INSULATION CLASSES

INSULATION CLASSIFICATIONS ACCORDING TO IEC			
Class	Temperature °C	°F	Type
E	120	248	ADOMIN®
B	130	266	ENOFLEX-B®
F	155	311	ENOFLEX-F®
H	180	356	ENOFLEX 180®
H	180	356	ENOFLEX-H®
H	180	356	IDIOTHERM®
200	200	392	MEDIOTHERM®
220	220	428	POLITHERM®
H	180	356	ENOBOND 180®
H	180	356	IDIOBOND®
200	200	392	MEDIOBOND 200®

The insulating materials are subdivided according to IEC standards into insulating classes showing the corresponding maximum working temperature that must not be exceeded at any point of the winding.

BARE CONDUCTOR

CHARACTERISTICS

Sizes and tolerances according to IEC 60317-0-1 standards.
The standard copper wire range goes from 0,07 mm up to 5,00 mm
Below are further annealed copper conductor characteristics:

COPPER CHARACTERISTICS (ANNEALED)		
DESCRIPTION	**UNIT**	**PARTICULARS**
Electric resistivity at 20°C	$\Omega mm^2/m$	0,017241
Temperature coefficient at 20°C	/°C	0,00394
Specific weight	gr/cm^3	8,89
Ultimate tensile strength	Kg/mm^2	22 - 30

TYPE

ADOMIN®

PROPERTIES	
STANDARDS	IEC 60317-12
	NEMA MW 15-C
	DIN 46416-1
INSULATION COATINGS	POLYVINYL ACETAL
AVAILABILITY	0,60-5,00 mm 2L
MECHANICAL PROPERTIES	**FOR ∅ 1,00**
ELONGATION	>38%
SPRINGINESS	<40
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>16,3N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	8 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	120
CUT THROUGH	2 min≥170 °C
HEAT SHOCK	1d, 1/2h≥155 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	6H
SOLDERABILITY	—
RESISTANCE TO REFRIGERANTS	FREON 12

Exceptional mechanical characteristics and very high resistance to transformer oils. Used primarily in dry or oil-immersed Transformers HT and LT.

TYPE

ENOFLEX - B®

PROPERTIES	
STANDARDS	IEC 60317-4
	NEMA MW 2-C
	DIN 46416-2
INSULATION COATINGS	POLYURETHANE
	130
AVAILABILITY	0,07-1,40 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,25**
ELONGATION	>25%
SPRINGINESS	<50
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>6,10N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	7 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	130
CUT THROUGH	2 min≥170 °C
HEAT SHOCK	1d, 1/2h≥155 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	4H
SOLDERABILITY	375 °C
RESISTANCE TO REFRIGERANTS	—

MAIN USES

Suited to production systems with automated soldering equipment. Used in the manufacture of small motors, transformers, relays and magnet coils.

TYPE

ENOFLEX - F®

PROPERTIES	
STANDARDS	IEC 60317-20
	NEMA MW 79-C
	DIN 46416-2
INSULATION COATINGS	POLYURETHANE
	155
AVAILABILITY	0,07-2,00 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,30**
ELONGATION	>30%
SPRINGINESS	<50
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>6,75N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	7 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	155
CUT THROUGH	2 min≥200 °C
HEAT SHOCK	1d, 1/2h≥175 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	4H
SOLDERABILITY	390 °C
RESISTANCE TO REFRIGERANTS	—

MAIN USES

Suited to production systems with automated soldering equipment. Used in the manufacture of small motors, transformers, relays and magnet coils.

TYPE

ENOFLEX - 180®

PROPERTIES	
STANDARDS	IEC 60317-51
	NEMA MW 82-C
INSULATION COATINGS	POLYURETHANE 180
AVAILABILITY	0,07-1,60 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,30**
ELONGATION	>30%
SPRINGINESS	<50
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>6,75N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	7 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	180
CUT THROUGH	2 min≥230 °C
HEAT SHOCK	1d, 1/2h≥200 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	4H
SOLDERABILITY	390 °C
RESISTANCE TO REFRIGERANTS	—

MAIN USES

Suited to production systems with automated soldering equipment. Used in the manufacture of small motors, transformers, relays and magnet coils.

TYPE

ENOFLEX - H®

PROPERTIES	
STANDARDS	IEC 60317-23
	NEMA MW 77-C
INSULATION COATINGS	POLYESTERIMIDE SOLDERABLE
AVAILABILITY	0,07-1,20 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,40**
ELONGATION	>35%
SPRINGINESS	<45
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>8N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	8 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	180
CUT THROUGH	2 min≥300 °C
HEAT SHOCK	1d, 1/2h≥200 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	3- 4H
SOLDERABILITY	470 °C
RESISTANCE TO REFRIGERANTS	—

MAIN USES

Typical applications:
- transformers
- motors
- electromagnetic coils
- transducers.

TYPE

IDIOTHERM®

PROPERTIES	
STANDARDS	IEC 60317-8
	NEMA MW 30-C
	DIN 46416-5
INSULATION COATINGS	THEIC MODIFIED POLYESTERIMIDE
AVAILABILITY	0,07-1,00 mm L 0,18-5,00 mm 2L
MECHANICAL PROPERTIES	**FOR ∅ 1,00**
ELONGATION	>38%
SPRINGINESS	<40
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>14,9N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	10 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	180
CUT THROUGH	2 min≥300 °C
HEAT SHOCK	1d, 1/2h≥200 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	5H
SOLDERABILITY	—
RESISTANCE TO REFRIGERANTS	FREON 12

MAIN USES

Motor/generator windings of temperature index 180.
Dry or oil immersed transformers.
Good resistance to FREON 12.

TYPE

MEDIOTHERM® 200

PROPERTIES	
STANDARDS	IEC 60317-13
	NEMA MW 73-C, MW 35-C
	DIN 46416-6/7
INSULATION COATINGS	MODIFIED POLYESTER (IMIDE) WITH POLYAMIDE-IMIDE OVERCOAT
AVAILABILITY	0,07-6,00 mm L 0,10-6,00 mm 2L
MECHANICAL PROPERTIES	**FOR ∅ 1,00**
ELONGATION	>38%
SPRINGINESS	<40
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>15,3N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	10 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	200, 210
CUT THROUGH	2 min≥360 °C
HEAT SHOCK	1d, 1/2h≥220 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	5H
SOLDERABILITY	—
RESISTANCE TO REFRIGERANTS	HFC 134 - 404 - 407 FREON 12 - 22

MAIN USES

Motor/generator winding operating at very high temperature.
Dry or oil-immersed transformers.
Hermetic compressor motors and nuclear applications.
Very high resistance to FREON 12-22, HFC 134-404-407 and transformer oil.

TYPE

POLITHERM®

PROPERTIES	
STANDARDS	IEC 60317-7/26
	NEMA MW 71-C
INSULATION COATINGS	POLYIMIDE OR POLYAMIDE-IMIDE
AVAILABILITY	0,07-1,00 mm L 0,18-5,00 mm 2L
MECHANICAL PROPERTIES	**FOR ∅ 1,00**
ELONGATION	>38%
SPRINGINESS	<40
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>10,80N
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	10 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	220
CUT THROUGH	2 min≥400 °C
HEAT SHOCK	1d, 1/2h≥240 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	5H
SOLDERABILITY	—
RESISTANCE TO REFRIGERANTS	HFC 134 - 404 - 407 FREON 12 - 22

MAIN USES

For applications requiring exceptional mechanical and thermal properties.
Electric motor windings of class 220, nuclear and space applications.
High resistance to FREON 12-22 and HFC 134-404-407.

TYPE

ENOBOND 180®

PROPERTIES	
STANDARDS	IEC 60317-35
INSULATION COATINGS	POLYURETHANE 180 WITH A BONDING LAYER
AVAILABILITY	0,20-0,80 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,30**
ELONGATION	>30%
SPRINGINESS	<55
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>6,75N
BONDING TEMP	190 °C
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	7 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	180
CUT THROUGH	2 min≥230 °C
HEAT SHOCK	1d, 1/2h≥200 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	4H
SOLDERABILITY	390 °C
RESISTANCE TO REFRIGERANTS	—

MAIN USES

For self-supporting windings, avoids varnish impregnations.
Suitable for TV deflection coils, small motors, magnetic relays.

TYPE

IDIOBOND®

PROPERTIES	
STANDARDS	IEC 60317-37
INSULATION COATINGS	THEIC POLYESTERIMIDE WITH A BONDING LAYER
AVAILABILITY	0,20-0,80 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,30**
ELONGATION	>30%
SPRINGINESS	<55
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>7,50N
BONDING TEMP	190 °C
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	8 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	180
CUT THROUGH	2 min≥300 °C
HEAT SHOCK	1d, 1/2h≥200 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	4H

MAIN USES

For self-supporting windings.
Avoids varnish impregnations.
Suitable when high operating temperature is required.

TYPE

MEDIOBOND 200®

PROPERTIES	
STANDARDS	IEC 60317-38
	NEMA MW 102-C
INSULATION COATINGS	MODIFIED POLYESTER (IMIDE) OVERCOATED WITH POLYAMIDE-IMIDE WITH A BONDING LAYER
AVAILABILITY	0,20-0,80 mm L-2L
MECHANICAL PROPERTIES	**FOR ∅ 0,40**
ELONGATION	>32%
SPRINGINESS	<50
ADHERENCE-FLEXIBILITY	EXCELLENT
RESISTANCE TO ABRASION	>8,50N
BONDING TEMP	190 °C
ELECTRICAL PROPERTIES	
BREAKDOWN VOLTAGE	8 KV
THERMAL PROPERTIES	
TEMPERATURE INDEX	200, 210
CUT THROUGH	2 min≥360 °C
HEAT SHOCK	1d, 1/2h≥220 °C
CHEMICAL PROPERTIES	
SOLVENT TEST	5H

MAIN USES

For self-supporting windings.
Avoids varnish impregnations.
Suitable when special thermal resistance is required.

STANDARD DIAMETERS

CABLEL ENAMELLED COPPER WIRES

ACCORDING TO IEC 60317-0-1

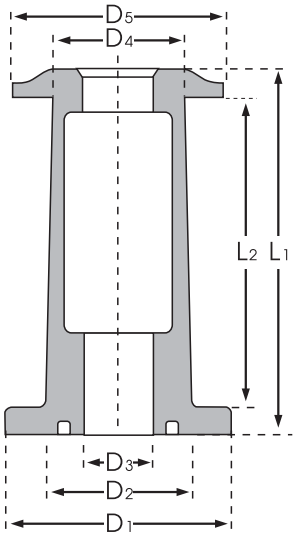
NOMINAL CONDUCTOR DIAMETER	CONDUCTOR TOLERANCE ±	MINIMUM DIAMETER INCREASE		MAXIMUM OVERALL DIAMETER	
		SIMPLE (L)	DOUBLE (2L)	SIMPLE (L)	DOUBLE (2L)
mm	mm	mm	mm	mm	mm
0,071	0,003	0,007	0,012	0,084	0,091
0,080	0,003	0,007	0,014	0,094	0,101
0,090	0,003	0,008	0,015	0,105	0,113
0,100	0,003	0,008	0,016	0,117	0,125
0,112	0,003	0,009	0,017	0,130	0,139
0,125	0,003	0,010	0,019	0,144	0,154
0,140	0,003	0,011	0,021	0,160	0,171
0,160	0,003	0,012	0,023	0,182	0,194
0,180	0,003	0,013	0,025	0,204	0,217
0,200	0,003	0,014	0,027	0,226	0,239
0,224	0,003	0,015	0,029	0,252	0,266
0,250	0,004	0,017	0,032	0,281	0,297
0,280	0,004	0,018	0,033	0,312	0,329
0,315	0,004	0,019	0,035	0,349	0,367
0,355	0,004	0,020	0,038	0,392	0,411
0,400	0,005	0,021	0,040	0,439	0,459
0,450	0,005	0,022	0,042	0,491	0,513
0,500	0,005	0,024	0,045	0,544	0,566
0,560	0,006	0,025	0,047	0,606	0,630
0,630	0,006	0,027	0,050	0,679	0,704
0,710	0,007	0,028	0,053	0,762	0,789
0,750	0,008	0,030	0,056	0,805	0,834
0,800	0,008	0,030	0,056	0,855	0,884
0,850	0,009	0,032	0,060	0,909	0,939
0,900	0,009	0,032	0,060	0,959	0,989
0,950	0,010	0,034	0,063	1,012	1,044
1,000	0,010	0,034	0,063	1,062	1,094
1,060	0,011	0,034	0,065	1,124	1,157
1,120	0,011	0,034	0,065	1,184	1,217
1,180	0,012	0,035	0,067	1,246	1,279
1,250	0,013	0,035	0,067	1,316	1,349
1,320	0,013	0,036	0,069	1,388	1,422
1,400	0,014	0,036	0,069	1,468	1,502
1,500	0,015	0,038	0,071	1,570	1,606
1,600	0,016	0,038	0,071	1,670	1,706
1,700	0,017	0,039	0,073	1,772	1,809
1,800	0,018	0,039	0,073	1,872	1,909
1,900	0,019	0,040	0,075	1,974	2,012
2,000	0,020	0,040	0,075	2,074	2,112
2,120	0,021	0,041	0,077	2,196	2,235
2,240	0,022	0,041	0,077	2,316	2,355
2,360	0,024	0,042	0,079	2,438	2,478
2,500	0,025	0,042	0,079	2,578	2,618
2,650	0,027	0,043	0,081	2,730	2,772
2,800	0,028	0,043	0,081	2,880	2,922
3,000	0,030	0,045	0,084	3,083	3,126
3,150	0,032	0,045	0,084	3,233	3,276
3,350	0,034	0,046	0,086	3,435	3,479
3,550	0,036	0,046	0,086	3,635	3,679
3,750	0,038	0,047	0,089	3,838	3,883
4,000	0,040	0,047	0,089	4,088	4,133
4,250	0,043	0,049	0,092	4,341	4,387
4,500	0,045	0,049	0,092	4,591	4,637
4,750	0,048	0,050	0,094	4,843	4,891
5,000	0,050	0,050	0,094	5,093	5,141

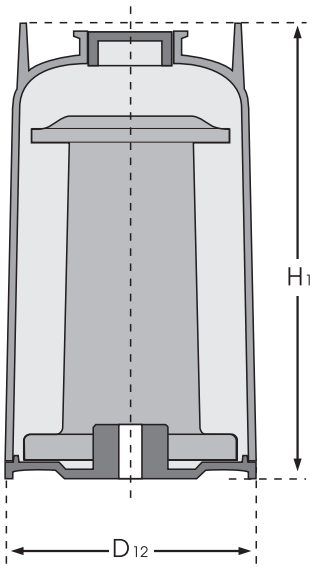
■ in between diameters up to 6 mm after order

PACKING

CONICAL REELS ACCORDING TO DIN 46383, IEC 264 - 3

Type of reel	Average content of wound wire (kg)	Dimensions (mm)								
		D_1	D_2	D_3	D_4	D_5	L_1	L_2	D_{12}	H_1
250/400	45	250	160	100	140	236	400	335	315	500
315/500	90	315	200	100	180	300	500	425	400	630
400/630	180	400	250	100	224	375	630	530	500	800
500/800	380	500	315	100	280	475	800	670	580	1000





CYLINDRICAL REELS ACCORDING TO DIN 46399, IEC 264 - 2

Type of reel	Wire range (mm)	Average content (kg)	Dinensions (mm)				
			Flange (D1)	Barrel (D2)	Bore (D3)	Width (L1)	Traverse (L2)
160	0.07-0.15	6.5	160	100	22	160	128
200	0.16-0.56	11	200	125	22	200	160
250	0.63-1.90	20	250	160	22	200	160
355	2.00-5.00	40	355	224	36	200	160
500	2.00-5.00	100	500	315	36	250	180