



**HAVELLS**



# ENVIREMENT FRIENDLY



PVC Insulated Industrial Grade Flexible Cable Catalogue 2017-18



ROHS Compliant  
Certified by Bureau Veritas



Heat Resistant  
Flame Retardant



Anti Termite  
and Anti Rodent



High Insulation  
Resistance



# NABL

## NABL Testing Laboratory

Havells India Ltd has emphasised on product quality by demonstrating quality evaluation for wires & cables at international level by obtaining NABL (National accreditation board for calibration & testing laborites) for testing & DSIR recognised technology center at cable division. NABL is an autonomous body which is working under the Department of Science & Research Industry (Govt. of India).

National accreditation board for testing and calibration to boast of, it is the first-of-its-kind private facility in india.The lab fully equipped as per international standard to test XLPE cables upto 66 kV grade, PVC cables, Flexible cables, aerial bunched cables, photovoltaic cables, instrumentation cables, fire survival cables.

The lab cover indian standards, British standard, International electrotechnical commission (IEC) standards, TUV-Germany standards, American society for testing and material (ASTM) standards and institute of electrical & electronics engineers (IEEE) standards along with eight type of different fire test to demonstrate fire-retardant behavior in cable.





HAVELLS

**The Cable Division**

Located in midst of tranquil hills of Aravali, is one of India's largest Cables plant by Havells India Limited. Set up in 1996, the plant today manufactures all types of cables on some of the most modern, laser controlled automated machines, using best raw material from primary manufacturers ensuring best quality.

Innovation is one of the core values and way of life at Havells. Moving with this philosophy, the company has invested in extensive R&D to develop best-in-class products and address the ever changing requirements of our discerning customers. Knowing well about critical application of our products, safety of our customers is of paramount importance to us. Our R&D team continuously strives to develop most innovative and safe products. Our engineers have developed special insulating compounds that have halogen free content and high on oxygen index. With many such innovations, Havells today offers a wide range of products that are highly insulated, anti-termite & anti rodent repulsion, heat resistant, fire retardant and eco-friendly.



## HRFR with S<sup>3</sup> (Higher Load with complete safety)

The Introduction of Havells HRFR insulation with advanced S<sup>3</sup> technology, now offers higher current carrying capacity and heat resistant properties suitable for operation at high temperatures. Our commitment towards environment friendly nature with features as High insulation resistance, RoHS compliance, anti-termite and anti-rodent features makes it the ideal Wire.



### About HR

Current carrying capacity of a wire is defined as how much load a conductor can carry (In amperage). When the current flows through the conductor a certain level of heat generates which can further increase up to the melting temperature of the insulation or insulating material.

Havells wires offer insulation with **(HR)** Heat resistant along with Flame Retardant properties which are suitable to bear a temperature **up to 85°C** whereas ordinary PVC is suitable only up to 70°C and due to this feature HAVELLS Wires are capable to **carry Higher current and ensures better electrical and mechanical performance at higher temperatures. The HRFR property is available from 0.5 sq mm to 4.0 sq mm in single core.**

### About S<sup>3</sup>

This advanced S<sup>3</sup> technology safeguard us and environment from harmful substances such as lead, mercury, cadmium and chromium, Havells Wires with S3 technology reduces current leakage to protect from any serious damage and installations in the house. Another benefit of S<sup>3</sup> is that Havells Wires comes with termite and rodent repulsion properties to protect insulation from the damage which can be caused by rodents & termites, which can lead to a short circuit and can harm to property and human life.

## HIGH INSULATION RESISTANCE

In all cables, there is generally leakage of current from the live conductor through the insulation. In case of inferior quality of insulation, the current leakage increases. This is unsafe and can cause damage to installations as well as become a threat to life.

**Low Leakage Current** – Havells wires have an allowable current-leakage limit that is 50 times lower than the prescribed international safety norms.

International safety standards specifies that current leakage limit in hand held equipment is considered to be safe if the value is not more than 0.75 mA. Havells cables, with S<sup>3</sup> technology, incorporate insulation of high quality which ensures that current leakage level is as low as 0.01 mA, which is much below the prescribed limit. Havells cables have been certified by the Central Power and Research Institute (CPRI) - a premier laboratory recognised by the Government of India.

Nominal area of conductor	Leakage current (m Amps)
0.50	0.008
0.75	0.009
1.00	0.009
1.50	0.010
2.50	0.011
4.00	0.013
6.00	0.015



**Safety from electrical shocks** – Electric shock occurs when a body-part comes in contact with a bare conductor of poor insulated wire. Higher insulation resistance protects against electric shock.



## RoHS COMPLIANT

Release of certain harmful substances such as lead, mercury, cadmium and chromium etc. in the plastics/equipment are dangerous to the environment and health. European Union has adopted a directive on the restriction of the use of certain hazardous substances in electrical and electronics equipment commonly referred to as Restriction of Hazardous Substances directive or RoHS.

Havells cables with S<sup>3</sup> technology are certified by Bureau Veritas for RoHS compliance as per directive 2006/95/EC. This ensures that release of hazardous substances are eliminated to provide safety for human health and to give us green environment.

An initiative for eco friendly environment by Havells.

## ANTI TERMITE AND ANTI RODENT

Termites and rodents cause extensive damage to paper, wood, plastic etc. In case of electrical installation, damaged caused by above pests may lead to short circuit which can become a cause for a major disaster, loss of property and human life. Havells cables with S<sup>3</sup> technology provide insulation with termite and rodent repulsion properties. Certification regarding the above has been obtained from the Central Power and Research Institute (CPRI).



## BEST COPPER USED

Havells wire use ETP grade annealed copper which is more than 99.95% pure and therefor ensures 101% conductivity (IACS).

**ANNEALED COPPER ETP GRADE  
101% CONDUCTIVITY (IACS) USED**

**Life Line Plus S<sup>3</sup>**  
**Single Core HRFR PVC Insulated Industrial Grade Copper Conductor**  
**(Unsheathed) Flexible Cables, 1100 Volts**

Basic Code	Nominal Cross Sectional area of conductor	Number/ Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Max. Conductor Resistance per KM at 20°C
					Conduit / Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Line Plus (HRFR)	sq. mm.	mm	mm	mm	Amps	Amps	Ohms
WHFFDN...A1X50	0.5	16/0.2	0.6	2.1	4	4	39.00
WHFFDN...A1X75	0.75	24/0.2	0.6	2.3	8	8	26.00
WHFFDN...A11X0	1.0**	14/0.3	0.7	2.7	12	13	18.10
WHFFDN...A11X5	1.5**	22/0.3	0.7	3.0	14	18	12.10
WHFFDN...A12X5	2.5**	36/0.3	0.8	3.6	20	24	7.41
WHFFDN...A14X0	4.0	56/0.3	0.8	4.1	26	32	4.95
WHFFDN...A16X0	6.0	84/0.3	0.8	4.6	34	41	3.30

...Fill the colour code i.e. B = Blue **B** / K = Black **K** etc...

Note: Available in 90 metres & 180 metres length in carton packaging.

\*\*Conductor Shall be class-II for 1.0, 1.5 & 2.5 Sqmm & for other size shall be of class V as per IS:8130.

\*The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria.

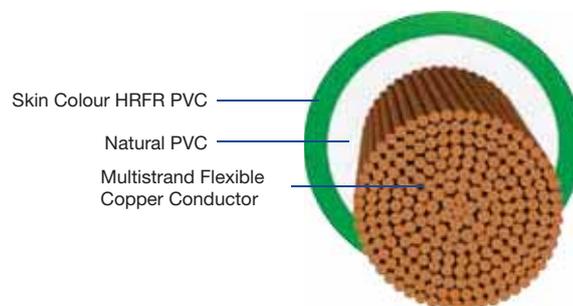
**Construction :-**

**Conductor :** Plain annealed copper conductor as per IS:8130

**Insulation :** Primary - Natural HR PVC with FR property  
 Secondary - Skin colour coated HR PVC with FR property

**Colour :** Red/Yellow/Blue/Black/Green

Any other colour on specific request can also be supplied.



**Life Line Plus S<sup>3</sup>**  
**Single Core HRFR PVC Insulated Industrial Grade Copper Conductor**  
**(Unsheathed) Flexible Cables, 1100 Volts**

Nominal Cross Sectional area of conductor	Number/ Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Approx. Overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Max. Conductor Resistance per KM at 20°C
				Unenclosed Clipped directly to a surface or on cable trays	Amps	
sq. mm.	mm	mm	mm	Amps	Ohms	
10	80/0.4	1.0	6.1	51	1.91	
16	126/0.4	1.0	7.0	69	1.21	
25	196/0.4	1.2	8.6	89	0.780	
35	276/0.4	1.2	9.7	113	0.554	
50	396/0.4	1.4	11.5	153	0.386	
70	360/0.5	1.4	13.0	238	0.272	
95	475/0.5	1.6	15.1	289	0.206	
120	608/0.5	1.6	16.6	339	0.161	
150	750/0.5	1.8	18.5	394	0.129	
185	925/0.5	2.0	20.4	461	0.106	
240	1221/0.5	2.2	23.2	555	0.0801	
300	1525/0.5	2.4	26.0	649	0.0641	
400	2013/0.5	2.6	30.0	771	0.0486	
500	2310/0.5	2.8	33.0	818	0.0384	
630	3090/0.5	2.8	38.0	916	0.0287	

...Fill the colour code i.e. B = Blue  $\bar{B}$  / K = Black  $\bar{K}$  etc...

Note: Conductor as per class V of IS : 8130 confirming to IS : 694. 100 Mtr in polywrap packing & in bigger packing on request"

\*The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria. Progressive sequential length marking on every meter.

**Construction :-**

**Conductor :** Plain annealed copper conductor as per IS:8130

**Insulation :** Primary - Natural PVC with FR property  
 Secondary - Skin colour coated PVC with FR property

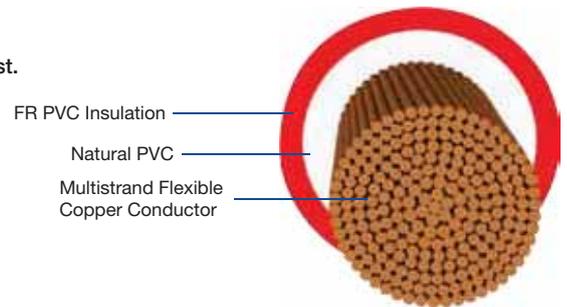
**Note :** 25 sq. mm and above will be in unicolour FR PVC

**Note :** 70 sq. mm and above are available in wooden drums

**Colour :** Red/Yellow/Blue/Black/Green

Any other colour on specific request can also be supplied subject to economical run.

**Note :** Single core PVC insulated Stranded Copper Conductor available on request.



**Life Guard FR-LSH**

FRLSH was developed and introduced for commercial building and specially for those buildings where exits and ventilation is restricted (Like - Cinema Halls), being in case of fire in these types of building most of the people become victims due to suffocation and non-visibility which occurs due to burning of PVC because PVC emits lots of black smoke and toxic gases while burning. Therefore FRLSH insulation was developed in a way that while burning of PVC having FRLSH feature should emit lesser smoke and toxic gases (halogen).

**Safety**

Havells FR-LSH flexible cables are made from specially formulated insulation that restricts toxic gases and smoke providing protection for human safety.

**High oxygen Index**

The oxygen index is 30% for FRLSH insulation .i.e. the Havells FRLSH insulation can catch the flame only if oxygen level in atmosphere or air is more than 30% whereas it known fact that in atmosphere oxygen level is 21% only. Higher the index value, greater the non-combustibility.

**Self-Extinguishing Property**

Havells FR-LSH flexible cable have self-extinguishing property which do not allow the fire to spread.

**Life Guard  
 Single Core FR-LSH PVC Insulated Industrial Grade Copper Conductor  
 (Unsheathed) Flexible Cables, 1100 Volts**

Basic Code	Nominal Cross Sectional area of conductor	Number/Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Max. Conductor Resistance per KM at 20°C
					Conduit/ Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Guard (FR-LSH)	sq. mm.	mm	mm	mm	Amps	Amps	Ohms
WHFFFN...A11X0	1.0**	14/0.3	0.7	2.7	11	12	18.10
WHFFFN...A11X5	1.5**	22/0.3	0.7	3.0	13	16	12.10
WHFFFN...A12X5	2.5**	36/0.3	0.8	3.6	18	22	7.41
WHFFFN...A14X0	4.0	56/0.3	0.8	4.1	24	29	4.95
WHFFFN...A16X0	6.0	84/0.3	0.8	4.6	31	37	3.30

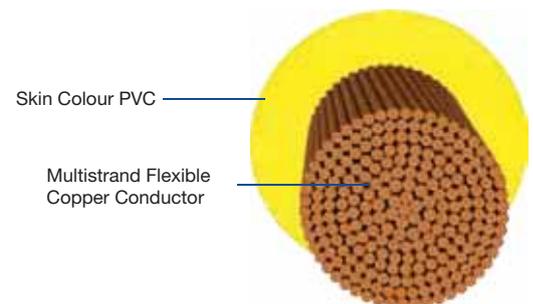
**Construction :-**

**Conductor :** Plain annealed copper conductor as per IS:8130

**Insulation :** Unicolour FRLSH PVC with two longitudinal line"

**Colour :** Red/Yellow/Blue/Black/Green

Any other colour on specific request can also be supplied.



### Life Shield HFFR

A breakthrough from R & D efforts of Havells engineers at the Havells cables plant at Alwar, the special compound is practically halogen-free content and has a very high oxygen index.

Havells HFFR's insulation was developed in keeping in view to have better safety in case fire and with improved conductivity in flexible cable range, being the basic raw- material used to develop this insulation is a special Polymer which requires a temperature up to 280° C. To melt/ burn, which is much higher than a PVC which melts/ burns at 85° C. The better burning temperature defines the higher heat bearing capacity and subsequently it proves the cable will have better conductivity (When current flow from a conductor it generates heat and if insulation has better heat bearing capacity it will improve the conductivity also).

Secondly this insulation have property that while burning it emits only 2% smoke that too transparent and Non- Toxic.

**NON-TOXIC:** An oxygen mask in case of fire – Research shows that maximum casualties in Fire happen due to choking caused by formation of hazardous gases. PVC Flame Retardant Low Smoke and Halogen cables release lesser toxic gases compared to ordinary PVC cables. Smoke generation in case of FRLSH cables is < 60% and release of halogen content is < 20%. Our HFFR (Halogen-free Flame Retardant) cables are practically halogen-free and are 10 times superior to FR-LSH cables as in case of fire release of Hazardous gases is < 0.5%. This ensures that people trapped in fire can breathe easy facilitating better chances of their rescue.

**Environment-Friendly** – Every day thousands of tonnes of Hazardous Halogen gases are released in the environment resulting in depletion of the earth's ozone layer which protects us from cancer causing UV radiations of the Sun - a phenomenon popularly known as Greenhouse Effect. Havells HFFR insulated industrial cables are practically halogen-free and are, therefore, environment friendly, protecting not only you and your family, but also the future generations against the Green House Effect.

### Life Shield Single Core HFFR Insulated Industrial Grade Copper Conductor (Unsheathed) Flexible Cables, 1100 Volts

Basic Code	Nominal Cross Sectional area of conductor	Number/Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Max. Conductor Resistance per KM at 20°C
					Conduit/ Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Shield (HFFR)	sq. mm.	mm	mm	mm	Amps	Amps	Ohms
WHFFZN...A11X0	1.0**	14/0.3	0.7	2.7	11	12	18.10
WHFFZN...A11X5	1.5**	22/0.3	0.7	3.0	13	16	12.10
WHFFZN...A12X5	2.5**	36/0.3	0.8	3.6	18	22	7.41
WHFFZN...A14X0	4.0	56/0.3	0.8	4.1	24	29	4.95
WHFFZN...A16X0	6.0	84/0.3	0.8	4.6	31	37	3.30

**Construction :-**

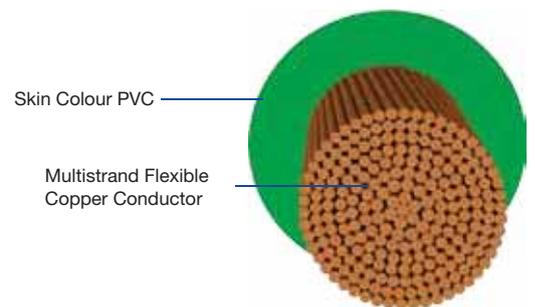
**Conductor :** Plain annealed copper conductor as per IS:8130

**Insulation :** Unicolour FRLSH PVC with two longitudinal line"

**Insulation :** Unicolour polymeric compound with HFFR property

**Colour :** Red/Yellow/Blue/Black/Green

Any other colour on specific request can also be supplied.



Project Packaging 200 meters  
Single Core PVC Insulated Industrial Grade Cables

Innovation is one of the core values and ways of life at Havells.

Moving with philosophy and to meet the rapidly changing consumer requirements, Havells is offering a new range of flexible cable which has been developed for use in applications where enhanced flexibility is required. The new range is in conformance with IS 694.

These wires provide easy of installation and have the best quality due to its electrical, mechanical and thermal properties.

**Features:**

- Enhanced flexibility.
- High bending capacity.
- Ideal for wiring in closed confined spaces.

Basic Code			Nominal Cross Sectional area of conductor	Number/ Nom. Dia of cond. strands*	Thick-ness of Insulation (Nom)	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Max. Conductor Resistance per KM at 20°C
							Conduit / Trunking	Unen-closed clipped directly to a surface or on cable trays	
Lifeline (FR)	Lifeguard (FR-LSH)	Lifeshield (HFFR)	sq. mm.	mm	mm	mm	Amps	Amps	Ohms
WHFFDN...F1X75	WHFFFN...F1X75	WHFNZN...F1X75	0.75	24/0.20	0.6	2.3	7	7	26.00
WHFFDN...F11X0	WHFFFN...F11X0	WHFNZN...F11X0	1.0**	32/0.20	0.7	2.7	10	11	19.50
WHFFDN...F11X5	WHFFFN...F11X5	WHFNZN...F11X5	1.5**	30/0.25	0.7	3.0	12	14	13.30
WHFFDN...F12X5	WHFFFN...F12X5	WHFNZN...F12X5	2.5**	50/0.25	0.8	3.6	17	19	7.98
WHFFDN...F14X0	WHFFFN...F14X0	WHFNZN...F14X0	4.0	56/0.30	0.8	4.1	24	29	4.95
WHFFDN...F16X0	WHFFFN...F16X0	WHFNZN...F16X0	6.0	84/0.30	0.8	4.6	31	37	3.30

...Fill the colour code i.e. B = Blue ... / K = Black ... etc...

Note: Lifeline 200 metres project length is available in polybag packaging.

Lifeguard & Lifeshield 200 metres project length is available in polywrap packaging.

\*\*Conductor Shall be class-V as per IS:8130.

\*The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria.

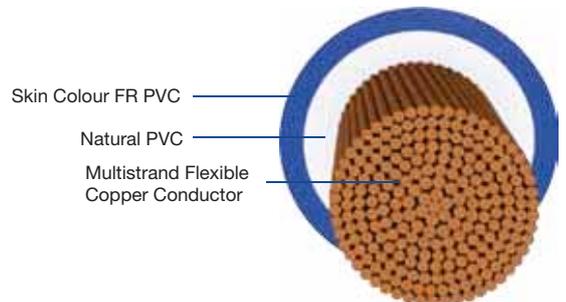
**Construction :-**

**Conductor** : Plain annealed copper conductor as per IS:8130

**Insulation** : Primary - Natural PVC with FR property  
Secondary - Skin colour coated FR property

**Colour** : Red/Yellow/Blue/Black/Green

Any other colour on specific request can also be supplied.



### Common Features of Havells Flexible Cables

#### Energy Efficient Cables

Havells Cable provide highest level of electrical conductivity at in the world at 101% copper conductivity, exceeding the parameter indicated by the International Annealed Copper Standards(IACS).This ensures minimum loss throughout the length of the cable which translated to saving of 2-3%in the electricity bill. It also provides additional protection against voltage fluctuations.

#### Low Voltage Drop

Drop in voltage from point of supply to the end receiving point is called voltage drop. High Voltage drop across conductor is undesirable as it reduces the supplied energy.Havells wires and cables have adequate conductor diameter to ensure low voltage drop and higher efficiency while using electrical equipment.

#### Short-Circuit Protection

Fire caused due to short-circuit is the most common electrical mishap. Short-circuit can be caused by a host of reasons such as faulty wiring, broken insulation due to inferior quality of insulation, circuit-overload, and defective plugs, switches, cords, receptacles, etc. Havells wires ensure superior insulation and conductor characteristics to prevent short-circuit due to wiring.

#### Higher Di-Electric Strength

Di-electric strength represents the magnitude of voltage endured by a test-piece of wire when a specified voltage is passed through it for a specified duration of time. Higher di-electric strength means better electrical characteristics. Havells has an in-house PVC compound manufacturing unit where PVC is blended to offer high di-electric strength to prevent electric breakdown in PVC.

#### Higher Convection Of Heat

Convection is the flow of heat from hot to cool region. Lubricants like wax are required to prevent PVC-melt from sticking to hot extruder surface, which ensures a good heat transfer within the melt. Higher convective heat dissipation capability of Havells S3 technology compound enables Havells cables to carry more current in overload conditions.

#### Water Proof and UV resistant

In many building, construction concrete may itself not be water-tight. Contact with water caused deterioration of the cable's electrical and mechanical properties. Exposure to cable polymer to UV radiation induces chemical processes that cause polymer damage like chalking, loss of impact or tensile strength and a host of other chemical changes. All this can greatly reduce the service life of the cable and expose people to electrical shocks.

Havells has developed a high-quality thermoplastic insulation compound made of single carbon-bond polymer chain. This makes Havells cables impermeable to water, ultra violet (UV) radiation and chemicals, thereby significantly enhancing the life and safety of Havells cable.



Some comparative technical features are given below.

S. No.	Feature	Heat Resistant & Flame Retardant PVC	Flame Retardant Low Smoke & Halogen FR-LSH	Low Smoke HFFR
1	Insulation Material	Spl. FR PVC	Spl. FR-LSH PVC	Spl. Polymer
2	Insulation Property	Good	Good	Very Good
3	Temperature Rating	85°C	70°C	70°C
4	Thermal Stability	Good	Good	Very Good
5	Flame Retardancy	Very Good	Very Good	Excellent
6	Safety during Burning	Good	Good	Excellent
7	Requirement of critical oxygen index as per ASTM D-2863 to catch fire (%)	>30	>30	>35
8	Temperature Index	>250°C	>250°C	>280°C
9	Light Transmission (Visibility) during Cable as per ASTM D-2843 Burning (%)	NA —	>40 Good	>80 Excellent
10	Release of Halogen Gas During Burning (%)	NA —	< 20% Good	< 0.5% Excellent
11	Abrasion Resistance During Installation	Good	Good	Good

### Three Core Flat PVC Insulated Industrial Grade Cable for Submersible use, 1100 Volts

A submersible Pump cable is a specialized product to be used for submersible pumps in a deep well. The area of installation is physically restrictive, and the environment is very hostile. Havells three core submersible flat cable are manufactured for designed for use in underground, under-water or on wet surface.

#### Features of Havells 3 Core Submersible Flat Cable

Outer sheath consists of highly abrasion resistant PVC compound impervious to grease, oil and water etc

Good insulation properties when submerged in water

Excellent mechanical & electrical properties.

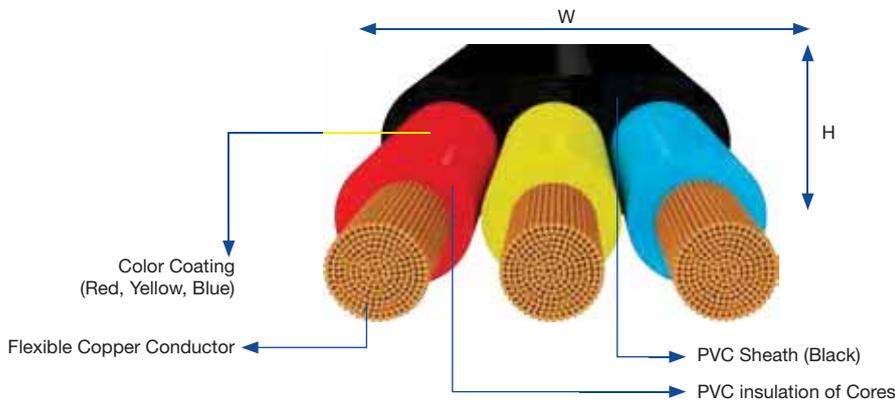
Progressive sequential length marking on every meter.

Basic Code	Nominal area of conductor sq. mm.	*Number/ Size of Wire for each Core mm	Thickness of Insulation (Nom.) mm	Thickness of Sheath (Nom.) mm	SHEATH Approx Overall Dimension		Max Conductor Resistance at 20°C (Max.) Ohm/Km	Current Carrying Capacity at 40°C Amps.
					Width (W) (Nom.) mm	Height (H) (Nom.) mm		
WHPNDSKB 31X5	1.50**	22/0.30	0.6	0.9	10.1	4.7	12.1	13
WHPNDSKB 32X5	2.50**	36/0.30	0.7	1.0	12.2	5.5	7.41	18
WHPNDSKB 34X0	4.00	56/0.30	0.8	1.0	14.6	6.5	4.95	24
WHPNDSKB 36X0	6.00	84/0.30	0.8	1.1	16.2	7.0	3.30	31
WHPNDSKB 3010	10.00	80/0.40	1.0	1.4	20.2	8.5	1.91	42
WHPNDSKB 3016	16.00	126/0.40	1.0	1.4	23.4	9.7	1.21	57
WHPNDSKB 3025	25.00	196/0.40	1.2	2.0	28.5	11.7	0.780	72
WHPNDSKB 3035	35.00	276/0.40	1.2	2.0	32.1	13.0	0.554	90

Note: Available in 500 ± 5% metres packing in drums. Also available in 100 metres packing on request.

\*The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria.

\*\*Conductor shall be class-II for 1.5 and 2.5 Sqmm and for other size shall be of class V as per IS:8130.



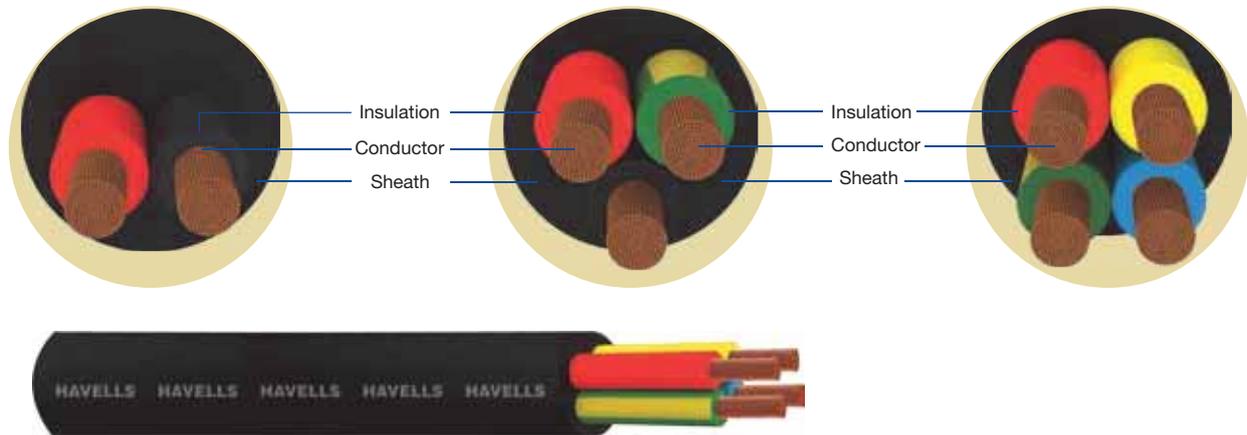
### Multicore Round FR PVC Insulated Industrial Grade Copper Conductor (Sheathed) Flexible Cables, 1100 Volts

“HAVELLS” manufacture and supply premium quality multi core flexible cables with copper conductor for various industrial and domestic applications like electrically operated Machines & Equipment’s (eg. Air-Conditioners/ Refrigerators/ motors etc.)

Special formulated “Polyvinyl Chloride” (PVC) used for insulation and sheath tends to flexibility of cables.

The sheathing material provides resistance to oil, and moisture and superior mechanical strength without losing its flexibility. **These cables can also be made available with FR-LSH & HFFR compound on request.**

Basic Code	Nominal Cross Sectional area of conductor	Number Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Nominal Thickness of Sheath			Appx. Overall Diameter			Current Rating AC	Voltage Drop/ Amp/Meter		Max. Conductor Resistance per KM at 20°C
				2 Core	3 Core	4 Core	2 Core	3 Core	4 Core		DC or Single Phase AC	3 Phase AC	
	sq. mm.	mm	mm	mm	mm	mm	mm	mm	mm	Amps	mV	mV	Ohms
WHMFDSKB_X50	0.5	16/0.20	0.6	0.9	0.9	0.9	6.2	6.5	7.0	4	83	72	39.0
WHMFDSKB_X75	0.75	24/0.20	0.6	0.9	0.9	0.9	6.6	6.9	7.5	7	56	48	26.0
WHMFDSKB_1X0	1.0	32/0.20	0.6	0.9	0.9	0.9	6.9	7.3	7.9	11	43	37	19.5
WHMFDSKB_1X5	1.5	30/0.25	0.6	0.9	0.9	1.0	7.4	7.8	8.7	13	31	26	13.3
WHMFDSKB_2X5	2.5	50/0.25	0.7	1.0	1.0	1.0	8.8	9.4	10.2	18	18	16	7.98
WHMFDSKB_4X0	4.0	56/0.30	0.8	1.0	1.0	1.0	10.2	10.9	11.9	24	11	9.6	4.95
WHMFDSKB_6X0	6.0	84/0.30	0.80	1.1	1.1	1.2	11.5	12.2	13.6	31	8	7	3.30



Basic Code	Nominal Cross Sectional area of conductor	Number Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Nominal Thickness of Sheath					Appx. Overall Diameter					Max. Conductor Resistance per KM at 20°C
				5 Core	6 Core	7 Core	8 Core	10 Core	5 Core	6 Core	7 Core	8 Core	10 Core	
	sq. mm.	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Ohms
WHMFDSKB_X50	0.5	16/0.20	0.6	0.9	0.9	0.9	1.0	1.0	7.8	8.2	8.2	9.4	11.0	39.0
WHMFDSKB_X75	0.75	24/0.20	0.6	0.9	1.0	1.0	1.0	1.1	8.3	9.4	9.4	10.4	11.8	26.0
WHMFDSKB_1X0	1.0	32/0.20	0.6	1.0	1.0	1.0	1.0	1.1	9.0	9.8	9.8	10.9	12.5	19.50
WHMFDSKB_1X5	1.5	30/0.25	0.6	1.0	1.0	1.0	1.1	1.1	9.8	10.7	10.7	12.0	13.7	13.30
WHMFDSKB_2X5	2.5	50/0.25	0.7	1.0	1.1	1.1	1.2	1.3	11.8	12.8	12.8	14.0	16.8	7.98
WHMFDSKB_4X0	4.0	56/0.30	0.8	1.1	1.2	1.2	1.3	1.4	13.8	15.8	15.8	16.8	20.4	4.95



Basic Code	Nominal Cross Sectional area of conductor	Number Nom. Dia of cond. strands*	Thickness of Insulation (Nom)	Nominal Thickness of Sheath					Appx. Overall Diameter					Max. Conductor Resistance per KM at 20°C	
				12 Core	14 Core	16 Core	19 Core	24 Core	12 Core	14 Core	16 Core	19 Core	24 Core		
	sq. mm.	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Ohms
WHMFDSKB_X50	0.5	16/0.20	0.6	1.0	1.1	1.1	1.1	1.2	11.6	12.0	12.7	13.2	15.4	39.0	
WHMFDSKB_X75	0.75	24/0.20	0.6	1.1	1.1	1.2	1.2	1.3	12.4	12.8	13.8	14.3	16.8	26.0	
WHMFDSKB_1X0	1.0	32/0.20	0.6	1.1	1.1	1.2	1.3	1.4	12.9	13.7	14.4	15.1	18.0	19.50	
WHMFDSKB_1X5	1.5	30/0.25	0.6	1.1	1.2	1.2	1.3	1.4	14.2	14.8	15.8	16.6	19.4	13.30	
WHMFDSKB_2X5	2.5	50/0.25	0.7	1.3	1.3	1.4	1.4	1.5	17.3	18.0	19.5	20.4	23.8	7.98	
WHMFDSKB_4X0	4.0	56/0.30	0.8	1.4	1.4	1.5	1.5	1.6	20.6	22.0	23.8	25.2	28.5	4.95	

Note: Available in 100 metres length with black outer sheath & in bigger packing on request. Any colour on specific request can be supplied, in economical run.

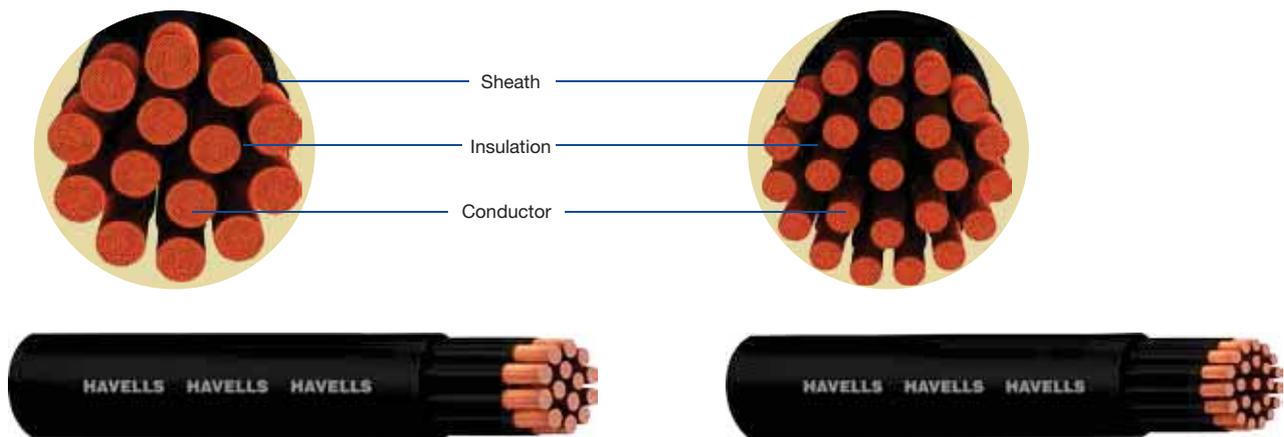
\*The number and diameter of conductor strands are for reference only. Conductor resistance as per IS:8130 is the governing criteria.

Conductor shall be of Class-V as per IS:8130

Progressive sequential length marking on every meter.

**Core Identification:**

- 2 CORE : Red & Black
- 3 CORE : Red, Black & Yellow-Green
- 4 CORE : Red, Yellow, Blue & Yellow-Green
- 5 CORE : Red, Yellow, Blue, Black & Grey
- 6 CORE : Red, Yellow, Blue, Yellow-Green, White & Black
- 7 CORE & Above : Number printing on each core / Colour code as specified in IS:694



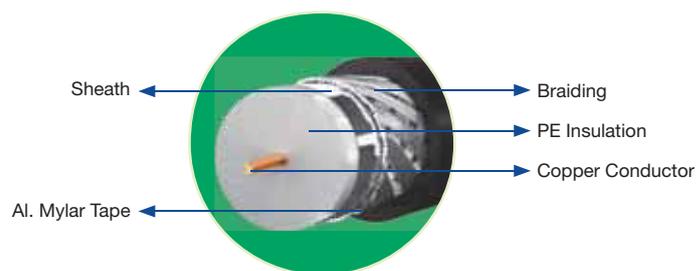
## Co-Axial TV Cables

Application

Used in cable TV operations, Computer net-working etc.

Construction

Solid annealed bare copper conductor polythelene insulated shielded with polyester backed aluminium tape and additional shielding with fine aluminium braid protected with polyester tape wrapping and sheathed with PVC.

Technical Data

S. No.	Type	
1	Size	RG-59, RG-6, RG-11
2	Inner Conductor	Solid Copper
3	Insulation	Gas Injected Physical Foamed Polyethylene
4	Outer Conductor	Bonded polyaluminium Tape, Braided with Aluminium Alloy Wire
5	Outer Jacket	UV Resistant Black PVC Jacket
6	Marking	Progressive Sequential Length Marking on Every Metre

Electrical Parameters

S. No.	Type	RG-11 Foam	RG-6 Foam	RG-59 Foam
1	Inner Conductor			
	Max. Resistance (Ohm/Km) @ 20°C	0.84	2.13	3.55
2	Inner Conductor			
	Loop Resistance (Ohm/Km) @ 20°C	1.66	2.78	4.64
3	Nom. Capacitance (pF/mtr.)	53	53	53
4	Nom. Impedance (ohm)	75	75	75
5	Nom. Velocity Ratio (%)	85	85	85
6	Nom. Attenuation @ 25° (dB/100m)			
	@55 Mhz	2.82	1.95	6.73
	@83 Mhz	3.87	6.20	8.04
	@187 Mhz	5.74	9.15	11.81
	@211 Mhz	6.23	9.50	12.47
	@250 Mhz	6.72	10.50	13.45
	@300 Mhz	7.38	11.50	14.60
	@350 Mhz	7.94	12.45	15.71
	@400 Mhz	8.53	13.30	16.73
	@450 Mhz	9.02	14.35	17.72
	@500 Mhz	9.51	14.95	18.70
	@550 Mhz	9.92	15.70	19.52
7	Structural Return Loss (db/100m)			
	From 30 to 300 Mhz	>26	>28	>30
	From 300 to 550 Mhz	>24	>22	>24
	Bending Radius, min (mm)	75	65	65

Note: RG 6 also available in CCS.

Construction Parameters

S. No.	Type Foam	RG-11 Foam	RG-6 Foam	RG-59 Foam	RG 6 CCS Foam
1	Inner Conductor	Solid Bare Copper	Solid Bare Copper	Solid Bare Copper	Copper Coated Steel
2	Nom. Diameter (mm)	1.63	1.02	0.80	1.02 ± 0.03
3	Dielectric	Foam PE	Foam PE	Foam PE	Foam PE
4	Nom. Diameter (mm)	7.11	4.57	3.55	4.57
5	Outer Conductor - First	Bonded AL Tape	Bonded AL Tape	Bonded AL Tape	Bonded Al Tape
6	Outer Conductor - Second	AL Braid	AL Braid	AL Braid	Al Braid
7	Nom. Coverage (%)	60	60	60	60
8	Jacket	PVC (Black)	PVC (Black)	PVC (Black)	PVC (Black)
9	Nom. Diameter (mm)	10.00	7.00	6.20	7.00 ± 0.10

Note: Supplied in 90 metres & 305 metres project packaging.

# Telephone Switch Board Cable

## Application

Cables used for Indoor Telephones, Telephone Exchanges, Industrial Plant Communication Systems, EPBAX Systems, Closed Circuit Security Systems, In-House Telephone wiring and various other equipments involving telephones.

## Standard

Cables are generally made as per TEC Specification No. G/WIR-06/02 or as per customer specification.

## Construction

Solid annealed tinned copper conductor, PVC insulated cores suitably colour coded for distinct identification, twisted to form pairs, pairs laid up, PVC sheathed.

## Design / Material

Conductor	: Tinned copper
Insulation	: PVC
Shielding	: Over all shielded with polyester tape or copper wire braid (Manufactured against customer's orders only for economical runs.)
Sheathing	: FR PVC
Conductor size Cable	: 0.4 / 0.5 mm
Configuration	: 1p, 2p, 3p, 4p, 5p, 10p, 20p

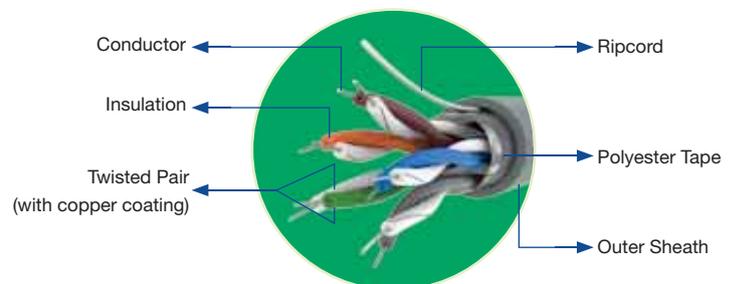
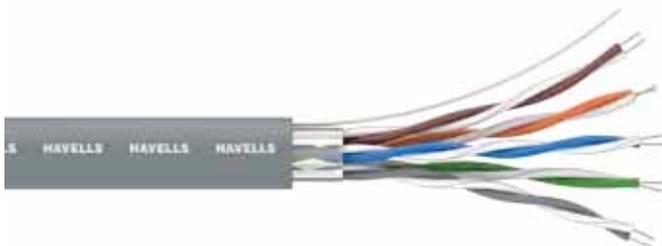
**Note:** Telephone Cable can also be made available with bare copper, polythelene insulation FR-LSH/polythelene sheathing & conductor sizes of 0.6/0.7/0.8/0.9 mm on request.

## Salient Features for Telephone Cable

- Hard grade PVC insulation is used for long life and stable properties of cables.
- Staggered lays of twisted pairs are used to ensure minimum cross talk.
- Sizing and processing of conductor and insulated cores is done in precisely controlled manner on automatic modern machines to have optimum values of capacitance, capacitance unbalance, image and cross talk attenuation and characteristic impedance.
- Shielding is done to protect from outside / inter pair interference as per specific needs.

## Prospective Buyers

BSNL, C.DOT, Switching equipment manufacturers, every industrial and commercial establishment, construction industry.



Note: Available in 90 metres length in carton packaging & 180 metres project length in polywrap packaging.

# LAN Cables - Complete Networking Solution

## Introduction

HAVELLS Networking Cables allows device to access high-speed networks / Internet data. The Cables are verified to the performance requirements of ISO/IEC 11801, TIA/EIA 568C.2 . Unshielded twisted pair (UTP) cable is used in many home and business-based Ethernet networks. It has four pairs of wires that are housed inside of the lining of the cable. Each pair is twisted to prevent interference from other devices on the network.

## CAT 6 (with star separator)

Category 6 cable, commonly referred to as Cat 6, is a standardized twisted pair cable for Gigabit Ethernet and other network physical layers that is backward compatible with CAT5/5e.

Cat 6 features more stringent specifications for crosstalk and system noise. The cable standard provides performance of up to 250 MHz.

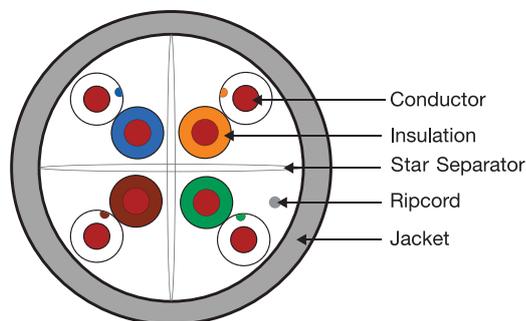
### Features

- Exceptional material properties and cable design
- High ACR values-providing low BER (Bit Error-Rate)
- Exceeds cat 6 Best transmission performance.
- Extremely high pair-balance-providing excellent EMC (Electromagnetic compatibility)
- Maximum noise immunity.
- ISO/IEC - 11801 Class E.
- UL-94V0 rated Plastics.
- ETL Verified
- Longer Cable segment Length.
- High speed data access
- Total end-to-end horizontal cabling solution
- Backwards compatible with HAVELLS Category 6 systems – ensuring support for legacy applications
- Unshielded Twisted Cable
- Cable supports frequencies up to 250 MHz.
- Cable supports data transfer speeds up to 1000Mbps - Gigabit
- Available in 305Mtr Box packaging

### Colour Code

- Pair 1 - White – Blue and Blue
- Pair 2 - White – Orange and Orange
- Pair 3 - White – Green and Green
- Pair 4 - White – Brown and Brown

### Cross Section View



Electrical characteristics	
Characteristic Impedance	100±6 Ω@ 1-250MHz
DC Resistance	72Ω/km (max)
Voltage Rating	72 Vdc max
Dielectric Strength	1500V/1minute min MHz
Insulation Resistance	500MΩ/km (min)@500Vdc
Nominal Velocity of Propagation (%)	69%
Conductor Resistance	<7.20/100m
Mutual Capacitance	5.6nF/100m nominal
Resistance Unbalance	5% Max
Capacitance Unbalance	330pF/100m
Delay Skew	< 45nS
Bending Radius	< 4 X Cable Diameter at -20°C ± 1°C
Operating Voltage	72V
Dielectric Strength	1.0KV dc or 0.75KV ac for 1min.

Technical Requirement	
Conductor Metal	23 AWG Solid Bare Copper
Insulation	High Density Polyethylene
Pairs	2 Insulated conductors twisted together
Sheath	PVC
Cable Diameter	6 ± 0.3mm
Printing	Each meter printed with sequential Length Counter

Mechanical Properties	
Outer Diameter	Nominal Diameter 6 ± 0.3 mm 4 twisted pair
Conductor Type	23 AWG bare annealed copper
Jacket Material	PVC
Standard Colour	Grey
Pulling Force	11.5 kg
Operating Tem. Ran.	-20°C to + 70°C
Storage Tem. Ran.	0°C to + 50°C

## Transmission Parameter as per 100 Mtr.

Frequency	Insertion Loss (DB/100M)	NEXT (DB)	PSNEXT (DB)	ELFEXT	PSELFEXT (DB)	RL (DB)	ACR (DB)
1	2.00	74.3	72.3	67.8	64.8	20.0	72.3
4	3.90	65.3	63.3	55.8	52.8	23.0	61.5
8	5.30	60.8	58.8	49.7	46.7	24.5	55.5
10	6.00	59.3	57.3	47.8	44.8	25.0	53.3
16	7.60	56.2	54.2	43.7	40.7	25.0	48.6
20	8.50	54.8	52.8	41.8	38.8	25.0	46.3
25	9.50	53.3	51.3	39.8	36.8	24.3	43.8
31.25	10.70	51.9	49.9	37.9	34.9	23.6	41.2
62.50	15.40	47.4	45.4	31.9	28.9	21.5	32.0
100	19.80	44.3	42.3	27.8	24.8	20.1	24.5
200	29.0	39.8	37.8	21.8	18.8	18.0	10.8
250	32.8	38.3	36.3	19.8	16.8	17.3	5.5



# CCTV Cables

## Introduction

HAVELLS CCTV Cables are offered in two types namely 4+1 CCTV Cable and 3+1 CCTV Cable. Coaxial cables form the carrier for video signal and the other '4 cores' or '3 cores' form the carriers for power. Coaxial cables are designed to transmit the complete video frequency range with minimum distortion or attenuation, making them an excellent choice for CCTV.

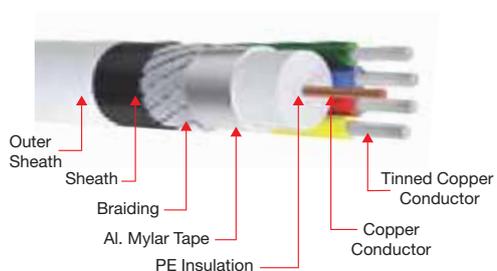
HAVELLS CCTV cables are designed to optimize the quality of video signals, which are transmitted through the Coaxial cable in the CCTV.

The Coaxial cable consists of solid annealed bare copper conductor of electrolytic grade which is insulated with foamed dielectric, aluminium foil taped, jelly flooded, braided with Al. Alloy and then jacketed with UV PVC.

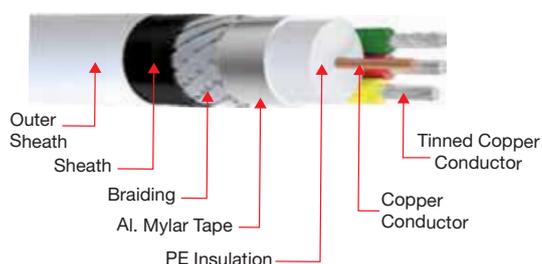
Topmost quality of construction of coaxial cable in HAVELLS CCTV cables ensures distortion free video signals and thus a clear picture over complete low frequency bandwidth of transmission in such applications.

The impedance of coaxial cable is 75, which matches the CCTV equipment. This matching ensures adequate signal strength, no reflection and best picture quality.

### Cross Section View for 4+1 CCTV



### Cross Section View for 3+1 CCTV



## Technical Requirement

S. No.	Particular	3+1 CCTV	4+1 CCTV
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### Co-Axial Cable

<b>1. Conductor</b>			
	Material	Annealed Bare Copper	Annealed Bare Copper
	No. of Wire/ Dia. of wire	0.80 ± 0.002	0.80 ± 0.002
<b>2. Insulation</b>			
	Material	Gas Injected Polyethylene	Gas Injected Polyethylene
	Thickness of Insulation (Nom.)	1.30 mm	1.30 mm
	Dia. of Insulation	3.50 ± 0.20	3.50 ± 0.20
<b>3. Overall Shielded (Braided)</b>			
	Material	Al. Foil - 100%	Al. Foil - 100%
	Material	Alum. Alloy	Alum. Alloy
	Coverage	55%	55%
<b>4. Flooding Compound</b>			
		Petroleum Jelly	Petroleum Jelly

### Outer Sheath

	Material	PVC	PVC
	Dia. of Sheath	5.50 mm ± 0.20 mm	5.50 mm ± 0.20 mm

<b>1. Conductor</b>			
	Material	Annealed Tinned Copper	Annealed Tinned Copper
	No. of Wire/ Dia of wire	14/0.13 ± 0.002	14/0.13 ± 0.002
<b>2. Insulation</b>			
	Material	PVC - Type -A	PVC - Type -A
	Thickness of Insulation (Nom.)	0.3	0.3
	Dia of Insulation	1.40 mm	1.40 mm

### Final Cable

<b>1. Barrier Tape</b>			
	Thickness of Tape	25 Micron	25 Micron
	Coverage	100%	100%
<b>2. Outer Sheath</b>			
	Material	PVC - ST-1	PVC - ST-1
	Thickness of Sheath (Nom.)	0.90 mm	0.90 mm

# Speaker Cables

## Introduction

HAVELLS India Limited, is India's largest and leading manufacturer of electrical goods, now going to introduce a new line of "SPEAKER CABLES".

Speaker Cable use to make connection between loudspeaker and audio amplifiers with in various sound instruments. In today's constructions, the new Building Code (Like for Airports, Railway platforms, Auditoriums, Offices, High-rise apartments and Hospitals etc.), Installation of speaker cables ensure a clear and distortion free voice with very low dB loss.

"HAVELLS" twin parallel Speaker cables are manufactured with multi wire, bright annealed flexible bare electrolytic grade copper conductor, each core designed to easy identification with Insulation of specially formulated and in house manufactured FR (Fire Retardant) PVC compound with high value of oxygen and temperature index.

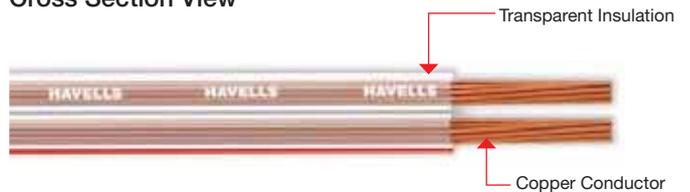
Packaging: Transparent Polywrapping in 100 meters.

## Technical Requirement

Conductor		Insulation			Web Dims (W x H)
Size (Sq. mm)	Max. Conductor Resistance at 20 Deg. C (Ohm/km)	Thickness of Insulation (in mm)	Width (in mm)	Height (in mm)	
0.5	39	1.0	5.5	2.85	5.5 x 2.85
0.75	26	1.1	6.3	3.24	6.3 x 3.24
1	18.1	1.2	7.6	3.8	7.6 x 3.8
1.5	12.1	1.3	8.6	4.3	8.6 x 4.3

**Construction Details:** The twin parallel cable have the following construction with different coloring of insulation.

## Cross Section View



## Alwar Plant



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