Standards for soldering fluxes

DIN EN 29454-1 (ISO 9454-1) Soldering Fluxes

This specification classifies soldering fluxes to their chemical composition. However, the suitability has to be determined by specific test procedures. The requirements are also defined in these specifications. Using these requirements a decision to choose a specific flux for a specific application can be made. If tested with well defined test methods cannot guarantee full reliability in every case, but gives a sufficient prediction weather flux residues have to be cleaned or not. The EN standard does not include SIR testing, a weak point.

Flux type	Base	Activator	Type
1 Rosin	1 Rosin	1 without Activator	A liquid
	2 without rosin	2 with Halides	
2 Organic	1 water soluble	3 without Halides	
	2 not water soluble		B solid
3 Inorganic	1 Salts	1 Ammonium chloride	
		2 without Ammoniumchl	
	2 Acids	1 Phosphoric acid	C paste
		2 other acids	
	3 Alkaline	1 Amines and/or Ammonia	

Table. 1a: Classification to DIN EN 29454-1 (ISO – Fluxes classes)- e.g. 1.1.2 halide containing rosin flux.

DIN 8511 Teil 2/05.88	DIN EN 28 454 Teil 1
Flussmittel, deren Rückstände Korrosion hervorrufen (Schwermetalle)	
F-SW-11	3.2.2.
F-SW-12	3.1.1.
F-SW-13	3.2.1.
Flussmittel, deren Rückstände bedingt korrodierend wirken können (Schwermetalle)	
F-SW-21	3.1.1.
F-SW-22	3.1.2.
F-SW-23	2.1.3. *oder* 2.2.1. *oder* 2.2.3.
F-SW-24	2.1.1. *oder* 2.1.3. *oder* 2.2.3.
F-SW-25	2.1.2. oder 2.2.2.
F-SW-26	1.1.2.
F-SW-27	1.1.3.
F-SW-28	1.2.2.
Flussmittel, deren Rückstände nicht korrodierend wirken (Schwermetalle)	
F-SW-31	1.1.1.
F-SW-32	1.1.3.
F-SW-33	1.2.3.
F-SW-34	2.2.3.

Table. 1b: Comparison of classification DIN EN294544-1 (ISO 9454-1) and obsolete old german DIN 8511

The application of test procedures are defined in DIN EN 29454-1, the requirements are defined in DIN EN 29454-2. test methods are listed in DIN EN 29455 resp. DIN EN ISO 9455.

Test methods DIN EN 29455 resp. DIN EN ISO 9455

Parts	
1 - 2	solid content
3	Acid value
5	Copper mirror test
6	Halide contents
10	Solder spread
11	Solubility of flux residues
12	Steel tube corrosion test
13	Flux spattering
14	Adhesion of flux residues
15	Copper-Corrosion
16	Wetting force (prEn)
	Surface insulation resistance

DIN EN 61190-1-1 Attachment materials for electronic assembly

Part 1-1: Requirements for soldering fluxes for high quality interconnections in electronic assembly

This specification defines the classification of soldering materials through specification and test methods and inspection criteria These materials include liquid flux, paste flux, solder paste flux, solder preform flux, and flux cored solder..

Composition	Flux Activity (% Halide)		Flux class to IEC	Flux class to ISO
Rosin (RO)	Low(0%)	L0	ROL0	1.1.1
	Low(<0.5%)	L1	ROL1	1.1.2.W, 1.1.2.X
	Moderate (0%)	M0	ROM0	1.1.3
	Moderate (0,5-2.0%)	M1	ROM1	1.1.2.Y, 1.1.2.X
	High (0%)	H0	ROH0	1.1.3.X
	High (>2%)	H1	ROH1	1.2.2.Z
Resin (RE)	Low(0%)	L0	REL0	1.2.1
	Low(<0.5%)	L1	REL1	1.2.2.W, 1.1.2.X
	Moderate (0%)	M0	REM0	1.2.3
	Moderate (0,5-2.0%)	M1	REM1	1.2.2.Y, 1.1.2.X
	High (0%)	H0	REH0	1.2.3.X
	High (>2%)	H1	REH1	1.2.2.Z
Organic (OR)	Low(0%)	L0	ORL0	2.2.1, 2.2.3.E
	Low(<0.5%)	L1	ORL1	-
	Moderate (0%)	M0	ORM0	-
	Moderate (0,5-2.0%)	M1	ORM1	2.1.2, 2.2.2.
	High (0%)	H0	ORH0	2.2.3.0
	High (>2%)	H1	ORH1	2.2.2
Inorganic (IN)	Low(0%)	L0	INL0	Not applicable
	Low(<0.5%)	L1	INL1	
	Moderate (0%)	M0	INM0	
	Moderate (0,5-2.0%)	M1	INM1	
	High (0%)	H0	INH0	
	High (>2%)	H1	INH1	

Table2: Classification of fluxes to DIN EN 61190-1-1

The flux characterisation takes place after classification of its activity and its residue: L means low, M is moderate and H high activity of the flux/residue. The absence or presence of halide is marked by assigning 0 or 1.
Tests were carried out to DIN EN 61190-1-1 Item 4.2.4. The test results must pass the criteria of this specification.

DIN EN 61190-1-1 is quite identical with ANSI J-STD-0004.

Flux-Class	Copper mirror	Silver-Chromate Cl^-, Br^-	Spot test fluorides	Halides Quantitative (Weight%)	Corrosion-test	Pass for 100MΩ-SIR-Requirements
LO	No evidence of mirror breakthrough	Pass	Pass	<0,01	No Corrosion	Both cleaned and not cleaned.
L1		Pass	Pass	<0,15		
M0	Breakthrough in less than 50% of test area	Pass	Pass	<0,01	Minor Corrosion acceptable	Cleaned or not cleaned
M1		Fail	Fail	0,15 – 2.0		
H0	Breakthrough in more than 50% of test area	Pass	Pass	<0,01	Major corrosion acceptable	Cleaned
H1		Fail	Fail	>2,0		

Table 3: Test requirements for flux activity classification

The most important test for No-Clean Fluxes is the SIR-Test, where the pass criteria is the 100MΩ-SIR requirement. The test procedure shall be carried out according to IEC 61189-5.

Flux Type	Test conditions for SIR acceptance		
	50°C, 90% RH, 7 days	50°C, 90% RH, 7 Tage	85°C, 85% RH, 7 Tage
L	100 MΩ Cleaned (C) or not cleaned (N)	100 MΩ Cleaned (C) or not cleaned (N)	100 MΩ Cleaned (C) or not cleaned (N)
M	100 MΩ Cleaned (C) or not cleaned (N)	100 MΩ Cleaned (C) or not cleaned (N))	100 MΩ Cleaned (C) or not cleaned (N)
H	100 MΩ Cleaned (C)	100 MΩ Cleaned (C)	100 MΩ Cleaned (C)

Table 4: SIR-Test requirements to IPC TM 650 2.6.3.3

The SIR (Surface Insulation Resistance) measurement gives information about the qualitative properties of flux residues. Specific interleaved comb patterns (e.g. IPC-B-24) were flux applied and soldered followed by a climate storage under applied bias voltage. The insulation resistance may not fall below 10^8 Ω.to give a pass. Corrosion and electromigration must not occur.

The obsolete DIN 8511 is out of duty since 1996, although Flux classification like F-SW 32 or F-SW 26 are still used. A conversion table is given in DIN EN29454-1.

International Standards

Beside the above mentioned specifications there are some others of importance.

USA: ANSI J-STD-004

IPC-SF-818, Bellcore TR—NWT-00078 and QQS571 are obsolete now.