INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR FUSE COMBINATION UNITS FOR VOLTAGES NOT EXCEEDING 1000 V ac** (*First Revision*)	**IPSS:1-04-019-02**
	Based on IS 13947 (Part 3) : 1993	Formerly : IPSS : 1-04-019-89

0. FOREWORD

0.1 This Inter Plant Standard has been prepared by the Standards Committee on Switchgears and Controlgears, IPSS 1:4, with the active participation of the representatives of the steel plants, major consulting organizations and established manufacturers of fuse combination units for voltages not exceeding 1000 V ac and was adopted in January 2002.

0.2 Inter Plant Standards for steel industry primarily aim at achieving rationalization and unification of parts and sub-assemblies used in steel plant equipment and accessories, and provide guidance in indenting stores or equipment for existing or new installations by individual steel plants. For exercising effective control on the inventories, it is advisable to select a fewer number of sizes (or types) from among those mentioned in this standard for the purpose of company standards of individual steel plants. It is not desirable to make deviations in technical requirements.

1. SCOPE

2.

2.1 This Inter Plant standard is essentially based on IS 13947 (Part 3) : 1993 ` Specification for low voltage switchgear & controlgear : Part 3 Switches, disconnectors, switch disconnectors and fuse combination units [*superseding IS 4064 (Parts 1 and 2)]*' except specified otherwise in this standard, and covers the requirements of fuse combination units of ac 22A and ac 23A duty for voltages not exceeding 1000 V ac suitable for use in steel industry.

2.2 Utilization categories of ac 22A and ac 23A duty fuse combination units used for frequent operation are as follows :

ac 22A - Switching of mixed resistive & inductive loads, including moderate overloads.

ac 23A - Switching of motor loads or other highly inductive loads.

2. SITE CONDITIONS

2.1 These are defined in 5 of IS 13947 (Part 3):1993 except for the following :

2.1.1 *Additional Requirement* – The switches shall be capable of operating in site conditions where there is a fair amount of conductive dust and corrosive fumes and dampness.

2.2 Derating factors shall be given by the manufacturers for use of the fuse combination units in hot areas having ambient temperatures of 50°C, 55°C and 60°C.

3. RATED OPERATIONAL CURRENT

3.1 The rated operational current in A shall be of the following series :

32, 63, 100, 125, 200, 250, 315, 400, 630 and 800.

4. CONSTRUCTIONAL REQUIREMENTS

4.1 The enclosure of switch unit shall be either of cast iron or of atleast 2.0 mm thick sheet metal. However, for ratings upto and including 100 A, sheet of adequate thickness may be used if it has required strength provided by means of ribs or is suitably shaped.

4.2 The fuse combination units shall be of robust construction with double break contacts having IP 54 enclosure and shall be painted with corrosion resistant paint.

4.3 The drive mechanism, spindle and actuating handle shall be of metal and insulated.

NOTE: For rating up to and including 100 A, the handle may also be of plastic, provided it has adequate mechanical strength and is unbreakable.

4.4 All insulating parts shall be of non-tracking material and shall have good dimensional stability.

4.5 The current conducting parts shall be of electrolytic copper or copper alloy. All contacts shall be silver plated, or shall be of silver alloy.

4.6 The minimum permissible clearances and creepage distances at terminations with phase barriers shall be as follows :

a)	Clearance between phases or phase to earth	=	45 mm
b)	Creepage distance (*with phase barriers, if necessary*) between phases or phase to earth	=	120 mm

4.7 The switches shall be suitable for use with either HBC/HRC fuse links covered by IS 13703 (Part 1):1993 “Low voltage fuses for voltages not exceeding 1000 V ac or 1500 V dc : Part 1 General Requirements” [*superseding IS 9224 (Pt 1):1979*].

4.8 Copper parts shall not be used as springs.

4.9 Terminals shall be suitable for termination of aluminium cables with crimped lugs for accommodating cables of optimum sizes as given below :

Nominal Current Rating in A at 415 V, 50 Hz	**Maximum Size of Al Cable (mm^2)**	
	At 40°C	*At 55°C*
32	10	Derating factor is 0.69
63	25	-do-
100	50	-do-
125	70	-do-
200	150	-do-
250	225	-do-
315	300	-do-
400	2 x 185	-do-
630	2 x 300	-do-
800	4 x 150	-do-

NOTE:

1. The basic current rating at 40°C and derating factor of 0.69 at 55°C ambient in air are as per IS 3961(Part 2) : 1967.

2. Depending on the environmental condition, derating factor at 55°C may be taken between 0.69 to 0.83.

3. For higher current ratings from 400 A to 800A, the number of cables selected depends on size of cables, space availability, phase to phase safe clearance after connection and dressing of cables in the panel.

4.10 The door shall be interlocked so that it can be opened only when the switch is made OFF. Door interlocked defeat feature shall also be provided for emergency. The door fixing means shall be of captive type.

5. MARKING

5.1 Rating plate

a) Manufacturer’s name
b) Year of manufacture
c) Rated operational voltage, V
d) Rated operational current, A

6. PERFORMANCE REQUIREMENTS

6.1 Conditions for making and breaking corresponding to the various utilization categories are given in **Table-1** below [*a part of Table-III of IS 13947 (Part 3):1993*] :

TABLE - I

Utilization category	Rated op. Current	Making (1)			Make-break			No. of operating cycles
		I/I_e	U/U_e	Cos ϕ	I_c/I_e	U_r/U_e	Cos ϕ	
AC–20A(2) -- AC-20B(2)	All values	-	-	-	-	-	-	
AC-21A -- AC-21B	All values	1.5	1.05	0.95	1.5	1.05	0.95	5
AC-22A-AC-22B	All values	3	1.05	0.65	3	1.05	0.65	5
AC-23A-AC-23B	0<Ic ≤100A 100A<Ie	10 10	1.05 1.05	0.45 0.35	8 8	1.05 1.05	0.45 0.35	5 3

I = Making current
I_c = Breaking current
I_e = Rated operational current
U = Applied voltage
U_e = Rated operational voltage
U_r = Power frequency or dc recovery voltage

(1) = For ac, the making current is expressed by the rms value of the periodic component of the current.

6.2 **Operational Performance** - Tests concerning the verification of the operational performance of an equipment are intended to verify that the equipment is capable of making & breaking without failure, the currents flowing in its main circuit for the intended use.

The number of operating cycles and the test circuit parameters for the operational performance test for the various utilization categories are given in **Tables II & III** below [*parts of Tables IV & V of IS 13947 (Part-3):1993 respectively*]. The test conditions are specified in 8.3.4.1 of IS 13947 (Part 3):1993 :

TABLE – II

Verification of operational performance
Number of operating cycles corresponding to
the rated operational current

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rated operational Current I_e	**Number of operating cycles per hour**	**Number of operating cycles**					
		ac and dc A categories			**ac and dc B categories**		
		Without Current	With Current	Total	Without Current	With Current	Total
$0 < I_e \leq 100$	120	8500	1500	10000	1700	300	2000
$100 < I_e \leq 315$	120	7000	1000	8000	1400	200	1600
$315 < I_e \leq 630$	60	4000	1000	5000	800	200	1000
$630 < I_e \leq 2500$	20	2500	500	3000	500	100	600
$2500 < I_e$	10	1500	500	2000	300	100	400

The values in the Table apply to all utilization categories except AC-20A, AC-20B, DC-20A and DC-20B. These categories shall comply with the total number of operating cycles in columns 5 or 8, but all without current unless some breaking and / or making capacity is claimed. See “notes” to 4.3.5.2 and 4.3.5.3 of IS 13947 (Part-3):1993 as reproduced in the bracket below :

(**NOTE 1** – In the case of disconnectors having a making capacity, although they are of utilization category AC-20 or DC-20, this value may be stated separately by the manufacturer together with the relevant test parameters.

NOTE 2 - In the case of disconnectors having a breaking capacity, although they are of utilization category AC-20 or DC-20, this value may be stated separately by the manufacturer together with the relevant test parameters.)

In this case, the verification shall be made at the values of voltage, current and power factor claimed and for the number of operating cycles given in the Table. Column 2 gives the minimum operating rate. The operating rate for any utilization category may be increased with the consent of the manufacturer.

TABLE – III

Test circuit parameters for Table – IV of IS 13947(Part 3) :1993

Utilization category	Value of the Rated operational. Current I_e	Making (1)			Breaking		
		I/I_e	U/U_e	Cos ϕ	I_c/I_e	U_r/U_e	Cos ϕ
AC-21A-AC-21B	All values	1	1	0.95	1	1	0.95
AC-22A-AC-22B	All values	1	1	0.8	1	1	0.8
AC-23A-AC-23B	All values	1	1	0.65	1	1	0.65

I = Making current
I_c = Breaking current
I_e = Rated operational current
U = Voltage before make (Applied voltage)
U_e = Rated operational voltage
U_r = Power frequency or dc recovery voltage

(1) = For ac, the making current is expressed by the rms value of the periodic component of the current.

6.3 The electrical life of contacts shall preferably be of 10 closing operations on fault as described under the second test of 8.2.7.2 of IS 13947 (Part 3):1993.

7. Two suitable earthing stud(s) depending on the rating shall be provided if they are not panel mounted.

8. The operating handle for switching ON/OFF shall have sufficient clearance from the body of the unit for safe operation.

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