General Specifications

CMZ900 series

GS 80B10M18E 1st

CMZ900B2
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).

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

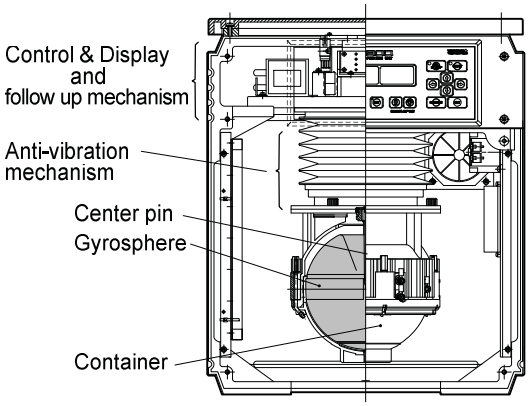
Certificate number of type approval

-- MED: No. MED-B-00003BT

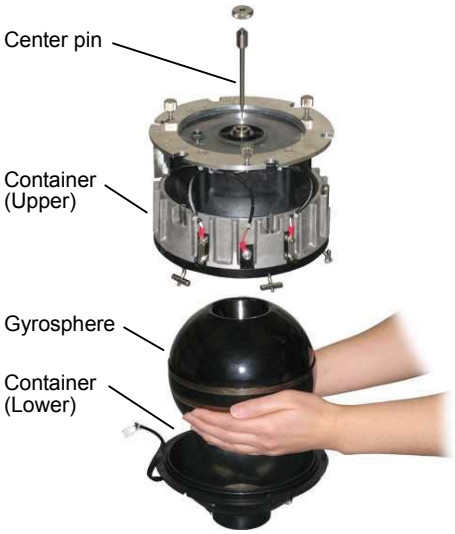
CMZ900B2 GYROCOMPASS
- MKM029 Master compass

Features

1) A modular design saves the space. Master compass can be integrated in the autopilot steering stand.
2) Manual and automatic speed error correction
3) External heading sensor can back up the heading outputs.
4) Serial data output IEC 61162-2 (high-speed transmission)
5) BAMS interface function based on IEC62288 Ed.2.
6) 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.
7) 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.
8) 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.
9) The restart time can be preset from 1 to 99 hours.

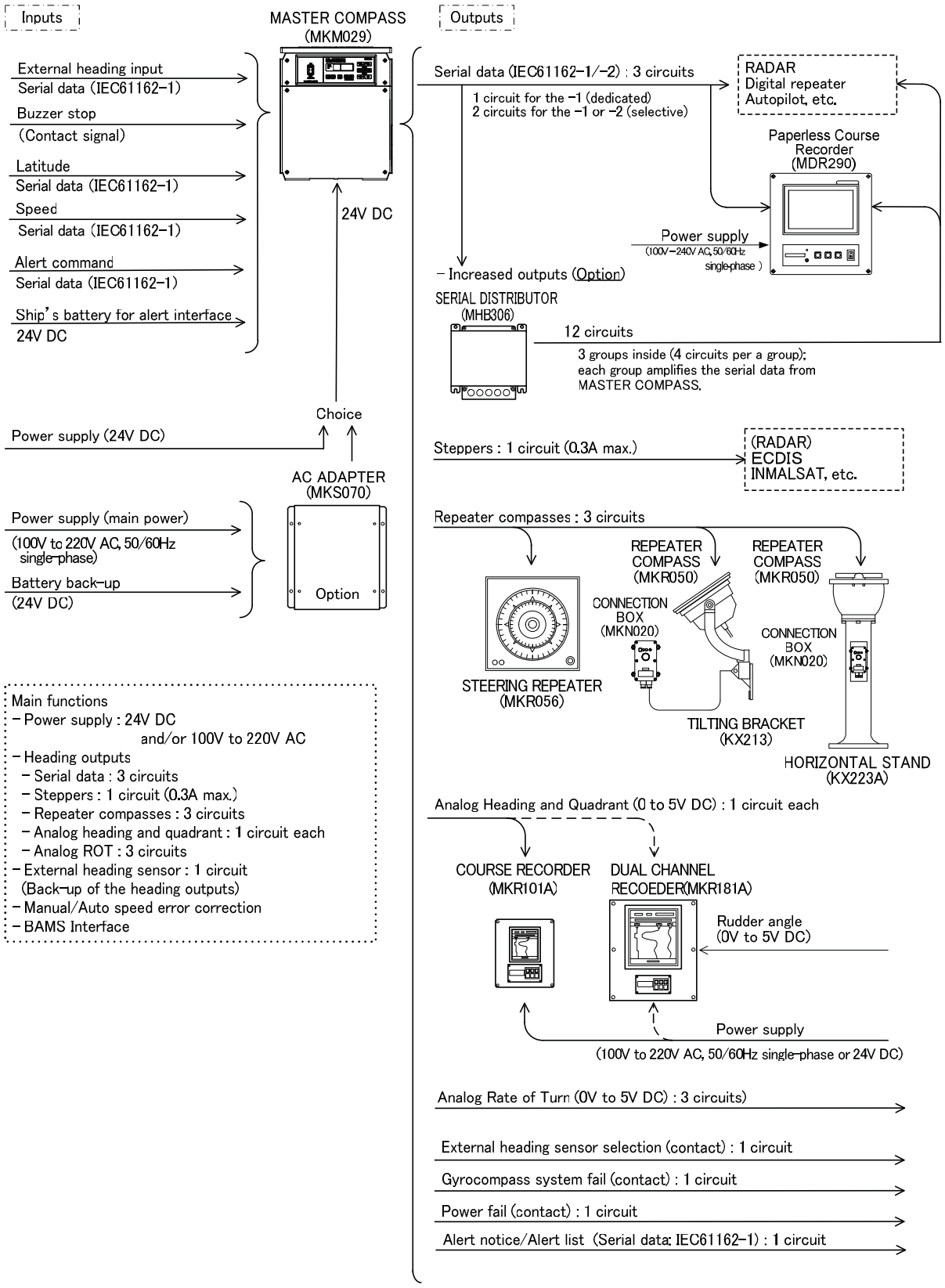


Exposure view of Master compass



Easy maintenance

System configuration diagram



Main functions
- Power supply : 24V DC
  and/or 100V to 220V AC
- Heading outputs
  - Serial data : 3 circuits
  - Steppers : 1 circuit (0.3A max.)
  - Repeater compasses : 3 circuits
  - Analog heading and quadrant : 1 circuit each
  - Analog ROT : 3 circuits
- External heading sensor : 1 circuit
  (Back-up of the heading outputs)
- Manual/Auto speed error correction
- BAMS Interface

Engineering specifications

- Power supply

Supply voltage
: 24V DC (20V to 30V DC)
: and/or 100V / 110V / 115V / 220V AC, 50/60Hz, shingle-phase (MKS070 AC adapter is required.)

Power consumption at DC drive
: Starting approx. 3.5A
+ 0.35A x number of repeater compasses (Max. 3)
: Operating approx. 2.3A
+ 0.35A x number of repeater compasses (Max. 3)

Power consumption at AC drive
: Starting approx. 125VA
+ 12VA x number of repeater compasses (Max. 3)
: Operating approx. 90VA
+ 12VA x number of repeater compasses (Max. 3)

- 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: Each port is available to receive multiple data from an external single talker.

Transmission convention: Serial asynchronous form

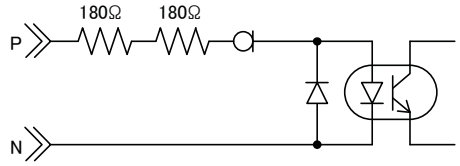
Signaling rate : 4800 bps

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[1] HRC	Heading/ROT (Yokogawa inherent)

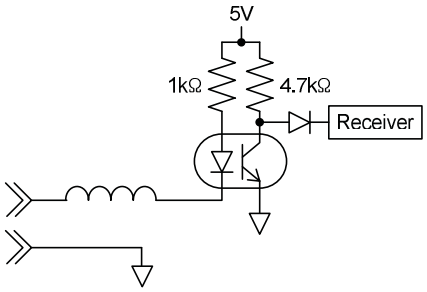
Note 1) Any Talker ID "xx" can be received.

Receive circuit (Typical): Photo-coupler



- Buzzer stop (contact)

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



- BAMS (Serial Signal: IEC61162-1)

Circuit : 1 circuit
Baud rate : 4800 bps
Data format : ACN, HBT
Input circuit : Photo-coupler

- Signal outputs

- Repeater compasses (heading signal)

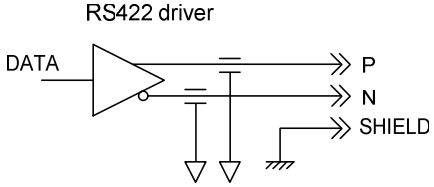
No. of circuits : 3 circuits
Electrical characteristics: RS422 (use a driver circuit equivalent to RS422A.)
Transmission convention: Serial asynchronous form
Signaling rate : 9600bps (Normal) / 4800bps
Transmission interval : 50ms
Characters : Start bit 1 bit
Data bit 8 bit
Stop bit 1 bit
Parity bit none

ID, formatter and transmission interval:

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

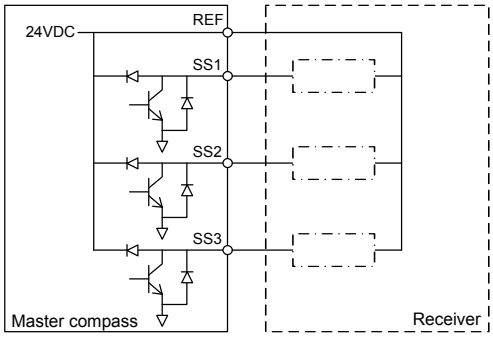
Note 1) Talker ID "xx" of HRC is HE when Gyro is selected, and subjected to ID of the ext. sensor when it is selected.
2) HRC and PYDKH are Yokogawa inherent format. It is only output when baud rate 9600bps is selected.

Output circuit (Typical)

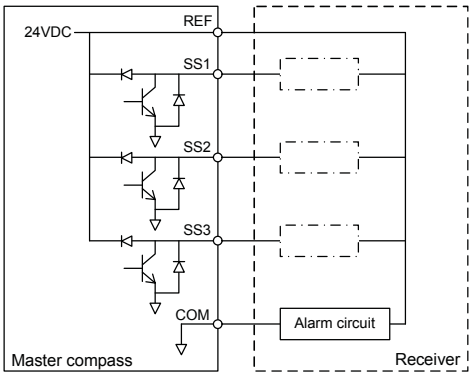


- Steppers (heading signal)
  - No. of circuits : 1 circuit
  - COM : 0V (circuit GND)
  - REF output voltage : 24V DC or 35V DC (Option)
  - REF output current : 0.3A max. or 1A max. (Option)
  - Output form : Open collector (3-bit gray code)
  - Sink current : 0.4A max. any signal line

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 receiver circuit equivalent to RS422A.)
  - Transmission convention: Serial asynchronous form
  - Signaling rate and transmission interval:

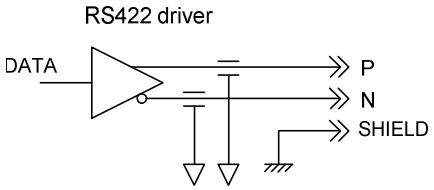
	Signaling rate	Transmission interval
IEC61162-1	4800bps	200/500/1000ms selectable
IEC61162-2	38400bps	20/200/500/1000ms selectable

  - ID & formatter:

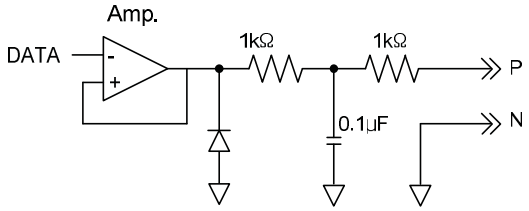
Data source		Content
Gyro	Ext. sensor	
HEHDT	xx [1] HDT [2]	Heading, true
HETHS	xx [1] THS [2]	True heading and status
-	xx [1] HDG	Heading, deviation and variation
	xx [1] HDM	Heading, magnetic
HEROT	xx [1] ROT	Rate of turn [3]
HEHRC [4]	xx [1] HRC	Heading / Rate of turn [3]
PYDKH [4]	xx [1] HRC	Heading / 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) HRC and PYDKH are Yokogawa inherent format.
5) Any circuit can transmit up to 3 records as far as the transmission interval allows.

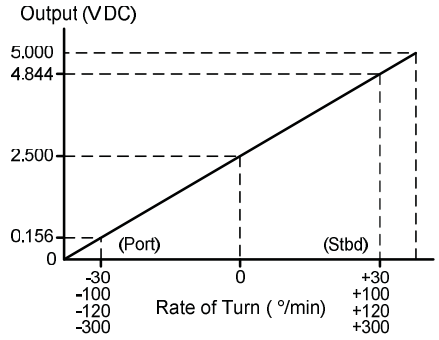
Output circuit (Typical)



- 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.
  - Output circuit (Typical):



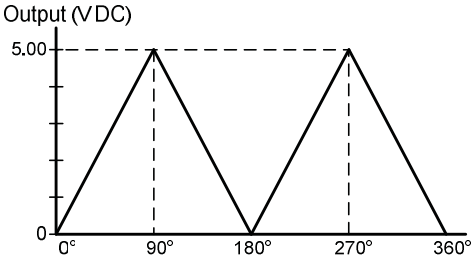
Signal format:



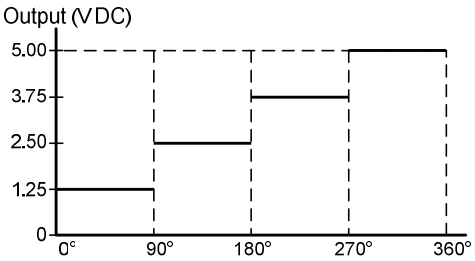
- Analog heading & quadrant signal

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

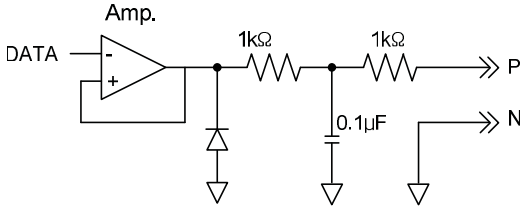
Heading signal



Quadrant signal



Output circuit (Typical)



- External heading sensor selection (contact)

No. of circuits : 1 circuit
Contact action : Opened and held during the external sensor is assigned to transmit
Electrical rating (contact): 24V DC 0.5A

- Master compass failure alarm (contact)

No. of circuits : 1 circuit
Contact action : Closed or opened (selectable) during the master compass failure occurs
Electrical rating (contact): 24V DC 0.5A

- Power failure alarm (contact)

No. of circuits : 1 circuit
Contact action : Closed or opened (selectable)during the absence of DC power supplied to Master compass
Electrical rating (contact): 24V DC 0.5A

- BAMS (IEC61162-1 Serial signal): Alert notice/Alert list

No. of circuits : 1 circuit
Baud rate : 4800bps
Data Format : ALF, ALC, ARC, HBT
Output circuit : RS485/422 Transceiver

Performance specifications

1) Settling time: Within 5 hours
(Usable accuracy in approx. 2 hours)
2) Accuracy
- Static : ±0.25°× sec Lat. (Lat. = latitude)
- Dynamic : ±0.7°× 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 equipment except Master compass
: -15℃ to +55℃
Master compass : -10℃ to +50℃
(Operating)
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)
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 CMZ900B. The equipment is listed right and the connection diagram may be covered as far as possible.

Equipment and accessories

Model	Nomenclature	Model	Nomenclature
MKM040	Master compass	MKS070	AC Adapter
MKR040	C. Operation unit		
MKR026	Switch unit		
MKT007	Gyrosphere		
MKZ115	Supporting liquid for installation		
MKZ512	Spare parts		

Other equipment and accessories listed right are available as a part of CMZ900B. For more detail information, another General Specifications GS80B11K03 is provided.

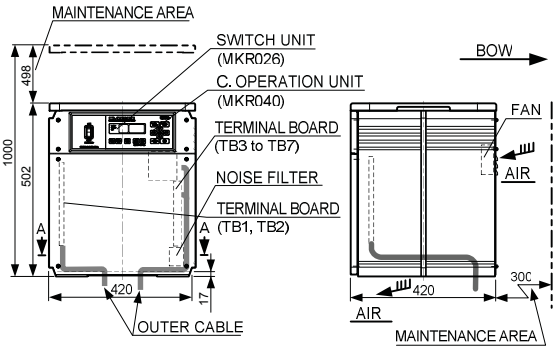
Other equipment and accessories

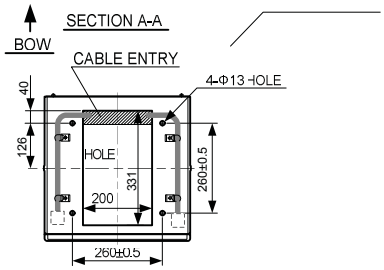
Model	Nomenclature	Model	Nomenclature
(Analog repeater)		(Digital repeater)	
MKR050	Repeater compass	MHR110A	Universal data display
MKN020	Connection box	MHR112	Assist monitor
KX605	Shading circle	MHR120	Universal data display
KX607	Repeater cover	MKD002	Dimmer box
MKX617	Azimuth circle	(Rate of Turn indicator)	
MKR056	Steering repeater	MHR130	ROT indicator
(Pedestal and bracket)		MRD010	Dimmer box
KX201A	Horizontal bracket	MRD011	Dimmer unit
KX213	Tilting bracket	(Recorder)	
KX223A	Horizontal stand	MKR101A	Course recorder
KX610A	Horizontal stand cover	MKR181A	Dual channel recorder
		(Signal distrbuter)	
		KN054	Distribution box (for steppers)
		MHB306	Serial distributor

MKM029 Master compass

MODEL	MKM029-1
MASS	43 kg

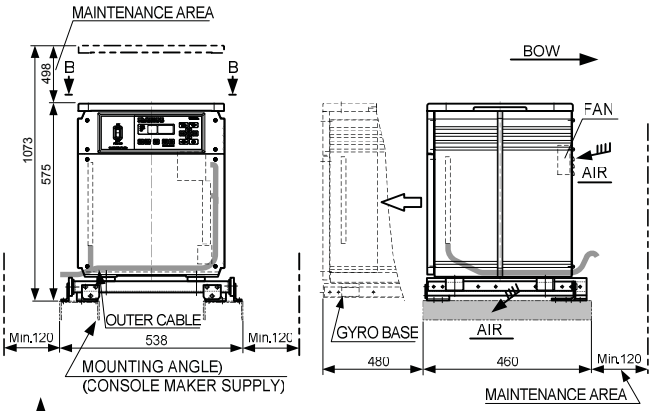
NOTE: Indraft of cable requires approx. 1m long above the bottom of master compass.

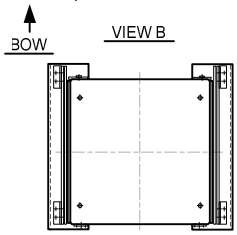




MODEL	MKM029-4
MASS	51 kg

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.



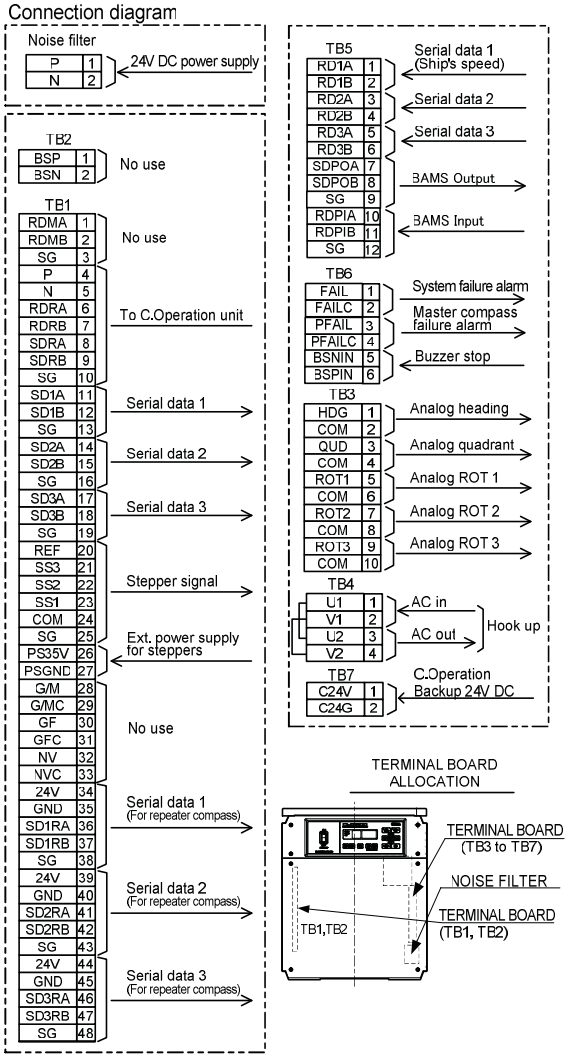


Master compass MKM029-X1···X7/option

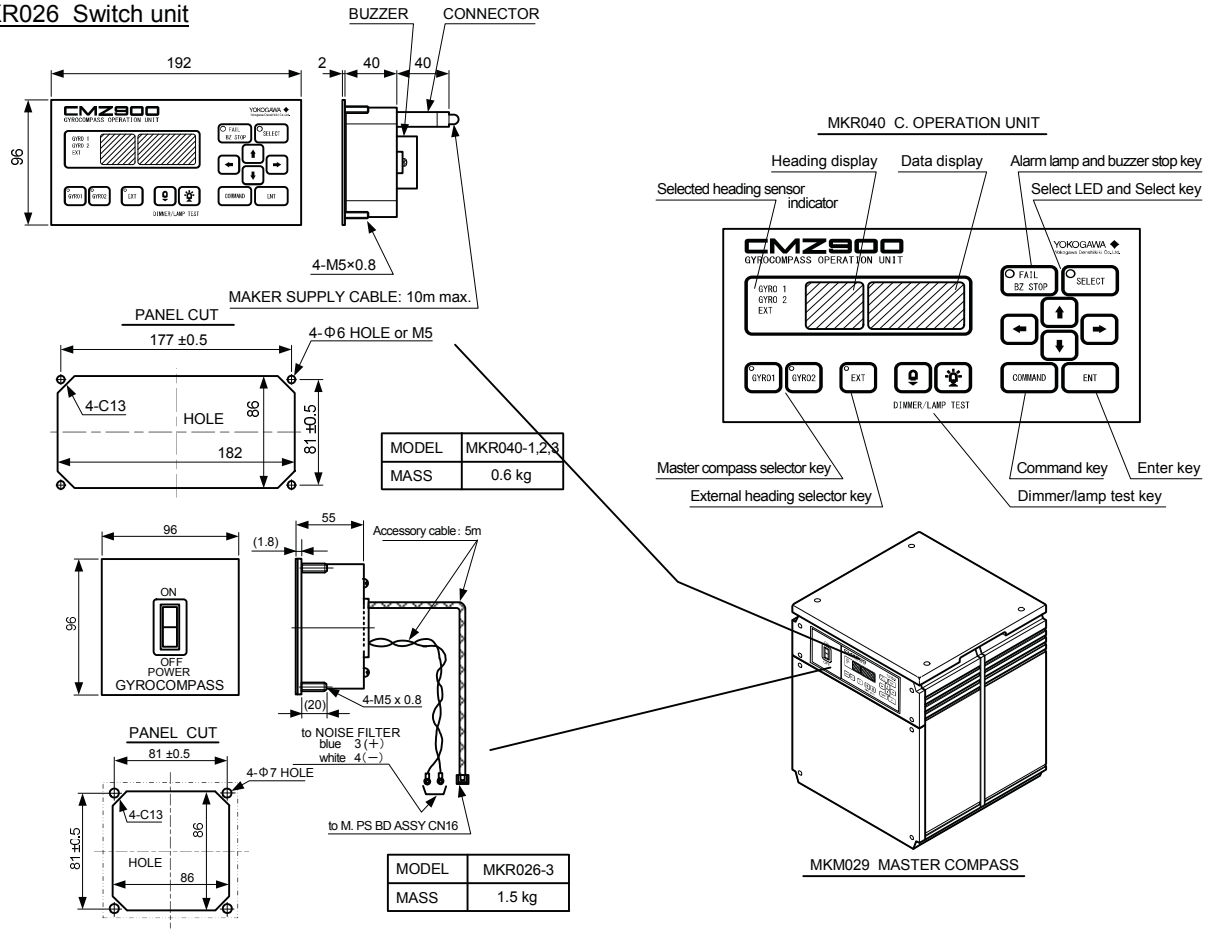
Model	Suffix	Specification
MKM026	·····	Master compass
Style	-1	Stand alone
	-4	Built-in Console
X1	-7	Built-in PT900 Pilot Stand (Only Mastercompass)
Paint color	0	Not applicable
X2	1	Munsell 0.8Y2.5/0.4 (LAMP BLACK)
Standards	0	Not applicable
	1	JG
X5	2	MED (wheel mark)
Name plate	1	Japanese and English
X6	2	English
Applied to	-1	9600bps Repeater compass (Normal)
X7	-2	4800bps Repeater compass
Option	/A1	Output range of ROT 30°/min
	/A2	Output range of ROT 100°/min
	/A3	Output range of ROT 300°/min
	/A4	Output range of ROT 120°/min
	/C	Chinese name plate
	/E	Serial data inputs: use
	/S24	Steppers reference 24V DC 1A max.
	/S35	Steppers reference 35V DC 1A max.
	/HL	Directive Speed Error Correction

Note: 1) C. Operation unit (MKR025) and Switch unit (MKR026) are not included in Master compass (MKM029). Individual order must be placed for these items.
2) Switch unit (MKR026) is required in case of X1 = -1 or -4.

Connection diagram



MKR040 C. Operation unit
MKR026 Switch unit



C. Operation unit MKR040-X1···X5

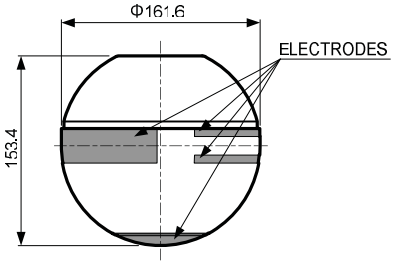
Model	Suffix	Specification
MKR040	·····	C. Operation unit
Style X1	−5	Built-in Mastercompass MKM029
Seat key X2	E	English
Name plate X3	1	Japanese & English
	2	English
	3	Japanese & English JG
	4	English JG
	5	Japanese & English MED
	6	English MED
Cable length X4	−1	Built-in Mastercompass
Applied to X5	2	CMZ900B2
Option	/E	Ext. serial data input use
	/M	MUTE function
	/NE	Without Ext. heading data (No change-over)
	/RMS	RMS sentence output function
	/HBT	BAMS HBT detecting function

Switch unit MKR026-X1···X3

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

MKT007 Gyrosphere

MODEL	MKT007-1
MASS	2.1 kg

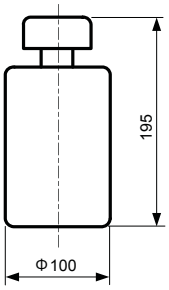


Gyrosphere MKT007-1

Model	Suffix	Specification
MKT007	·····	Gyrosphere
Applied to X1	-1	CMZ900

MKZ115 Supporting liquid for installation

MODEL	MKZ115-1
MASS	1.2 kg

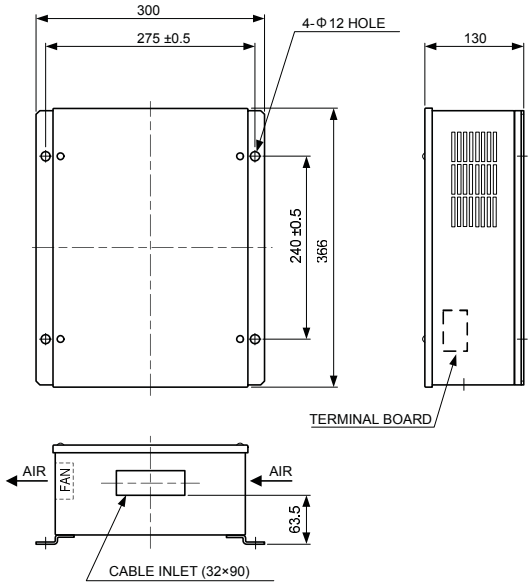


Supporting liquid for installation MKZ115-1/option

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

MKS070 AC adapter

MODEL	MKS070
MASS	10.5 kg



AC adapter MKS070-X1···X4/option

Model	Suffix	Specification
MKS070	·····	AC adapter
Power supply X1	-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
	-4	220V AC 50/60Hz single-phase, 24V DC
Standards X2	0	Not applicable
	1	JG
	2	MED (wheel mark)
Name plate X3	1	Japanese and English
	2	English
Paint color X4	-1	Munsell 0.8Y2.5/0.4 (LAMP BLACK)
	-2	Munsell 2.5G7/2
	-3	Munsell 7.5BG7/2
Option	/C	Chinese name plate

MKZ512 Spare parts

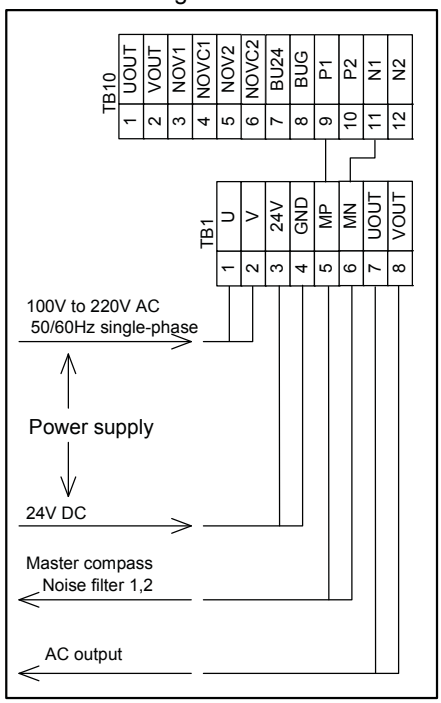
Spare parts MKZ512-X1···X3/option

Model	Suffix	Specification
MKZ512	·····	Spare parts
Applied to X1	-1	CMZ900B2 without MKS070 AC adapter
	-2	CMZ900B2 with MKS070 AC adapter
Box size X2	B	Large (plastic made)
Name plate X3	1	Japanese and English
	2	English
Option	/C	Chinese name plate

Note: Content of spare parts

Item	CMZ900B2 without MKS070 AC adapter	CMZ900B2 with MKS070 AC adapter
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	1 litter
Filter	10 pcs.	10 pcs.
Terminal screw driver	1 pc.	1 pc.
Illumination lamp	10 pcs. (28V 0.04A)	10 pcs. (28V 0.04A)
Fuse		4 pcs. (32V DC 15A)
Fuse		4 pcs. (250V AC 10A)
Fuse		4 pcs. (250V AC 2A)

Connection diagram



End