REF. NO. DPS-3054

PROPOSAL SPECIFICATION

FOR

CAPACITOR UNIT

7.02 (6.6) kV 3ϕ 50Hz 213 (200) kvar

MAR, 2001

NISSIN ELECTRIC (THAILAND) CO., LTD.

THAILAND

Contents

Chap- I General Specification

1. Scope

This specification covers the static shunt capacitor unit to be used for power factor improvement.

2. Usual Service Condition

a) Ambient air temperature : Max. $50^{\circ}C$

: Mix. $-5^{\circ}C$

b) Altitude : 1,000 m or less

3. Standard

Performance and tests of the capacitor equipments will conform substantially to the JIS unless otherwise stated in this specification.

4. Materials

Since the manufacturer will use materials obtainable in Japanese market and Thailand market, the characteristics of all materials will conform to Japanese standard and Thailand standard.

5. Test and Inspection

The shop test and inspection will be the standard commercial test and inspection normally performed by the manufacturer.

The manufacturer will furnish to the purchaser inspection and test report stating that the equipment has undergone and successfully met such test and inspection. If any shop test and inspection beyond the scope of NET's standard commercial procedures is required by the purchaser, charges for such test and inspection shall be added to our estimate, and conditions of any such test and inspection shall be such as may be mutually agreed upon.

6. Guarantee

For period of 12 calendar months after the equipment has been put into operation or 18 calendar months after delivery of the equipment, whichever may be the earlier, the manufacturer will be responsible for any damage to the equipment and any defects that may develop under proper use, arising from faulty materials design, or workmanship in the equipment, but not otherwise, and will remedy such damage and defects when called upon so to do by the purchaser, who shall state in writing in what respect any portion is faulty.

7. Colour of bushing

The outside bushings are of white glazed porcelain.

8. Colour of painting

Colour of painting for finish coat is Grey.

Chap – II Capacitor Unit

1. Type , Ratings and quantity

a)	Type	:	NISSIN " PET-FK2" , Outdoor
b)	Rated voltage (kV , rms)	:	7.02 (6.6)
c)	Rated capacity (kvar)	:	213 (200)
d)	Rated frequency (Hz)	:	50
e)	Rated current (A , rms)	:	17.5
f)	Insulation level	:	22 / 60 kV
g)	Number of Phase	:	Three
h)	Number of bushing	:	Three
i)	Dielectric Liquid	:	Aromatic hydro-carbon type synthetic oil (Non - PCB)

2. Construction :

a) Internal element

The internal element of the capacitor is manufactured by winding several sheets of synthetic film as an insulator and the aluminum foil as an electrode. Capacitor elements are sealed hermetically in a steel sheet case, the capacitor unit is completely dehydrated under high vacuum and temperature, and the elements so dried are then impregnated with the insulation oil which had been completely refined and degasified not to leave any gas or impuritics in the case which may cause deterioration of the dielectrics.

The change of the oil volume in the hermetically sealed steel case is adjusted without any contact with atmosphere by expansion and construction of the case wall.

b) Terminal :

Three (clamp type) line terminals will be located at the top of bushing and one case terminal will be located at the lower fixture.

c) Case and painting :

The case of each capacitor unit will be made of galvanize steel sheet with all joints welded.

The outside surface of the case will be undercoated by the primer and then finished by the two coat of weatherproof final paint.

d) Discharge device :

Each capacitor unit will have discharge resistor in the case for removing dangerous residual charge of the capacitor unit after being switching off.

3. Performance Characteristics

a) Tolerance in kvar rating :

Capacitor unit will be designed to give the following capacity (kvar) at rated sinusoidal voltage and frequency.

-5% ~ +10% of rated capacity

b) Maximum permissible KVAR :

Capacitor unit will operate satisfactorily at 135 % of rated KVAR with the condition conform to JIS.

c) Maximum permissible voltage :

Capacitor units will be suitable for continuous operation at a terminal to case voltage (including harmonics but excluding transients) of 110 % of the rated voltage rms provided that the peak voltage including harmonics does not exceed 1.2 x $\sqrt{2}$ times rated voltage rms and provided that the maximum permissible 135 % of rated KVAR is not exceeded.

d) Capacitor loss :

Loss of each capacitor unit at rated voltage at $25^{o}C \pm 5^{o}C$ will be not exceed 0.20 watts per kvar average before stabilized.

e) Discharge characteristics :

The discharge resistor contained in the capacitor unit will reduce the residual voltage to 50 volts or less within 5 minutes after the capacitor unit is disconnected from the source of supply.

4. Routine Test

Each capacitor unit will be tested at the manufacturer's factory according to the following routine test items.

a) Capacitance test :

Capacitance will be measured between terminal to terminal by capacitance bridge with 50 Hz and rated voltage and kvar rating of capacitor at $25^{o}C$ capacitor temperature by applying proper correction factor.

b) Loss determination test :

Capacitor loss of each capacitor unit will be measured at room temperature by Scheming bridge at rated voltage and frequency of 50 Hz and the measured value will be corrected to the figure at $25^{o}C$ capacitor temperature by applying proper correction factor.

The later values of the dielectric loss angle will be less than 0.02 % (0.2 watts per kvar).

c) Short time over voltage test :

Terminal – to – Terminal test

Following test voltage of which frequency is 50 Hz will be applied between two terminals for the duration of ten seconds.

2.0 Uo (Uo : rated voltage)

d) Discharge resistor test :

Each capacitor containing an internal discharge resistor will be tested to insure that resistors meet performance characteristics item (e) of clause 3 in this specification.

e) Leak test :

The capacitor unit will be insured to be free from leaks by heating in an oven, all parts reach a temperature to $80^{\circ}C$ for at least 2 hr.

f) Inspection of construction :

Dimensions, constructions, paintings and nameplate marking will be checked in accordance with the approved drawings.

5. Accessories (for one unit)

a)	Line terminal (clamp type for 14 ~ 38 mm2)	3 set.
b)	Nameplate	1 pcs.
c)	Hanger	2 pcs.
d)	Fixture	2 pcs.
e)	Insulation cap	3 pcs.

6. Nameplate Marking

The following items will be given in English on all capacitor unit nameplates.

a) Name of manufacturer

b) Unit serial number

c) Manufacturer's type

d) Year of manufacture

e) Rated reactive power in kvar

f) Rated voltage, rms in kV

g) Number of phases

h) Rated frequency in Hz

i) Insulation level

j) Statement that capacitor contains an internal discharge device

7. Attached documents

a) Proposal data sheet

b) Outline drawing

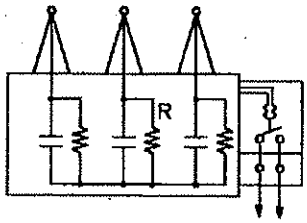
CAPACITOR UNIT

PROPOSAL DATA

1.	MAKE AND COUNTRY OF ORIGIN	NISSIN ELECTRIC THAILAND CO., LTD.
2.	TYPE / MODE / CAT. NO.	PET-FK2
3.	APPLIED STANDARDS	JIS C4902 (1998)
4.	RATED VOLTAGE	7.02 (6.6) kV
5.	RATED CURRENT	17.5 A
6.	FREQUENCY	50 HZ
7.	BASIC IMPULSE INSULATION LEVEL (BIL)	22 / 60 kV
8.	CONTINUOUS RATED CAPACITY AT RATED VOLTAGE AND FREQUENCY	213 (200) kvar
9.	MAX. PERMISSIBLE WORKING VOLTAGE	7.72 kV
10.	MAX. PERMISSIBLE WORKING CAPACITY	287 (270) kvar
11.	TYPE AND CHARACTERISTIC OF DIELECTRIC MATERIAL	POLYPROPYLENE FILM
12.	TYPE AND CHARACTERISTIC OF IMPREGNANT	AROMATIC HYDRO – CARBON TYPE SYNTHETIC OIL (NON-PCB)
13.	ELECTRICAL STRESS BETWEEN TWO FOILS ACROSS THE FILMS AT RATED VOLTAGE (RMS. VOLTAGE DIVIDED BY TOTAL FILM THICKNESS)	56.3 kV / MM
14.	MAX. ALLOWABLE CONTINUOUS ELECTRICAL STRESS BETWEEN TWO FOILS ACROSS THE FILMS (RMS. VOLTAGE DIVIDED BY TOTAL FILM THICKNESS)	61.9 kV / MM
15.	MAX. WORKING VOLTAGE OF CAPACITOR ELEMENT	2.03 kV
16.	INTERNAL CONNECTION OF CAPACITOR UNIT	S = 2 P = 2 PER PHASE
17.	TEMPERATURE LIMIT TMIN / TMAX	-20 / B
18.	TYPE OF BUSHING (GLASS, PORCELAIN, ETC.)	WHITE PORCELAIN
19.	BUSHING'S MANUFACTURER / COUNTRY	CHUNG RUNG INSULATORS CO., LTD. TAIWAN R.O.C.
20.	CREEPAGE DISTANCE	155 MM
21.	TYPE OF CONTAINER (TANK)	GALVANIZE STEEL SHEET
22.	PROVISION DISCHARGE RESISTOR	(✓) YES ( ) NO

23.	DISCHARGE TIME TO 50 V	5 MIN
24.	OVERALL HEIGHT INCLUDING BUSHING	605 MM
25.	OVERALL LENGTH x WIDTH x HEIGHT	535 x 170 x605 MN
26.	WEIGHT	45 KG
27.	FUSE	(✓) EXTERNAL ( ) INTERNAL
28.	MAX. LOSSES BEFORE STABILIZED LOSS	0.2 W / KVAR
29.	STABILIZED LOSS	0.15 W / KVAR

INTERNAL CONNECTION

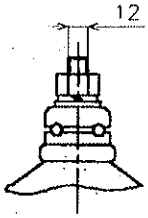


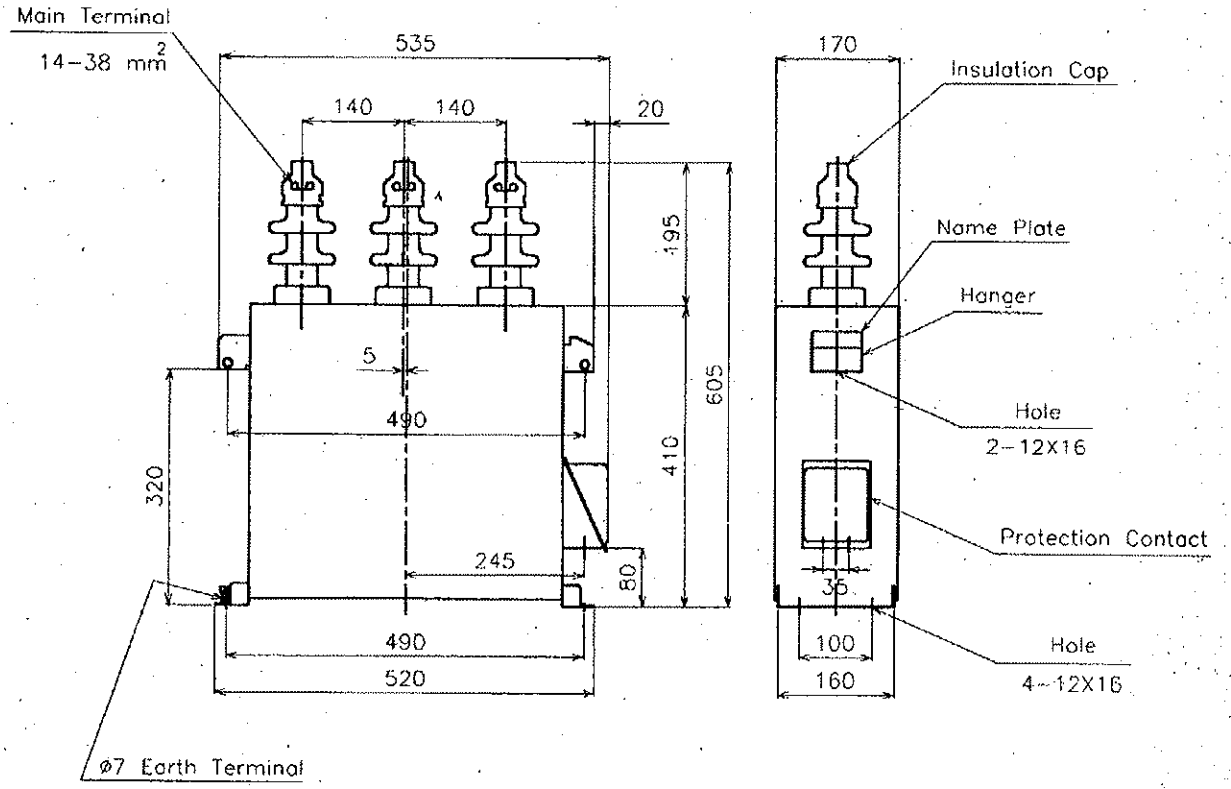
R:DISCHARGE RESISTORS

RATINGS

TYPE	: NISSIN "PET-[illegible]K2"
RATED VOLTAGE	: AC 7.02(6.6) kV
NO.OF PHASES	: THREE
RATED FREQUENCY	: 50 Hz
RATED CAPACITY	: 213(200) kvar
TEST VOLTAGE(T-T)	: AC 14.04 kV
INSULATION LEVEL	: 22/60 kV
OIL VOL.	: 14 L
TEMP. CATEGORY	: -20/B
APPROX. WEIGHT	: 45 kg
STANDARD	: JIS C4902 (1998)

LINE TERMINAL





0	CAPACITOR	NEY-00146	1				
No	Parts name	Drawing No.	Q'TY	Material	Material code	Dimension	Remarks

			Sub no.	Scale 1:10	App'd	Ch'k'd
				Unit mm	Des'd N. Nirun	Dr'wn N. Nirun
Date	Revision	Des'n	Date 22/11/2000	Dwg no. NEY-00146		
Surface Treatment						
Remarks			NISSIN ELECTRIC (THAILAND) CO.,LTD FAX No.(66-2)5290971,TEL No.5290968-70			