

K.C. LTD.



DRAWING TITLE	APPROVAL DRAWING
ITEM	IMPRESSED CURRENT CATHODIC PROTECTION (I.C.C.P) SYSTEM & SHAFT EARTHING DEVICE
SHIPYARD	TAIZHOU MAPLE LEAF SHIPBUILDING CO.,LTD.
HULL No.	MLBC31800-039/040
VESSEL TYPE	31,800 DWT BULK CARRIER
K.C. LTD. REF. No.	5799
K.C. LTD. MODEL. No.	KC1T 730A

--	--	--	--	--

0	ORIGINALLY PREPARED	H.J.S.		NOV.18,10
REV	DESCRIPTION	DWN.	APP.	DATE

K.C. LTD.
1589-6, Songjung-dong, Kangsu-ku,
Busan 618-818, Korea
Tel : +82 51 831 7720
Fax : +82 51 831 7726
E-mail : kcind@iccp-mgps.com
Web : http://www.iccp-mgps.com

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

K.C. LTD.

INDEX		
	List	Page No
1	Specification & Scope of Supply	1-2
2	General arrangement of Anode assembly	3
3	Di-electric shield area for Anode	4
4	Exploded diagram of Anode installation	5
5	General arrangement of Ref. Electrode cell assembly	6
6	Exploded diagram of Ref. electrode cell installation	7
7	Power Supply Unit details	8
8	Specification of shaft earthing device	9
9	Detail of General arrangement of shaft earthing device	10
10	Detail of millivolt meter	11
11	Detail of shaft earthing device brush set	12
12	Detail of shaft slip ring	13
13	Ground arrangement for Rudder stock	14
14	System Position details	15
15	System wiring & terminal details	16
16	Spare parts list	17

K.C. LTD.

SPECIFICATION & SCOPE OF SUPPLY	
SHIPYARD	TAIZHOU MAPLE LEAF SHIPBUILDING CO., LTD.
PROJECT No	MLBC31800-039/040

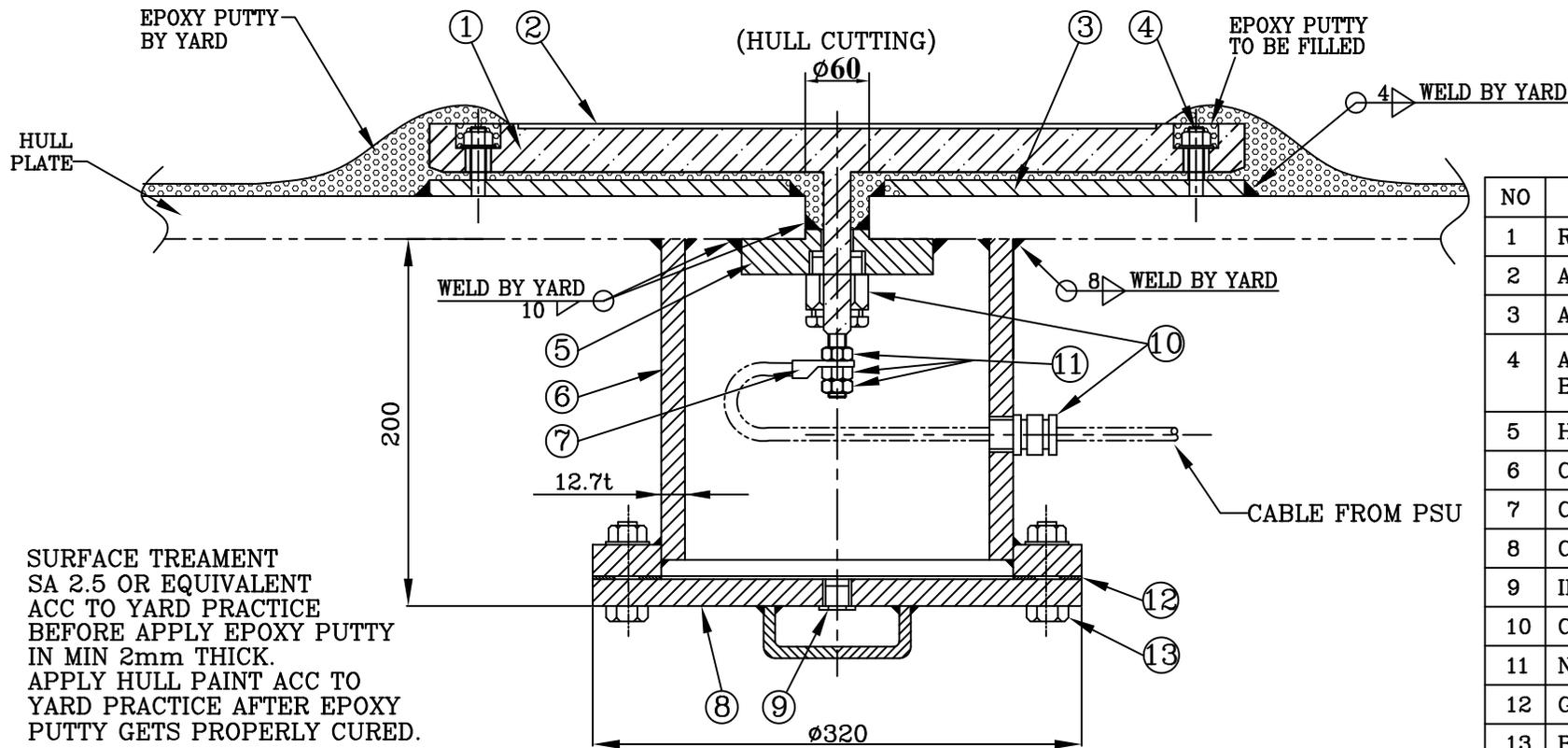
DESIGN BASE	1. TOTAL WETTED SURFACE AREA : - HULL : 7,462 m ²
	2. TOTAL SYSTEM REQUIRED : - HULL : $7,462 \text{ m}^2 \times 35\text{mA/ m}^2$ (mean current density) = 261.17 Amp TOTAL 261.17 Amp
	TOTAL SYSTEM PROVIDED BY K.C. LTD. : 300Amp

QUANTITY	DESCRIPTION FOR SYSTEM :
ONE(1)	300 AMPERE KC1T 730A POWER SUPPLY CONTROL UNIT : INPUT : 440V/60HZ/1PH OUTPUT : 300A/24V DC PAINTED : RAL 7032 SUPPLIED COMPLETE WITH EARTHING CABLE
TWO (2)	150 AMPERE MMO/Ti CIRCULAR ANODE ASSEMBLY EACH COMPLETE WITH : EPOXY PUTTY FOR DI-ELECTRIC SHIELD ANODE FIXING PLATE HULL BOSS COFFERDAM CABLE GLANDS
TWO (2)	PURITY ZINC REFERENCE ELECTRODE CELL ASSEMBLY EACH COMPLETE WITH : COFFERDAM CABLE GLAND

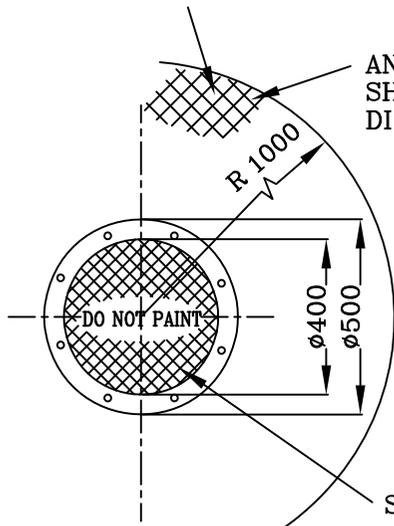
K.C. LTD.

SPECIFICATION & SCOPE OF SUPPLY	
SHIPYARD	TAIZHOU MAPLE LEAF SHIPBUILDING CO., LTD.
PROJECT No	MLBC31800-039/040

QUANTITY	DESCRIPTION FOR ASSOCIATED EQUIPMENT
ONE (1)	EPOXY PUTTY FOR MOUNTING ANODES AND FILLING IN COFFERDAM OF REF ELECTRODE CELL
ONE (1)	SHAFT GROUNDING DEVICE CONSISTING OF SLIP RING, BRUSH(SILVER GRAPHITE), mV METER(0~150mV) WITH GLAND, BRUSH HOLDER, GROUNDING CABLE AND BAND
ONE (1)	RUDDER STOCK BONDING CABLE
ONE (1)	SYSTEM SPARES WITH BOX
ONE (1)	SYSTEM LOG SHEET
SIX (6)	OPERATION / INSTRUCTION MANUALS IN ENGLISH

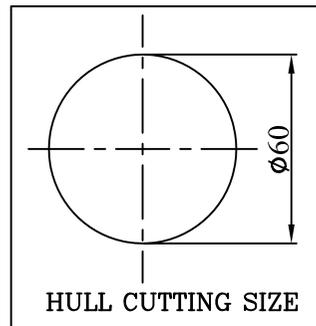


SURFACE TREATMENT
SA 2.5 OR EQUIVALENT
ACC TO YARD PRACTICE
BEFORE APPLY EPOXY PUTTY
IN MIN 2mm THICK.
APPLY HULL PAINT ACC TO
YARD PRACTICE AFTER EPOXY
PUTTY GETS PROPERLY CURED.



ANY MARKS, SHIPSIDE NOZZLE
SHOULD BE AWAY FROM
DI-ELECTRIC SHIELD AREA.

SEE NOTE 2.



HULL CUTTING SIZE

NO	DESCRIPTION
1	RESIN BLOCK
2	ANODE FACE (KEEP CLEAN)
3	ANODE FIXING PLATE - SEE NOTE 1
4	ANODE FIXING BOLT/NUT/WASHER (M10)
5	HULL BOSS
6	COFFERDAM
7	CABLE TERMINAL
8	COFFERDAM COVER
9	INSPECTION PLUG (PF 1/2")
10	CABLE GLAND
11	NUT (M12)
12	GASKET
13	BOLT/NUT/WASHER (M20 X 8)

WEIGHT OF COFFERDAM : 31 Kg
WEIGHT OF ANODE : 12.6 Kg

NOTE :

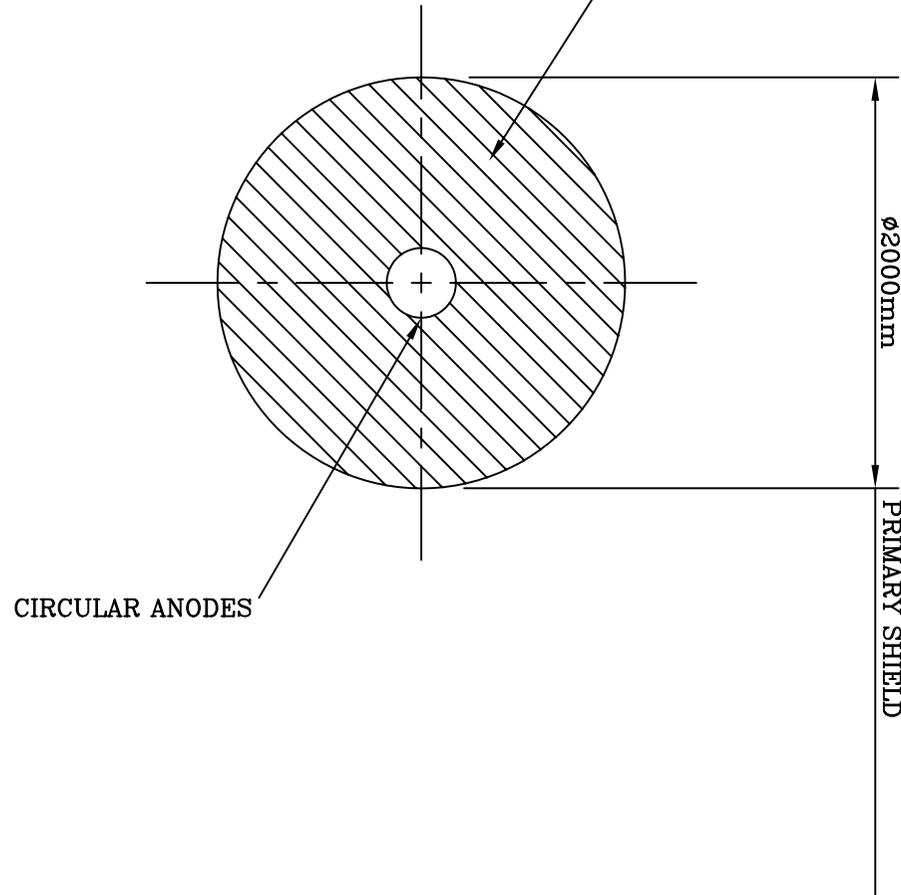
1. WELD ANODE FIXING PLATE USING FILLER PLATES OR WELD BUILD-UP IF NECESSARY AT ANY UNEVEN POINTS/PLACES.
2. ANODE FACE TO BE KEPT FREE FROM PAINT OR GREASE.

K.C. LTD.
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE					
GENERAL ARRANGEMENT OF CIRCULAR ANODE ASSEMBLY					
REF.	DATE		SCALE		
	AUG.10,04		N.S		
DWN.	CHD.	APP.	DRG NO		
SYH	SCO	SHJ	IACR14		

0	AUG.10,04	ORIGINALLY PREPARED
REV NO	DATE	MODIFICATION
HISTORY		

NOTE : GRITBLAST ENTIRE AREA TO
S.A. 2.5 BEFORE APPLICATION
OF EPOXY PUTTY



KEY TO EPOXY PUTTY AREAS:



----- AREAS OF
DI-ELECTRIC SHIELD EPOXY PUTTY.
COATING TO RUN 2.0mm THICK
IN AREA SHOWN.

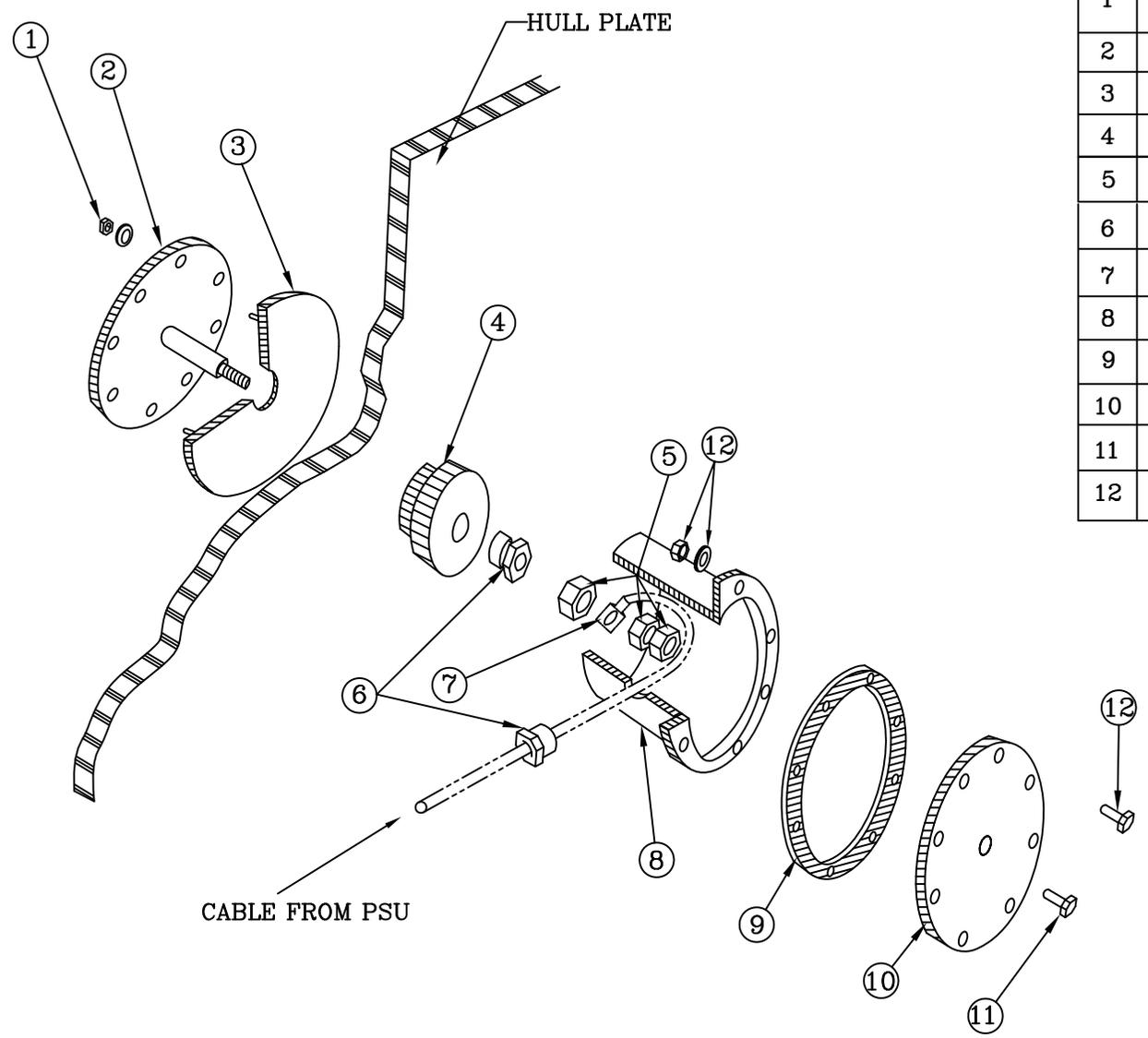
* REMARK : AFTER FULL DRY OF EPOXY PUTTY
(DI-ELECTRIC SHIELD) YARD TO
PAINT WHOLE DI-ELECTRIC SHIELD
ACC TO YARD'S STANDARD A/F
PAINTING BUT KEEP ANODE
UNPAINTED.

-4-

K.C. LTD.
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
DI-ELECTRIC SHIELD AREAS FOR
CIRCULAR ANODES

0	FEB.24,98	ORIGINALLY PREPARED	REF.	DATE	FEB.24,98	SCALE	N.S
REV NO	DATE	MODIFICATION	DWN.	HCK	CHD.	SCO	APP. SHJ
HISTORY			DRG NO		C1196-2		

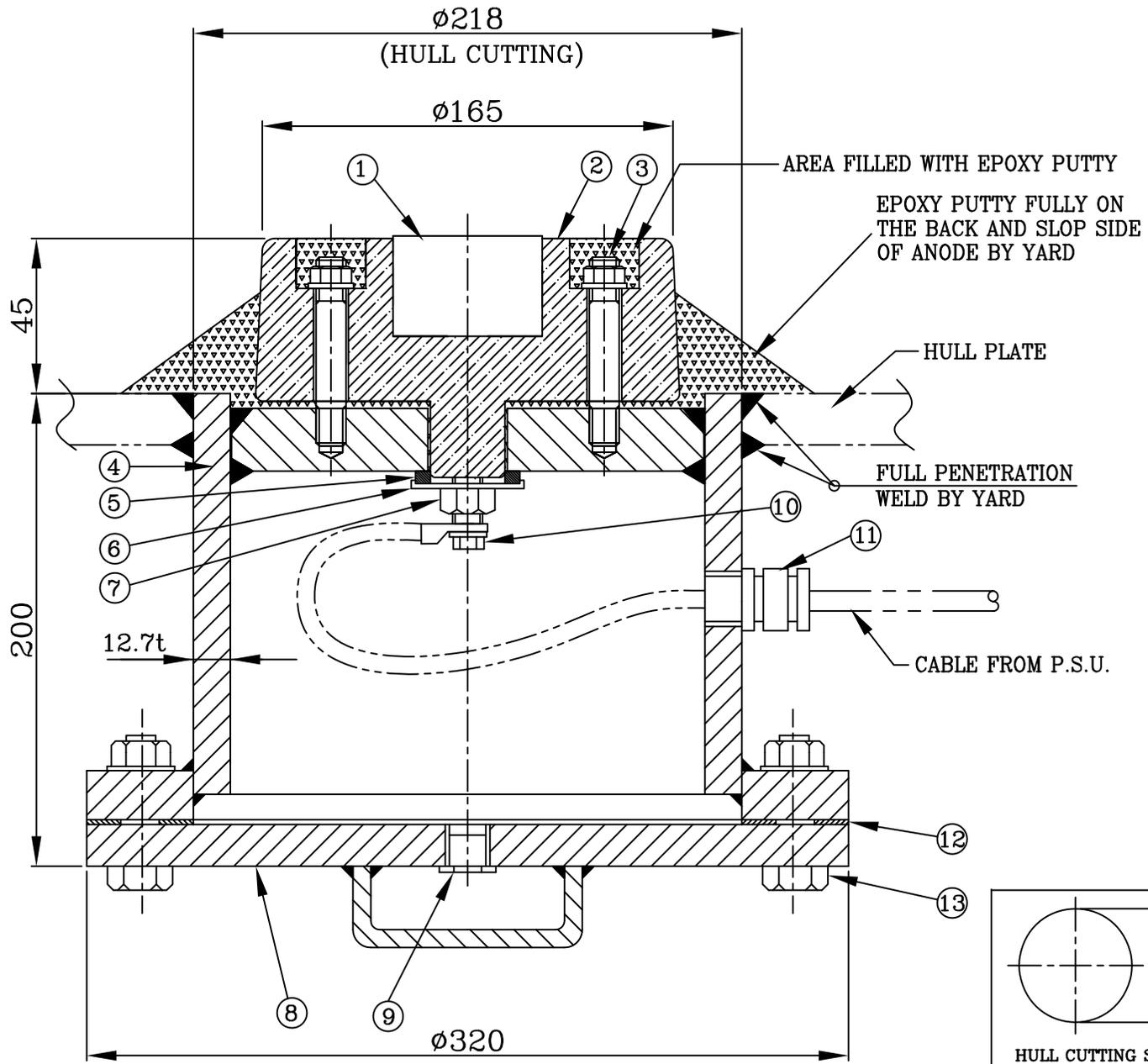


No	DESCRIPTION	MATERIAL	Q'TY
1	M10 NUT & WASHER FOR ANODE TO ANODE FIXING PLATE ASSEMBLY	STAINLESS STEEL	8
2	ANODE ASSEMBLY	MMO/Ti & RESIN	1
3	ANODE FIXING PLATE	STEEL	1
4	HULL BOSS	STEEL	1
5	NUT (M12)	STAINLESS STEEL	3
6	CABLE GLAND	BRASS	2
7	CABLE TERMINAL	STEEL	1
8	COFFERDAM (200A)	STEEL	1
9	GASKET	RUBBER	1
10	COFFERDAM COVER	STEEL	1
11	INSPECTION PLUG (PF 1/2")	GAL.SS	1
12	BOLT, NUT & WASHER (M20)	HOT DIP GAL.SS	8

K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
 EXPLODED DIAGRAM OF
 CIRCULAR ANODE INSTALLATION

0	AUG.10,04	ORIGINALLY PREPARED	REF.	DATE	AUG.10,04	SCALE	N.S
REV NO	DATE	MODIFICATION	DWN.	CHD.	APP.	DRG NO	IACRD14
HISTORY			SYH	SCO	SHJ		



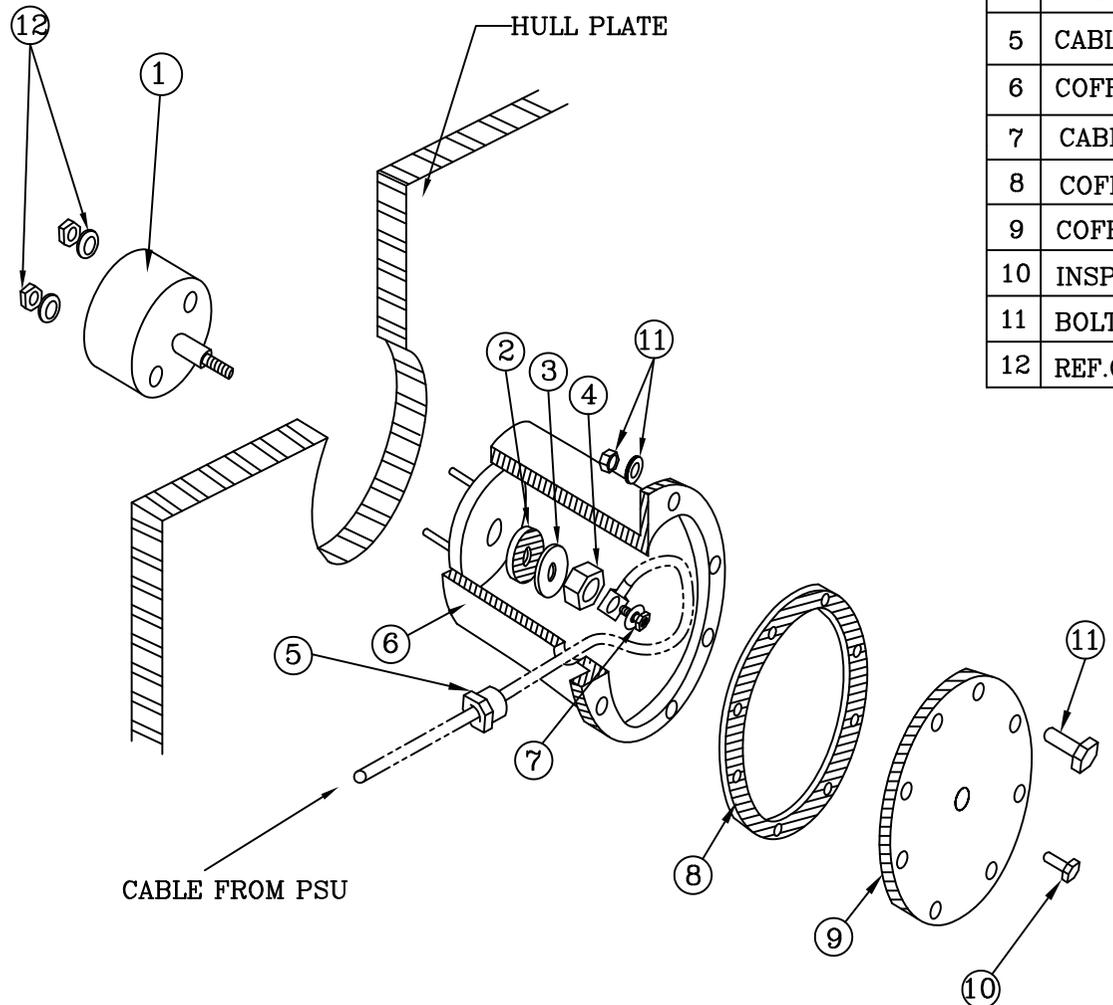
NO	DESCRIPTION
1	ZINC REFERENCE CELL BLOCK
2	RESIN BLOCK
3	REF. CELL FIXING BOLT, NUT & WASHER
4	COFFERDAM
5	GASKET
6	WASHER
7	NUT (M12)
8	COFFERDAM COVER
9	INSPECTION PLUG (PF 1/2")
10	CABLE FIXING BOLT, WASHER
11	CABLE GLAND
12	COFFERDAM GASKET
13	BOLT/NUT/WASHER (M20×8)
ASSEMBLY WEIGHT : 42Kg	

NOTE: REFERENCE ELECTROD CELL BLOCK FACE TO BE KEPT FREE FROM PAINT OR GREASE

K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-818, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE							
GENERAL ARRANGEMENT OF REF ELECTRODE CELL ASSEMBLY							
REF.	DATE		SCALE		N.S		
DWN.	SYH	CHD.	SCO	APP.	SCO	DRG NO	IREA21-2

REV NO	DATE	MODIFICATION
0	JAN.05.09	ORIGINALLY PREPARED
HISTORY		

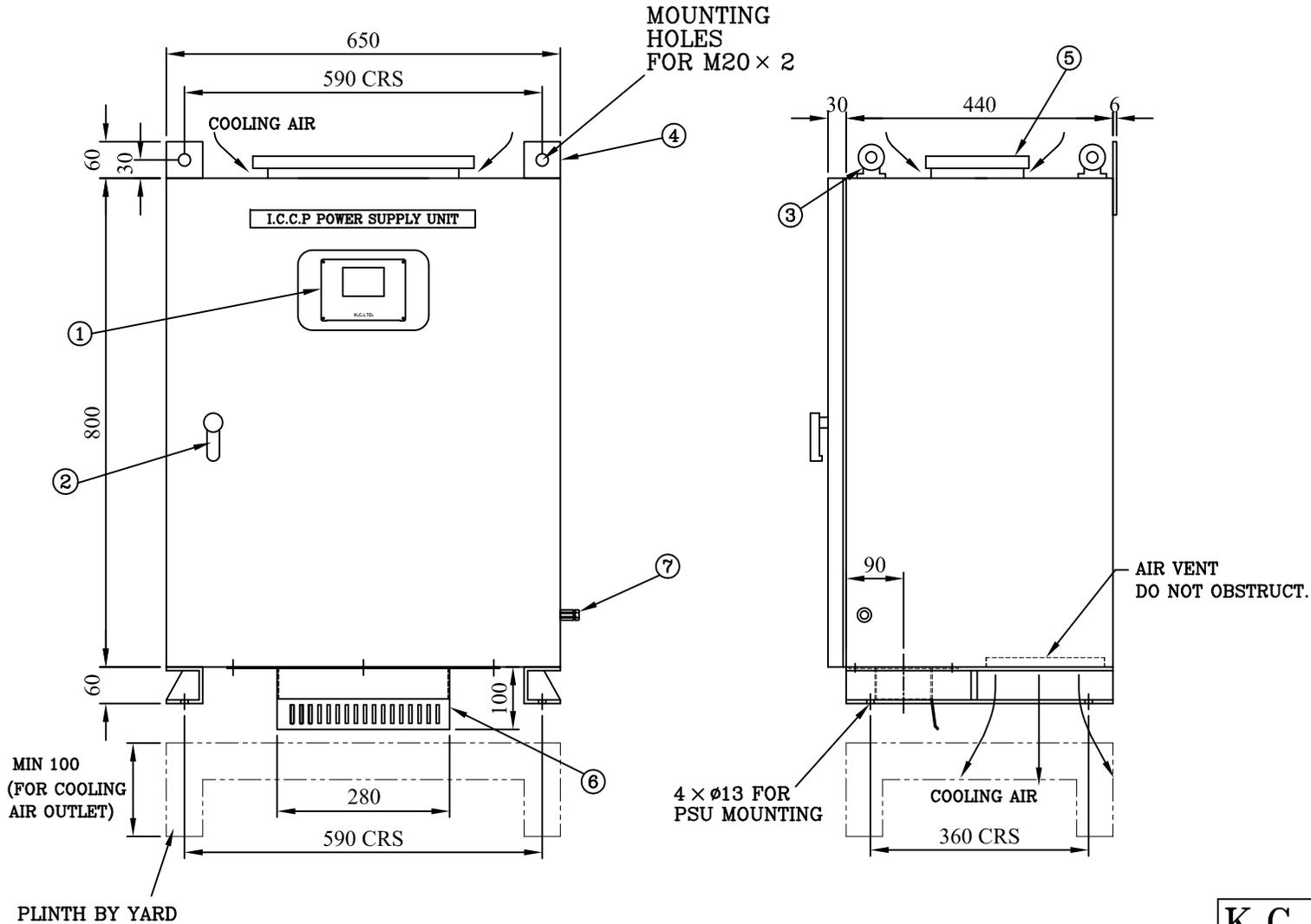


No	DESCRIPTION	MAT'L	Q'TY
1	REFERENCE ELECTRODE CELL	ZINC/RESIN	1
2	GASKET	SILICONE	1
3	WASHER	PVC	1
4	NUT (M12)	STAINLESS STEEL	1
5	CABLE GLAND	BRASS	1
6	COFFERDAM	STEEL	1
7	CABLE FIXING BOLT, WASHER	STEEL	1
8	COFFERDAM GASKET	RUBBER	1
9	COFFERDAM COVER	STEEL	1
10	INSPECTION PLUG (PF 1/2")	GAL.SS	1
11	BOLT, NUT & WASHER (M20)	HOT DIP GAL.SS	8
12	REF.CELL FIXING NUT & WASHER (M12)	STAINLESS STEEL	2

K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
 EXPLODED DIAGRAM OF REFERENCE
 ELECTRODE CELL INSTALLATION

0	AUG.25,05	ORIGINALLY PREPARED	REF.	DATE	AUG.25,05	SCALE	N.S
REV NO	DATE	MODIFICATION	DWN.	CHD.	APP.	DRG NO	IREDA21
		HISTORY	SYH	SCO	SHJ		



NO	DESCRIPTION
1	TOUCH SCREEN COMPUTER CONTROLLER
2	DOOR LOCKER
3	LIFTING LUG
4	MOUNTING BAR
5	AIR VENT
6	CABLE COAMING PLATE
7	EARTHING BOLT

SPECIFICATION	
TYPE	KC1T 730A
PSU CAPA	300 AMP
POWER SOURCE	440V AC 60HZ/1PH
POWER CONSUMPTION	9 KW
MAXIMUM WEIGHT	210 KG
PAINTING COLOR	RAL 7032
ENCLOSURE SPEC	IP 44
RATED CURRENT	MAX 20.45 AMP

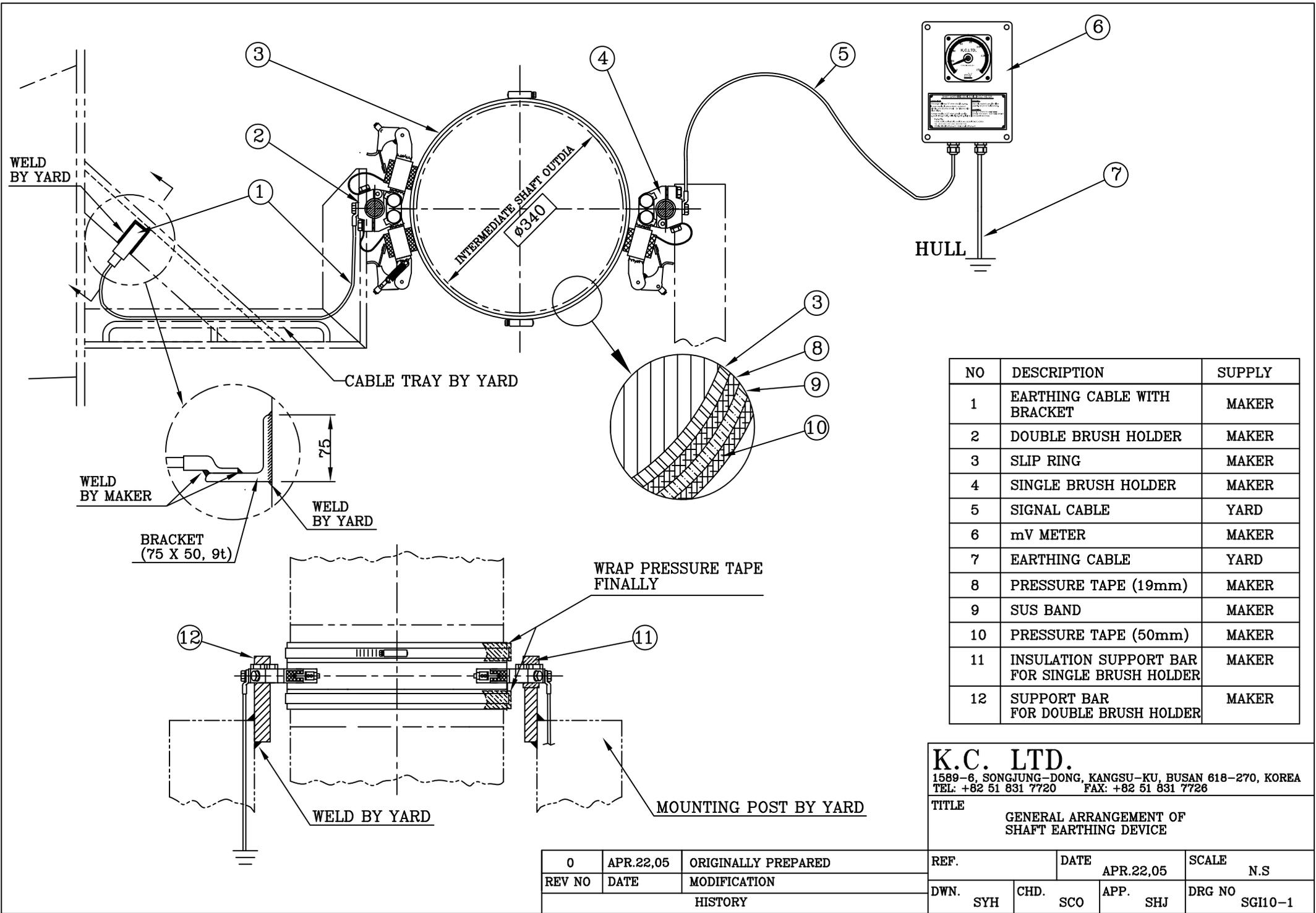
K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE					
POWER SUPPLY UNIT DETAILS					
REF.	DATE	SCALE		N.S	
	DEC.08,09				
DWN.	CHD.	APP.	DRG NO	IPSU7301PA	
SYH	SCO	SCO			

0	DEC.08,09	ORIGINALLY PREPARED
REV NO	DATE	MODIFICATION
HISTORY		

K.C. LTD.

SPECIFICATION & SCOPE FOR Shaft Grounding Device		
SHIPYARD		TAIZHOU MAPLE LEAF SHIPBUILDING CO.,LTD.
SHAFT OUT DIAMETER		Ø 340
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 × 50mm ² SHAFT EARTH CABLE
2	KCS011	STAINLESS STEEL BAND
1	KCS0151	PRESSURE TAPE (50mm)
1	KCS015	PRESSURE TAPE (19mm)

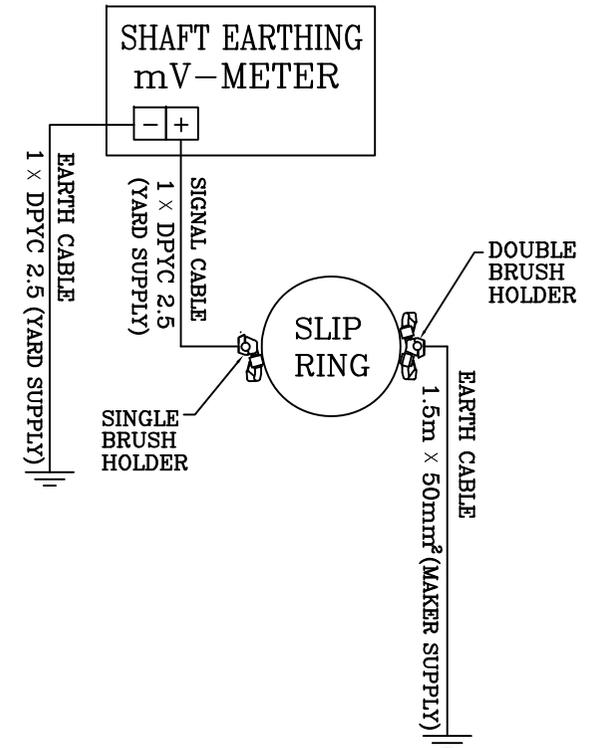
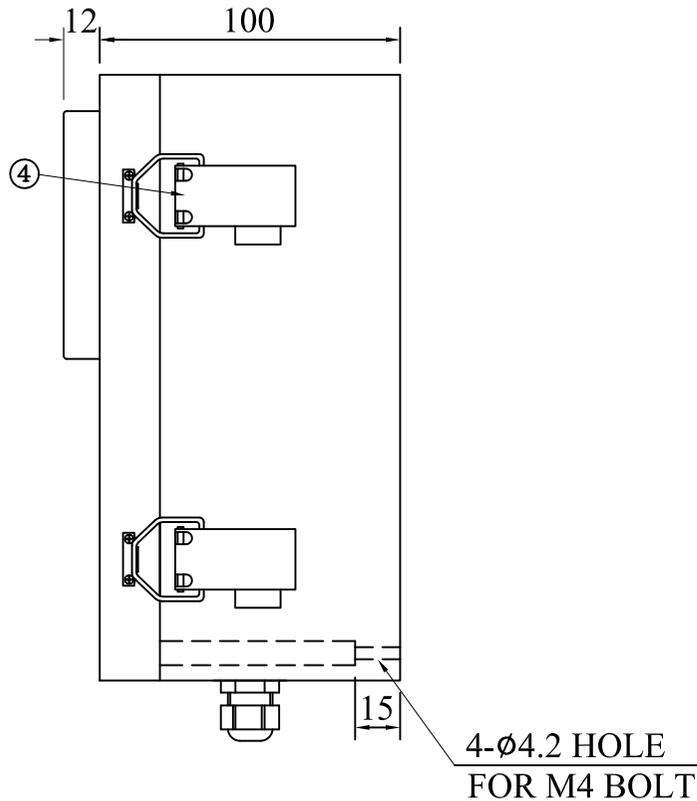
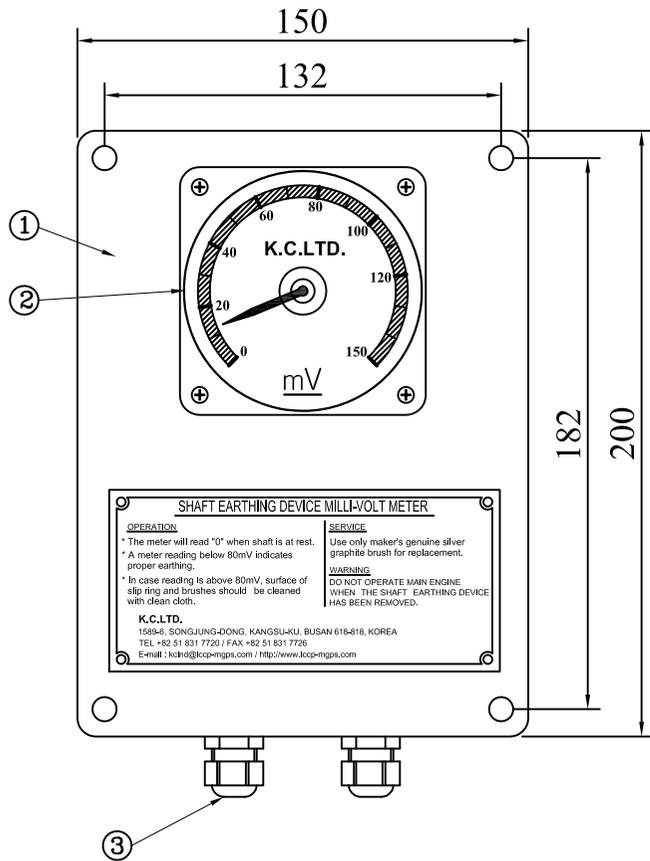


NO	DESCRIPTION	SUPPLY
1	EARTHING CABLE WITH BRACKET	MAKER
2	DOUBLE BRUSH HOLDER	MAKER
3	SLIP RING	MAKER
4	SINGLE BRUSH HOLDER	MAKER
5	SIGNAL CABLE	YARD
6	mV METER	MAKER
7	EARTHING CABLE	YARD
8	PRESSURE TAPE (19mm)	MAKER
9	SUS BAND	MAKER
10	PRESSURE TAPE (50mm)	MAKER
11	INSULATION SUPPORT BAR FOR SINGLE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

K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE					
GENERAL ARRANGEMENT OF SHAFT EARTHING DEVICE					
REF.	DATE		SCALE		
	APR.22,05		N.S		
DWN.	CHD.	APP.	DRG NO		
SYH	SCO	SHJ	SG110-1		

REV NO	DATE	MODIFICATION
0	APR.22,05	ORIGINALLY PREPARED
HISTORY		



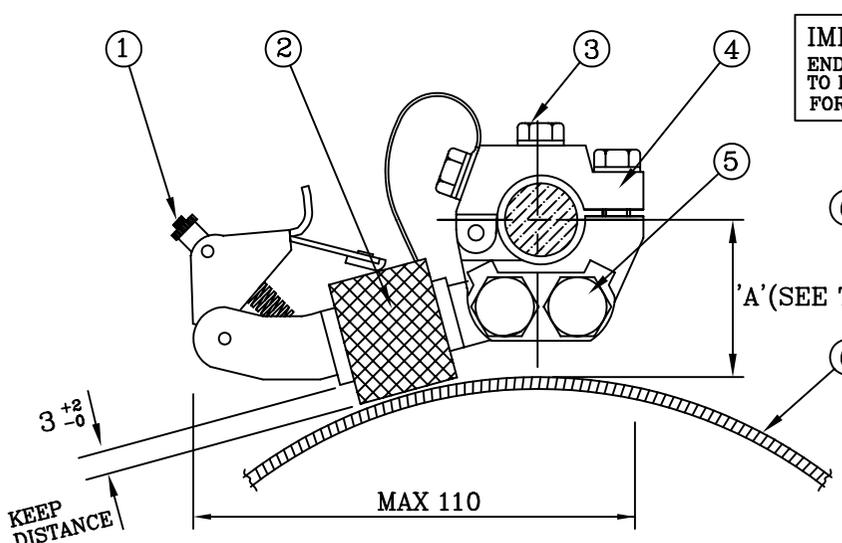
SYSTEM WIRING & TERMINAL DETAILS

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

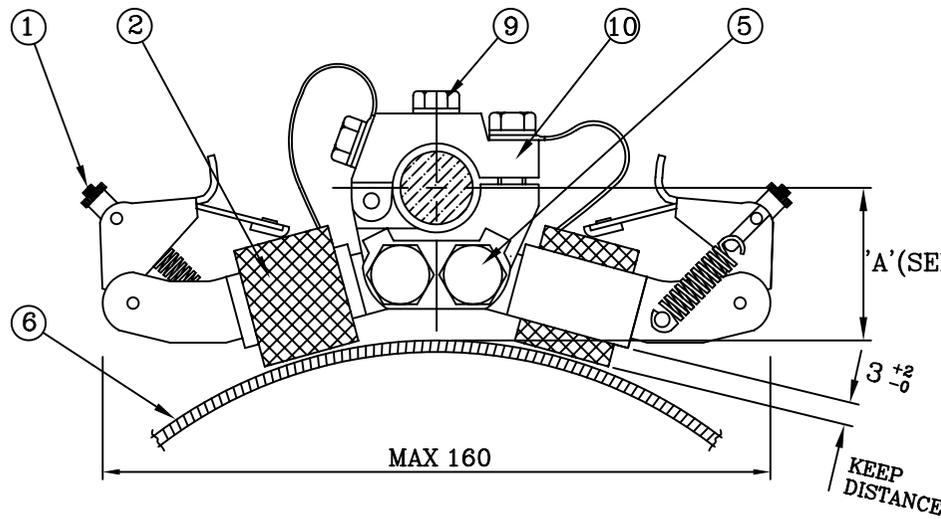
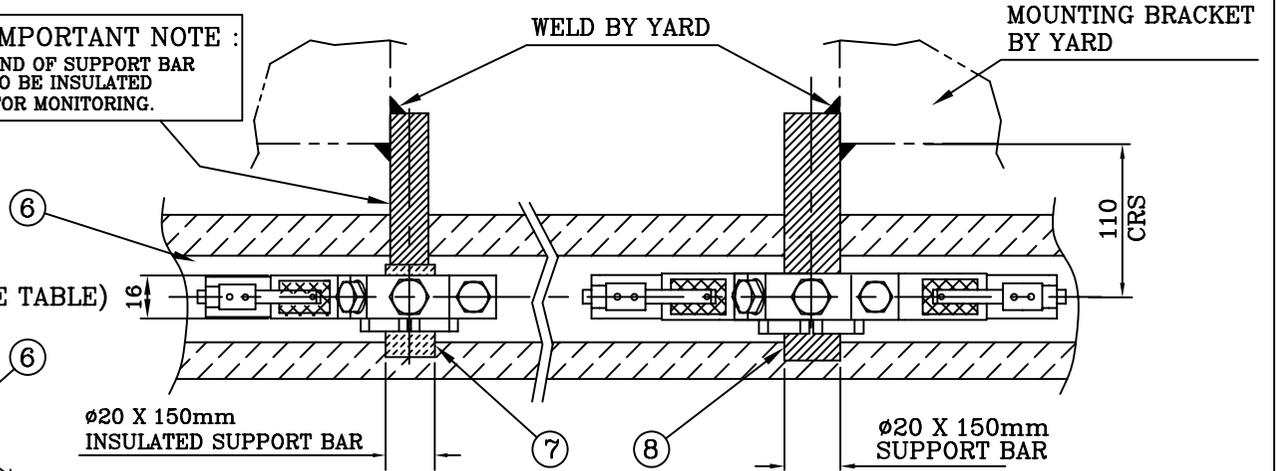
REV NO	DATE	MODIFICATION
0	MAR.14.05	ORIGINALLY PREPARED
HISTORY		

K.C. LTD.					
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 616-270, KOREA TEL : +82 51 831-7720 FAX : +82 51 831-7726					
TITLE SHAFT EARTHING MILLIVOLT METER					
REF.	DATE		SCALE		
	MAR.14,05		N.S		
DWN.	CHD.	APP.	DRG NO		
SYH	SCO	SHJ	SSM04-1		



SINGLE BRUSH HOLDER FOR MONITORING

IMPORTANT NOTE :
END OF SUPPORT BAR TO BE INSULATED FOR MONITORING.



DOUBLE BRUSH HOLDER FOR EARTHING

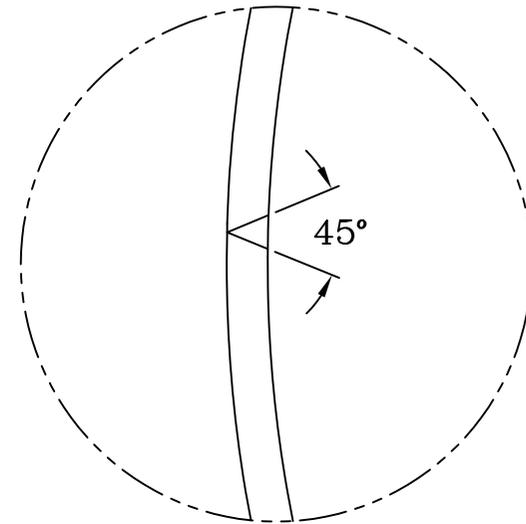
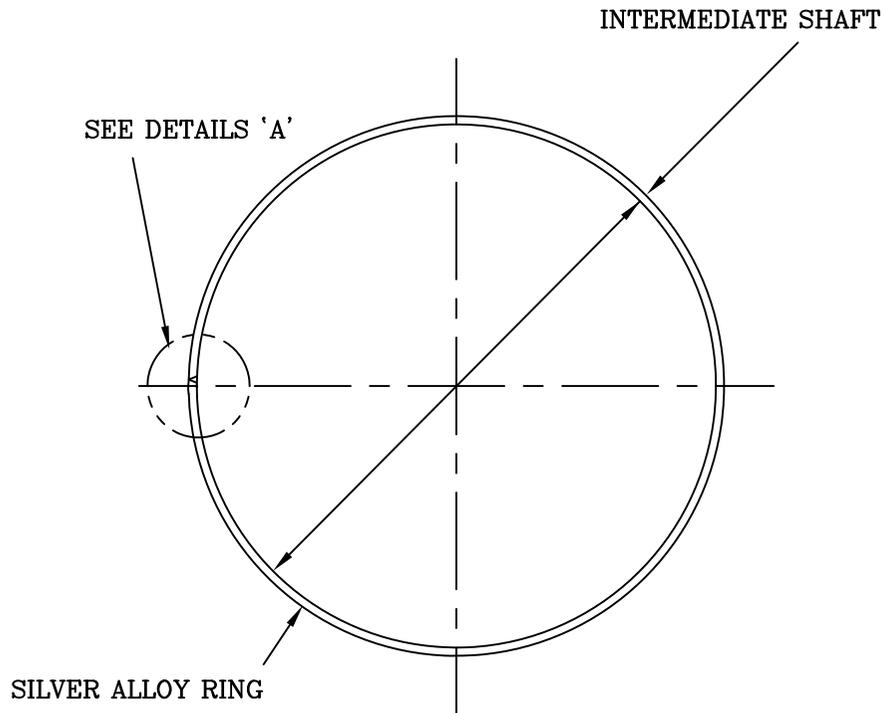
SHAFT O/D	A
BELOW ø200	39
ø210 ~ ø400	38
ø410 ~ ø700	37
ø710 ~ ø900	36
ABOVE ø910	35

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

K.C. LTD.
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
SHAFT EARTHING BRUSH SET DETAIL

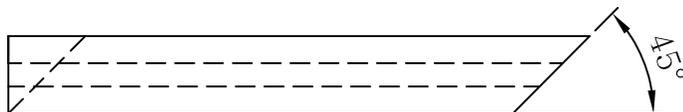
REV NO	DATE	MODIFICATION	REF.	DATE	SCALE
0	MAR.20,01	ORIGINALLY PREPARED		MAR.20,01	N.S
HISTORY			DWN. HYL	CHD. SCO	APP. SHJ
					DRG NO SBH06



DETAILS OF 'A'

NOTES :

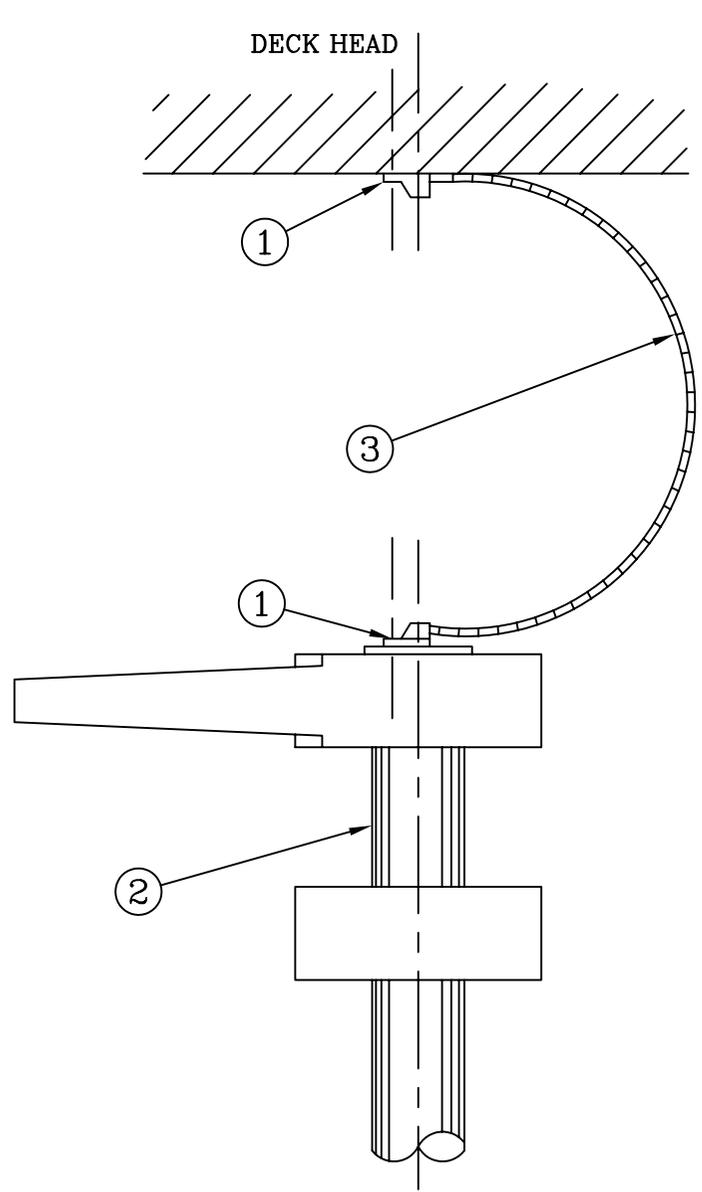
1. CLIENT TO BAND SLIP RING AND CUT WITH 45° CUT END.
2. ANY PROTRUSION AFTER BENDING FIRMLY TO BE RUBBED BY EMERY PAPER



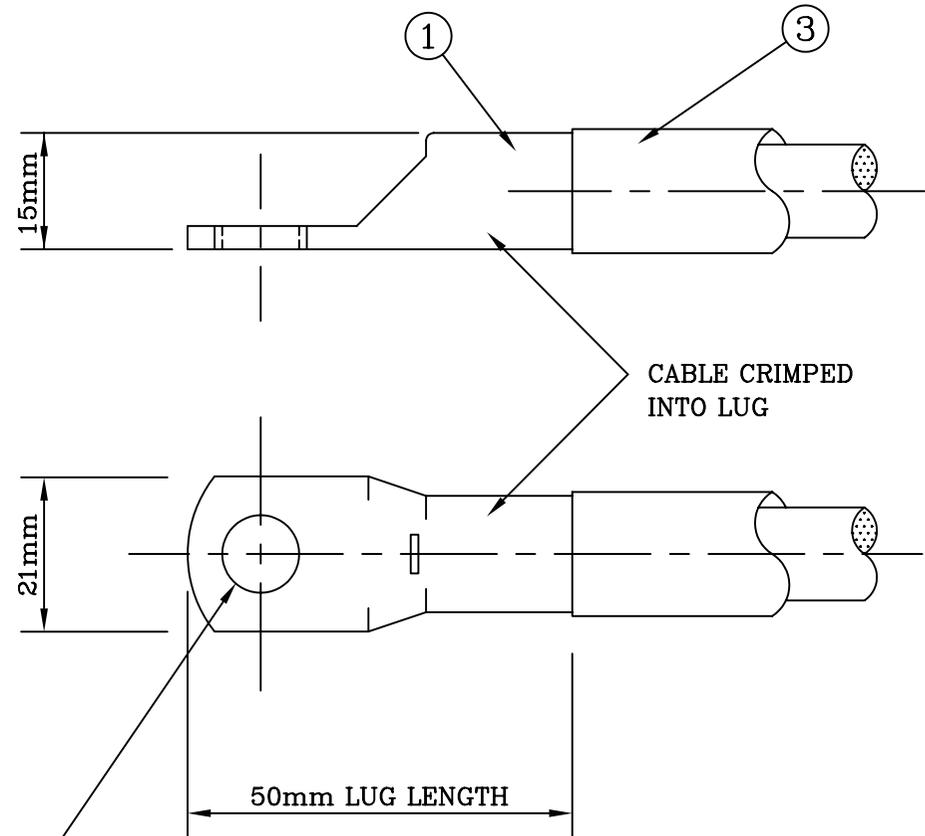
CUT OF SLIP RING

1	OCT.29,03	REVISED
0	JAN.15,03	ORIGINALLY PREPARED
REV NO	DATE	MODIFICATION
HISTORY		

K.C. LTD.					
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA					
TEL: +82 51 831 7720 FAX: +82 51 831 7726					
TITLE					
SHAFT SLIP RING					
REF.		DATE		SCALE	
		JAN.15,03		N.S	
DWN.	CHD.	APP.	DRG NO		
HYL	SCO	SCO	SSR05-1		



RUDDER STOCK BONDING ARRANGEMENT



Ø13 FOR M10 BOLT
WELD OR BOLT LUG IN POSITION
BY YARD

NO	DESCRIPTION
1	CABLE LUG
2	RUDDER STOCK
3	70mm ² CORE CABLE x 2m

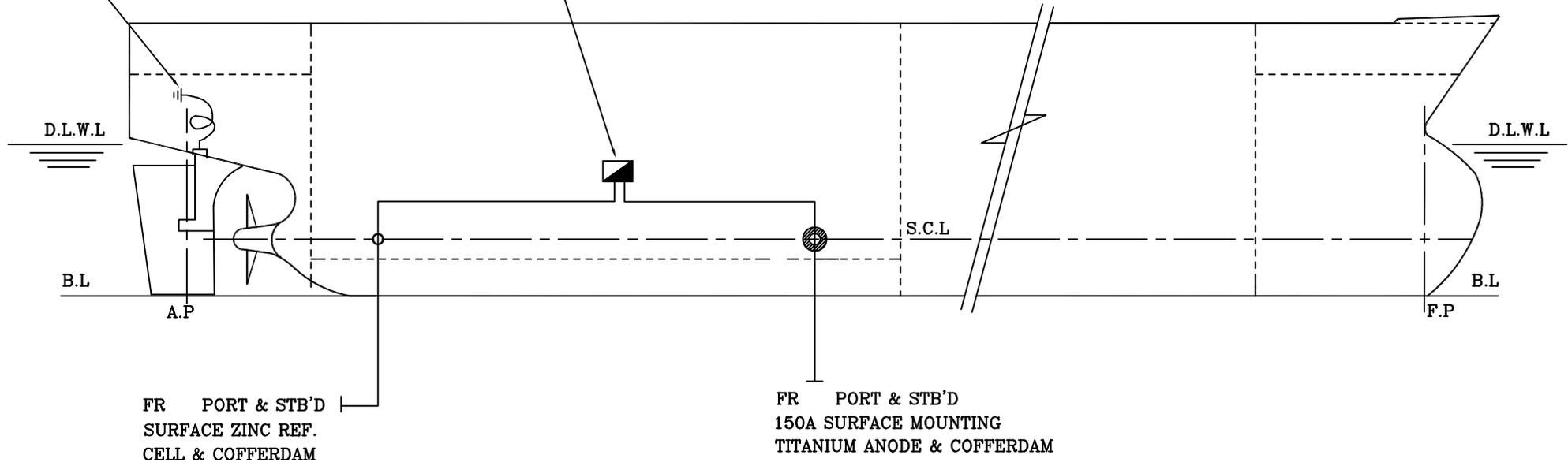
K.C. LTD.
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
GROUND ARRANGEMENT FOR RUDDER STOCK

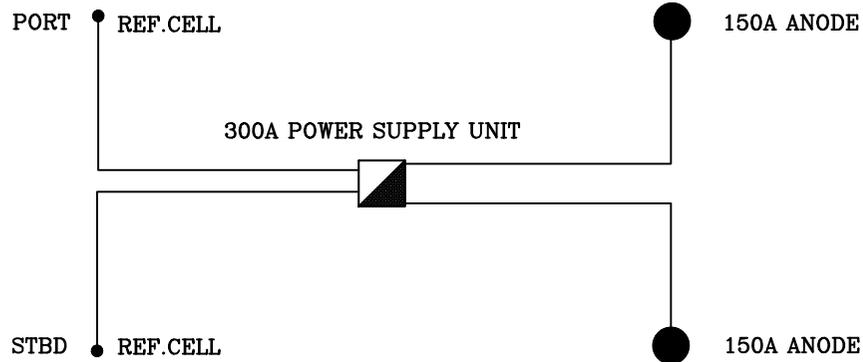
REV NO	DATE	MODIFICATION	REF.	DATE	SCALE
0	JUL.10.92	ORIGINALLY PREPARED		JUL.10.92	N.S
HISTORY			DWN. HCK	CHD. SCO	APP. SHJ
					DRG NO RSC01

RUDDER STOCK
BONDING

POWER SUPPLY UNIT
INPUT AC 440V 60HZ 1PH
OUTPUT 300A DC 24V



SYSTEM SCHEMATIC WIRING



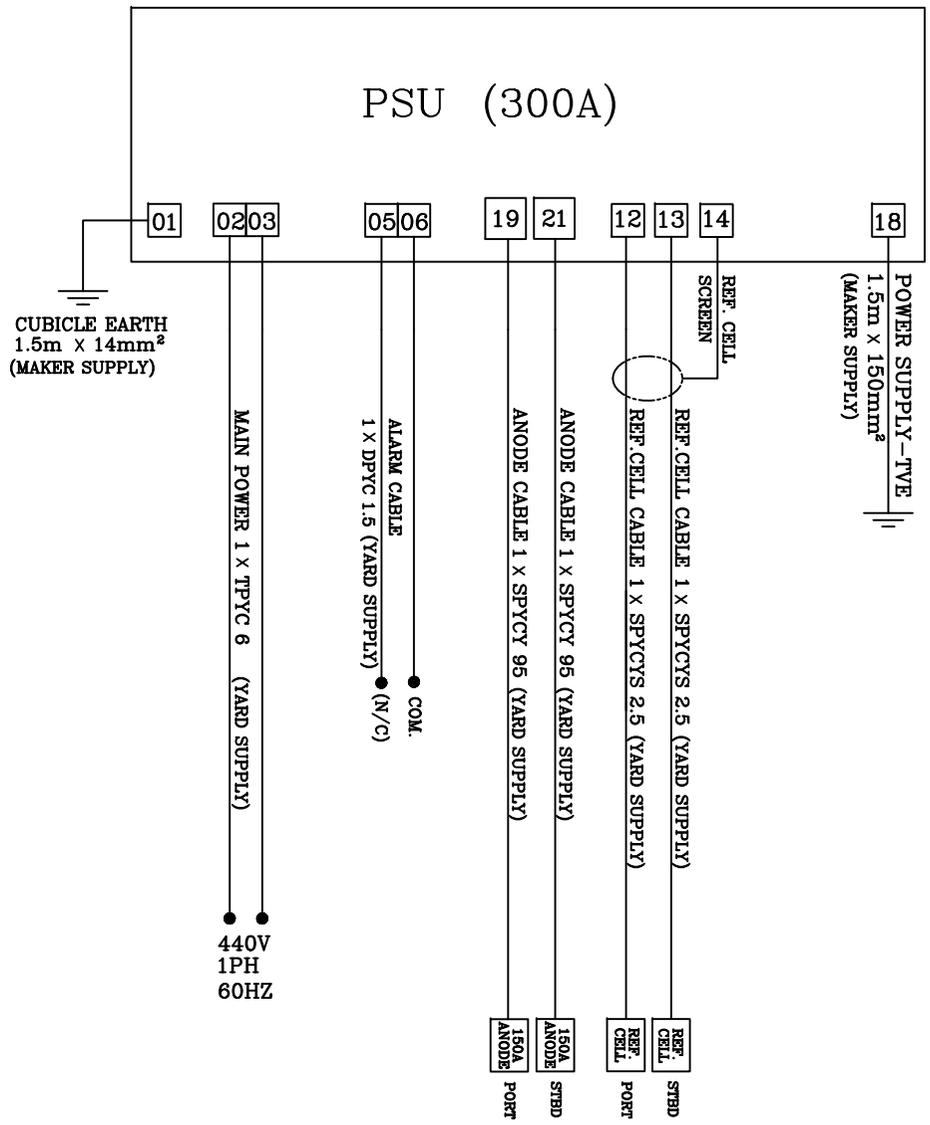
* NOTE

1. DISTANCE BETWEEN ANODE EDGE AND REF.CELL TO BE MIN 8000mm.
2. REF.CELL TO BE MIN 3000mm AWAY FROM SEA CHESTS AND/OR ANY DISSIMILAR MT'L.
3. ANODES AND REF.CELLS SHOULD BE ALWAYS BELOW WATER LINE.
4. SHIPYARD TO CHECK POSITION OF ANODE AND REF. CELL AND CONFIRM TO MAKER WITH G/A.

K.C. LTD.
1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE					
SYSTEM POSITION DETAILS					
REF.	DATE	JUN.05,02		SCALE	N.S
DWN.	HYL	CHD.	SCO	APP.	SHJ
DRG NO				ISP04-1	

0	JUN.05,02	ORIGINALLY PREPARED
REV NO	DATE	MODIFICATION
HISTORY		



K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

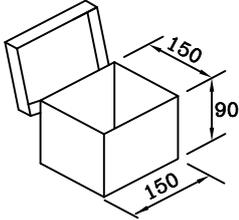
TITLE
 SYSTEM WIRING & TERMINAL DETAILS

REF.	DATE	SCALE
	APR.30,04	N.S
DWN. HYL	CHD. SCO	APP. SHJ
		DRG NO ISWT02

NOTE
 ENSURE THE VOLTAGE DROP IN ANY CABLES
 DOES NOT EXCEED 3 VOLTS.

0	APR.30,04	ORIGINALLY PREPARED
REV NO	DATE	MODIFICATION
HISTORY		

SHIP NAME / HULL No. : MLBC31800-039/040

No	NAME	TYPE	PART No	SUPPLY		REMARK
				WORKING	SPARE	
1	ANODE FUSE	150A	IAF00150	2	1	
2	MAIN FUSE	50A	IPF00050	2	1	
3	TRANSFORMER CONTROL FUSE	1A	ITRCF001	2	1	
4	SPARE STORAGE BOX		ISPBO001		1	

K.C. LTD.
 1589-6, SONGJUNG-DONG, KANGSU-KU, BUSAN 618-270, KOREA
 TEL: +82 51 831 7720 FAX: +82 51 831 7726

TITLE
 SPARE PARTS LIST

0	JUL.06,04	ORIGINALLY PREPARED	REF.	DATE	JUL.06,04	SCALE	N.S
REV NO	DATE	MODIFICATION	DWN.	CHD.	APP.	DRG NO	ISPLST001
HISTORY			CHY	SHJ	SHJ		