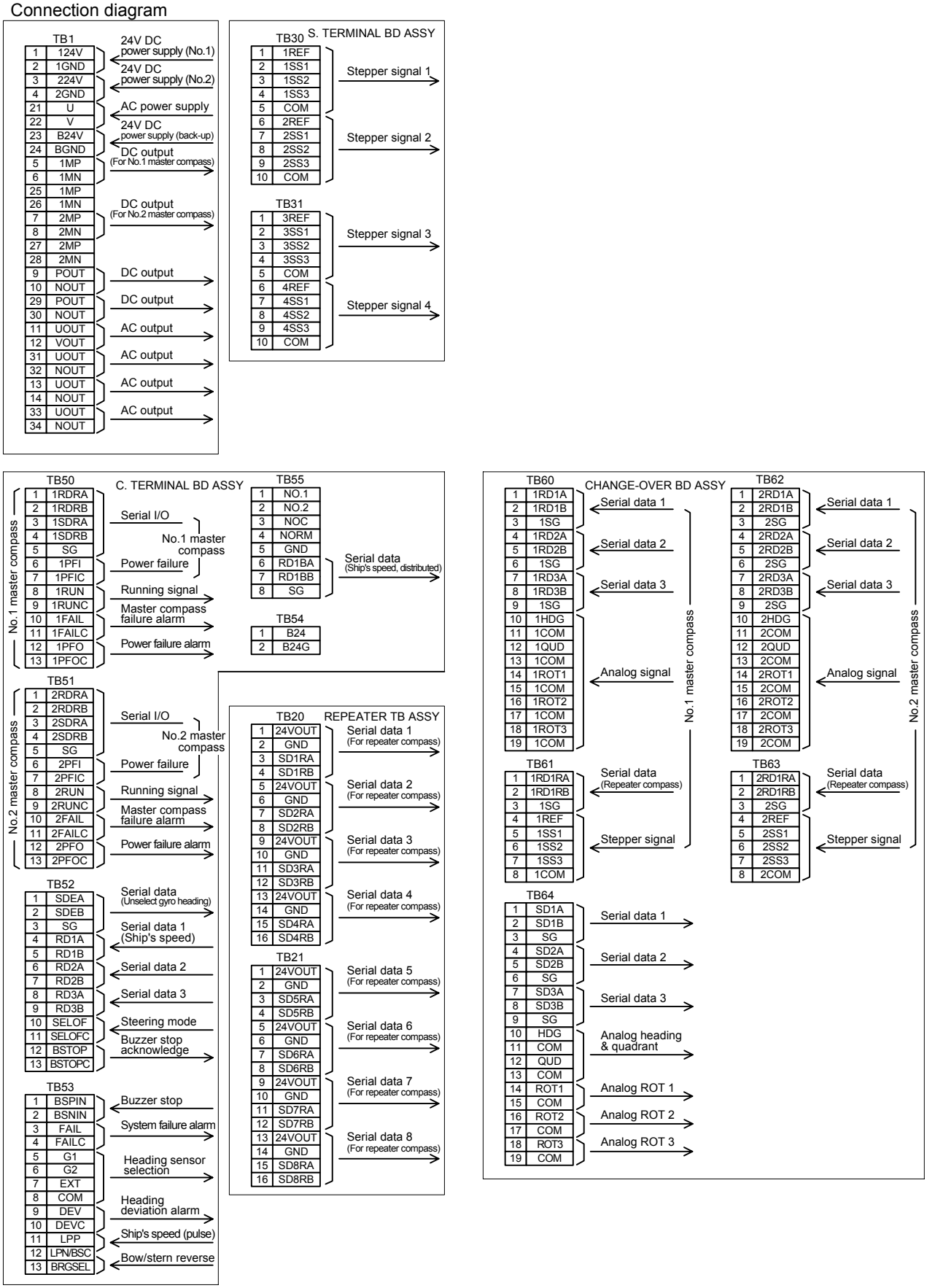


Control box MKC327-X1···X6/option

Model	Suffix	Specification
MKM327	·····	Control box
Style	-F1	Flush mount type
	-S1	Built-in Pilot stand (MKM026: in)
	-S2	Built-in Pilot stand (MKM026: out)
X1	-W1	Wall mount type
DC back-up	-0	No use
X2	-1	Use
C. Operation unit	1	Built-in Control box
	2	Built-in Pilot stand
	3	Console mount (cable: under 10m long)
X3	4	Console mount (cable: over 10m long)
Standards	0	Not applicable
	1	JG
	2	MED (wheel mark)
X4		
Name plate	-1	Japanese and English
X5	-2	English
Paint color	0	Not applicable
	1	Munsell 0.8Y2.5/0.4 (LAMP BLACK)
	2	Munsell 2.5G7/2
X6	3	Munsell 7.5BG7/2
Option	/C	Chinese name plate
	/S	Steppers reference 35V DC 1A max.

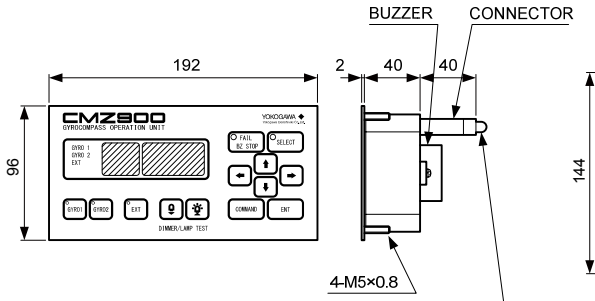
Note: 1) C. Operation unit (MKR040) is not included in Control box (MKC027). Individual order must be placed for this item.
2) In case the Control box is flush or wall mount type (X1 = -F1 or -W1);
- Junction unit (MKN018) is required, if the C. Operation unit is built in Pilot stand (X3 = 2).
- Junction unit (MKN018) is required, if the C. Operation unit is built in Console with cable over 10m long (X3 = 4).
3) In case the Control box is built in Pilot stand (X1 = -S1 or -S2);
- Junction unit (MKN018) is required, if the C. Operation unit is built in

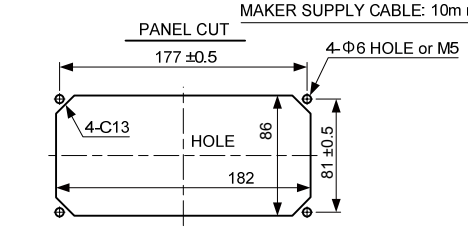
Connection diagram



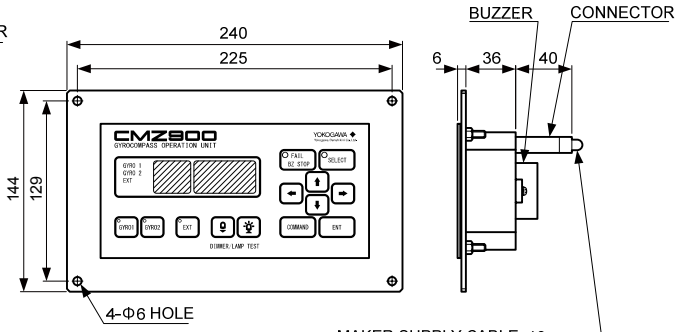
MKR040 C. Operation unit

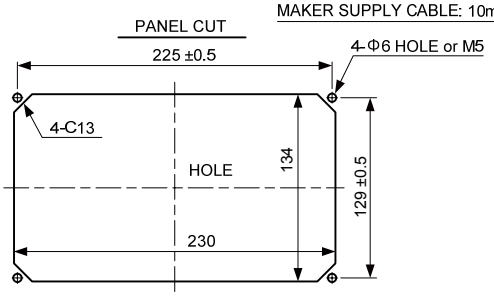
MODEL	MKR040-1,2,3
MASS	0.6 kg





MODEL	MKR040-4
MASS	1 kg

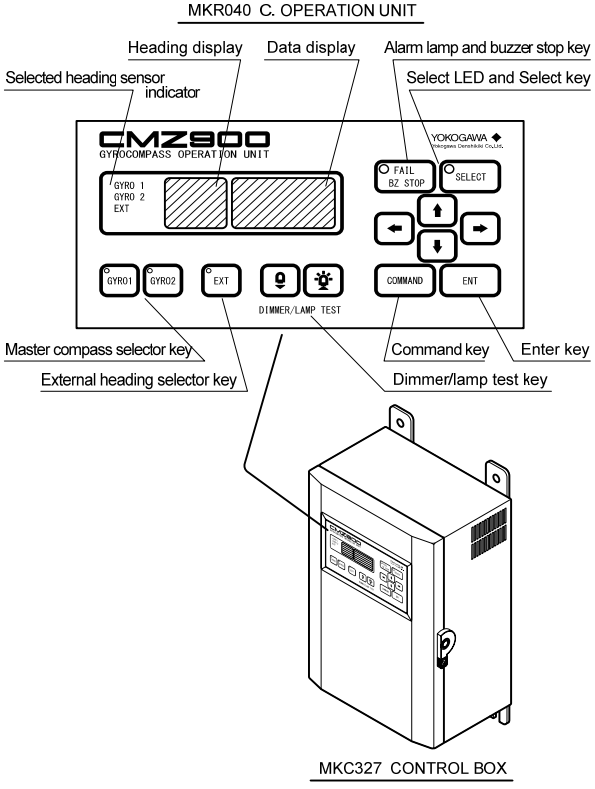




C. Operation unit MKR040-X1···X5/option

Model	Suffix	Specification
MKR040	·····	C. Operation unit
Style	-1	Built-in Control box
	-2	Built-in Pilot stand
	-3	Console mount (size 96X192)
X1	-4	Console mount (size 144X240)
Seat key	E	English
X2		
Name plate	1	Japanese & English
X3	2	English
Cable length	-1	Built-in Control box or Pilot stand
	-2	1.5m
	-3	3.0m
	-4	5.0m
X4	-5	10.0m
Applied to	D	CMZ900D
X5		
Option	/AC	Automatic change-over of Master compass
	/E	Ext. serial data input use
	/L	Bow/stern reverse function
	/M	MUTT function

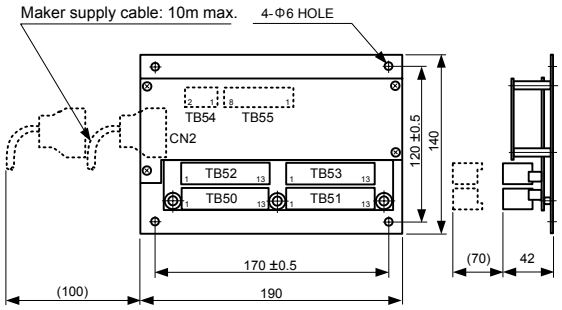
MKR040 C. OPERATION UNIT



MKC327 CONTROL BOX

MKN018 Junction unit

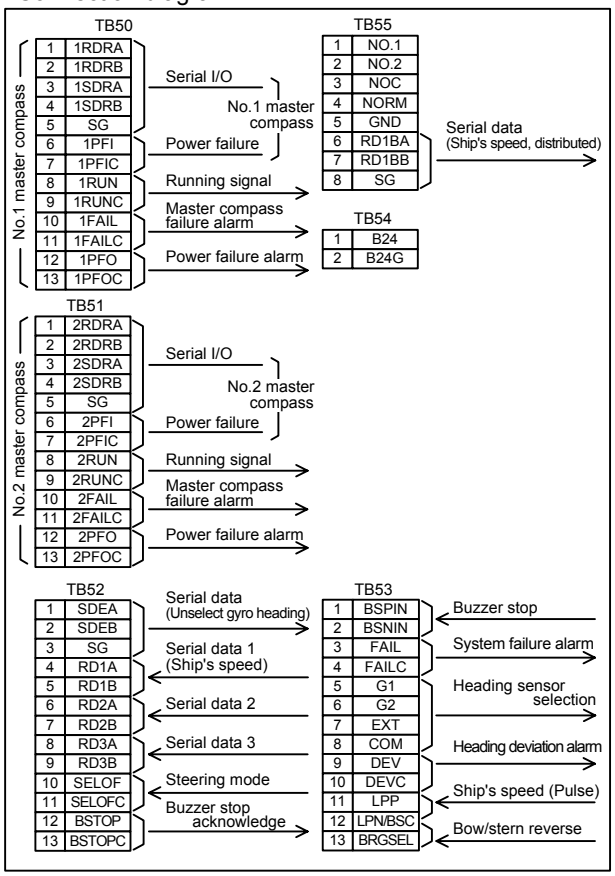
MODEL	MKN018-C
MASS	0.8 kg



Junction unit MKN018-X1X2

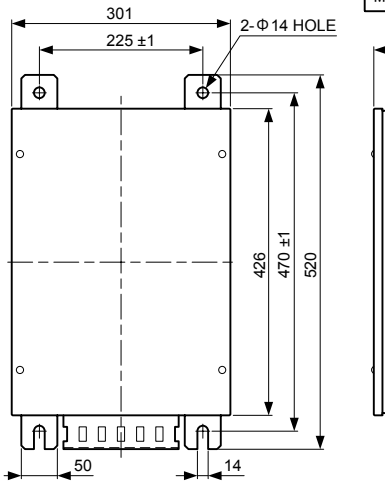
Model	Suffix	Specification
MKN018	·····	Junction unit
Style X1	-C	Console mount
	-S	Built-in Pilot stand
Name plate X2	-1	Japanese & English
	-2	English

Connection diagram

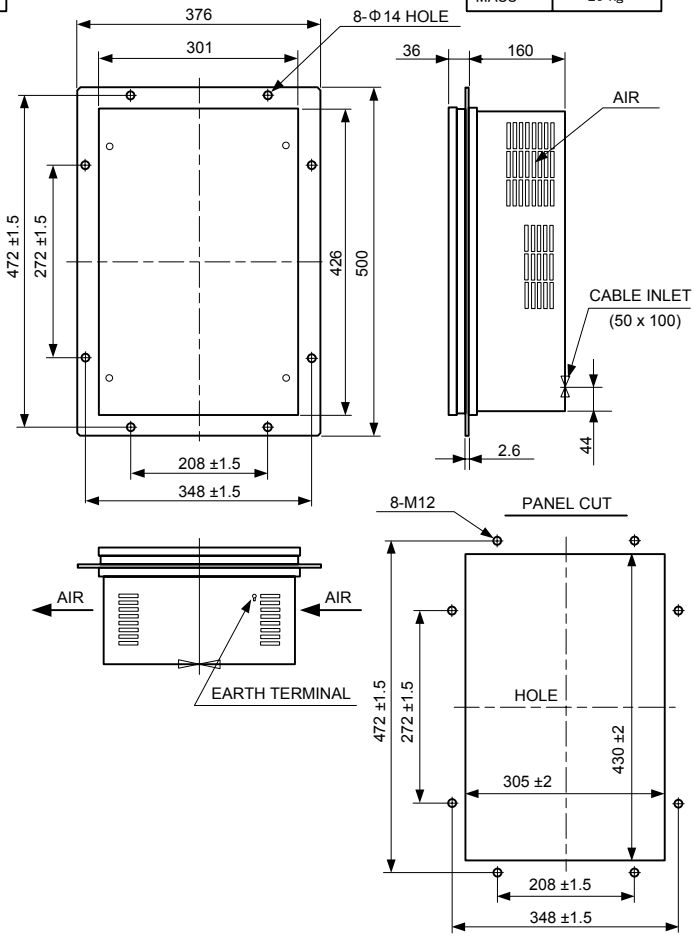


MKS066 Dual AC adapter

MODEL	MKS066-W
MASS	20 kg



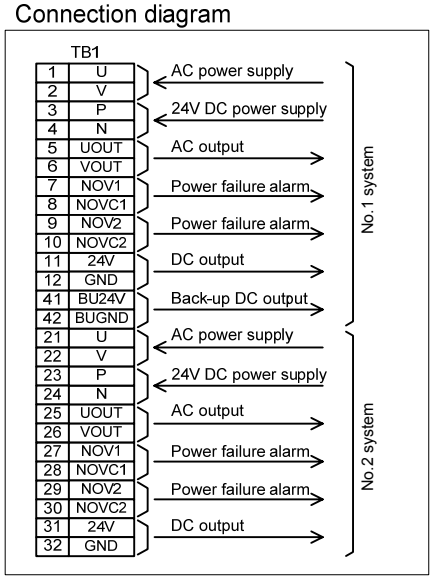
MODEL	MKS066-F
MASS	20 kg



Dual AC adapter MKS066-X1···X6/Option

Model	Suffix	Specification
MKS066	·····	Dual AC adapter
Style	-F	Flush mount type
X1	-W	Wall mount type
Power supply	-1	100V AC 50/60Hz single-phase, 24V DC
	-2	110V AC 50/60Hz single-phase, 24V DC
	-3	115V AC 50/60Hz single-phase, 24V DC
X2	-4	220V AC 50/60Hz single-phase, 24V DC
DC back-up	1	No use
X3	2	Use
Standards	0	Not applicable
	1	JG
	2	MED (wheel mark)
X4		
Name plate	1	Japanese and English
X5	2	English
Paint color	-1	Munsell 0.8Y2.5/0.4 (LAMP BLACK)
	-2	Munsell 2.5G7/2
X6	-3	Munsell 7.5BG7/2
Option	/C	Chinese name plate

Connection diagram



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