



**FORTUNE  
ELECTRIC**

# **TRANSFORMER**

## **INSTRUCTION BOOK**

**NO.:DR902B8,C1,C4,C5**

<b>CUSTOMER</b>	<b>GE POWER SYSTEM</b>
<b>PO. No.</b>	<b>180285532</b>
<b>VOLTAGE</b>	<b>4.16KV/380V</b>
<b>CAPACITY</b>	<b>1000 KVA</b>
<b>SERIAL No.</b>	<b>D903333,D903335,D903338,D903339</b>

Project Name : Mesquite Generating Station

Made for : Mesquite Power LLC

PPE Project No. : 512M1051


GT DM# : GR0708

Equipment MLI : A150

NO.	DESCRIPTION	DRAWING NO.	RECORD						
				FIRST	SECOND	THIRD	FOURTH	FIFTH	SIXTH
01	TRANSFORMER SPECIFICATION (1000KVA)	DR902B8,2C1,2C4,2C5	DELIVERY RESULT	JULY.16-2001 RNC					
02	NAME PLATE	14-18435	DELIVERY RESULT	JULY.16-2001 RNC					
03	OUTLINE OF EXCITATION TRANSFORMER	13-10272	DELIVERY RESULT	JULY.16-2001 RNC		JUNE.07-2002			
04	EXCITATION TRANSFORMER H.V. BUSHING ASSEMBLY	14-0524-223	DELIVERY RESULT	JULY.16-2001 RCN	JULY.19-2001				
05	EXCITATION TRANSFORMER L.V. BUSHING ASSEMBLY	13-8307-46	DELIVERY RESULT	JULY.16-2001 RCN	JULY.19-2001				
06	CONTROL CIRCUIT	14-18436	DELIVERY RESULT	JULY.16-2001 RNC		JUNE.07-2002			
07	FOUNDATION	14-18437	DELIVERY RESULT	JULY.16-2001 RNC					
08	EARTHING TERMINAL	14-17768-38	DELIVERY RESULT	JULY.16-2001 RNC					
09	DIAL THERMOMETER FOR OIL	14-0528-156	DELIVERY RESULT	JULY.16-2001 RNC					
10	OIL LEVEL GAUGE (TYPE LA14K)	14-0552-153	DELIVERY RESULT	JULY.16-2001 RNC					
11	PRESSURE RELIEF DEVICE (TYPE 208-60F)	14-16928~31	DELIVERY RESULT	JULY.16-2001 RNC					
12	TRANSFORMER INSTALLATION AND MAINTENANCE MANUAL		DELIVERY RESULT			JUNE.07-2002			
13									
14									
15									
16									
17									
18									
19									
20									

RNC-Reviewed NO Comments  
RCN-Reviewed Comments as Noted

Project Name : Mesquite Generating Station  
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 PPE Project Number : 512M1051  
 GT DM# : GR0708  
 Equipment MLI : A150

△						SCALE 1/NTS	UNIT	DWN. S.C.Lai 7-12-'01	TITLE	DWG. NO.	REV. NO.
△						PROJECTION		CHKD. J.H.Tzeng 7-12-'01	3ø-60HZ-4.16KV/380V-1000KVA	14-18434	△
△	6-7-'02	AMEND NO.3, NO.6 & ADD NO.12	S.C.Lai	J.H.Tzeng	J.H.Tzeng			APPD. J.H.Tzeng 7-12-'01	DWG. NAME:	REFER.	
△	7-19-'01	AMEND FOR APPROVAL	S.C.Lai	J.H.Tzeng	J.H.Tzeng				CONTENT	DR902B8,DR902C1,DR902C4,DR902C5	
SYM.	DATE	REVISIONS	REVD.	CHKD.	APPD.	 <b>FORTUNE ELECTRIC CO., LTD.</b>					

# Transformer Specification

Rating	Spec. No. : DR902B8,DR902C1,DR902C4,DR902C5					Date :	2002/6/18	
Type	SEALED	Class	H Winding	X Winding	YWinding			
Phase	3		4.16 KV	0.38 KV	---	KV		
Cycles	60 Hz	OA	1000 KVA	1000 KVA	---	KVA		
Insul. Liquid	Mineral Oil	FA	---	KVA	---	KVA	---	
Max. Ambient Temp.	50 Celsius	Winding and Oil Temp. Rise above ambient Temp. : 55 Celsius						

Additional Tap Voltages	
H Winding :	4.368-4.264-4.16-4.056-3.952 KV
X Winding :	--- KV
Connections for operation : Yd1	

Performance Based on a Loading of			Dielectric Tests			Basic Impulse Level	
H Winding	4.16 KV	1000 KVA	Applied Voltage (To other winding and ground)	HV Winding	26 KV	H Line	75 KV
X Winding	0.38 KV	1000 KVA		X Winding	10 KV	X Line	30 KV
YWinding	--- KV	--- KVA		Y Winding	--- KV	Y Line	--- KV
			Induced Voltage	Line to Line	8.32 KV	H Neutral	--- KV
				Line to ground	--- KV	L Neutral	--- KV

PERFORMANCE DATA at 85 Celsius at 1000 KVA						
Losses and Exciting Current				Regulation		
Excitation	%Ex.1	No Load Loss	Load Loss (W)	Total Loss (W)	Power Factor	% Regulation
100%	3.5	1600	9240	10840	1.0	1.13
110%					0.8	4.67

Auxiliary Losses					
Transformer KVA	Class		Watts Aux. Loss		
Average Sound Level : 85dB					
Percent Impedance Volts					
%IZ	Between Windings	at KVA	%IZ	Between Winding	at KVA
6±7.5%	H-X	1000			
Efficiencies					
Load (%)	Full Load	3/4 Load	1/2 Load	1/4 Load	
	98.93%	99.10%	99.22%	99.14%	

MECHANICAL DATA		
Not for Construction Purposes		
Outline DWG No. :	13-10272	
Dimensions (Approximate)	mm	inch
Height (A)	1680	66.1
Width (B)	2400	94.5
Depth (C)	2150	84.6
Height over cover (D)	---	---
Untanking Plus Slings (E)	---	---
Weights (Approximate)	Kg	lbs
Core & Coil	2020	4453
Tank & Fittings	1080	2381
Oil 1000.(L)	900	1984
Total Weight	4000	8818
Shipping Weight	---	---
Shipped	---	---

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NAME PLATE

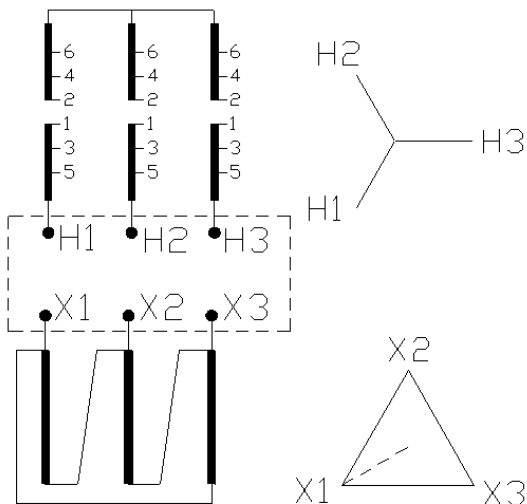


**TRANSFORMER**  
RECTIFIER DUTY  
TO STANDARD ANSI

MVA  PHASE   
 RATED VOLTAGE { H.V.  V VECTOR SYMBOLS   
 { L.V.  V TYPE OF COOLING   
 RATED CURRENT { H.V.  A FREQUENCY  HZ  
 { L.V.  A IMPEDANCE  %  
 MAX. AMBIENT TEMP.  °C

TEMPERATURE RISE  °C ABOVE MAX. AMBIENT TEMP. IN OIL  
 TEMPERATURE RISE  °C ABOVE MAX. AMBIENT TEMP. IN WINDING

TANK OPERATING PRESSURE  kPa BASIC IMPULSE LEVEL  
 INSTRUCTION BOOK NO.   
 GE P.O. NO.  H.V. WINDING  kV  
 L.V. WINDING  kV



H.V. WINDING TAP CONNECT.

HV VOLTAGE	TAP POS.	CONNECT.
4368	1	1 - 2
4264	2	2 - 3
4160	3	3 - 4
4056	4	4 - 5
3952	5	5 - 6

MAKER'S SERIAL NO.  OIL  L  
 YEAR OF MANUFACTURE  TOTAL WEIGHT  KG

**FORTUNE ELECTRIC CO., LTD.**  
 MADE IN TAIWAN

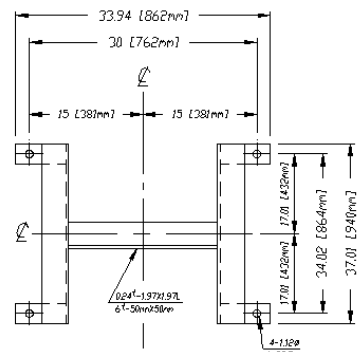
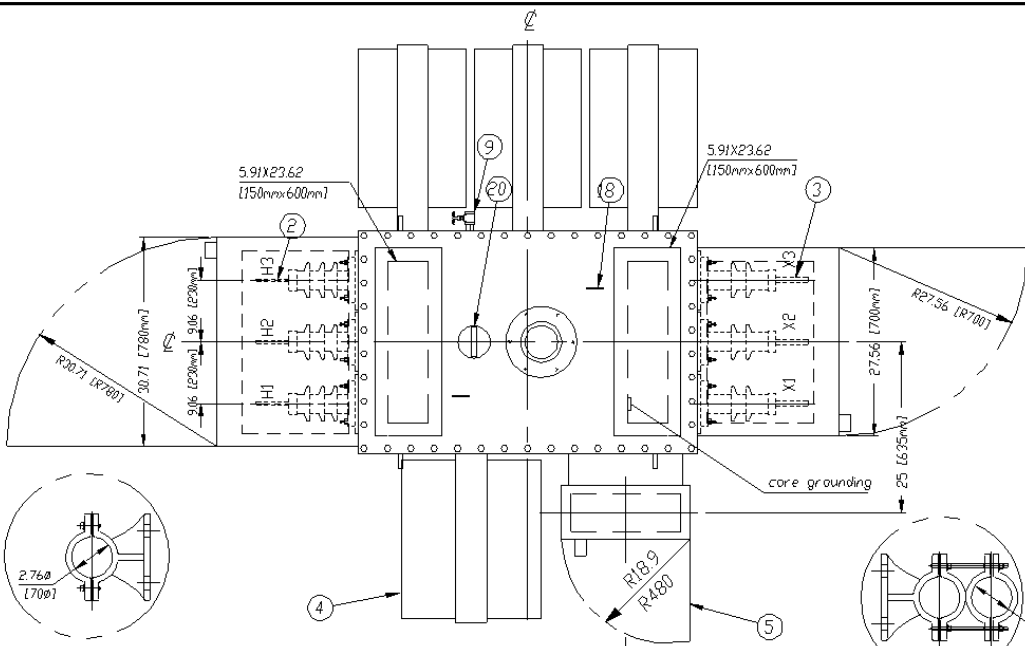
INSTRUCTION BOOK NO. DR902B8, DR902C1, DR902C4, DR902C5  
 MAKER'S SERIAL NO. D903333, D903335, D903338, D903339  
 YEAR OF MANUFACTURE: JUN. 2002, JUL. 2002, NOV. 2002, DEC. 2002

MATERIAL : STAINLESS STEEL  
 SIZE : 0.8<sup>t</sup>-230<sup>w</sup>-300<sup>l</sup>

Project Name : Mesquite Generating Station  
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 Equipment MLI : A150

REVISION

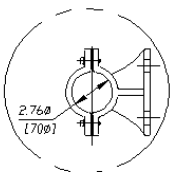
REVISION	DATE	NAME	SCALE	3RD. ANGLE PROJECTION	DWG NO: 14-18435	△
DRAWN	7 - 12 - '01	S.C.Lai	1 / 1.5	FORTUNE ELECTRIC CO., LTD.	DR902B8, DR902C1, DR902C4, DR902C5	△
CHECKED	7 - 12 - '01	T.H.Tzeng				△
INSPECTED	7 - 12 - '01	T.H.Tzeng				△



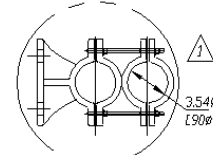
DETAIL OF FOUNDATION

ACCESSORIES DESCRIPTION

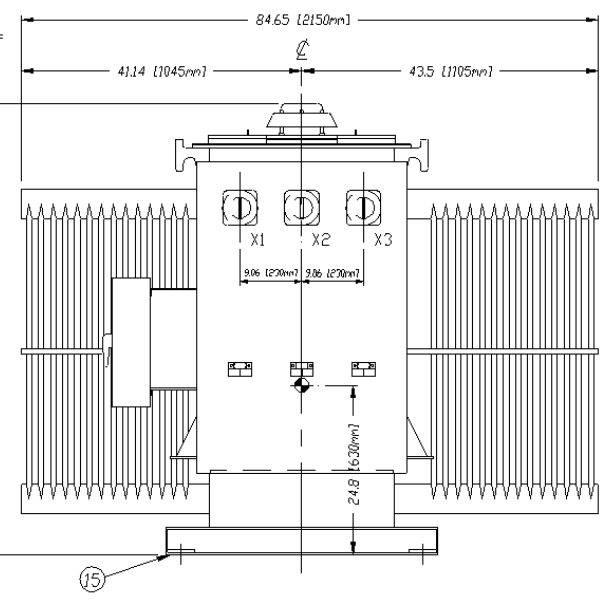
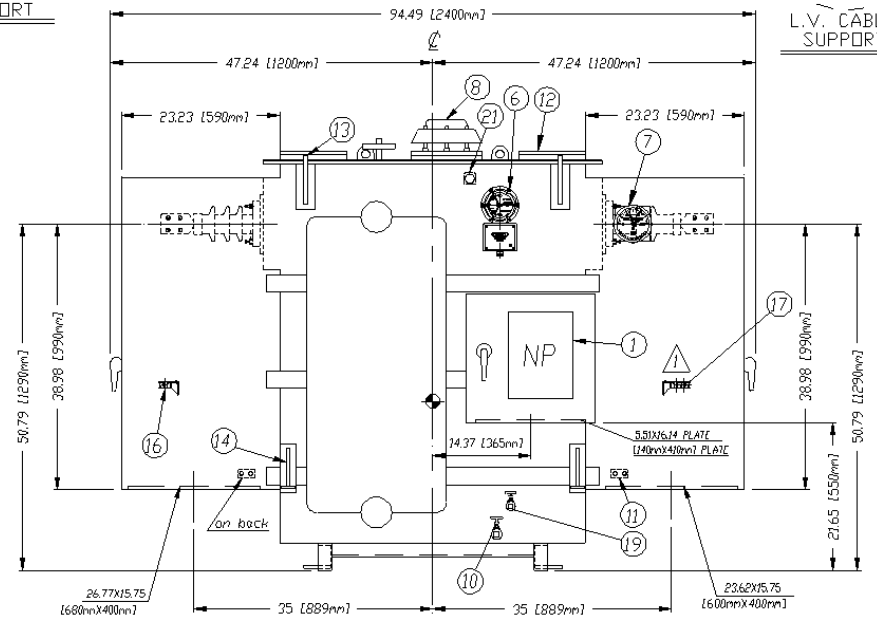
ITEM	DESCRIPTION	Q'TY	DWG. NO.
1	NAME PLATE	1	14-18435
2	PRIMARY BUSHINGS	3	14-0524-223
3	SECONDARY BUSHINGS	3	13-8307-46
4	RADIATORS	4	
5	CONTROL BOX (NEMA 3R)	1	
6	OIL LEVEL GAUGE WITH ALARM CONTACT (71Q)	1	14-0552-153
7	DIAL THERMOMETER WITH ALARM AND TRIP CONTACTS (26Q)	1	14-0528-156
8	PRESSURE RELIEF DEVICE WITH ALARM CONTACT (63PR)	1	
9	OIL FILLING VALVE	1	
10	OIL DRAIN VALVE	1	
11	GROUNDING DEVICE	2	14-17768-38
12	HAND HOLE	2	
13	LIFTING LUG FOR TANK	4	
14	LIFTING BOSSES	4	
15	SKID BASE	1	14-18437
16	H.V. CABLE SUPPORT (70Ø)	3	
17	L.V. CABLE SUPPORT(90Ø)	3	
18	LIFTING LUG FOR COVER	2	
19	OIL SAMPLING VALVE	1	
20	NO LOAD TAP CHANGER	1	
21	GAS SAMPLING DEVICE	1	



H.V. CABLE SUPPORT



L.V. CABLE SUPPORT



APPROXIMATE QUANTITY	
TOTAL WEIGHT	8818 lbs 4000 KG
TANK & FITTINGS	2381 lbs 1080 KG
CORE & WINDINGS	4453 lbs 2020 KG
TOTAL OIL (< 1000 LITERS)	1984 lbs 900 KG

RATINGS				
CLASS	PHASE	KVA	TERMINAL VOLTS	
			H.V.	L.V.
OA	3	1000	4160V	380 V Δ
	60			

The windings will be made of copper

- NOTE:
1. DIMENSION TOLERANCE IS ± 3%
  2. MEAN CENTER OF GRAVITY FOR COMPLETE ASSEMBLY
  3. AMBIENT MAXIMUM 122°F (50°C)

Project Name : Mesquite Generating Station  
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 GT DM# : GR0708  
 Equipment ML# : A150

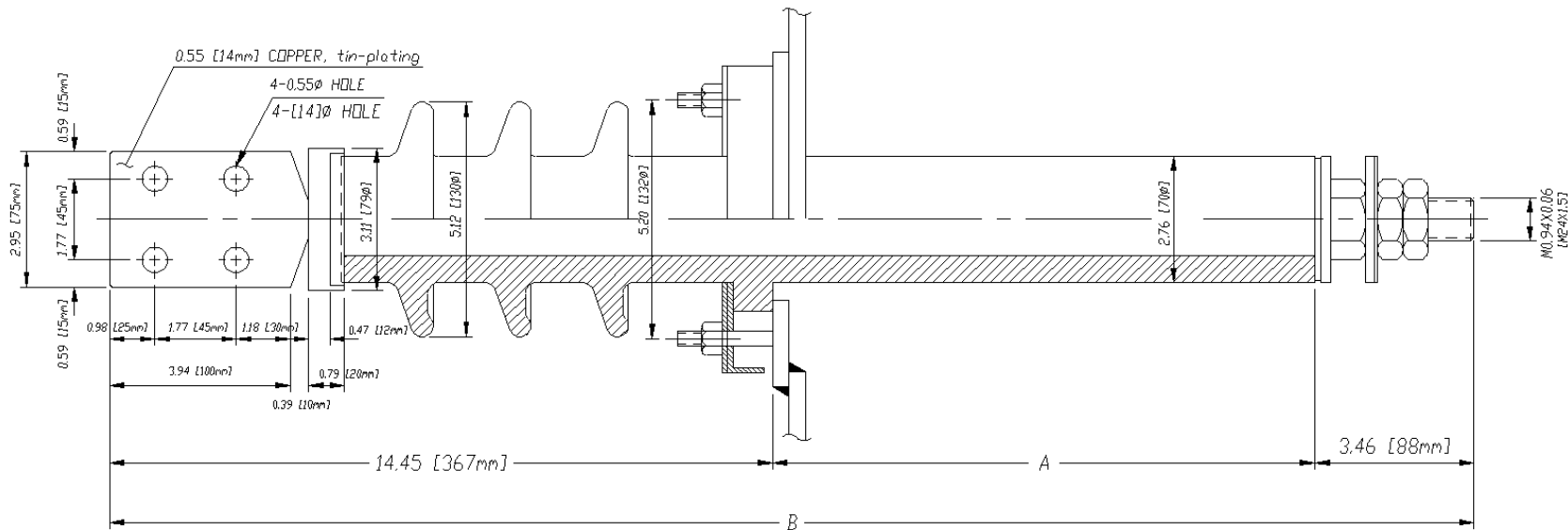
SYMBOL	DATE	REVISIONS	REV.D.	CHKD.	APPD.
▲	3-27-'02	AMEND ITEM 17	C.S.Snieh	J.H.Tzeng	J.H.Tzeng

SCALE: 1:30 UNIT: inch(mm)  
 PROJECTION: 1st Angle  
 DWN. S.C.Lai 7-12-'01  
 CHKD. J.H.Tzeng 7-12-'01  
 APPD. J.H.Tzeng 7-12-'01

**TE FORTUNE ELECTRIC CO., LTD.**

TITLE: 3Ø-60HZ-4.16KV/380V-1000KVA  
 DWG. NAME: OUTLINE OF EXCITATION TRANSFORMER

DWG. NO. 13-10272	REV. NO.
DR902B8, DR902C1, DR902C4, DR902C5	



TECHNICAL DATA  
CHARACTERISTICS

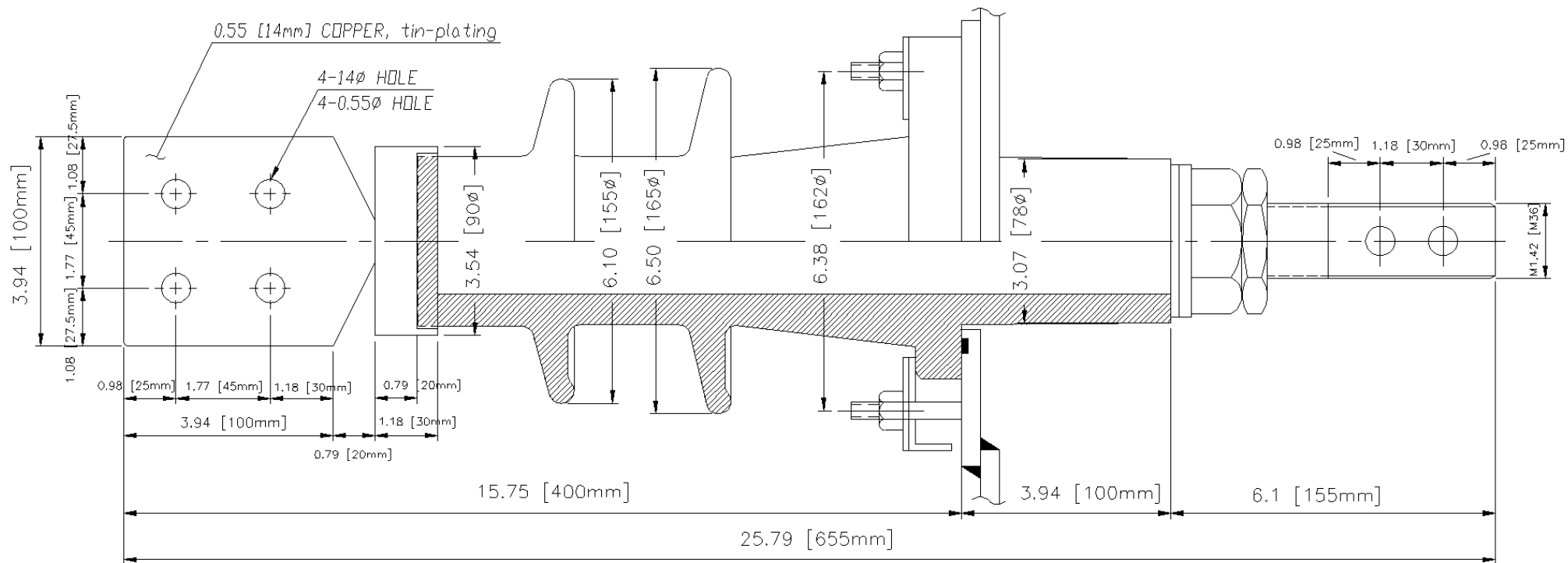
1. Insulation Class 15KV
2. Rated Continuous Current 900A
3. Frequency 60Hz
4. With stand test voltages
  - 4-1. Low frequency dry (one minute) 50KV
  - 4-2. Low frequency wet (ten seconds) 45KV
  - 4-3. Impulse (full wave) 110KV
5. Creepage distance min 13.39 [340mm]
6. Bending stress 149.9lbs [68KG]
7. Material : Porcelain
8. Colour : BROWN



Item	A	B	REMARKS
01	3.94 (100)	21.85 (555)	1000KVA, HV
02	8.66 (220)	26.57 (675)	
03	11.81 (300)	29.72 (755)	
04	15.75 (400)	33.66 (855)	

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 Equipment MLI : A150

	7-19-'01	DEL STANDARD: IEC.137	S.C.Loi	J.H.Tzeng	J.H.Tzeng	SCALE 1:4	UNIT inch(mm)	DWN. S. C. Loi 7-12-'01	TITLE 15KV-900A-BIL; 110KV	DWG. NO. 14-0524-223	REV. NO. 		
	PROJECTION											CHKD.W. B. Wang 7-12-'01	
	SYM. DATE						APPD.J. H. Tzeng 7-12-'01					DWG. NAME:	REFER.
REVISIONS						FORTUNE ELECTRIC CO., LTD. EXCITATION TRANSFORMER H.V. BUSHING ASSEMBLY						DR902B8, DR902C1, DR902C4, DR902C5	



**TECHNICAL DATA CHARACTERISTICS**

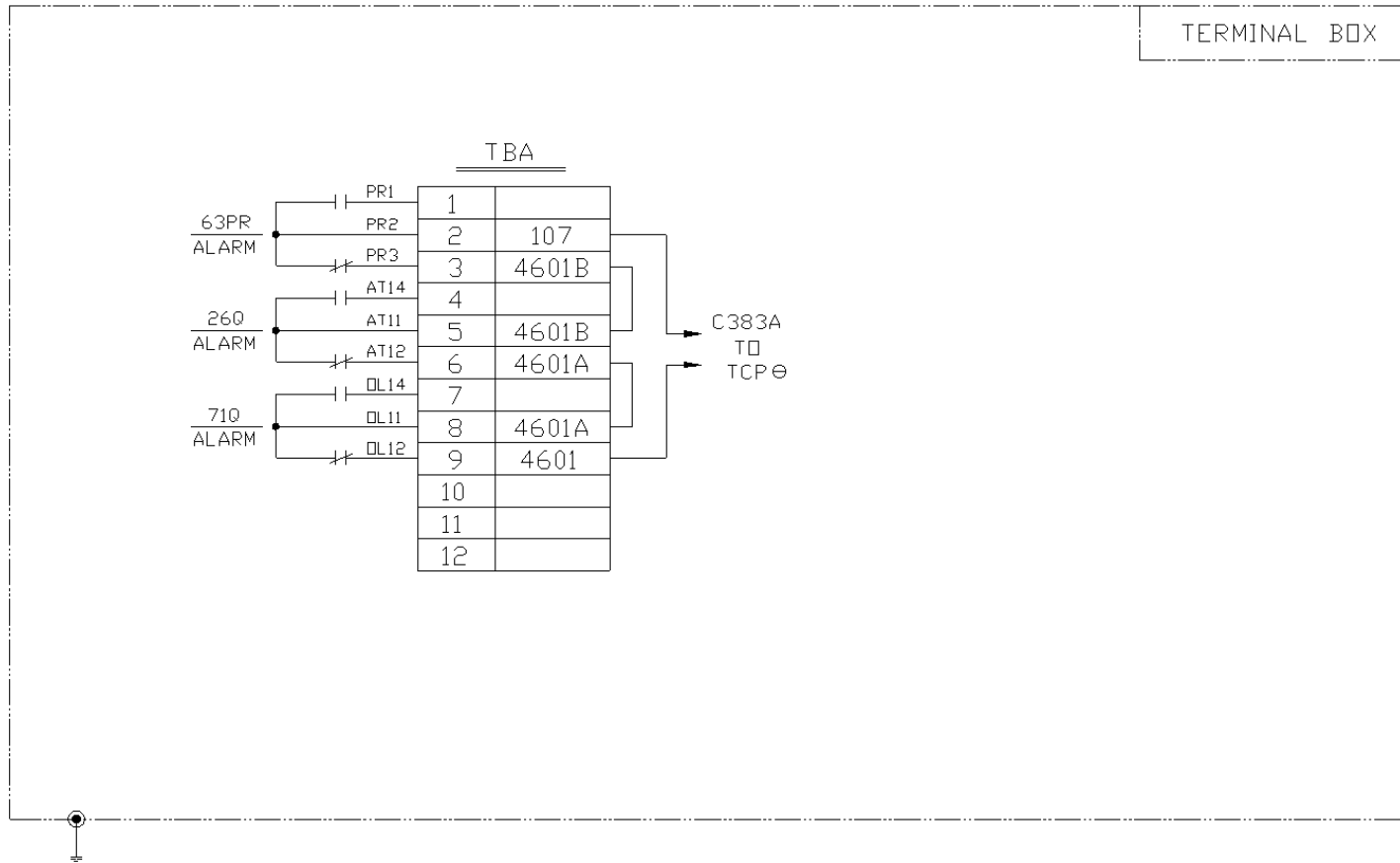
- 1. Insulation Class 15KV
- 2. Rated Continuous Current 1600A
- 3. Frequency 60Hz
- 4. With stand test voltages
  - 4-1. Low frequency dry (one minute) 50KV
  - 4-2. Low frequency wet (ten seconds) 45KV
  - 4-3. Impulse (full wave) 110KV
- 5. Creepage distance min 17.0 [432mm]
- 6. Material : Porcelain
- 7. Colour : BROWN

Note:use for 100KVA LV Bushing

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 GT DM# : GR0708  
 Equipment MLI : A150

SYM.	DATE	REVISIONS	REV.D.	CHK.D.	APP.D.	SCALE	UNIT	DWN. S. C. Loi 7 - 12 - '01	TITLE	DWG. NO.	REV. NO.	
						1:3	inch(mm)					CHKD. J. H. Tzeng 7 - 12 - '01
						PROJECTION						APPD. J. H. Tzeng 7 - 12 - '01
7-19-'01 DEL STANDARD: IEC.137 S.C.Loi J.H.Tzeng J.H.Tzeng FORTUNE ELECTRIC CO., LTD.								15KV-1600A-BIL:110KV DWG. NAME:	13-8307-46 DR902B8,DR902C1,DR902C4,DR902C5	EXCITATION TRANSFORMER L.V. BUSHING ASSEMBLY		

NOTE:  
 SIZE OF CONTROL WIRE  
 CONTROL AND ALARM CIRCUITS 14 AWG  
 CT CIRCUITS 10 AWG  
 POWER CIRCUITS 12 AWG  
 WIRE TYPE : 600V XHHW-2

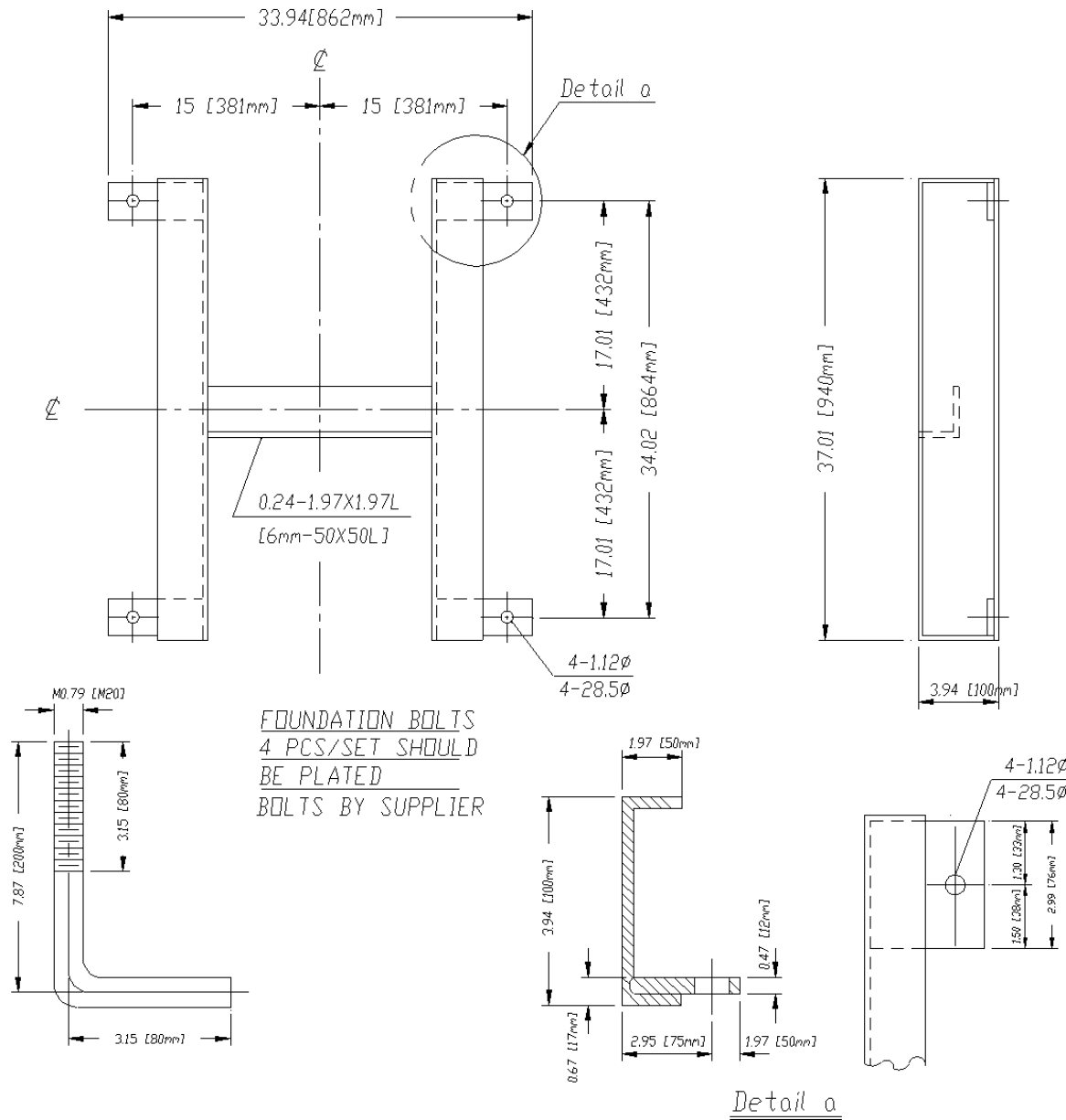


CIRCUIT	DESCRIPTION
63PR	PRESSURE RELIEF DEVICE
26Q	DIAL TYPE THERMOMETER FOR OIL
71Q	OIL LEVEL GAUGE

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 Equipment MLJ : A150

	3-27-'02	AMEND 4601C TO 4601A FOR TBA-6	C.S.Shieh	J.H.Tzeng	J.H.Tzeng	SCALE 1/NTS PROJECTION 	UNIT mm	DWN. S.C.Lai 7 - 12 - '01	TITLE 3Ø-60Hz-4.16KV/380V-1000KVA	DWG. NO. 14-18436	REV. NO. 
								CHKD. J.H.Tzeng 7 - 12 - '01			
								APPD. J.H.Tzeng 7 - 12 - '01			
SYM.	DATE	REVISIONS	REVD.	CHKD.	APPD.	FORTUNE ELECTRIC CO., LTD.		DWG. NAME: TR. CONTROL CIRCUIT		REFER. DR902B8, DR902C1, DR902C4, DR902C5	





FOUNDATION BOLTS  
4 PCS/SET SHOULD  
BE PLATED  
BOLTS BY SUPPLIER

Project Name : Mesquite Generating Station  
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 PPE Project Number : 512M1051  
 GT DM# : GR0708  
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Detail a

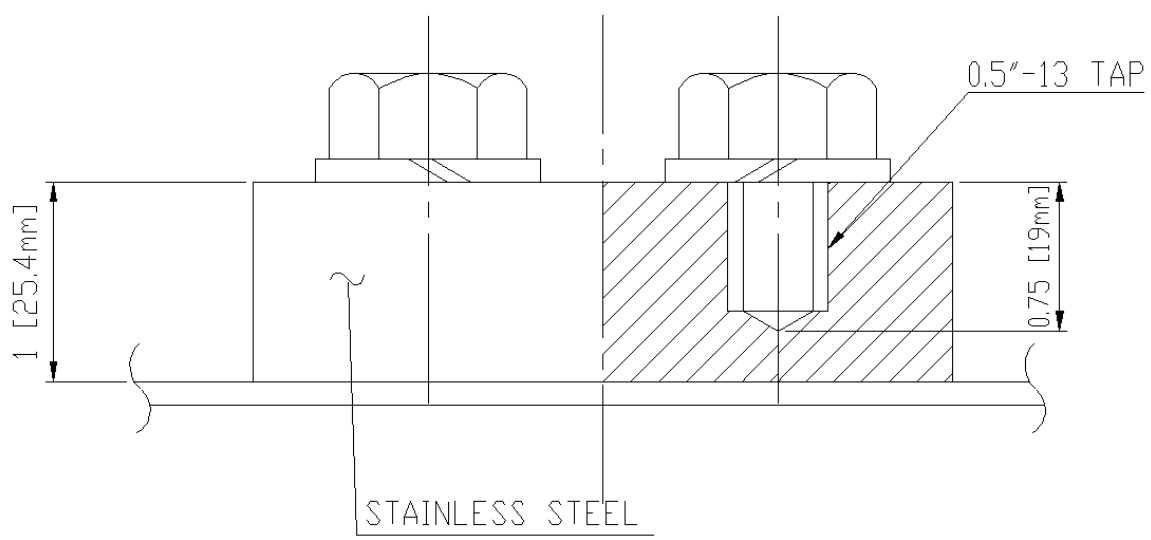
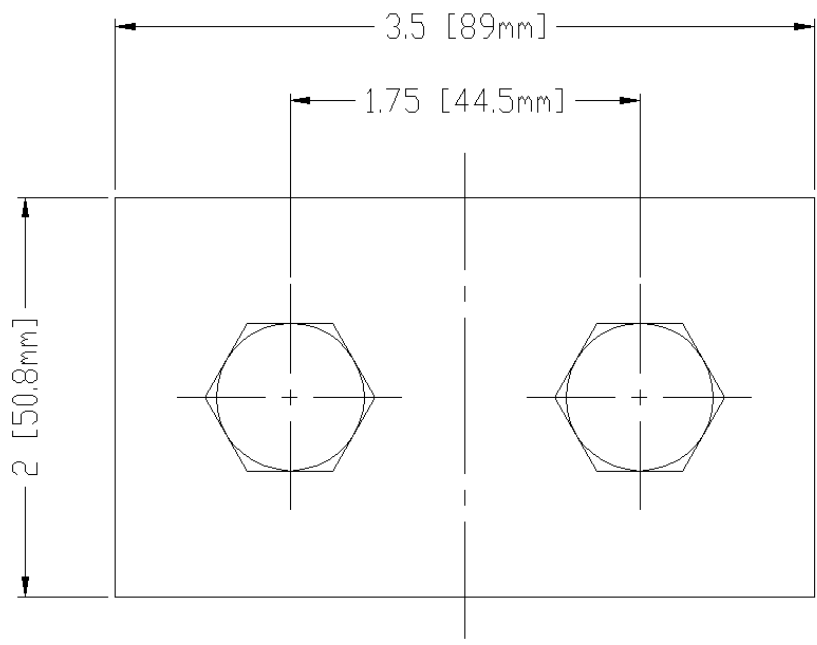
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△						1:NTS	inch(mm)	CHKD.	7-12-'01	3φ-60HZ-4.16KV/380V-1000KVA	DWG. NO.	△
△						PROJECTION		APPD.	7-12-'01		14-18437	△
△										DWG. NAME:	DR902B8,DR902C1,DR902C4,DR902C5	△
SYM.	DATE	REVISIONS	REV.D.	CHKD.	APPD.	FORTUNE ELECTRIC CO., LTD.			FOUNDATION			

1

2

3

4



A

B

C

D

E

△					
△					
△					
△					

Project Name : Mesquite Generating Station  
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 PPE Project Number : 512M1051  
 GT DMH : GR0708  
 Equipment MLJ : A150

SYM.	DATE.	REVISIONS	REVD.	REVD.	APPD.

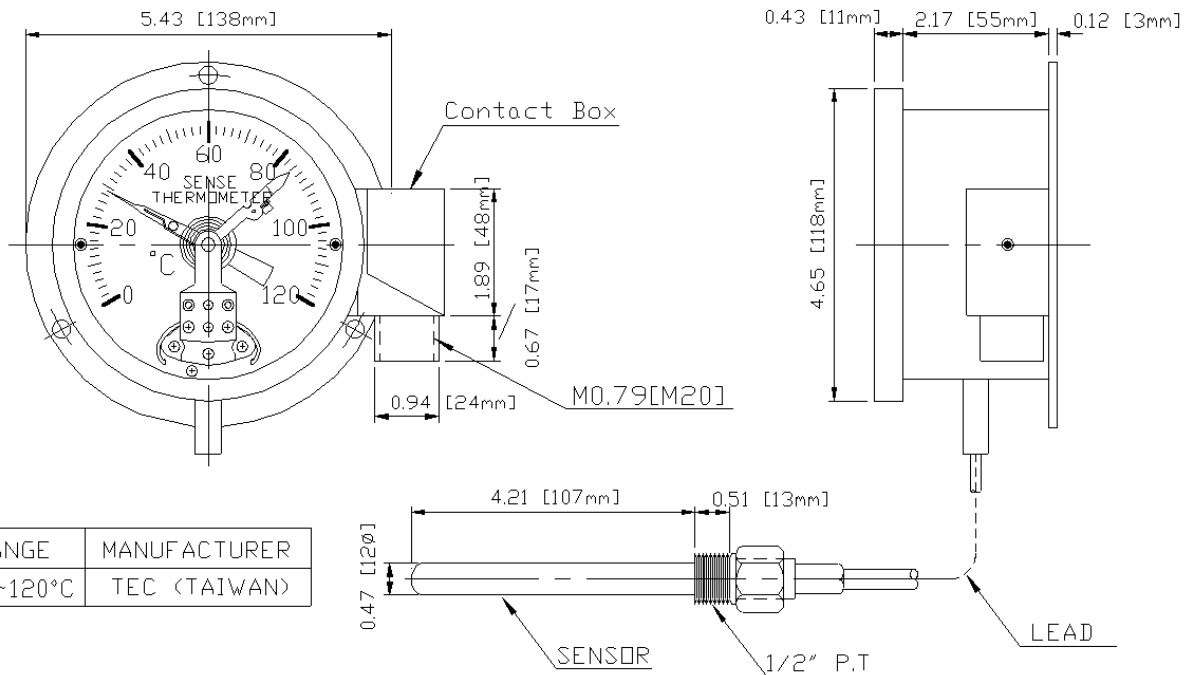
SCALE	UNIT	DWN. S. P. Cheng 7-12-'01
1:NTS	inch(mm)	CHKD. J. H. Tzeng 7-12-'01
PROJECTION		APPD. J. H. Tzeng 7-12-'01

TITLE:	DWG. NO.
	14-17768-38
DWG. NAME:	REFER.
EARTHING TERMINAL	DR902B8,DR902C1,DR902C4,DR902C5

REV. NO.	
△	
△	
△	



**FORTUNE ELECTRIC CO., LTD.**



TYPE	RANGE	MANUFACTURER
TH-013	0°C~120°C	TEC (TAIWAN)

This dial type thermometer is used for measurement of the temperature of the oil in a transformer. The thermometer is constituted of a temp sensing element (mercury filled type) indicator. On the top cover or side wall of the transformer, A pocket for the temp sensing element is formed in order to facilitate sensing of the Temperature, there-by even if the temp sensing element is drawnout the oil can not spout out and the atmosphere is perfectly interrupted too. The indicator, besides a needle, provides a stationary needle for alarm and trip. The moving and stationary needle being set in a specified scale, if the movable needle has attained to this temperature, both contacts are to open an electric circuit as a normal close condition.

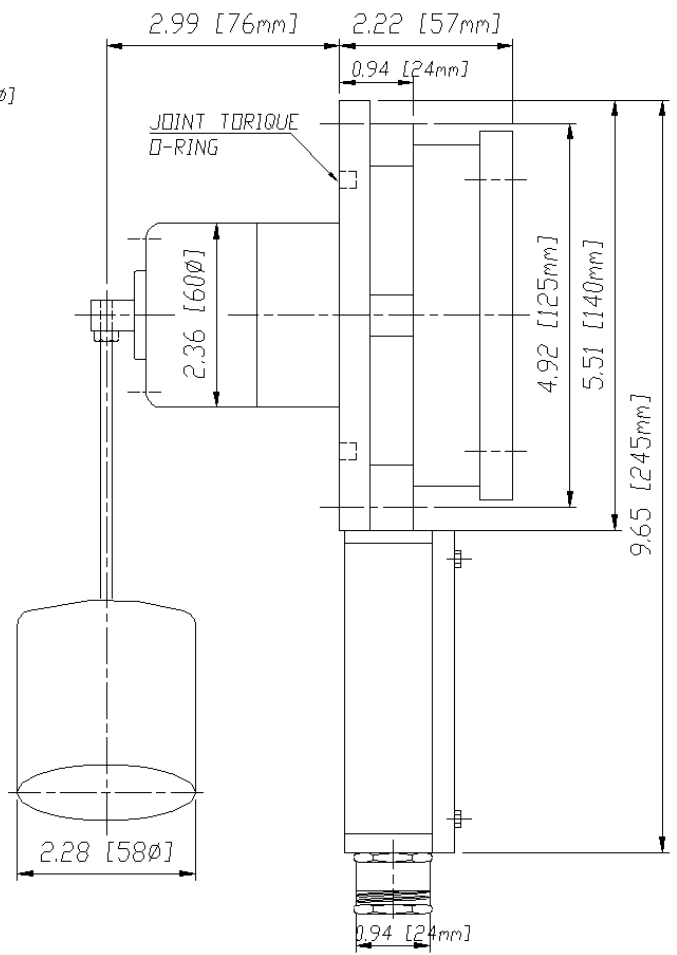
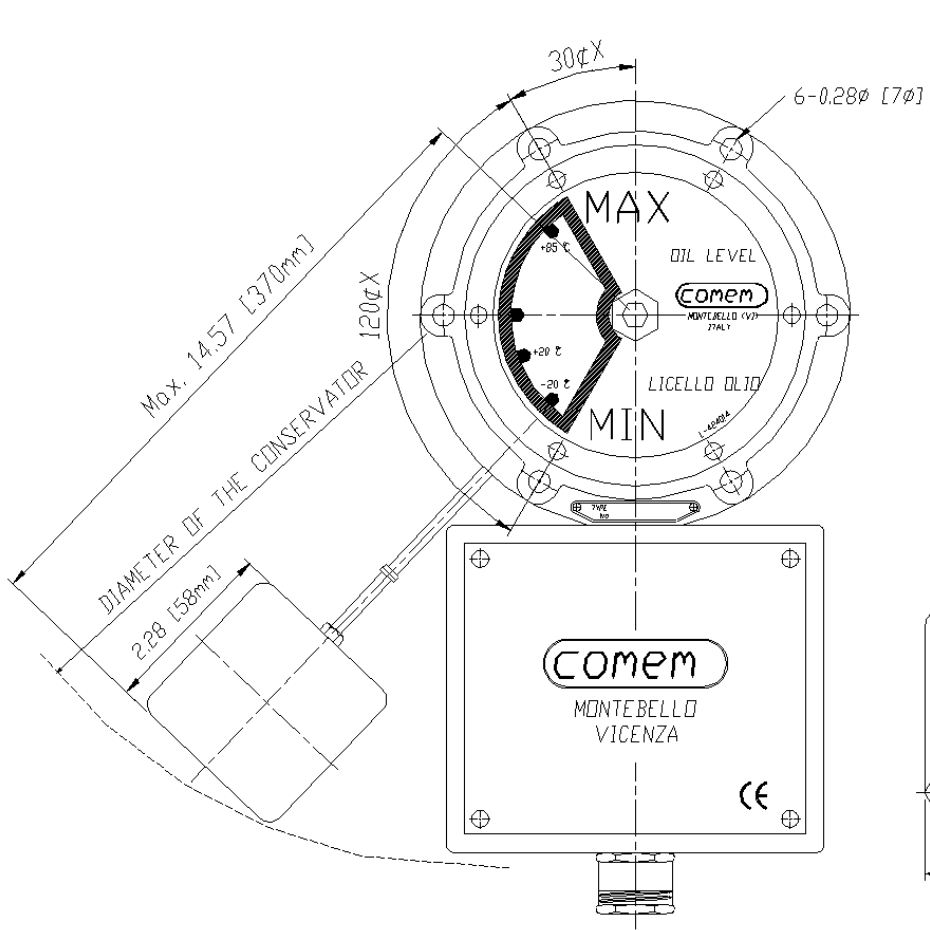
The stationary needle is usually set at 85°C for alarm and 90°C for trip, however if the front glass cover is opened, it is adjustable at optional temperature.

The connection for alarm is made by the lower terminals.  
The connection for trip is made by the higher terminals.

△					
△					
△					
△					
SYM.	DATE.	REVISIONS	REVD.	REVD.	APPD.

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 Equipment MLI : A150

SCALE 1:3	UNIT inch(mm)	DWN. S.T.Luo 7-12-'01	TITLE: OUTLINE OF THERMOMETER	DWG. NO. 14-0528-156	REV.NO. △ △ △
PROJECTION 		CHKD. J.H.Tzeng 7-12-'01	DWG. NAME:	REFER. DR902B8, DR902C1, DR902C4, DR902C5	
		APPD. J.H.Tzeng 7-12-'01	FORTUNE ELECTRIC CO., LTD.		



MANUFACTURER: COMEM (ITALY)

ITEM	COMEM CODE	REMARKS
1	LA14 K	WITH 1 CONTACT ON MIN
2	LA14 Y	WITH 2 CONTACT ON MIN

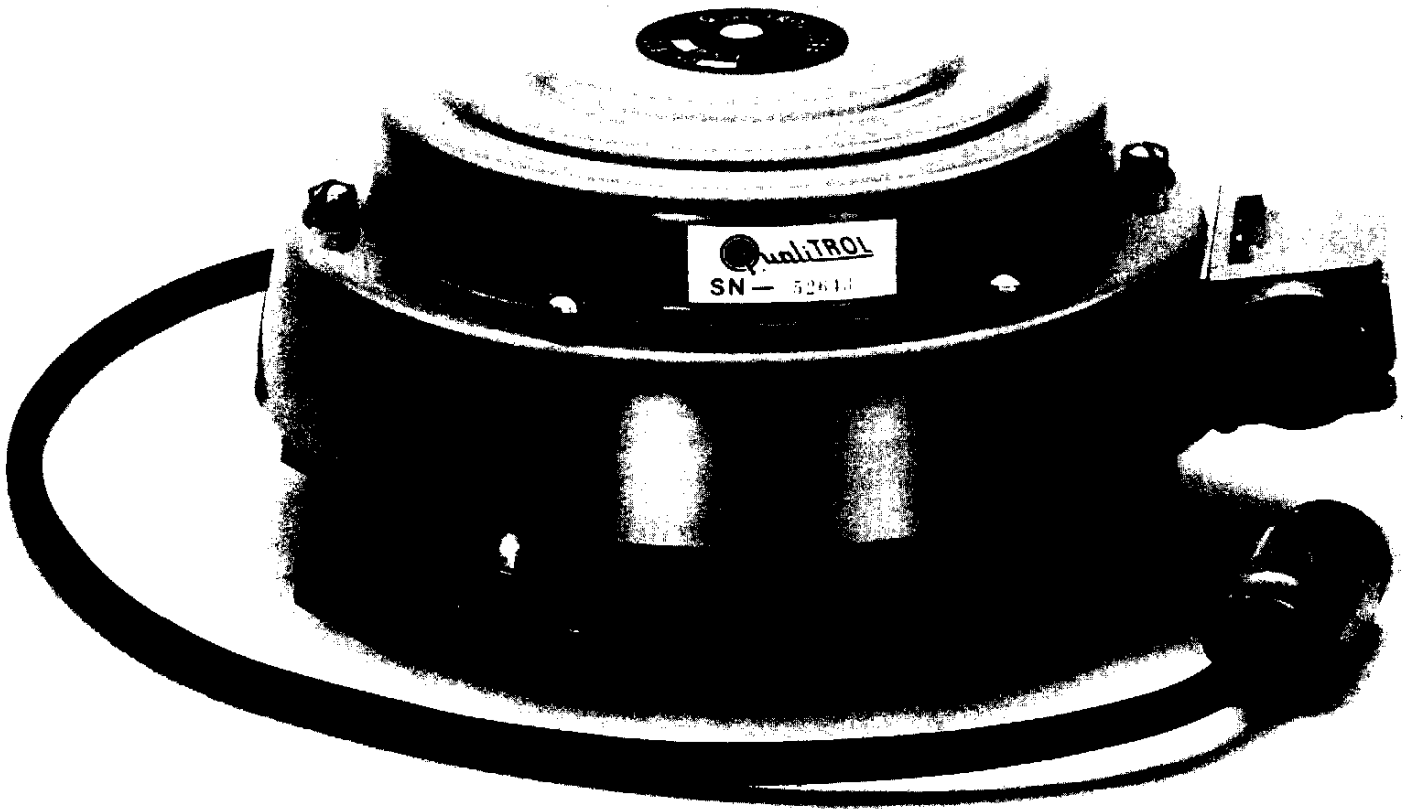
Project Name : Mesquite Generating Station  
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△						SCALE	UNIT	DWN. S. C. Loi	7 - 12 - '01	TITLE	DWG. NO.	REV. NO.
△						1:3	inch(mm)	CHKD. J. H. Tzeng	7 - 12 - '01	3φ-60Hz-4.16KV/380V-1000KVA	14-0552-153	△
△						PROJECTION		APPD. J. H. Tzeng	7 - 12 - '01	DWG. NAME:	REFER.	△
△								FORTUNE ELECTRIC CO., LTD.		OIL LEVEL GAUGE	DR902B8, DR902C1, DR902C4, DR902C5	△
SYM.	DATE	REVISIONS	REVD.	CHKD.	APPD.							

# Series 208 Pressure Relief Device

For Liquid-Filled Transformers

BULLETIN  
QT 4-208



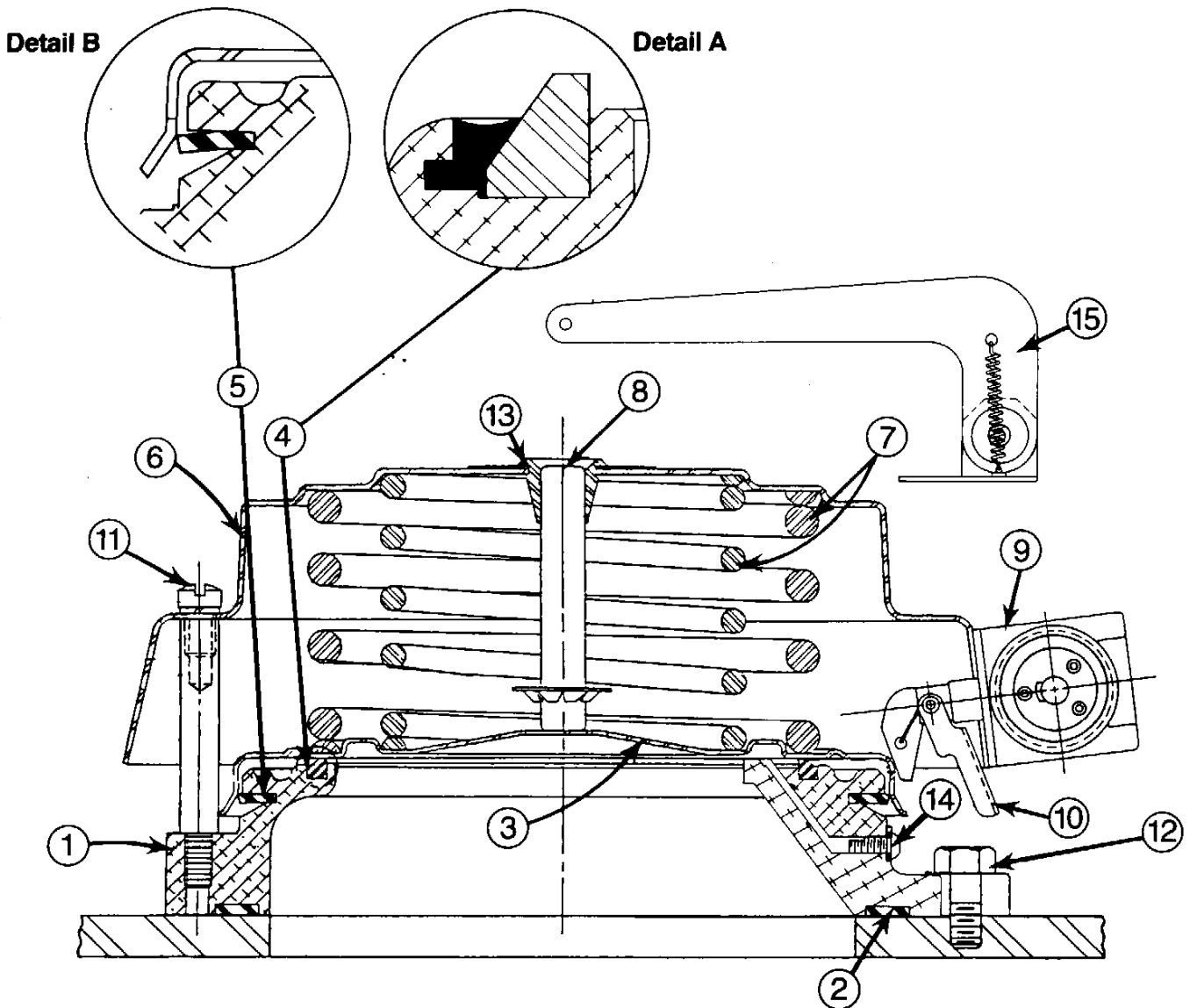
## FEATURES:

- Field proven top seal configuration provides high reliability and consistent operation. (Nitrile compound standard)
- Epoxy key-lock top seal retaining system improves gasket retention during high pressure relief operations. (Patent pending)
- Patented Nitrile secondary seal wiper gasket provides more reliable operation.
- Specially designed reverse wound springs and assembly methods provide uniform valve loading and improved relief rates.
- Vacuum impregnated mounting flange casting with conversion coating prevents leaks resulting from casting porosity and provides excellent paint adhesion.
- A zinc clad deep drawn cover provides added corrosion protection.
- Type 304 stainless steel deep drawn operating disc with spring locater convolutions.
- Coated springs protect against rust and fatigue.
- Baked two part epoxy finish for additional corrosion resistance.
- All stainless steel fasteners and hardware.
- Brightly colored operation indicator with dual retainer.
- Many options available for standard and special applications.
- Pressure relief devices 100% tested for proper operation and serialized for traceability.
- Thirty-five years' experience in manufacturing pressure relief devices specifically designed for the power industry.

**QUALITROL**™ DWG. NO. : 14-16928  
CORPORATION

# Pressure Relief Device

## DESIGN AND OPERATION:



The pressure relief device is essentially a spring-loaded valve having a unique means of providing instantaneous amplification of actuation force. In the above cutaway drawing, the unit is shown mounted on the transformer by customer supplied  $\frac{1}{2}$ " hex bolts (12) through flange (1) and sealed by mounting gasket (2). Operating disc (3) is spring-loaded and sealed against Nitrile top gasket (4) and side wiper gasket (5) by springs (7). Cover (6) provides spring (7) compression and is held in place by six screws (11). These cover mounting screws (11) must never be removed without the use of extreme caution.

Operation is effected when the pressure acting against the area defined by top gasket (4) exceeds the opening pressure established by

springs (7). As operating disc (3) moves slightly upward from top gasket (4), the transformer pressure then quickly becomes exposed to the disc area of the diameter of Nitrile side gasket (5), resulting in a greatly increased force and causing extremely rapid opening of the operating disc corresponding to the closed height of the springs (7). The transformer pressure is rapidly reduced to normal values and springs (7) return disc (3) to the sealed position.

A brightly colored-coded mechanical indicator pin (8) in cover (6), although not fastened to disc (3), moves with it during operation and is held in raised position by the pin bushing guide (13). This pin is clearly visible from a great distance, indicating that the unit has functioned. Pin

(8) may be reset by manually pushing it downward until it rests on disc (3). A long-armed semaphore (15) can also be supplied, for visual indication from even greater distances.

The relief device can be provided with a sealed, weather-proof alarm switch assembly (9) mounted on the cover. The switch assembly includes a single-pole, double-throw switch having a 3-conductor cable for connection to a remote alarm or signal device. Actuated by movement of disc (3), the switch is latched and must be manually reset by arm (10).

An optional gas bleed system (14) can be provided when device is mounted below oil level or used on conservator style transformers and solid liquid filling is required.

DWG.NO. :14-16929

# Pressure Relief Device

## INSTALLATION ADVICE:

### Typical Installations

QualiTROL pressure relief devices are used in a wide variety of transformer systems including:

- Network (up to 500KVA and higher in certain applications)
- Large distribution and small power (up to 2,500KVA)
- Medium power (2,500KVA to 10,000KVA)
- Large power (10,000KVA and above)
- Load tap changes
- Mobile systems
- Electric railway locomotives

### Number Per Installation

While no precise formula applies in the determination of the number of pressure relief devices that should be used per installation, it is usual to apply the following general rule: Use one (1) pressure relief device for each 10,000 gallons of cooling liquid capacity or fraction thereof.

Some specifications require the use of pressure relief devices on transformers rated at 1,000KVA or higher, but QualiTROL pressure relief devices are in use on transformers rated as low as 300KVA. In the higher ratings, multiple devices are used.

### Mounting

QualiTROL pressure relief devices are usually mounted in the horizontal position, top side up. Although the horizontal position is recommended, the device may be mounted on its side (vertical plane).

When the device is mounted below the fluid level, the head pressure must be considered when determining the operating value. In addition, provision should be made for proper clearance of the operation indicator.

## ORDERING INFORMATION:

### Pressure Relief Devices

Model Number	Operating Pressure
208-60AG	4 PSI
208-60N	5 PSI
208-60U	8 PSI
208-60E	10 PSI
208-60S	12 PSI

### Pressure Relief Devices With Alarm Switch (415-P73E)

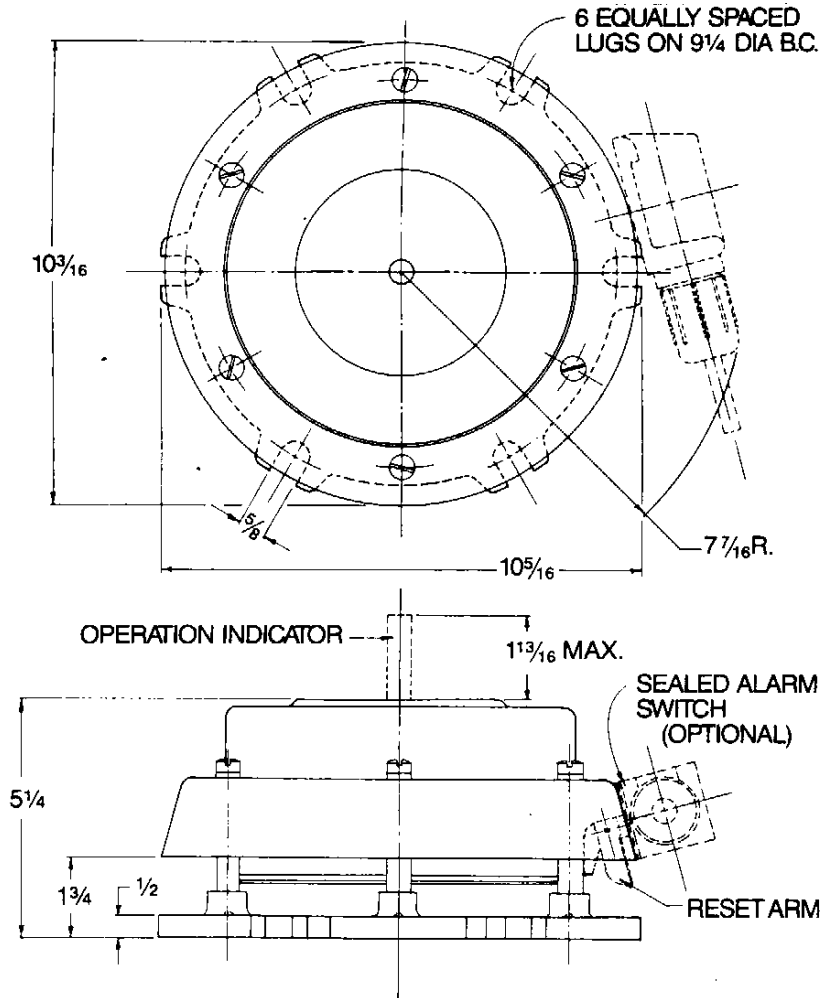
Model Number	Operating Pressure
208-60P	5 PSI
208-60Z	8 PSI
208-60F	10 PSI
208-60Y	12 PSI

### Available Options

Model Number	Description
415-P73E (Standard)	Alarm switch with 48" cable
415-P73C (Standard)	Alarm switch only (see CON-603 Series for connectors)
SWT-648-1 (ANSI)	Alarm switch only (see CON-659 Series for connectors)
207-60-3	Long-armed semaphore (yellow)
207-60-14B	Mounting gasket
Consult Factory	Pressure Relief Device with gas bleed system
Consult Factory	Special alarm switch arrangements
Consult Factory	Pressure Relief Device with fluorocarbon or silicon gaskets
Consult Factory	Operating pressures not listed above

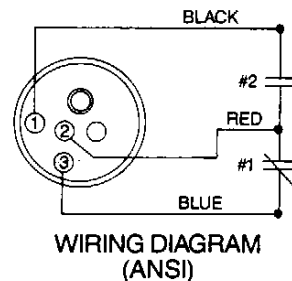
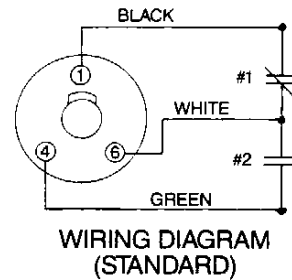
DWG.NO. : 14-16930

# Pressure Relief Device



## ALARM OR SIGNAL SWITCH (OPTIONAL)

Type	Single-pole Double-throw
Operation:	a.) Contact #1 normally closed, #2 normally open b.) Contact #2 closes and #1 opens when device operates c.) Manual reset from b to a
Rating:	15 amps @ 125, 250 and 480V AC 1/2 amp @ 125V DC, non-inductive 1/4 amp @ 250V DC, non-inductive



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**FORTUNE ELECTRIC CO.,LTD.**

**TRANSFORMER  
INSTALLATION AND MAINTENANCE  
MANUAL**

## SCHEDULE OF CONTENTS

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C	INSPECTION AND MAINTENANCE AFTER OPERATION	----- 5

## **SECTION A**

### **INSTALLATION OF TRANSFORMER**

Select a location where air can circulate freely. If the transformer is to be installed in a compartment or vault, provide adequate ventilation to avoid overheating.

Provide a strong, level foundation preferably of reinforced concrete. And provide foundation holes before put on the anchor-bolts that means preliminary the transformer will install template to measure the actual dimension of foundation and then fix the anchor-bolts for final transformer installation.

## **SECTION B**

### **The inspection procedure before start up transformer.**

#### **The structure**

##### 1.1 General inspection:

- A. Does the anchor bolts; bushes, radiators, valves and other parts are securely tightened?
- B. The safety distance between cables.
- C. Any leakage from the tank.

##### 1.2 Tap Changer:

- A. Check up the indicator position. Refer to the nameplate.
- B. Is the tap changer work smoothly?

##### 1.3 Accessories:

- A. The fan direction.
- B. The indication position for all indicators.

##### 1.4 The alarm system:

Does the alarm system works correctly?

##### 1.5 Temperature & oil level indicators:

Does the indication position is correct for temperature & oil level?

##### 1.6 Ground system:

- A. Does the ground wire on HV & LV cable box are securely tightened?
- B. Check up the ground resistance.

##### 1.7 Conductors.

Does all conductors are securely tightened?

#### **The Performance**

##### 1.1 The insulation resistance:

Checking the insulation resistance between H – L, H – E and L - E with insulation Megger Ohm meter ( 1000V or 2000V ).

##### 1.2 The ratio test:

To make sure the winding ratio. Compare with the nameplate.

## SECTION C

### Inspection and Maintenance of the Apparatus after placed in Operation

#### **1.Attention**

A detailed plan shall be mapped out before the inspection and maintenance are commenced to avoid any disaster or accident that could cause damage to human life and the apparatus.

##### 1-1 Caution before Inspection and Maintenance

Before commencing the work, make sure beforehand that the transformer has been cut off from the power system, and use a voltage detector suitable for the voltage of the circuit to check that the apparatus is in a non-voltage state.

##### 1-2 Caution for Inspecting the Inside

In inspecting the inside, special attention shall be paid to the dress of inspectors. No wristwatch, coin or knife is allowed to be carried in the pocket, so that no matter will drop down inside.

#### **2. Daily Inspection and Maintenance**

Daily Inspection and Maintenance shall be made in an operating state when checking the transformer. Since the transformer is usually equipped with the instruments needed for the operation, the inspector shall record the readings shown on these instruments and compare them with the readings recorded regularly. The Inspector shall check the transformer if any abnormality is found in the inspection. Attention shall also be paid to the abnormalities sensed by human sensory organs, such as abnormal noise, smell, discoloring and so on.

#### **3. Temperature of Transformer**

The temperature of the Transformer is associated directly to the life of the insulator. It is, therefore, necessary to check the temperature carefully. In the daily inspection, the inspector shall not only check in accordance with the general specifications that the temperature of the insulating oil shall not exceed 90° under an ambient temperature of 40°, but also compare the data stated in the Plant Test Performance Sheet attached by the company with the load state and the ambient temperature to make sure that the oil temperature is correct.

#### **4. Oil Level**

From the viewpoint of insulation and cooling, it is very important to monitor the oil level to ensure that it is in the most appropriate position. Appropriate measures shall be taken rapidly to remove the abnormalities found when the oil level rises or drops with the change of the temperature.

## **5. Noise**

Daily noise. If the inspector is used to the noise, it can be deemed as an omen of accidents. The factors causing noise are as follows:

5-1 Resonance of the housing and radiator caused by the violent change of the frequency;

5-2 Flaws of the iron core fixing mechanism;

5-3 Short circuit between the iron core layers caused by the flaws of iron core clamps and bolts;

5-4 Looseness of bolts;

5-5 Static discharge caused by incomplete grounding or some metals being in a non-ground state;

The aforementioned noises, even if they are very low can be sensed by approaching the ear close to the housing wall.

## **6. Looseness of Fixed Parts and Valves**

The operating shall be stopped when any port or grounding terminal is found loose. The apparatus shall be re-started until the loose parts are re-tightened. The foundation bolts may sustain great pressure when it is loose, and shall be re-tightened before it can be used again.

Valves may become loose due to vibration. It is, therefore, necessary to check and make sure that they are in appropriate state.

## **7. Oil Leakage**

Oil leakage is one of the reasons for the deterioration of oil and may contaminate the transformer seriously. Screws, bolts and pads (packing) shall be checked carefully to ensure that no oil leakage occurs in these areas. If the oil leakage is caused by inappropriate welding, please advise the company for resolving the problem.

## **8. Periodical Inspection**

The following items shall be inspected periodically:

8-1 Insulation resistance of winding;

8-2 Power factor of winding;

8-3 Insulating oil

The insulating performance of the winding and bushing is dependent on preservation of the insulating oil. Since the preservation of the insulating oil plays a key role for the life of the transformer, the inspector shall pay more attention to the maintenance of the oil.

## **9. Tap Changer**

Since most members of the tap changer are immersed in the oil, it is difficult to carry out a complete inspection. When making the inspection from the outside, all switching actions of the tap shall be performed one by one to ensure that all the rotating actions of the revolving parts operate correctly.

## **10. N2 Filling Plug**

There are many types of N2 filling plugs that can be used for the apparatus. The inspector shall check in accordance with the User's Manual provided by the company that no gas or oil leakage occurs on the joints, the gaskets are in good condition and the pressure gauge functions well, the inspector shall undertake the analysis of oxygen content in nitrogen.

## **11. Bushing**

No matter what type of bushing is used, the inspector shall check that no local overheating occurs on the bushing, the conduit is not damaged and the screws are not loose. The inspector shall also remove all pollutants found on the bushing. If the oil meter used for the sealed bushing fails, please advise the company for repair.

## **12. Thermometer**

12-1 Dial thermometer: The inspector shall check that the inside of the thermometer is not rusty, no water permeates into the thermometer, the needle moves smoothly and the alarm contact operate correctly. The gasket shall be replaced if the glass surface becomes unclear.

12-2 Electrical Thermometer: The electrical thermometer functions by using the oil temperature to change the resistance value of the temperature detector. The inspector shall check and make sure that the contact resistance of each terminal is changing.

## **13. Standard Frequency of Periodical Inspection**

The standard frequency of periodical inspection stated in the following table is applicable to the power transformer in a normal loading state. Appropriate measures shall be taken and inspection shall be made carefully when the transformer operates abnormally.

#### 14. Standard Frequency of Periodical Inspection

	Items	Frequency	
1	Winding	Inspection of insulation voltage	Once per half year
2		Inspection of power factor	Once per year
3	Insulating oil	Inspection of breakdown voltage	Once per half year
4		Inspection of acid value	Once per half year
5		Performance test	Test when abnormality is found in any one of the inspections from 1 to 4
6		Oil filtering	Inspect when abnormality is found in any one of the inspections from 1 to 5
7	No load tap changer	Switching operation	Once per year
		Oil leakage	Once per year
		Interlock inspection	Once per year

8	Bushing	Single type	Once per three years
9	Thermometer Oil meter	Inspection of indication	Once per year
		Inspection of alarm contact	Once per year
		Cleaning of dial scale surface	Once per year
10	Protective relay	Inspection of actions	Once per year
		Inspection of control circuit	Once per year
11	Pressure relief device	Inspection of pressure relief plate	Once per year
		Inspection of alarm contact	Once per year
		Gas leakage inspection	Once per year
12	Housing Radiator	Oil leakage inspection	Once per year
		Coating inspection	Once per year
		Inspection of vibration protecting device	Once per year

#### 15. Easy Methods for Judging Whether TR Is in a Running State

1. Confirm with the service staffs of the substation;
2. Check whether the temperature of the thermometer is higher than the ambient temperature;
3. Wear voltage detector and come close to the cable box. Open the cable box door to check voltage;
4. Check whether the transformer core produces noise.