

DATE	REV. NO.	DESCRIPTION	CHKD	CHKD	APPD
OCT.08,2008	A	SUBMITTED TO OWNER FOR REFERENCE.	J.H PARK	✗	✗
NOV.05,2008		ISSUED FOR WORKING.	J.H PARK	✗	✗
FEB.05,2009		ISSUED FOR CONSTRUCTION.	J.H PARK	✗	✗



图纸 分发			
分发处		分发数	
汉 字	ENGLISH	FW	FC
综合设计	Integrated Design Division		
船体构造设计	Hull Structure Team		
船体生产设计	Hull Production Team		
船装设计	Hull Outfitting Design		
船室设计	Accommodation Design		
机装详细设计	Machinery Detail Design	1	1
机装生产设计	Machinery Production Design	1	
电装设计	Electrical Design	1	1
先行舾装	Preoutfitting Division		2
E/R 舾装	E/R Outfitting		2
船室生产	Accommodation Production		
试航部	Trial Cruise Division		1
采购管理 2	Procurement Team 2		
品质经营	Quality Assurance		2
搭载管理	Erection Team		
精度管理	Technical Specification Team		
品质物流(镇海)	Logistics Team (Jinhae)		1
轴舵设计(保管)	Shaft & Rudder Design	1	1
合 计 (Total)		4	10
<input type="checkbox"/> For Working			
<input type="checkbox"/> For Construction			
<input type="checkbox"/> For Revision			

HULL NO. 1009~1012 1031~1032		PROJECT TPC KOREA 33,5K DWT LOG / BULK CARRIER	
APPD BY M. Y. Park		TITLE  <h1>SHAFT EARTHING DEVICE</h1>	
CHKD BY J. S. Lee			
CHKD BY J. H. Park (Ext : 0133)			
DWN BY K.C. LTD.			
TEL +86> 0631-538-0204		TOTAL 13 SHEET(S) WITH COVER	
 Samjin Shipbuilding Industries Co.,Ltd.		DEPT RUDDER & SHAFT DESIGN TEAM	
		DWG NO. DV6320002	SCALE EACH
		DATE Oct. 08. 2008	REV. NO. 0

# K.C. LTD.



<b>DRAWING TITLE</b>	<b>WORKING DRAWING</b>
<b>ITEM</b>	<b>SHAFT EARTHING DEVICE</b>
<b>SHIPYARD</b>	<b>SAMJIN SHIPBUIDLING IND.CO.,LTD</b>
<b>HULL No.</b>	<b>1009/10/11/12, 1031/32</b>
<b>VESSEL TYPE</b>	<b>33.5K BULK CARRIER</b>
<b>K.C. LTD. REF. No.</b>	<b>4259</b>

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0	ORIGINALLY PREPARED	H.W.H.	<i>Henry</i>	OCT.08,08
REV	DESCRIPTION	DWN.	APP.	DATE

**K.C. LTD.**

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**CAUTION**  
THIS DOCUMENT CONTAINS CONFIDENTIAL  
AND PROPRIETARY INFORMATION OF  
K.C. LTD.  
THIS DOCUMENT ALWAYS REQUIRES PRIOR  
WRITTEN CONSENT OF K.C. LTD.  
FOR  
(1)ITS REPRODUCTION BY ANY MEANS,  
(2)ITS DISCLOSURE TO A THIRD PARTY,  
(3)ITS USE FOR ANY PURPOSE OTHER THAN  
THOSE FOR WHICH IT IS SUPPLIED

SPECIFICATION & SCOPE FOR Shaft Earthing Device		
CLIENT		SAMJIN SHIPBUILDING IND.CO., LTD.
SHAFT OUT DIAMETER		Ø 390
TOTAL WEIGHT		APPROX. 11.0 kgs
NO OFF	PART NO	DESCRIPTION
1	KCS0044	MILLI-VOLT METER WITH CABLE GLANDS
1	KCS005	SILVER ALLOY SLIP-RING
1	KCS0032	SHAFT EARTHING DOUBLE BRUSH HOLDER
1	KCS0022	SHAFT MONITORING SINGLE BRUSH HOLDER
1	KCS009	BRUSH HOLDER SUPPORT BAR
1	KCS010	INSULATED BRUSH HOLDER SUPPORT BAR
3	KCS0014	HIGH DENSITY SILVER GRAPHITE BRUSH
1	KCS006	1.5m x 50mm <sup>2</sup> SHAFT EARTH CABLE
2	KCS011	STAINLESS STEEL BAND
1	KCS0151	PRESSURE TAPE (50mm)
1	KCS015	PRESSURE TAPE (19mm)

## **1. Introduction**

A turning propeller shaft on a ship becomes electrically insulated from the hull by the lubricating oil film in the bearings and by the use of non-metallic bearing materials in the tail shaft. When the shaft is insulated in this way an electrical potential can be measured between the shaft and the hull and this can accelerate corrosion in the ship. If the ship has a system of cathodic protection, whether it is sacrificial anode or an impressed current system, the shaft insulation will prevent the propeller and the boss from receiving protection.

The electrical potential between the shaft and the hull can also cause a heavy current to flow in bearings when the oil film breaks down or is contaminated with seawater. This current can cause deep pitting of the bearing surface. Excessive wear on the shaft bearings can often be traced to this cause.

Now in addition it's necessary to reduce the spark erosion causing the excessive wear on main engine metal bearings and this shaft earthing is the most appropriate method.

All the troubles can be avoided and cathodic protection can be extended to the propeller if the shaft is properly earthed with a propeller shaft slip ring. The effectiveness of the shaft earthing system should ensure a maximum contact resistance of no greater than 0.001 ohms for a water filled bearing and 0.01 ohms for an oil filled bearing.

Our own tests indicate that high silver content brushes running on a silver track have repeatable low conductivity that can maintain these limits and ensure a low resistance contact is maintained even under dirty conditions.

The shaft earthing assembly comprises a pair of high silver content / graphite compound brushes mounted in balanced brush holder, running on a silver alloy slip ring.

Each brush holder has a adjustable spring tensioner which is supplied preset to the minimum, and results in a pressure of 225g/cm<sup>2</sup>.

At this pressure the expected life of the brush is in excess of one year.

## **2. Design base**

- Intermediate shaft diameter : Ø 390 mm

## **3. Installation work by shipyard**

- Assembling the intermediate shaft earthing assembly
- Attaching the intermediate shaft monitoring millivoltmeter & wiring
- Welding the brush holder support bar & Assembling the brush holder.

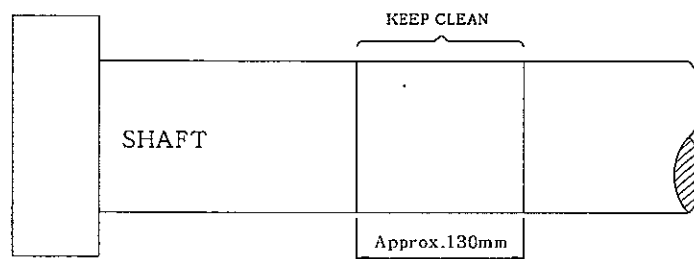
## 4. Installation

### 4.1 Slip ring

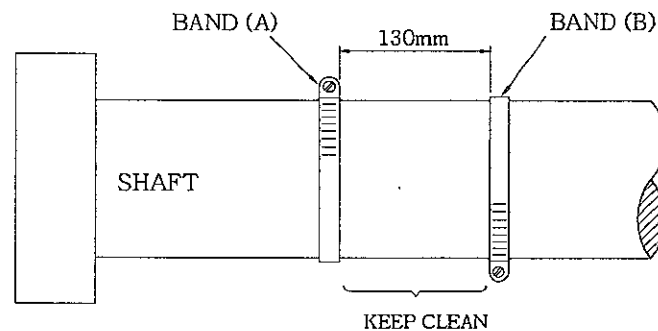
**CAUTION** : It is strictly required to install slip ring correctly according to following procedure for the good performance of shaft earthing and longer life time of brushes.

#### 4.1.1. Make clean the area where slip ring is positioned.

The area should be cleaned and prepared for a bright bare steel.

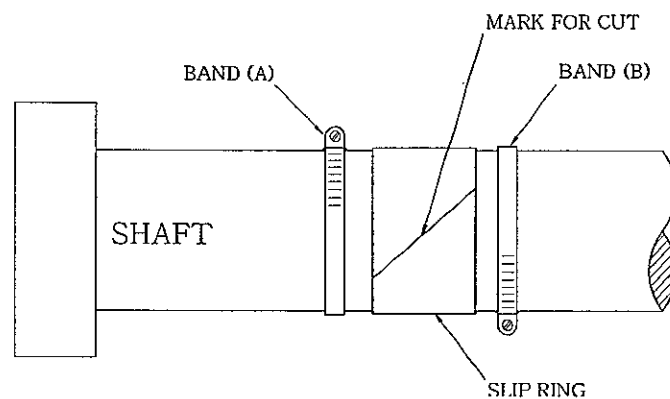


#### 4.1.2. Fasten stainless steel bands (A & B) temporarily.

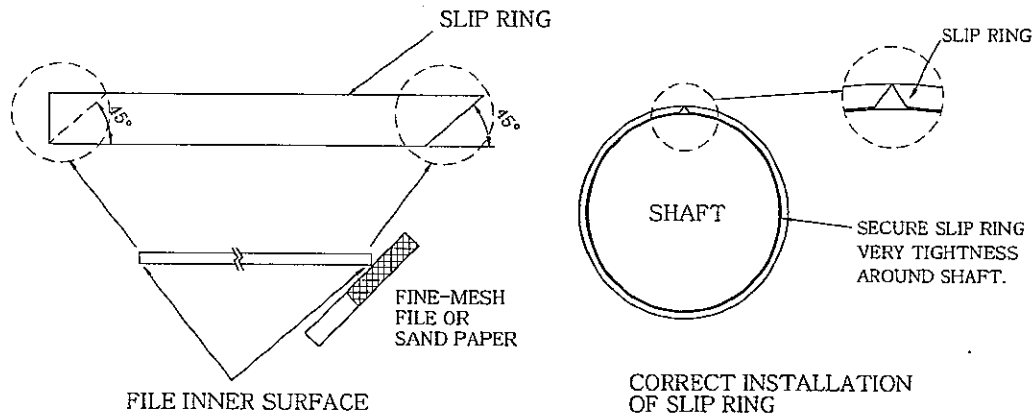


#### 4.1.3. Wrap the slip ring around the shaft and mark the overlapped part.

Cut the overlapped part at an angle of  $45^\circ$  carefully, which is very important job.



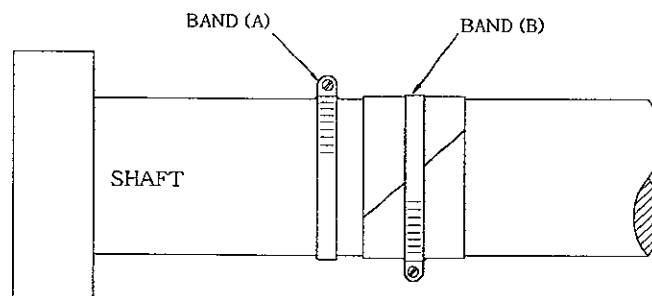
- After cutting properly rub the both edges of inner surface of slip ring with a fine-mesh file or sand paper as below. Then secure slip ring very tightness around shaft;



- 4.1.4. Wrap the slip ring around the shaft and fasten with the stainless steel band(B).

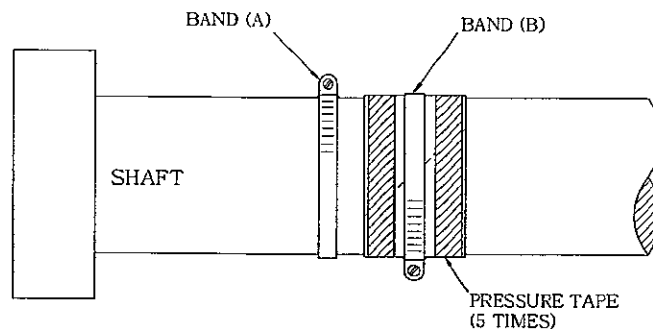
When the slip ring is tightly installed no protrusion or gap is found.

In case there happens with protrusion or gap smoothly rub the protrusion with sand paper.

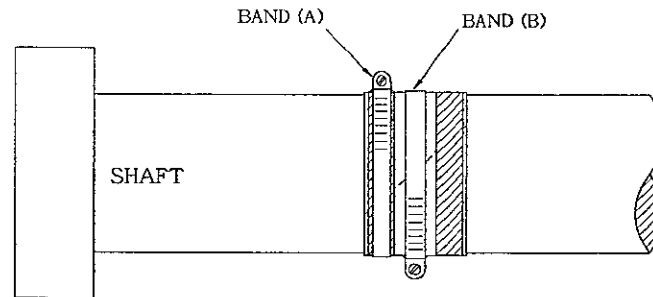


- 4.1.5. Wrap the both edges of slip ring with 3/4" pressure tape for a preparation of tight fastening of stainless steel band.

Apply the tape to the slip ring five times at the opposite direction of the shaft rotation.

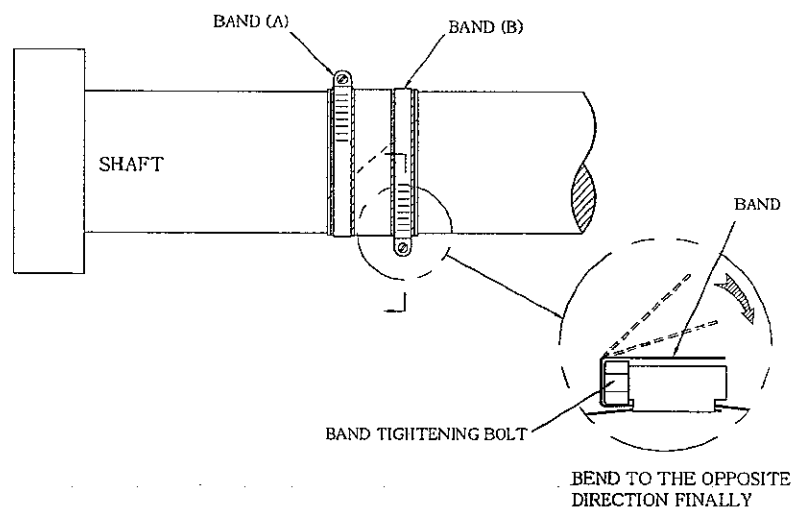


- 4.1.6. Fasten the stainless steel band(A) over the pressure tape tightly around the edge of slip ring.

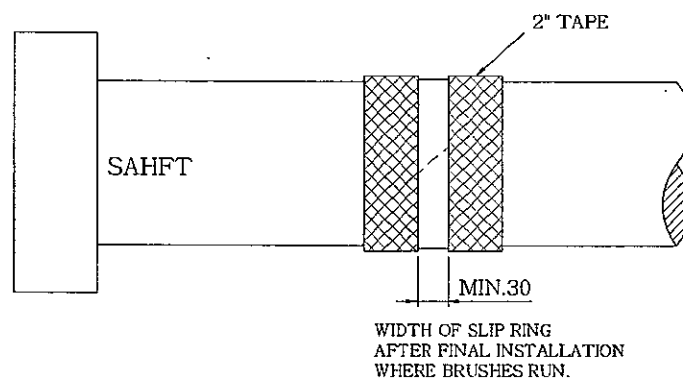


- 4.1.7. Fasten the stainless steel band(B) over the pressure tape tightly around the edge of slip ring.

After tightening bands (A, B), bend the end part of band to the opposite direction to prevent loosening during the shaft rotates.



- 4.1.8. Apply 2" tape over both stainless steel bands (A & B) at the opposite direction of the shaft rotation finally.



## 4.2. Brush holder

- 4.2.1. Carefully study the drawing for correct installation and keep the distance of 3mm between bottom of brush holder and slip ring surface.
- 4.2.2. Fit the brush holder to the support bar and align the assembly so that the brushes will run centrally on the slip ring, and the brush holders assembly is to be clear of the slip ring securing brackets when the shaft rotates.  
Secure the assembly in this position by tightening the hexagon headed bolt at the top of the brush holder body.
- 4.2.3. Do not adjust the tension of spring without approval from K.C.Ltd.

## 4.3. Shaft monitoring millivolt meter

- 4.3.1. The system comprises a bulkhead mounted panel that incorporate terminals, a display meter and a separate monitor brush holder. The system is self contained and requires no external power supply.
- 4.3.2. For ease of interpretation the display meter is scaled up to 150mV.  
As the meter reading rises above 80mV it is recommended that the slipping and brushes be checked and cleaned.

## 5. Operation

- 5.1 The millivolt meter normally reads 150mV full scale.
- 5.2 Reading of below 80mV when shaft is turning at sea indicates proper grounding. If readings are above 80mV, clean the faces of slip ring and brush with a clean cloth.
- 5.3 The millivolt meter will read '0' when shaft is at rest because of the current entering the propeller will return to the hull through main engine bearings and engine foundation.
- 5.4 A millivolt meter reading of '0' when shaft is turning at sea indicates a faulty millivolt meter installation. Checks for connections of all the terminals and tightness of all the fitting are required.



## 6. Maintenance and service

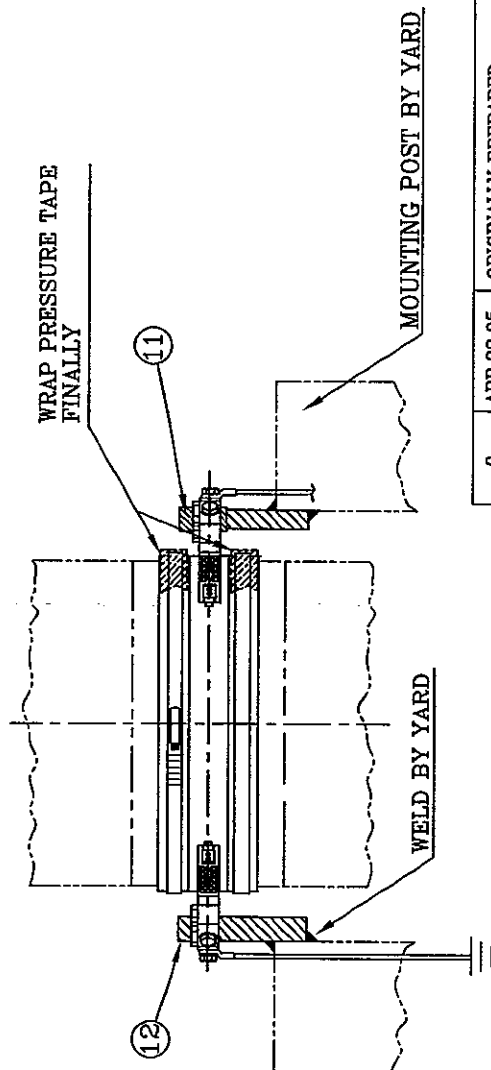
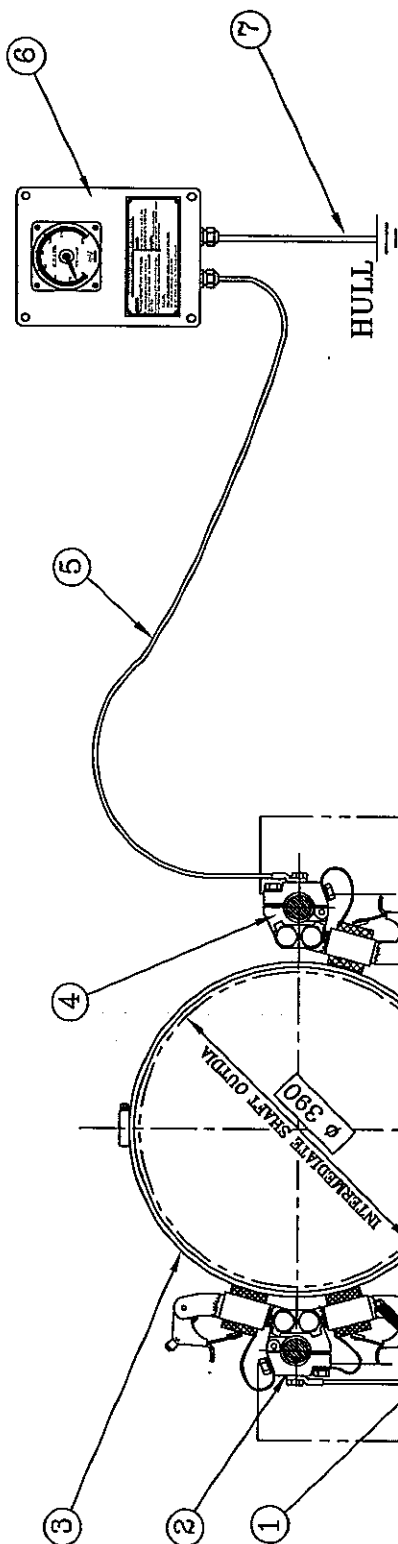
- 6.1 This grounding assembly should be checked at least twice a week for cleanliness.
- 6.2 If there has been a build-up of oil, dirt, scale and rust on the slip ring face or between slip ring and shaft, this should be removed with a degreaser, emery paper and clean cloth.
- 6.3 Inspect and clean the brushes and brush holder to prevent their moving due to dirt build-up. Inspect the brush copper leads (pig tails) to ensure they have not become loose or corroded. The brush wear-down should be noted.
- 6.4 At the time of every dry dock, disassemble the slip ring and clean the surface of the shaft right thereunder.

## 7. The life time of brushes

- 7.1 The brushes are getting worn out by metal touch with slip ring.  
Therefore it's strictly required to keep clean and smooth surface of slip ring, also to carry out proper installation / alignment of brush holders as per our manual and drawing. Otherwise it's very hard to obtain the proper earthing and the proper life time of brushes.
- 7.2 The brushes are consumable parts with wearing ratio approximately 5~10mm per 1,000 hours shaft rotation under proper installation.  
the replacement time is shown by engraving the line (15mm from the top) on the brushes.  
Customer is requested to replace brushes with spares when the time comes.
- 7.3 Brushes are consumable parts as stated above and they are often consumed earlier but it's not a matter of guarantee claim for supplying extra brushes.
- 7.4 Use only our genuine silver graphite brushes.  
Contact K.C. LTD. for purchasing and indicate part number.

### **CAUTION**

**Customers are recommended for the purchase of genuine parts from us.  
Imitated parts make the system get fatally damaged.**



NO	DESCRIPTION	SUPPLY
1	EARTHING CABLE	MAKER
2	DOUBLE BRUSH HOLDER	MAKER
3	SLIP RING	MAKER
4	SINGLE BRUSH HOLDER	MAKER
5	SIGNAL CABLE	YARD
6	mv METER	MAKER
7	EARTHING CABLE	YARD
8	PRESSURE TAPE (19mm)	MAKER
9	SUS BAND	MAKER
10	PRESSURE TAPE (50mm)	MAKER
11	INSULATION SUPPORT BAR FOR SINGLE BRUSH HOLDER	MAKER
12	SUPPORT BAR FOR DOUBLE BRUSH HOLDER	MAKER

**K.C. LTD.**

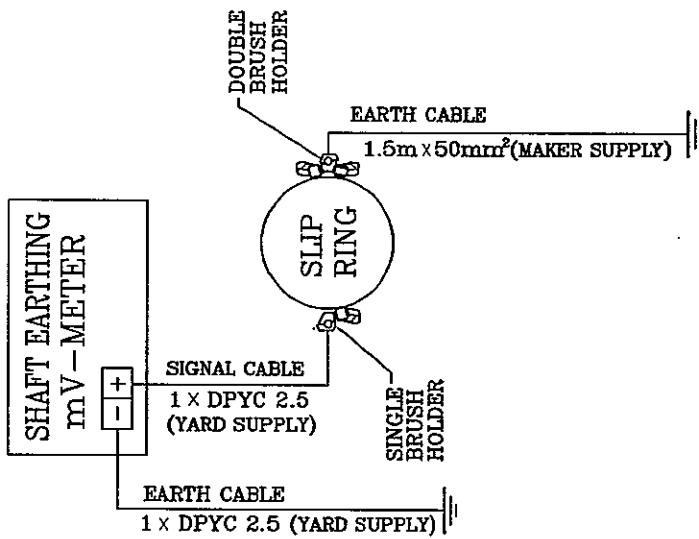
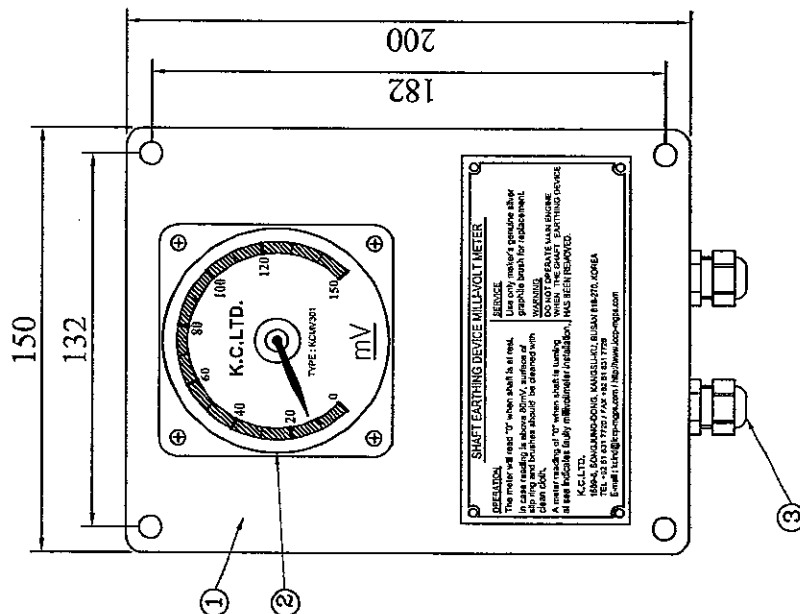
1589-9, SONGUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA  
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE

GENERAL ARRANGEMENT OF  
SHAFT EARTHING DEVICE

REV NO	DATE	ORIGINALLY PREPARED	REF.
0	APR.22.05	MODIFICATION	
		HISTORY	

DWN.	SYH	CHD.	SCO	APP.	SCALE	N S
				SHJ	APR.22.05	
					DRG NO	SG10-1



# SYSTEM WIRING & TERMINAL DETAILS

NO	DESCRIPTION
1	MV METER BODY
2	MV METER GAUGE 0~80 mV : GREEN COLOR 80~150 mV : RED COLOR
3	CABLE GLAND
4	DOOR LOCK

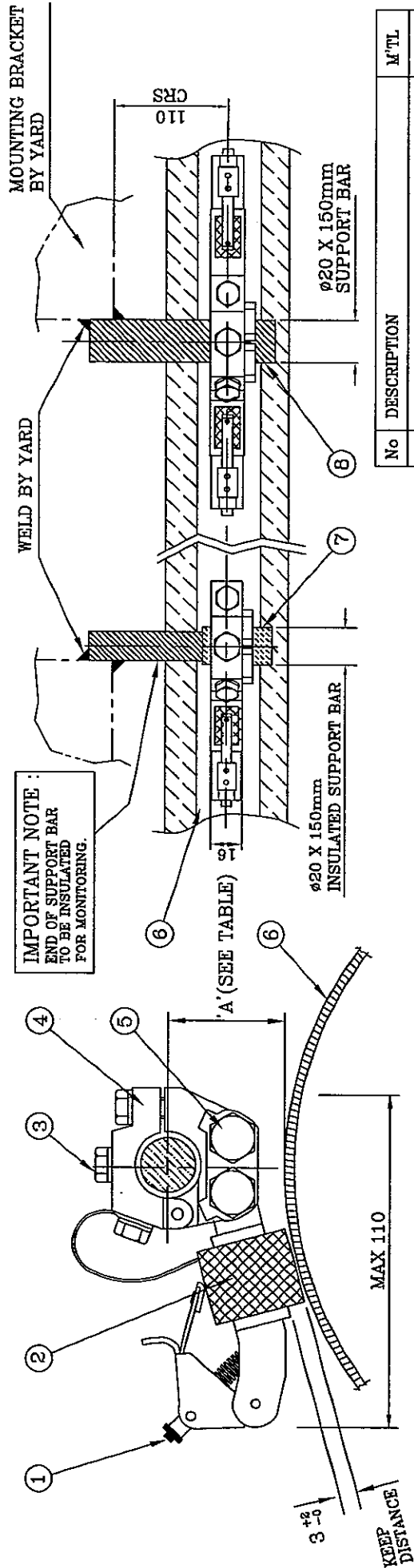
NOTE	
1. ENCLOSURE SPEC	I.P 44
2. WEIGHT	2 KGS

REV NO	DATE	DESCRIPTION
0	MAR.14.05	ORIGINALLY PREPARED
		MODIFICATION
		HISTORY

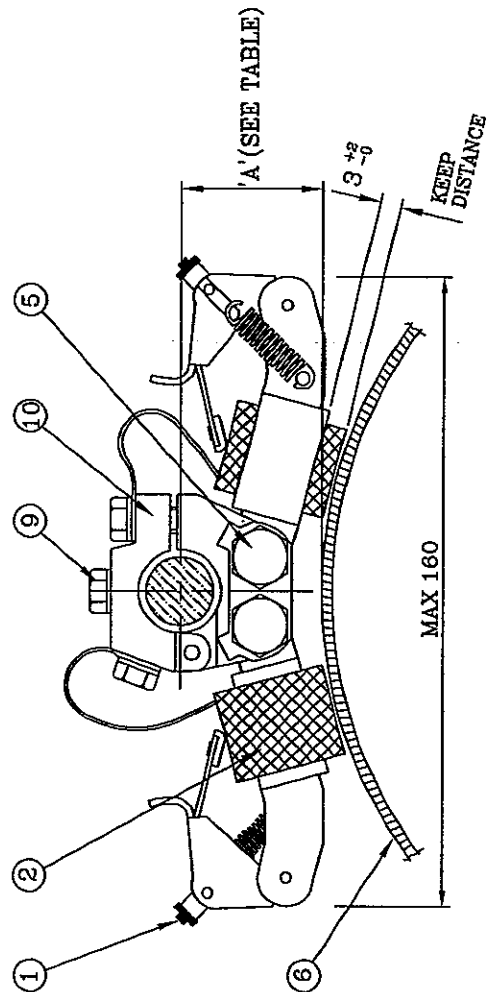
**K.C. LTD.**  
1589-9, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA  
TEL : +82 51 831-7720 FAX : +82 51 831-7726

SHAFT EARTHING MILLIVOLT METER

REF.	DATE	SCALE	N.S
	MAR.14.05		
DWN.	SYH	CHD.	SCO
		APP.	SHJ
		DRG NO	SSM04-1



**SINGLE BRUSH HOLDER  
FOR MONITORING**



**DOUBLE BRUSH HOLDER  
FOR EARTHING**

No	DESCRIPTION	M'TL
1	SPRING TENSION BOLT	BS
2	HIGH DENSITY SILVER GRAPHITE BRUSH	Ag/C
3	CABLE BOLT TERMINAL CONNECTION TO MILLIVOLT METER	SUS
4	SINGLE BRUSH HOLDER FOR MONITORING	BS
5	BRUSH HOLDER ALIGNMENT BOLTS	SUS
6	SILVER ALLOY SLIP RING	Ag
7	INSULATED SUPPORT BAR FOR SINGLE BRUSH HOLDER	SS
8	SUPPORT BAR FOR DOUBLE BRUSH HOLDER	SS
9	BRUSH SET EARTHING CABLE BOLT TERMINAL CONNECT TO HULL PLATE	SUS
10	DOUBLE BRUSH HOLDER FOR EARTHING	BS

SHAFT O/D	A
BELOW φ200	39
φ210 ~ φ400	38
φ410 ~ φ700	37
φ710 ~ φ900	36
ABOVE φ910	35

**K.C. LTD.**

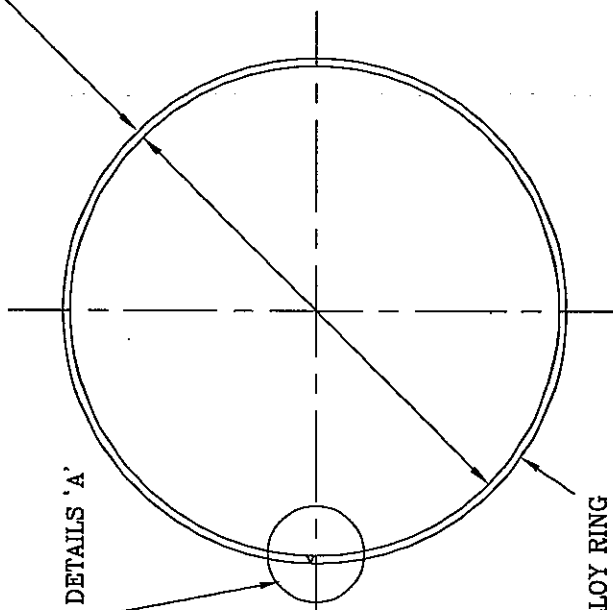
1588-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA  
TEL: +82 51 831 7720 FAX: +82 51 831 7728

TITLE

SHAFT EARTHING BRUSH SET DETAIL

0	MAR.20.01	ORIGINALLY PREPARED	REF.	DATE	MAR.20.01	SCALE	N.S			
REV NO	DATE	MODIFICATION	DWN.	HYL	CHD.	SCO	APP.	SHJ	DRG NO	SBH06
HISTORY										

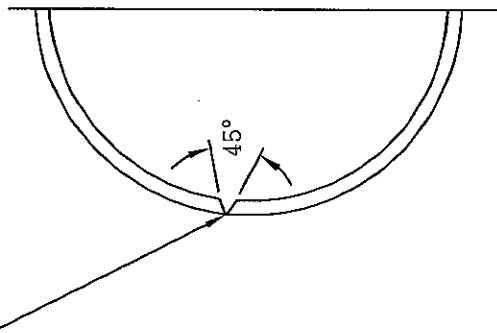
INTERMEDIATE SHAFT



SEE DETAILS 'A'

SILVER ALLOY RING

FILL ANY GAP WITH SOFT SOLDER  
AND MUST BE RECESSED



DETAILS OF 'A'

# NOTES :

1. CLIENT TO BAND SLIP RING AND CUT WITH 45° CUT END.
2. ANY PROTRUSION AFTER BENDING FIRMLY TO BE RUBBED BY EMERY PAPER



CUT OF SLIP RING

K.C. LTD.

1589-8 SONGTUNG-DONG, KANGSU-KU BUSAN 618-270, KOREA  
TEL: +82 51 831-7720 FAX: +82 51 831-7726

TITLE

SHAFT SLIP RING

0	JAN.15.03	ORIGINALLY PREPARED	REF.	DATE	SCALE	N.S
REV NO	DATE	MODIFICATION	DWN.	CHD.	SCO	SHJ
HISTORY						
DRG NO SSR05						