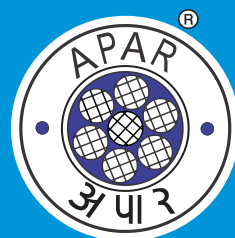


“Tomorrow’s Progress Today”



APAR INDUSTRIES LTD.
(Unit: Uniflex Cables)



APAR INDUSTRIES LIMITED (Unit: Uniflex Cables)
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MANUFACTURED BY: APAR INDUSTRIES LTD. (Unit: Uniflex Cables)

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APAR

UNICAB
ANUSHAKTI
MAHASHAKTI

THE FUTURE OF WIRING IN INDIA

WIRES & CABLES THAT WITHSTAND HIGH TEMPERATURES
WIRES & CABLES WITH INCREASED CURRENT CAPACITY





COMPANY PROFILE

APAR INDUSTRIES LTD - founded by Late Shri Dharmsinh D Desai, in the year 1958 is one among the best established Companies in India; operating in the diverse field of Electrical, Metallurgical and Chemical Engineering. Over the years, it has evolved to be a Rs 5500 Crore diversified Company, offering value added products and services in Power Transmission Conductors, Transformer Oils & Specialty Oil Products and Power Distribution & Telecommunication Cables after merger of Uniflex Cables Ltd. with Apar Industries Ltd. Apar Industries is the 5th largest manufacturer of Transformer Oils in the world. Apar is also amongst the largest producer and exporter of Conductors, exporting to over 65 countries in the world; having a full range of ACSR and AACR upto 1200 kV and has recently introduced state-of-the-art High Temperature Conductors.

Apar Industries Ltd (Unit: Uniflex Cables) has its plants at Umbergaon and Khatalwada in South Gujarat (150 kms from Mumbai) for manufacture of Energy & Telecommunication Cables. Apar has also set up a state-of-the-art 1.5 MeV and 3.0 MeV Electron Beam Accelerators along with suitable handling systems.

POWER CABLES

This includes XLPE Cables upto to 33 kV besides LV PVC and specialty Cables. The Company has a state-of-the-art manufacturing facility to manufacture Medium Voltage XLPE cables on a high precision CCV line from Royale Systems, USA. The Company manufactures cables as per Indian as well as International standards. The facility is also equipped to manufacture LT and MV Aerial Bundled Cables upto and including 33 kV, Instrumentation pairs and Triad Cables, Control Cables, PVC Flexible cables for Industrial, Building and Panel wiring. The Company has also introduced Medium Voltage Covered Conductors and Anti Power Theft Cables and 105°C Irradiated Power Cables.

ELASTOMER CABLES

The Company enjoys a pioneer status in manufacture of Elastomer Cables in India and has been supplying these types of cables since 1981 to various clients like Railways, Ship-Wiring Industry, Steel and Cement Plants, Nuclear Plants, Windmills, Solar and Mining Sectors. The plant is capable to process various types of compounds like EPR, EPDM, PCP, CSP, CPE, Silicon, EVA Halogen free and Fire Resistant non Toxic Compounds. We offer cables with ATC, GI wire braid, Synthetics or Textile Yarn and Glass Fibre. Our range includes Trailing Cables, Locomotive Cables, Ship Wiring Cables, Wind Mills Cables, Solar Cables, Welding Cables, Mining Cables, LFH Cables & Wires, Fire Survival and Composite Cables having integrated Fibre Optic core.

OPTIC FIBRE CABLES

We manufacture High Performance Data and Video Transmission cables which includes 2F to 24F Unitube and 2 F to 432 F Loose tube.

Also manufactures Ribbon Cables of Unitube 144F and Multitube 588F. The cables are manufactured in various configurations like Unarmoured, Armoured, ADSS, Figure 8, FTTH etc with Single mode or multimode fibers. These cables are extensively deployed with Telecom Operators like BSNL/BBNL, Reliance Infocom, Reliance Jio, ACT and several multi service operators. Cables can be offered to any National or International Specifications.

ELECTRON BEAM IRRADIATION FACILITY

State-of-the-art Electron Beam Accelerators (1.5 MeV and 3 MeV) have been installed in Western India at Kathalwada located about 20 kms away from Vapi, Gujarat. We have a complete range of handling system for irradiation of various types of Electrical and Automotive Cables & Wires, PE sheets, Polymeric Tubes and Pipes, Heat Shrink Products, Gems and Diamonds, Medical product Sterilisation, reprocessing of PTFE scrap etc. The Electron Beam Cross Linked wires and cables offer superior performance in demanding application and in extreme environments. Our high performance EBXL cables have been type approved by renowned organizations like TUV, DQAN, DRDO, RDSO, Railways, ABS, NPCIL etc.

SPECIALITY CABLES

We offer various types of Hybrid / Specialty Cables. We have a diverse experience to design and offer specialized cables like Trailing Cables with Power/Control/Shielded cores, CRD cables with integrated Multimode Optical Fibre Cables, Underwater subsea cables, Festoon Cables, 11 kV landline Mining cables for Stacker/Reclaimer etc. We have to our credit the development of cables like Heavy TOW Cables and Light TOW cables for subsea applications, Torpedo cables (Fibre Optic Cables for Naval applications), Festoon Fibre Optic Cables for Large cranes, Elastomeric Cables upto 33 kV for Mining and Windmill applications, Aluminium Conductor Elastomer Cables, Electron Beam Irradiated Cables for Railway Locomotive and Ship Wiring, CRD cables with integrated Fibre Optic for ladel cranes for steel industry, Solar PV Cables for DC applications and Solar Cables with Rodent Resistance, Underwater Sub-sea Power Cables and Sub-Sea Fibre optic cables.

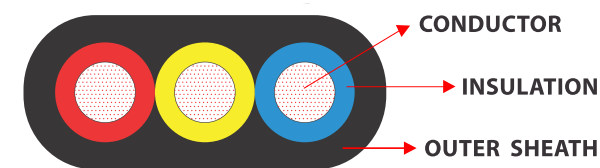
APAR ANUSHAKTI WIRES / MAHASHAKTI CABLES

Developed in-house, Apar Anushakti Wires and Mahashakti cables, are with specially developed PVC Compounds of 105°C rating and XLPO compound respectively, enabling protection against Electric Shock/Short Circuit, High Oxygen and Temperature Index for Fire Retardancy. These wires & cables can easily take long term overload of over 40%. The insulation does not melt when in contact with any hot object and is non softening, infusible, non dripping, high insulation resistance, self extinguishing and do not catch fire, better ageing properties and longer operating life.



Three Core Flat Cables - size, dimensions and rating (for reference) as per IS 694/2010

Construction Drawing



Description	Apar Unicab	Apar Mahashakti E-Beam Cables
Conductor	99.97% Plain annealed flexible copper (Class 5)	
Insulation	PVC Type A	XLPO
Outer sheath	PVC Type ST2	Special Elastomer
Temperature withstand capacity	70°C	120°C

Nominal Area of Conductor	Number/ Nominal Diameter of wire	Thickness of insulation (Nominal)	Nominal thickness of sheath	Approx Nominal Dimensions		Conductor Resistance (Max) per km @ 20°C	Current carrying capacity 2 cables, single phase	
				Width	Thickness		Apar Unicab	Apar Mahashakti E-Beam Cables
Sq mm	mm	mm	mm	mm	mm	Ohms	Amps	Amps
1.5	30/0.25	0.6	0.9	10.3	4.9	13.3	14	21
2.5	50 / 0.25	0.7	1.0	12.6	5.8	7.98	18	27
4	56/0.30	0.8	1.0	14.8	6.6	4.95	26	39
6	84/0.30	0.8	1.2	16.95	7.4	3.30	31	46
10	140/0.3	1.0	1.4	24.2	10.2	1.91	42	63
16	226/0.3	1.2	1.4	26.2	10.9	1.21	57	85
25	354/0.3	1.4	2.0	33.4	14.2	0.780	72	105
35	495/0.3	1.4	2.0	37.4	15.8	0.554	90	130
50	703/0.3	1.5	2.2	42.9	17.8	0.386	115	165

Note:

Technical data in case of Mahashakti shall be available on request

Three Core Round - XLPO Insulated and Double Sheathed Cables Size, dimensions and rating (for reference)

Nominal Area of Conductor	Number/ Nominal Diameter of wire	Thickness of insulation (Nominal)	Thickness of inner sheath	Thickness of outer sheath	Overall Diameter	Conductor Resistance (Max) per km @ 20°C	Apar Unicab	Apar Mahashakti E-Beam Cables
			Approximate	Nominal	Approximate			
Sq mm	mm	mm	mm	mm	mm	Ohms	Amps	Amps
1.5	30/0.25	0.7	0.4	1.2	10.5	13.3	14	21
2.5	50 / 0.25	0.8	0.4	1.2	11.9	7.98	18	27
4	56/0.3	0.8	0.4	1.2	13.0	4.95	26	39
6	84/0.3	0.8	0.4	1.4	14.6	3.30	31	46
10	140/0.3	1.0	0.6	1.4	18.7	1.91	42	63
16	226/0.3	1.0	0.8	1.4	21.5	1.21	57	85
25	354/0.3	1.2	0.8	1.6	25.7	0.780	72	108
35	495/0.3	1.2	1.0	1.6	28.6	0.554	90	135

Note:

The number of strands and strand diameter shall be such that it meets the conductor resistance as per relevant IS.



General test requirements for Flame Retardant Cables

TEST	Description of Test requirement	Specification	Specified Values
Critical Oxygen Index	To determine the percentage of Oxygen required to support combustion of insulating material	ASTM-D:2863 IS: 10810 Part-58	≥ 29
Temperature Index	To determine the temperature at which normal 21% Oxygen content in air that will support combustion of insulating material	ASTM-D:2863 IS: 10810 Part-64	≥ 250°C
Smoke Density	To determine the (Light Transmission) visibility during fire of insulating material	ASTM-D 2843	Light Transmission ≥ 60 % (Avg)
Acid Gas Generation	To ascertain the HCL acid gas released by insulating material during fire	IEC 60754-I	≤ 20 % (by weight)
Circuit Integrity / Fire Survival Test	To determine the ability of cable to maintain the circuit in flame at 750°C for at least 3 hours (950°C for 3 hours as per BS: 6387)	IEC 60331-21	Cable shall withstand 750°C flame temperature and maintains the circuit uninterruptedly. Also for 950°C as per CWZ can be offered

Comparison of key features of various category of fire safety cables

	Ordinary PVC	FR	EBXL-FR	FR-LSH	LSOH	FIRE SURVIVAL
Test	Specified Values	Specified Values	Specified Values	Specified Values	Specified Values	Specified Values
Critical Oxygen Index	23 %	≥ 29 %	≥ 30 %	≥ 29 %	≥ 30 %	≥ 30 %
Temperature Index	160°C	≥ 250°C	≥ 250 %	≥ 250°C	≥ 280°C	≥ 280°C
Smoke Density	≈ 85 %	≈ 75 %	≈ 70 %	< 60 %	< 20 %	< 20 %
Acid Gas Generation	≈ 50%	≈ 40 %	< 20 %	< 20 %	< 0.5 %	< 0.5 %
Fire Survival Test	NA	NA	NA	NA	NA	IEC 60331-21

Selection guide for Three Core Flat Cables for submersible applications

HP vs Current rating																		
HP	5	7.5	10	12.5	15.5	17.5	20	25	30	35	40	45	50	55	60	65	70	80
Amp	7.5	11	14.9	18.9	22.5	25.2	28.4	35.6	42.3	50.4	58.1	62.1	67.5	73.8	81	87.3	93.6	100.8

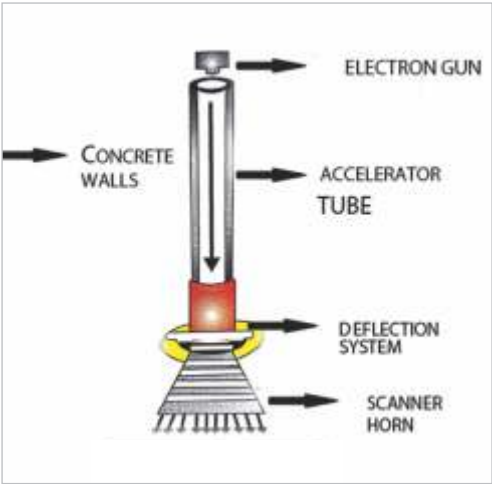
Derating factors: Based on the various ambient temperatures, the current carrying capacities are to be multiplied by the factors given below

Ambient temperature °C	30	35	40	45	50
Rating Factor	1.09	1.04	1.00	0.95	0.77

E-BEAMTECHNOLOGY:

Radiation has been used in various fields such as nuclear physics, chemistry, medical and isotopes ever since X-Ray was first discovered by German engineer and physicist - Wilhelm Conrad Röntgen in 1895. After radiation, cross-linking phenomena was experimented on polyethylene in 1952. Presently over 1800 (estimated) electron accelerators based processing units are in operation worldwide with 650 units in North America, 380 in Japan, 240 in China, 6 in India – of which Apar Industries has two such machines

As the name implies, Electron Beam is the flow of high energy electrons and the energy is obtained as kinetic energy when the electrons move in a high electric field. The radiation processing by Electron Beam is a Physical reaction caused in a material by an exposure to its irradiation. The E-Beam Irradiation is a process in which the polymer is exposed to an energetic, highly changed stream of electrons. Polymers are made of hydrocarbons having C = C as strong bond and C - H as weak bond. The principal effect of high velocity electrons is to break the existing weak hydrogen bonds & create a free radical in the polymeric insulation materials. Similarly another electron penetrates and knocks off another H and creates another free radicals. These two free radicals react with each other and form a double bond which we call as cross-links between molecules. This cross linking significantly improves Thermal, Mechanical and Chemical properties of the polymer i.e. insulation & sheathing materials. Electron Beam Irradiation (for cross linking) makes the polymer dimensionally more stable under the influence of heat, resistant to chemicals, solvents and high temperatures, tough and more abrasion resistant. The conventional methods of cross-linking based on thermally induced “chemical cross-linking”, have drawbacks that it is carried out at high temperature which does affect the life of polymers due to degradation caused by high temperature exposure whereas the electron Beam cross-linking is carried out at room temperature. With the electron-beam accelerators, the insulation materials can be cross-linked within few seconds. The homogenous irradiation ensures that the homogenous cross-linking is achieved. The term irradiation is simply the act of applying radiation (or radiant energy) to some material.



The Electron Beam Cross Linked (EBXL) wires and cables offer superior performance in demanding application and in extreme environments. Some of the improved Mechanical Properties are:

- Improved Mechanical Properties
- Tensile strength increases
- Thermal Resistance
- Flame Propagation Resistance
- Abrasion Resistance
- Stress Cracking Resistance
- Deformation Resistance



Abreast to the technologies worldwide, Apar’s “Anushakti and Mahashakti” cables & wires are manufactured with EB technology and exhibit properties such as...

- High temperature withstanding capacity upto 105°C / 120°C
- High current carrying capacity
- Prevents short circuit
- Heat and melt resistant and thereby solder iron resistant
- Passes the hot deformation Test (80 ± 2°C for 6 hours)
- Reduced smoke
- Reduced toxicity
- Longer operating life span

Apart from the above they are environment friendly safe wires, ideal for the high end projects



Single Core, Unsheathed Flexible Cables - size, dimensions and rating (for reference) as per IS 694/2010

Nominal Area of Conductor	Number/ Nominal Diameter of wire	Thickness of insulation (Nominal)	Approx Overall Diameter	Conductor Resistance (Max) per km @ 20°C	Current carrying capacity			
					Apar Unicab		Apar Anushakti E-Beam Cables	
					In conduit / trunking	Unenclosed-clipped directly to surface or on cable tray	In conduit / trunking	Unenclosed-clipped directly to surface or on cable tray
Sq mm	mm	mm	mm	Ohms	Amps	Amps	Amps	Amps
0.75	24/0.20	0.6	2.20	26.00	6	7	9	14
1	32/0.20	0.6	2.40	19.50	11	12	16	24
1.5	30/0.25	0.7	2.85	13.30	13	16	20	32
2.5	50/0.25	0.8	3.50	7.98	18	22	27	44
4	56/0.30	0.8	4.00	4.95	24	29	36	58
6	84/0.30	0.8	4.50	3.30	31	37	47	74
Max current rating in Amperes								
10	80/0.4	1.0	6.30	1.91		46		83
16	126/0.4	1.0	7.25	1.21		62		105
25	196/0.4	1.2	8.80	0.780		80		128
35	276/0.4	1.2	10.35	0.554		102		143
50	396/0.4	1.4	12.25	0.386		138		194
70	360/0.5	1.4	13.90	0.272		214		300
95	475/0.5	1.6	15.90	0.206		260		364
120	608/0.5	1.6	17.80	0.161		305		427
150	750/0.5	1.8	19.80	0.129		355		497
185	925/0.5	2.0	22.00	0.106		415		581
240	1221/0.5	2.2	26.00	0.0801		500		700

Note:

1. The number of strands and strand diameter shall be such that it meets the conductor resistance as per relevant IS.
2. Available in packing lengths of 90m / 180m or as per requirement
3. Available with FR / FR - LSH / Zero halogen cables / RoHS

Description	Apar Unicab	Apar Anushakti E-Beam Cables
Conductor	99.97% Plain annealed flexible copper (Class 5)	
Insulation	FR PVC	EBXL FR PVC
Temperature withstand	70°C	105°C



Multiple Core Round Flexible Cables - size, dimensions and rating (for reference)

Nominal Area of Conductor	Number/ Nominal Diameter of wire	Thickness of insulation (Nominal)	Nominal thickness of sheath			Approx Overall Diameter			Conductor Resistance (Max) per km @ 20°C	Current carrying capacity 2 cables, single phase	
			2-core	3-core	4-core	2-core	3-core	4-core		Apar Unicab	Apar Mahashakti E-Beam Cables
Sq mm	mm	mm	mm	mm	mm	mm	mm	mm	Ohms	Amps	Amps
0.75	24/0.20	0.6	0.9	0.9	0.9	6.7	7.2	7.9	26.00	7	10
1	32/0.20	0.6	0.9	0.9	0.9	7.0	7.5	8.1	19.50	12	17
1.5	30/0.25	0.6	0.9	0.9	1.0	7.6	8.1	8.9	13.30	15	21
2.5	50/0.25	0.7	1.0	1.0	1.0	9.1	9.6	10.5	7.98	20	28
4	56/0.30	0.8	1.0	1.0	1.0	10.5	11.3	12.4	4.95	27	38
6	84/0.30	0.8	1.1	1.2	1.2	11.5	12.5	14.0	3.30	31	43
10	80/0.4	1.0	1.3	1.4	1.4	16.5	17.5	19.5	1.91	39	55
16	126/0.4	1.0	1.4	1.4	1.4	18.5	20.0	22.0	1.21	53	74

Note:

1. The above tables are as per IS 694/2010 for Unicab Cables
In case of Mahashakti the data shall be available on request
2. The number of strands and strand diameter shall be such that it meets the conductor resistance as per relevant IS.
3. Available in packing lengths of 100m or as per requirement
4. Available with FR / FR - LSH / Zero halogen cables / RoHS

Description	Apar Unicab	Apar Mahashakti E-Beam Cables
Conductor	99.97% Plain annealed flexible copper (Class 5)	
Insulation	PVC	XLPO
Outer sheath	FR PVC	Special Elastomer
Temperature withstand capacity	70°C	120°C

FIRE SURVIVAL / FIRE RESISTANCE CABLES

Apar manufactures cables (brand: Unicab) that enhance SAFETY standards. Such cables survive /operate for a particular period in emergencies / fire hazards where faster evacuation and minimal firefighting efforts, besides maintaining emergency lighting and fire protection circuits is of prime importance. Fire Survival Cables (FS) or Fire Resistance Cables are designed to continue to operate and withstand temperature upto 950°C for 3 hours, without electrical breakdown at rated voltage. These FS cables with LSOH (Low Smoke Zero Halogen) insulation that emits minimal smoke and limits acid gas generation, which is a hazardous and toxic. They are also known as circuit integrity cables, since these are used in circuits that must be able to maintain their integrity during a fire.

Apar manufactures these cables with LSOH (Low Smoke Zero Halogen) insulation that emits minimal smoke and limits acid gas generation that helps faster evacuation and firefighting efforts, besides maintaining emergency lighting and fire protection circuitry. Apar possess the coveted RDSO E14/40 approval for use of its fire survival cables for Metro coach wiring.

The application...

- Fire alarm systems
- Emergency lighting systems
- Fire lifts
- Equipments that need safe switching off

Ideally installed in...

- Industries / Factories
- High-rise residential towers
- Hotels / Malls / Theaters / Hospitals
- Railway stations / Metro rail / Airports

Standards to which FS cables are manufactured...

- IEC 60331-21
- BS:6387 including the CWZ condition

