

OBJS2 System Component, Electrical Insulation - Component		E321249
AEV LTD		
MARION ST BIRKENHEAD MERSEYSIDE CH41 6LT GB		
System Component	System Designation	System Temp(Class)
Ultifil 2004TCB, Ultifil 2114TC#, Ultifil 2001 810SSTB, Ultifil 2001 810NL#, Utimeg 2220GP	AEV 180-3	180(H)
Underwriters Laboratories Inc.		

Construction Details (Table I)

The use of this insulation system is limited to the combination of materials specified below. Where more than one item is designated under Insulation Function, they may be used together, unless otherwise indicated, or they may be used as alternates to one another. Functions designated "optional" are not necessarily required for every design. Insulation thicknesses and/or layers indicated below are minimum.

Winding Wire	<ul style="list-style-type: none"> - Recognized Component - Magnet wire (OBMW2), single build or greater, round or rectangular listed below or - Recognized Component - Single and Multi-Layer Insulated Winding Wire (OBJT2) listed below or - Recognized Component - Appliance Wiring Material (AVLV2) listed below - Bare conductors wrapped or interleaved with a paper or film listed below need not be a Recognized Component
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(unless otherwise noted, winding wire types listed below may be used in combination within a single product)

MW 35 or 200C Polyester-amide-imide (Polyamide-imide)

MW 36 or 200C Polyester (Polyamide-imide)

MW 37 or 220C Polyester (Polyamide-imide)

MW 73A or 220C Polyester-amide-imide (Polyamide-imide)

MW 74 or 200C Polyester-amide-imide

Ground & Interwinding Insulations

Designation (no.)	mils(mm)comments
3M	
CeQuin 3000	10 (0.25)
CeQuin I	10 (0.25) unfired ceramic based rubber bonded paper
CeQuin X	10 (0.25)
CeQuinbord 3000	10 (0.25)
CeQuinbord CGA	10 (0.25) unfired ceramic millboard and rubber bonded paper
CeQuinbord X, XHT	10 (0.25)

TufQuin 110	7 (0.18)	
TufQuin 120	7 (0.18)	
TufQuin PC	7 (0.18)	
3M (Minnesota Mining & Mfg Co)		
92	3 (0.08)	Recognized Component - Insulating Tape (OANZ2)
August Krempel		
Trivoltherm N	5 (0.13)	minimum thickness Nomex 410 layer(s)
Coveme		
DyTerm N3D	5 (0.13)	minimum thickness Nomex 410 layer(s)
E. I. Dupont de Nemours & Co.		
Nomex® 410	5 (0.13)	aramid insulating paper
Nomex® 414	5 (0.13)	aramid insulating paper
Nomex® 418	5 (0.13)	aramid insulating paper
Rynite 530	15 (0.38)	polyethylene terephthalate (PET)
Rynite 530L	15 (0.38)	polyethylene terephthalate (PET)
Rynite 935	15 (0.38)	polyethylene terephthalate (PET)
Rynite FR515	15 (0.38)	polyethylene terephthalate (PET)
Rynite FR530	15 (0.38)	polyethylene terephthalate (PET)
Rynite FR530L	15 (0.38)	polyethylene terephthalate (PET)
Rynite FR945	15 (0.38)	polyethylene terephthalate (PET)
Isovolta AG		
Isonom NMN 0881	5 (0.13)	minimum thickness Nomex 410 layer(s)
Isonom NMN 2035	5 (0.13)	minimum thickness Nomex 410 layer(s)
Jones Stroud		
Hypertherm F Grade 210	5 (0.13)	minimum thickness Nomex 410 layer(s)
Hypertherm F Grade 27	5 (0.13)	minimum thickness Nomex 410 layer(s)
Polifibra SpA		
Polimex NM	5 (0.13)	made using nomex 410, 414, or 418 minimum thickness Nomex 410 layer(s)
Polimex NMN	5 (0.13)	made using nomex 410, 414, or 418 minimum thickness Nomex 410 layer(s)
Pucaro		
Triflexil NM/50	5 (0.13)	minimum thickness Nomex 410 layer(s)
Triflexil NM/80	5 (0.13)	minimum thickness Nomex 410 layer(s)
SEG		
Seguimex T5	5 (0.13)	(NMN 2/5/2) minimum thickness Nomex layer(s)

Von Roll USA Inc. (Acme)

Myoflex 2NK	5 (0.13)	
Myoflex NMN	5 (0.13)	minimum thickness Nomex 410 layer(s)

Lead Wires

(optional)

- 150 ETFE - extruded Tefzel + +
- 150 XLPE - crosslinked polyethylene + +
- 150 XLPE - irradiated crosslinked polyethylene+ +
- 180 SI - silicone rubber - with or without glass braid
- 200 TFE - tetraflouroethylene

+ To be isolated from direct contact with windings (magnet wire) by any insulating material (tape, layer insulation, sleeving, etc.) listed in this table - unless specifically excluded from this requirement by a special note at the beginning of this table.

Minor Sheet Insulations

(optional) layer, outer, wrap etc.

Any sheet insulation or tape described in this table with no minimum thickness requirement.

Designation (no.)	comments
3M Innovative Paper Technologies	
CORQUIN	
CeCUINBORD CGA	
CeQUINBORD 3000	
CeQuin 30G, 30G30, G30G	
CeQuin 500	
CeQuin 510	
CeQuin I	
CeQuin IF, IFI, FIF	
CeQuin IG, IGI, GIG	
CeQuin II	
Cequin 3000	
Cequin 30F, 30F30, F30F	
Cequin IF, IFI, FIF	
Cequin VF, VFV, FVF	
DMD	
DMD180	
TufQUINBORD	
TufQuin 100	
TufQuin 110, 120, PC	
TufQuin TF, TFT, FTF	
August Krempel	
Trivoltherm TF	
Cierre	
Type Rp3	
Cottrell Paper	
CK125TU	
Copaco	
Copaco 125	

Copaco Kraft
Coveme
dy Flex SDF 125
dy Flex SDF 190
dy Term N2D190
dy Term N2S190
dy Term N3D100
Dell-Erba
DMD
NMN
E. I. Dupont de Nemours & Co.
Nomex SDS
Essex
Polymat DMD
Freundenberg
Viledon H1162
Isocom
Isotherm DMD
Isovolta AG
Voltaflex F
Jones Stroud
Hyperlastomer S
Hypertape ISO M
Hypertape ISO M/P
Hyply E5.1
Polifibra SpA
DM
NMHS
Polimex NM 2S
Polimex NMN
Thermef DMD
Nomex/Mylar/Nomex
Pucaro Elektroisolerstoffe
Triflexil M
VRI
GPO3
Myoflex 2N
Myoflex PV-PVS-PS
Myoflex PVS
Therm-AL H
Various Manufacturers
Polyethylene terephthalate film (PET)
Recognized Component Plastics (QMFZ2)

**Cores, Tubes
Bobbins**

(optional) for mechanical support only

Designation (no.)	comments
3M	
CorQuin	
DSM Engineering Plastics	

Akulon K224-HG6

E. I. Dupont de Nemours & Co.

Crastin CE 7931

Crastin S660FR

Crastin SK652FR

Crastin SK655FR

Crastin SK655GFR1

Rynite 415HP

Rynite 530

Rynite 530L

Rynite 935

Rynite FR515

Rynite FR530

Rynite FR530L

Rynite FR543

Rynite FR945

Zytel 51G35HSL

Zytel 70G30HSL

Glastic Corp.

FHT

UTR

Victrex

Peek 450G

Tapes (optional)

Designation (no.)	comments
3M (Minnesota Mining & Mfg Co)	
1	polyester film/epoxy resin composite
10	thermosetting rubber, polyester nonwoven/epoxy resin composite
1205	acrylic adhesive, polyimide film
1218	
1318(#)	(#) - Replaced with suffix B-1, B-2, W-1, W-2, Y-1 or Y-2
1318-1	acrylic adhesive, polyester film
1318-2	acrylic adhesive, polyester film
1339	acrylic adhesive, polyester film
1350	polyester film
20+	polyester nonwoven/epoxy resin composite
27	thermosetting rubber adhesive, glass cloth
44	thermosetting rubber adhesive, web reinforced polyester film
44A	
44D	polyester film/non-woven composite
44D-A	polyester film/non-woven composite
44T	polyester film/non-woven composite
44T-A	polyester film/non-woven composite
46	thermosetting rubber adhesive, web

	reinforced polyester film
46	
5	acrylic adhesive, polyester film
54	thermosetting rubber adhesive, polyester film
55	thermosetting rubber adhesive, polyester film/mat
56	thermosetting rubber adhesive, polyester film
57	thermosetting rubber adhesive, polyester film
58	thermosetting rubber adhesive, polyester film
60	thermosetting silicone adhesive, PTFE film
60	
61	thermosetting acrylic adhesive, PTFE film
62	thermosetting acrylic oil compatible adhesive, PTFE film
63	acrylic adhesive, PTFE film
69	thermosetting silicone adhesive, glass cloth
74	thermosetting rubber adhesive, polyester film
75	thermosetting rubber adhesive, double coated polyester film
79	acrylic adhesive, glass cloth
90	glass cloth
90	
92	thermosetting silicone adhesive, polyimide film
92	
MR94	polyester film/non-woven composite
MR94B	
PAI 220	
Super 10	polyester film/epoxy resin composite
Super 20	
Bondtec	
B175	
B831T	
B832W	
B911-2A	
B911-2D	
B921F-2E	
B921F-2EL	
CMC	
10260	
10966	
16701	
18102	
35160	
65100	
65120	
70100	
84170	
Electro Tape Specialties Inc	
ETS-21 FR	

ETS-269	woven fiberglass
ETS-451	
ETS-97	
H-old S R L	
GL.94	glass cloth
GL.95	glass cloth
GL.96	glass cloth
H.20	polyimide
P.31	PET
P.315	PET
P.34	
P355	
P40	
P42	
PR.30	composite PET film
PS.30	composite PET film
PS25	
PS30	
PT.25	composite PET film
X.50	
Ideal Tape Co Inc	
700	thermosetting rubber adhesive, polyester film glass filament
7007	thermosetting acrylic adhesive, polyester film glass filament
701	thermosetting rubber adhesive, polyester film glass filament
7017	thermosetting acrylic adhesive, polyester film glass filament
702	thermosetting rubber adhesive, polyester film glass filament
7170	thermosetting silicone adhesive, polyimide film
7270	thermosetting silicone adhesive, polyimide film
730	thermosetting rubber adhesive, glass cloth
7300	thermosetting silicone adhesive, glass cloth
750	thermosetting rubber adhesive, polyester film glass filament
780	thermosetting rubber adhesive, polyester film glass filament
7807	acrylic adhesive, polyester/glass
Intertape Polymer Group (Tesa, Tuck, Spinnaker)	
4118	polyimide film
4118-00	
4238	polyester film glass reinforced
4238-00	
4426	
4426-00	polyester film laminated to rope fiber

4426-04	polyester film laminated to rope fiber
4427	
4427-00	polyester film laminated to rope fiber
4428	polyimide film
4428-00	
4429	polyimide film
4429-00	
4560	acetate cloth
4560-00	
4564	polyester non-woven
4564-00	
4570	
4570-00	
4570-04	acetate cloth
4616-00	glass cloth
4617	glass cloth
4617-00	
4618	glass cloth
461FR	
461FR-04	
49LY	
51	
51560	polyester film
51578	polyester film laminated to rope fiber
51578-00	
51579	polyimide film
51579-00	
51580	
51587-04	polyester film
51587-17	polyester film
51588	polyester film
51588-00	
51589-00	polyester film
51589-00-04	
51589-00-17	
51589-04	
51589-17	polyester film
51592-00	
51592-08	
51592-17	
51593-00	
51594-17	
51595-00	
51595-04	
51596	polyester film laminated to polyester nonwoven matte
51596-00	
51597	polyester film with glass filament coating
51597-00	
51599	polyester film glass reinforced

51599-00	
51599PV1	
51599PV1-00	
54113-00	
54113-17	polyester film
54143-00	
54143-17	polyester film
56228	Nomex paper
58	
64	
Jones Stroud	
Hyperten 2000HP	
Vidatape GN	
Nitto Denko Corp	
188 UL	silicone adhesive, glass cloth
31B	
32B	
340	acrylic adhesive, polyester/non-woven film
350A UL	acrylic adhesive, polyester/non-woven epoxy
380 UL	acrylic adhesive, aramid paper
903	PTFE
P Leo & Co (B C) Ltd	
glass cloth 1G155	
1A025BL	
1E075	
1G006	aramid fiber (Nomex) paper
1G015	silicone adhesive, glass cloth
1G130	glass cloth
1G180	glass cloth
1G190	
1H802	
1H860	acrylic adhesive, polyester film
1H86A	
1K063	silicone adhesive, polyimide film
1K7170	Kapton film
1M608	
1N012	Aramid fiber (Nomex), Acrylic Adhesive
1P800	polyester film
1P801	acrylic adhesive, polyester film
1P802	
1P808	polyester film
1P830	
1P9FR	
1PEN2	
1PEN3	
1PN820	
1PN828	
1TF05	
1TF07	
PPI Adhesive Products Ltd	

0161	
01610	thermosetting rubber adhesive, polyester/polyester fleece
10130	thermosetting polyacrylate adhesive, polyester film
10140	synthetic rubber adhesive, polyester film
10220	polysiloxane adhesive, polyester film
10260	synthetic rubber adhesive, polyester film
10280	synthetic rubber adhesive, polyester film
16100	thermosetting rubber adhesive, polyester/polyester fleece
16200	thermosetting rubber adhesive, polyester/polyester fleece
17110	synthetic rubber adhesive, poly/glass cloth
65100	synthetic rubber adhesive, polyamide paper, aramid paper
6512	
Saint-Gobain Performance Plastics Corp.	
G551	thermosetting rubber adhesive, glass cloth
G565	silicone adhesive, flame retardant fiberglass cloth
G569	acrylic adhesive, fiberglass cloth
K100	double-sided silicone adhesive, polyimide film
K103	acrylic adhesive, polyimide film
K104	silicone adhesive, polyimide film
K250	silicone adhesive, polyimide film flame retardant
K350	silicone adhesive, polyimide film flame retardant
M50	silicone adhesive, polyester film
M52	silicone adhesive, polyester film
M54	thermosetting rubber adhesive, polyester film
M56	thermosetting rubber adhesive, polyester film
M60	acrylic adhesive, transparent polyester film
M64	thermosetting rubber adhesive, polyester film
M69	acrylic adhesive, transparent polyester film
M705	acrylic adhesive, polyester film
M706	acrylic adhesive, polyester film
M730	silicone adhesive, polyester film
M787	rubber adhesive, polyester film
M97	acrylic adhesive, printable polyester film
Spec Tape	
ST101	thermosetting rubber adhesive, reinforced polyester film
Symbio Inc	
GL06	silicone adhesive, glass cloth
GL08	
KA00	
NM13	aramid (Nomex) paper

Tesa Tape
51408
Various Manufacturers
Cotton, Untreated
Untreated woven glass
Von Roll Isola
Polyglas H200
Samicapor 366.58-18
Samicapor 374.15
Samicapor P326.30
Von Roll UK
Vectroflex

Spacers and Wedges	(optional)
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Designation (no.)	comments
3M	
Cequinbord CGA	
Cequinbord Cel	
Cequinbord CelSat	
Cequinbord M	
AEV Iberica	
G11	
Acebsa	
Ibersil	
Ibsersol	
Berne SARL	
GVF 10	
GVF 21	
Delfingen US, Inc.	
NU-FLEX HT-1232	
NU-FLEX HTS-520	
NU-FLEX HTS-532	
NU-SLEEVE AG-155	
NU-SLEEVE SG-200	
NU-SLEEVE VG-130	
E. I. Dupont de Nemours & Co.	
Rynite 530	
Rynite 935	
Rynite FR530	
Rynite FR945	
Favier	
IS	
PEP	
SCS	
SEP	
SHT	

SS
SVF

**Federal Mogul Systems
Protection Group Inc.**

1258-1
1258-2
Ben Har 1151 A
Ben Har 1151-FR A
Ben Har 1151-FR C
Ben Har 1151-HA-1
Ben Har 1151-XL-200 A
Ben Har 1151-XL-200 C
Ben Har 1151-XL-220 A
Ben Har 1151-XL-240 A
Ben Har 1151-XL-FR-1 A
Ben Har Acryl A
Ben Har Acryl C
Ben Har Acryl F-A-1
Ben Har Acrylflex VPI
Ben Har Ex Flex (std)
Ben Har ST (std)
Ben Har ST-1250 C3

Glastic Corp.

FHT
SG-200
UTR
UTS

Grange

PTFE

Haysite

EFM	flexible, glass reinforced thermosetting polyester
EHC	glass reinforced thermosetting polyester
ETS	NRMA GPO-1 130
HST II	
HTF	flexible, glass reinforced thermosetting polyester

Hilec (Brand Rex, Voltube)

200 Series
300 Series
400 Series
500 Series
700 Series
800 Series
Canflex 210C Series
Heat Treated (std)
Heat Treated-Saturated
(std)
Hilec 210, 310, 410, 510,
710

Turbo 117E - Grades A, B,

C

Turbo 117F - Grades A, B,

C

Turbo 117G

Turbo 117U

Isola UK

Delmat 68.010

Delmat 68.660

Vetronit G11

Jones Stroud Ltd.

Vidaflex 111

Vidaflex 942

Vidaflex Monofil PE106

Vidaflex Monofil PE125

Vidaflex S350

Vidaflex S500

Vidaflex S550

Vidaflex SD350

Vidaflex SD550

Liberty Polyglas

Polyester Supersil

Polyglas G3

Polyglas Polyester

M+S Damerius

Adaglas

Adasil

Nohl

APO-1

APO-3

GPO-3

N155

N180

N220

TR220

Omerin

Siligaine 13F 3

Siligaine 13FU

Siligaine 15C

Siligaine 16F

Primo Sverige AB

Sonoglas Type NR1, NR2,
NR3, NR4

Raychem

Viton E H/S

Relats

Revitex GUF

Rochling

GP03 Polyester

SIGI

13F3
13F3AC
13F3UV
15C
21C
21F1
SHT

Sleevit

symel

Suflex Inc.

Suflex Acrylflex F
Suflex Acrylflex F A
Suflex Acrylflex F C
Suflex Acrylflex VPI
Suflex Flexicone 200 A
Suflex Flexicone 200 B
Suflex Flexicone 200 C
Suflex Flexicone 200 C-1
Suflex Silverflex T&D
Suflex Silicone Resin B, C,

C-1, C-2, C-3

Varglas Silicone Rubber

Coated Fiberglass

Tufnol

Vulcanized fiber

Various Manufacturers

Wood, Untreated

Von Roll USA Inc. (Acme)

Delmat 68.170

Delmat 68.660

G11

Polyglas H200

Sleevings (optional)

Designation (no.) comments

Acebsa

Ibersil

Ibersol

Atkins & Pearce Inc.

Ben Har 1151-FR

Ben Har 1151-XL-200

Ben Har 1151-XL-FR-1

Ben Har Ex Flex

Berne

GVF 10

GVF 21

Delfingen US, Inc.

Nu-Flex HT1220 (1200

Thermoflex)

Nu-Flex HT1232 (HT220)

Nu-Flex HTS520 (500
Thermoflex)
Nu-Flex HTS532 (AW752)
Nu-Sleeve AG-155
Nu-Sleeve SG200
Nu-Sleeve VG130 (VF)

Essex

Suflex Acryflex VPI-NF
Suflex Acylflex F
Suflex Flexicone 200
Suflex Silicone Resin
Suflex Silicone Rubber
Suflex Silverflex T & D

Favier

IS
PEP
SCS
SEP
SHT
SS
SVF

Hilec

317B
417
727N
Hilec 310
Hilec 410
Hilec 710
Turbo 117E A
Turbo 117F
Turbo 117G

Jones Stroud Ltd.

Vidaflex 111
Vidaflex 942
Vidaflex Monofil PE125
Vidaflex S320
Vidaflex S350
Vidaflex S500
Vidaflex SD550
Vidaflex Monofil PE106

Lamina

ETFE
Plamar
Plamaron

M+S Damerius

Adaglas
Adasil

Markel

PTFE

Omerin

Siligaine 13F3

Siligaine 13FU

Siligaine 15C

Siligaine 16F

Protech Power Industries

Polyurethane varnished

glass

Raychem Corp.

RNF 100

Viton E H/S

Relats

REvitex GUF VPG

Sigi

13F3

13F3 AC

13F3B

13F3UV

15C

fiberglass-silicone

21C

21F1

SHT

Sleevit

symel

Sumitomo Electric

PVDF Tubing K

PVDF Tubing K2

Trival Elektroizolcije

Slovenia

Trivasil GU

Varflex

Varglas Silicone Rubber

500 H-A-1

Silicone Resin 500 H-C-1

Silicone Rubber S-A-1

Suflex

Varfil B-A-1

Varglas 240 silicone rubber

Class SA1

Varglas 343 acrylic F-A-1

Varglas A397 Acrylic Class

FA1

Varglas ES-4400 silicone

rubber Class RA1

Varglas Hermetic Class

BB1

Varglas Non Fray Type H

Varglas Non Fray Type HO

Varglas Non Fray Type HP

Varglas Non-Fray Type

HM

Varglas S1600 Type H
Varglas Viton 231 Class R-

A1

Tie Cords (optional)

Designation (no.)	comments
American Efird Inc.	
LP 1008	
LP 1126	
LP 1552	
LP 1556	
Atkins & Pearce Inc.	
17-200-NX	
29-210	
AP-3100-T	
MS 9023-T4	
Breyden Products	
5070, 5100, 5200, 5311, 5312, 5313, 5350, 150, 225, 350	optional prefix of "G" or suffixes of "-1"
60, 75, 100, 200, 252, 330, 350, 390, 500, 504, 6100, 6200, 6500, 3MC, 5MC, 7MC	optional prefix of "HT" or suffixes of "-1" or "-LS"
Emotech Ltd.	
DTEX 1100/1X4	
Gordian Strappings	
RT Tape	
TY Tape	
Hilec (Brand Rex, Voltube)	
800 Series	fiberglass tape
Isolcavi	
4/940R	
Jones Stroud	
Vidacord BG	
Vidacord BP	
Panatex	
Polyester	
Varflex	
48	silicone coated fiberglass
Various Manufacturers	
Fiberglass, untreated	
Western Filament	
50DOF17W	
DHS-1CL	

Potting Compounds (optional)

Designation (no.)	comments
AEV PLC	

Ultifil 2001 810NL#
Ultifil 2001 810SSTB
Ultifil 2004TCB
Ultifil 2114TC#
Ultimeg 2220GP

Miscellaneous Minor Insulations	(optional)
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Designation (no.)	comments
ACG Silicones	
Silcoset 151	
AEV PLC	
UB8000	
VRI	
H200 polyglass	
isorope	
Various Manufacturers	
Untreated Fiberglass	

