HAVELLS

WIRES THAT KEEP YOUR HOME SAFE, THE WAY YOU KEEP LOVED ONES SAFE

CHOOSE HAVELLS WIRES THAT DON'T CATCH FIRE OR EMIT HARMFUL GASES

Flame Retardant

Halogen and Smoke Free

bina dikhe, safe rakhe

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 laboratories) 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 220 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.

NABL

HAVELLS

The Wire & Cables 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.

QUALITY SYSTEM CERTIFICATION DNV ISO 9001 ENVIRONMENTAL SYSTEM CERTIFICATION DNV ISO 14001 SAFETY SYSTEM CERTIFICATION DNV ISO 45001 TC - 5988 CC - 3903 BASEC ISO 9001 UKAS MANAGEMENT SYSTEMS 004 CERTIFICATE NO: CS1-207 ENERGY MANAGEMENT SYSTEM DNV·GL ISO 50001 IS:694 CM/L-8158075 CE

Certification

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Havells India Limited
QRG Tower, 2 D, Sector 126, Express Highway, Noida - 201 304, Uttar Pradesh, India
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015

This certificate is valid for the following scope:
Design, manufacturing, servicing and marketing of LT power cables, HT power cables, control cables & domestic wire cables

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Havells India Limited
A - 461- 462, SP-215, 204, 204 (A), MIA,Alwar - 301 030, Rajasthan, India

has been found to conform to the Energy Management System standard:
ISO 50001:2018

This certificate is valid for the following scope:
Design & manufacture of LT power cables, HT power cables, EHV cables upto 220 KV, Control cables & Domestic wire cables

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Havells India Limited
A - 461- 462, SP-215, 204, 204 (A), MIA, Alwar - 301030, Rajasthan, India

has been found to conform to the Environmental Management System standard:
ISO 14001:2015

This certificate is valid for the following scope:
Design and manufacture of LT power cables, HT power cables upto 220 KV, control cables, domestic wire cables and manufacturing of PVC & XLPE compound.

DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of
Havells India Limited
A - 461- 462, SP-215, 204, 204 (A), MIA, Alwar - 301030, Rajasthan, India

has been found to conform to the Occupational Health and Safety Management System standard:
ISO 45001:2018

This certificate is valid for the following scope:
Design and manufacture of LT power cables, HT power cables upto 220 KV, control cables, domestic wire cables and manufacturing of PVC & XLPE compound

BASEC

Certificate No.
CS1-207/002

Certificate of Conformity

BASEC hereby certifies that:

Havells India Limited
A461/462 & SP-215, 204, 204(A),
Matsya Industrial Area (M.I.A), Alwar, 301030,
Rajasthan, India

Has implemented and maintains a Management System that fulfils the requirements of:

BS EN ISO 9001:2015

In respect of the location listed above and for the following scope of activities:

Scope of Certification:

The design, manufacture, testing and distribution of cable products to national and international specifications including LV power cables, LV control cables, LV house-wiring cables, MV power cables up to and including 33kV, HV single core power cables rated at 66 kV, HV Cables rated upto 220kV. The above with copper or aluminium conductors, PVC or XLPE insulation, galvanised steel or aluminium wire/strip, armour, copper wire / tape screened, PVC, low smoke zero halogen or polyethylene sheath.

Issue no: 8

Date of initial certification: 15/03/2010

Issue date: 11/05/2023

Signed for and on behalf of
BASEC Group Ltd

Kieran O'Brien Date: 11/05/2023

If the conditions set out in the certification agreement are not fulfilled this Certificate may be rendered invalid. This certificate does not confirm product conformity in any way and is issued subject to ongoing surveillance for continued compliance, and in accordance with BASEC's Regulations.

BASEC Group Ltd, Presley House, Presley Way, Milton Keynes, MK8 0ES, UK. Registered in England No. 13950143. Tel: +44 (0)1908 267300 Email: mail@basec.org.uk Web: www.basec.org.uk
BSF000 Issue 5 (20-03-2023)

Expiry date: 10/05/2026

BASEC

Certificate No.
PCR-207

Certificate of Conformity

BASEC hereby certifies that:

Havells India Limited
A461/462 & SP-215, 204, 204(A),
Matsya Industrial Area (M.I.A), Alwar, 301030,
Rajasthan, India

Has implemented and maintains a Management System that fulfils the requirements of:

BASEC PCR*

In respect of the location listed above and for the following scope of activities:

Scope of Certification:

The design, manufacture, testing and distribution of cable products to national and international specifications including LV power cables, LV control cables, LV house-wiring cables, MV power cables up to and including 33kV.

The above with copper or aluminium conductors, PVC or XLPE insulation, galvanised steel or aluminium wire/strip, armour, copper wire / tape screened, PVC, low smoke zero halogen or polyethylene sheath.

Issue no: 10

Date of initial certification: 11/06/2008

Issue date: 11/05/2023

Signed for and on behalf of
BASEC Group Ltd

Kieran O'Brien Date: 11/05/2023

If the conditions set out in the certification agreement are not fulfilled this Certificate may be rendered invalid. This Certificate is only valid when issued in conjunction with a valid BASEC product licence and is issued subject to ongoing surveillance for continued compliance, in accordance with BASEC's Regulations. *Auditing requirements as per current version of BASEC PCR.

BASEC Group Ltd, Presley House, Presley Way, Milton Keynes, MK8 0ES, UK. Registered in England No. 13950143. Tel: +44 (0)1908 267300 Email: mail@basec.org.uk Web: www.basec.org.uk
BSF121 Issue 7 (20-03-2023)

BASEC PCR

Expiry date: 10/05/2026

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

HAVELLS INDIA LIMITED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

A-461/462, SP-215, M.I.A., ALWAR, RAJASTHAN, INDIA

in the field of

CALIBRATION

Certificate Number: CC-3903

Issue Date: 23/04/2024 **Valid Until:** 22/04/2026

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Entity: Havells India Limited

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

National Accreditation Board for Testing and Calibration Laboratories

NABL

CERTIFICATE OF ACCREDITATION

HAVELLS INDIA LIMITED

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

for its facilities at

A-461/462 & SP-215, M.I.A., ALWAR, RAJASTHAN, INDIA

in the field of

TESTING

Certificate Number: TC-5988

Issue Date: 24/09/2022 **Valid Until:** 23/09/2024

This certificate remains valid for the Scope of Accreditation as specified in the annexure subject to continued satisfactory compliance to the above standard & the relevant requirements of NABL.
(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Identity : Havells India Limited

Signed for and on behalf of NABL

N. Venkateswaran
Chief Executive Officer

HRFR with S^3 (Higher Load with complete safety)

The Introduction of Havells HRFR insulation with advanced S^3 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 amperes). 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 630 sq. mm in single core.**

About S^3

This advanced S^3 technology safeguard us and environment from harmful substances such as lead, mercury, cadmium and chromium, Havells Wires with S^3 technology reduces current leakage to protect from any serious damage and installations in the house. Another benefit of S^3 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^3 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 (mA)
0.50 sq. mm	0.008 mA
0.75 sq. mm	0.009 mA
1.00 sq. mm	0.009 mA
1.50 sq. mm	0.010 mA
2.50 sq. mm	0.011 mA
4.00 sq. mm	0.013 mA
6.00 sq. mm	0.015 mA

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^3 technology are certified for RoHS compliance as per directive (EU) 2015/863. 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^3 technology provide insulation with termite and rodent repulsion properties. Certification regarding the above has been obtained from the Central Power and Research Institute (CPRI).

Anti termite/Anti rodent feature is applicable for a period of 12 months from the date of invoice.

ANNEALED COPPER ETP GRADE
101% CONDUCTIVITY (IACS) USED

BEST COPPER USED

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

Life Line Plus S³
Single Core HRFR PVC Insulated Copper Conductor (Unsheathed) Flexible Cables, 1100 Volt

Basic Code	Nominal Cross Sectional area of conductor	Number/Maximum Diameter of conductor strands*	Nominal Thickness of Insulation	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Maximum Conductor Resistance per kiloMetre at 20 °C
					Conduit / Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Line Plus (HRFR)	sq. mm	mm	mm	mm	A	A	Ω (Ohm)
WHFFDN...A1X50	0.5 sq. mm	16 N/0.2 mm	0.6 mm	2.1 mm	5 A	5 A	39.00 Ω (Ohm)
WHFFDN...A1X75	0.75 sq. mm	24 N/0.2 mm	0.6 mm	2.3 mm	9 A	9 A	26.00 Ω (Ohm)
WHFFDN...A11X0	1.0 sq. mm**	14 N/0.3 mm	0.7 mm	2.7 mm	15 A	16 A	18.10 Ω (Ohm)
WHFFDN...A11X5	1.5 sq. mm**	22 N/0.3 mm	0.7 mm	3.0 mm	19 A	21 A	12.10 Ω (Ohm)
WHFFDN...A12X5	2.5 sq. mm**	36 N/0.3 mm	0.8 mm	3.6 mm	25 A	28 A	7.41 Ω (Ohm)
WHFFDN...A14X0	4.0 sq. mm	56 N/0.3 mm	0.8 mm	4.1 mm	32 A	35 A	4.95 Ω (Ohm)
WHFFDN...A16X0	6.0 sq. mm	84 N/0.3 mm	0.8 mm	4.6 mm	43 A	47 A	3.30 Ω (Ohm)

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

Note: Available in 90 m length in carton packaging.

**Conductor Shall be class-II for 1.0 sq. mm , 1.5 sq. mm & 2.5 sq. mm & for other sizes 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.

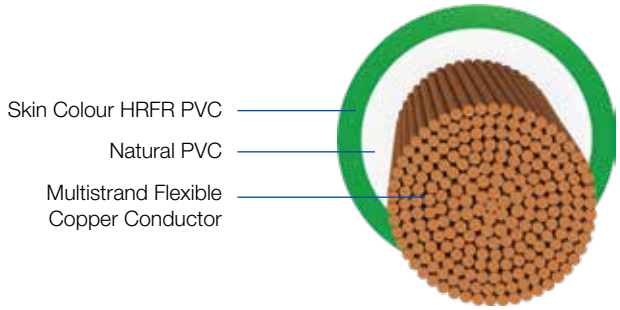
Construction :-

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 S³
Single Core HRFR PVC Insulated Copper Conductor (Unsheathed) Flexible Cables, 1100 Volt

Nominal Cross Sectional area of conductor	Number/Maximum Diameter of conductor strands*	Nominal Thickness of Insulation	Approx. Overall Diameter	Current Carrying Capacity 2 Cables Single Phase	Maximum Conductor Resistance per kiloMetre at 20 °C
				Unenclosed Clipped directly to a surface or on cable trays	
sq. mm	mm	mm	mm	A	Ω (Ohm)
10 sq. mm	80 N/0.4 mm	1.0 mm	6.1 mm	59 A	1.91 Ω (Ohm)
16 sq. mm	126 N/0.4 mm	1.0 mm	7.0 mm	79 A	1.21 Ω (Ohm)
25 sq. mm	196 N/0.4 mm	1.2 mm	8.6 mm	93 A	0.780 Ω (Ohm)
35 sq. mm	276 N/0.4 mm	1.2 mm	9.7 mm	113 A	0.554 Ω (Ohm)
50 sq. mm	396 N/0.4 mm	1.4 mm	11.5 mm	153 A	0.386 Ω (Ohm)
70 sq. mm	360 N/0.5 mm	1.4 mm	13.0 mm	238 A	0.272 Ω (Ohm)
95 sq. mm	475 N/0.5 mm	1.6 mm	15.1 mm	289 A	0.206 Ω (Ohm)
120 sq. mm	608 N/0.5 mm	1.6 mm	16.6 mm	339 A	0.161 Ω (Ohm)
150 sq. mm	750 N/0.5 mm	1.8 mm	18.5 mm	394 A	0.129 Ω (Ohm)
185 sq. mm	925 N/0.5 mm	2.0 mm	20.4 mm	461 A	0.106 Ω (Ohm)
240 sq. mm	1221 N/0.5 mm	2.2 mm	23.2 mm	555 A	0.0801 Ω (Ohm)
300 sq. mm	1525 N/0.5 mm	2.4 mm	26.0 mm	649 A	0.0641 Ω (Ohm)
400 sq. mm	2013 N/0.5 mm	2.6 mm	30.0 mm	771 A	0.0486 Ω (Ohm)
500 sq. mm	2310 N/0.5 mm	2.8 mm	33.0 mm	818 A	0.0384 Ω (Ohm)
630 sq. mm	3090 N/0.5 mm	2.8 mm	38.0 mm	916 A	0.0287 Ω (Ohm)

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

Note: Conductor as per class V of IS 8130 confirming to IS 694. 100 m 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 Metre.

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

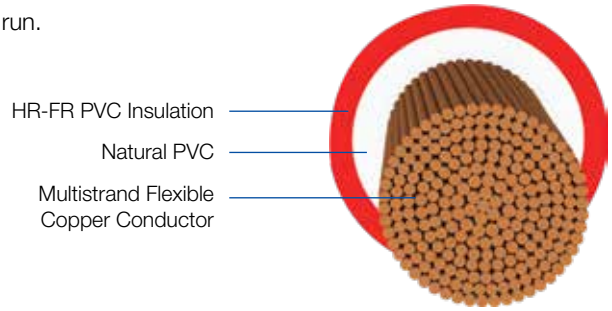
Note : 70 sq. mm and above are available in wooden drums

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.

FRLSH is also 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 Copper Conductor
(Unsheathed) Flexible Cables, 1100 Volt

Basic Code	Nominal Cross Sectional area of conductor	Number/ Maximum Diameter of conductor strands*	Nominal Thickness of Insulation	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Maximum Conductor Resistance per kiloMetre at 20 °C
					Conduit/Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Guard (FR-LSH)	sq. mm	mm	mm	mm	A	A	Ω (Ohm)
WHFFFN...A11X0	1.0 sq. mm**	14 N/0.3 mm	0.7 mm	2.7 mm	13 A	15 A	18.10 Ω (Ohm)
WHFFFN...A11X5	1.5 sq. mm**	22 N/0.3 mm	0.7 mm	3.0 mm	17 A	19 A	12.10 Ω (Ohm)
WHFFFN...A12X5	2.5 sq. mm**	36 N/0.3 mm	0.8 mm	3.6 mm	23 A	26 A	7.41 Ω (Ohm)
WHFFFN...A14X0	4.0 sq. mm	56 N/0.3 mm	0.8 mm	4.1 mm	29 A	32 A	4.95 Ω (Ohm)
WHFFFN...A16X0	6.0 sq. mm	84 N/0.3 mm	0.8 mm	4.6 mm	39 A	43 A	3.30 Ω (Ohm)

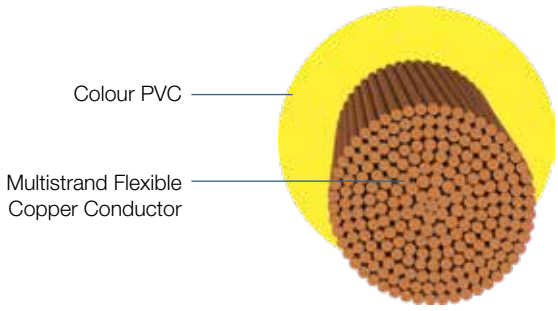
Construction :-

Conductor : Plain annealed copper conductor as per IS 8130

Insulation : FR-LSH PVC

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 (>31%). Havells Life shield cable is made in conformance to IS 17048.

Havells HFFR's insulation was developed, keeping in view to have better safety in case of fire with improved flexibility and better mechanical Strength in complete cable range.

The insulation and sheath of HFFR cables are made from special type of materials (Thermoplastic or Cross-linked HF-FR) with operating Temperature -15 ºC to 90 ºC Range, Better ozone Resistance, less hot deformation with improved electrical property, secondly this insulation have property that while burning it doesn't emit toxic fumes and smoke and light transmission (>70%) during fire much better than ordinary PVC Cable.

NON-TOXIC: Research shows that maximum causalities in Fire happen due to chocking 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 easily and giving a better chance of rescue during fire.

Environment-Friendly - Havells HF-FR insulated industrial cables are practically halogen-free, Havells HF-FR Wire protecting not only you and your family, but also the future generations against the Green House Effect.

Application – HAVELLS Cable insulated and sheathed with halogen free flame retardant thermoplastic or cross-linked halogen free flame retardant thermosetting compound confirming to IS 17048 is suitable to use in electric power and lighting for indoor use in AC single phase or three phase (earthed or unearthed) systems with rated voltage up to and including 1100 V. This cable is also suitable for DC systems with rated voltage up to and including 1500 V to earth.

Life Shield
Single Core HFFR Insulated Copper Conductor
(Unsheathed) Flexible Cables, 1100 Volt

Basic Code	Nominal Cross Sectional area of conductor	Number/ Maximum Diameter of conductor strands*	Nominal Thickness of Insulation	Approx. overall Diameter	Current Carrying Capacity 2 Cables Single Phase		Maximum Conductor Resistance per kiloMetre at 20 ºC
					Conduit/Trunking	Unenclosed clipped directly to a surface or on cable trays	
Life Shield (HFFR)	sq. mm	mm	mm	mm	A	A	Ω (Ohm)
WHFFZN...A11X0	1.0 sq. mm**	14 N/0.3 mm	0.7 mm	2.7 mm	15 A	16 A	18.10 Ω (Ohm)
WHFFZN...A11X5	1.5 sq. mm**	22 N/0.3 mm	0.7 mm	3.0 mm	19 A	21 A	12.10 Ω (Ohm)
WHFFZN...A12X5	2.5 sq. mm**	36 N/0.3 mm	0.8 mm	3.6 mm	25 A	28 A	7.41 Ω (Ohm)
WHFFZN...A14X0	4.0 sq. mm	56 N/0.3 mm	0.8 mm	4.1 mm	32 A	35 A	4.95 Ω (Ohm)
WHFFZN...A16X0	6.0 sq. mm	84 N/0.3 mm	0.8 mm	4.6 mm	43 A	47 A	3.30 Ω (Ohm)

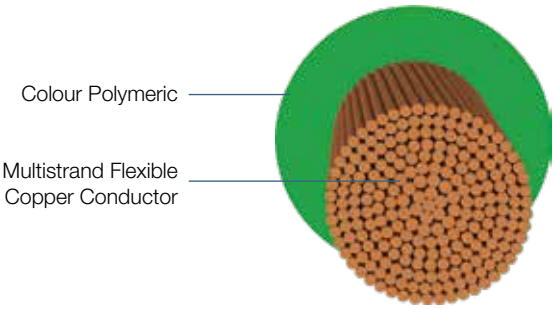
Construction :-

Conductor : Plain annealed copper conductor as per IS 8130

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
Single Core PVC Insulated Copper Conductor (Unsheathed) Flexible 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.

Life line & Life guard range is in conformance with IS 694.

Life shield is in conformance with IS 17048.

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.

180 Metre Trade Segment

Basic Code	Nominal Cross Sectional area of conductor (sq. mm)	Number/Maximum Diameter of conductor strands* (mm)	Nominal Thickness of Insulation (mm)	Approx. overall Diameter (mm)	Current Carrying Capacity 2 Cables Single Phase		Maximum Conductor Resistance per kiloMetre at 20 °C Ω (Ohm)
					Conduit / Trunking (A)	Unenclosed clipped directly to a surface or on cable trays (A)	
Lifeline (FR)							
WHFFDN...L1X757	0.75 sq. mm	24 N/0.20 mm	0.6 mm	2.3 mm	9 A	9 A	26.00 Ω (Ohm)
WHFFDN...L11X07	1.0 sq. mm**	32 N/0.20 mm	0.6 mm	2.7 mm	12 A	14 A	19.50 Ω (Ohm)
WHFFDN...L11X57	1.5 sq. mm**	30 N/0.25 mm	0.6 mm	3.0 mm	15 A	17 A	13.30 Ω (Ohm)
WHFFDN...L12X57	2.5 sq. mm**	50 N/0.25 mm	0.7 mm	3.6 mm	21 A	23 A	7.98 Ω (Ohm)
WHFFDN...L14X07	4.0 sq. mm	56 N/0.30 mm	0.8 mm	4.1 mm	29 A	32 A	4.95 Ω (Ohm)
WHFFDN...L16X07	6.0 sq. mm	84 N/0.30 mm	0.8 mm	4.6 mm	39 A	43 A	3.30 Ω (Ohm)
Lifeguard (FR-LSH)							
WHFFFN...L11X07	1.0 sq. mm**	32 N/0.20 mm	0.6 mm	2.7 mm	12 A	14 A	19.50 Ω (Ohm)
WHFFFN...L11X57	1.5 sq. mm**	30 N/0.25 mm	0.6 mm	3.0 mm	15 A	17 A	13.30 Ω (Ohm)
WHFFFN...L12X57	2.5 sq. mm**	50 N/0.25 mm	0.7 mm	3.6 mm	21 A	23 A	7.98 Ω (Ohm)
WHFFFN...L14X07	4.0 sq. mm	56 N/0.30 mm	0.8 mm	4.1 mm	29 A	32 A	4.95 Ω (Ohm)
WHFFFN...L16X07	6.0 sq. mm	84 N/0.30 mm	0.8 mm	4.6 mm	39 A	43 A	3.30 Ω (Ohm)
Lifeshield (HFFR)							
WHFNZN...L11X07	1.0 sq. mm**	32 N/0.20 mm	0.6 mm	2.7 mm	13 A	15 A	19.50 Ω (Ohm)
WHFNZN...L11X57	1.5 sq. mm**	30 N/0.25 mm	0.6 mm	3.0 mm	17 A	19 A	13.30 Ω (Ohm)
WHFNZN...L12X57	2.5 sq. mm**	50 N/0.25 mm	0.7 mm	3.6 mm	23 A	26 A	7.98 Ω (Ohm)
WHFNZN...L14X07	4.0 sq. mm	56 N/0.30 mm	0.8 mm	4.1 mm	32 A	35 A	4.95 Ω (Ohm)
WHFNZN...L16X07	6.0 sq. mm	84 N/0.30 mm	0.8 mm	4.6 mm	43 A	47 A	3.30 Ω (Ohm)

200 Metre Project Segment

Basic Code	Nominal Cross Sectional area of conductor (sq. mm)	Number/Maximum Diameter of conductor strands* (mm)	Nominal Thickness of Insulation (mm)	Approx. overall Diameter (mm)	Current Carrying Capacity 2 Cables Single Phase		Maximum Conductor Resistance per kiloMetre at 20 °C Ω (Ohm)
					Conduit / Trunking (A)	Unenclosed clipped directly to a surface or on cable trays (A)	
Lifeline (FR)							
WHFFDN...F1X75	0.75 sq. mm	24 N/0.20 mm	0.6 mm	2.3 mm	9 A	9 A	26.00 Ω (Ohm)
WHFFDN...F11X0	1.0 sq. mm**	32 N/0.20 mm	0.6 mm	2.7 mm	12 A	14 A	19.50 Ω (Ohm)
WHFFDN...F11X5	1.5 sq. mm**	30 N/0.25 mm	0.6 mm	3.0 mm	15 A	17 A	13.30 Ω (Ohm)
WHFFDN...F12X5	2.5 sq. mm**	50 N/0.25 mm	0.7 mm	3.6 mm	21 A	23 A	7.98 Ω (Ohm)
WHFFDN...F14X0	4.0 sq. mm	56 N/0.30 mm	0.8 mm	4.1 mm	29 A	32 A	4.95 Ω (Ohm)
WHFFDN...F16X0	6.0 sq. mm	84 N/0.30 mm	0.8 mm	4.6 mm	39 A	43 A	3.30 Ω (Ohm)
Lifeguard (FR-LSH)							
WHFFFN...F11X0	1.0 sq. mm**	32 N/0.20 mm	0.6 mm	2.7 mm	12 A	14 A	19.50 Ω (Ohm)
WHFFFN...F11X5	1.5 sq. mm**	30 N/0.25 mm	0.6 mm	3.0 mm	15 A	17 A	13.30 Ω (Ohm)
WHFFFN...F12X5	2.5 sq. mm**	50 N/0.25 mm	0.7 mm	3.6 mm	21 A	23 A	7.98 Ω (Ohm)
WHFFFN...F14X0	4.0 sq. mm	56 N/0.30 mm	0.8 mm	4.1 mm	29 A	32 A	4.95 Ω (Ohm)
WHFFFN...F16X0	6.0 sq. mm	84 N/0.30 mm	0.8 mm	4.6 mm	39 A	43 A	3.30 Ω (Ohm)

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

180 m

Lifeline & Lifeguard 180 Metre project length is available in carton packaging.
Lifeshield 180 Metre project length is available in carton packaging.
White colour carton is used in 180 m trade 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.

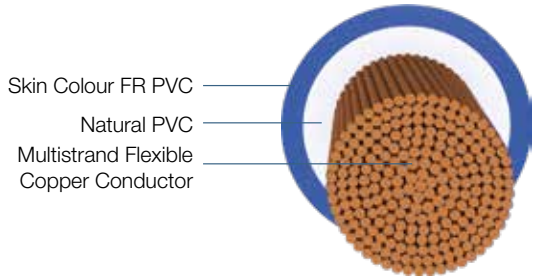
200 m

Lifeline & Lifeguard 200 Metre project length is available in carton packaging.
Brown colour carton is used in 200 m project 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 :-

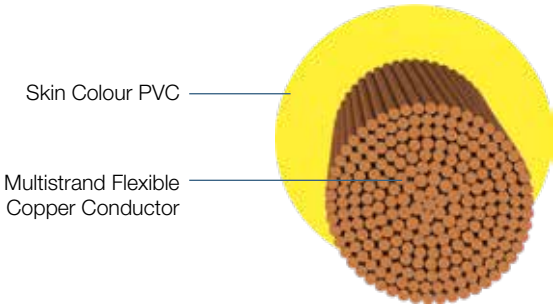
Life Line

Conductor : Plain annealed copper conductor as per IS 8130
Insulation : Primary - Natural PVC with FR property
Secondary - Skin colour coated FR property



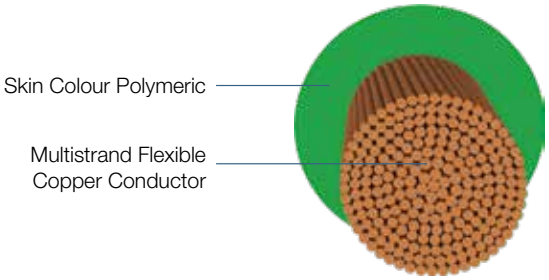
Life Guard

Conductor : Plain annealed copper conductor as per IS 8130
Insulation : FR-LSH PVC



Life Shield

Conductor : Plain annealed copper conductor as per IS 8130
Insulation : Unicolour polymeric compound with HFFR 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 in the world at 101% copper conductivity, exceeding the parametre 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. in presence of uniform electric field 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 S^3 technology compound enables Havells cables to carry more current in overload conditions.

Water Proof and UV resistant

In many buildings, 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.

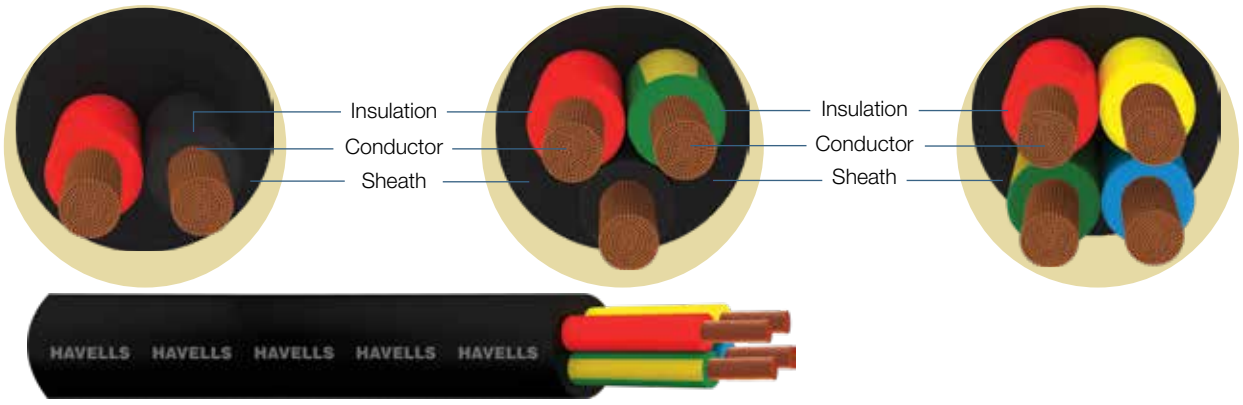
Some comparative technical features are given below.

S. No.	Feature	Heat Resistant & Flame Retardant PVC	Flame Retardant Low Smoke & Halogen FR-LSH	Low Smoke HFFR
1	Insulation Material	Spl. HR PVC	Spl. PVC	Spl. Polymer
2	Insulation Property	Good	Good	Very Good
3	Temperature Rating	85 °C	70 °C	70 °C & 90 °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 to catch fire (%)	>29	>29	>31
8	Temperature Index	>250 °C	>250 °C	>280 °C
9	Light Transmission (Visibility) during Cable as per ASTMD-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

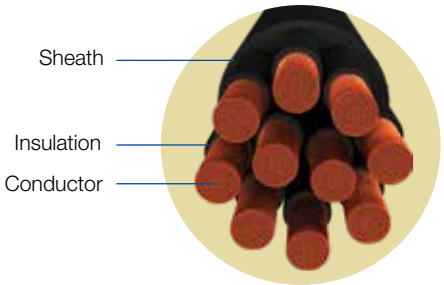
Multicore Round PVC Insulated Copper Conductor (Sheathed) Flexible Cables, 1100 Volt

"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, moisture and superior mechanical strength without losing its flexibility. **These cables can also be made available with HRFR & FR-LSH compound on request.**

Basic Code	Nominal Cross Sectional area of conductor	Number Nominal Diameter of conductor strands*	Nominal Thickness of Insulation	Nominal Thickness of Sheath			Appx. Overall Diameter			Current Rating AC	Voltage Drop/ Amp/Metre		Maximum Conductor Resistance per kiloMetre at 20 °C
				2 Core	3 Core	4 Core	2 Core	3 Core	4 Core		DC or Single Phase AC	3 Phase AC	
WHMFDSKB_X50	0.5 sq. mm	16 N/0.20 mm	0.6 mm	0.9 mm	0.9 mm	0.9 mm	6.2 mm	6.5 mm	7.0 mm	4 A	83 mV	72 mV	39.0 Ω (Ohm)
WHMFDSKB_X75	0.75 sq. mm	24 N/0.20 mm	0.6 mm	0.9 mm	0.9 mm	0.9 mm	6.6 mm	6.9 mm	7.5 mm	7 A	56 mV	48 mV	26.0 Ω (Ohm)
WHMFDSKB_1X0	1.0 sq. mm	32 N/0.20 mm	0.6 mm	0.9 mm	0.9 mm	0.9 mm	6.9 mm	7.3 mm	7.9 mm	11 A	43 mV	37 mV	19.5 Ω (Ohm)
WHMFDSKB_1X5	1.5 sq. mm	30 N/0.25 mm	0.6 mm	0.9 mm	0.9 mm	1.0 mm	7.4 mm	7.8 mm	8.7 mm	13 A	31 mV	26 mV	13.3 Ω (Ohm)
WHMFDSKB_2X5	2.5 sq. mm	50 N/0.25 mm	0.7 mm	1.0 mm	1.0 mm	1.0 mm	8.8 mm	9.4 mm	10.2 mm	18 A	18 mV	16 mV	7.98 Ω (Ohm)
WHMFDSKB_4X0	4.0 sq. mm	56 N/0.30 mm	0.8 mm	1.0 mm	1.0 mm	1.0 mm	10.2 mm	10.9 mm	11.9 mm	24 A	11 mV	9.6 mV	4.95 Ω (Ohm)
WHMFDSKB_6X0	6.0 sq. mm	84 N/0.30 mm	0.8 mm	1.1 mm	1.20 mm	1.2 mm	11.5 mm	12.40 mm	13.6 mm	31 A	8 mV	7 mV	3.30 Ω (Ohm)



Basic Code	Nominal Cross Sectional area of conductor	Number Nominal Diameter of conductor strands*	Nominal Thickness of Insulation	Nominal Thickness of Sheath					Appx. Overall Diameter					Maximum Conductor Resistance per kiloMetre 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	Ω (Ohm)
WHMFDSKB_X50	0.5 sq. mm	16 N/0.20 mm	0.6 mm	0.9 mm	0.9 mm	0.9 mm	1.0 mm	1.0 mm	7.8 mm	8.2 mm	8.2 mm	9.4 mm	11.0 mm	39.0 Ω (Ohm)
WHMFDSKB_X75	0.75 sq. mm	24 N/0.20 mm	0.6 mm	0.9 mm	1.0 mm	1.0 mm	1.0 mm	1.1 mm	8.3 mm	9.4 mm	9.4 mm	10.4 mm	11.8 mm	26.0 Ω (Ohm)
WHMFDSKB_1X0	1.0 sq. mm	32 N/0.20 mm	0.6 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm	1.1 mm	9.0 mm	9.8 mm	9.8 mm	10.9 mm	12.5 mm	19.50 Ω (Ohm)
WHMFDSKB_1X5	1.5 sq. mm	30 N/0.25 mm	0.6 mm	1.0 mm	1.0 mm	1.0 mm	1.1 mm	1.1 mm	9.8 mm	10.7 mm	10.7 mm	12.0 mm	13.7 mm	13.30 Ω (Ohm)
WHMFDSKB_2X5	2.5 sq. mm	50 N/0.25 mm	0.7 mm	1.0 mm	1.1 mm	1.1 mm	1.2 mm	1.3 mm	11.8 mm	12.8 mm	12.8 mm	14.0 mm	16.8 mm	7.98 Ω (Ohm)
WHMFDSKB_4X0	4.0 sq. mm	56 N/0.30 mm	0.8 mm	1.1 mm	1.40 mm	1.40 mm	1.40 mm	1.50 mm	13.8 mm	15.8 mm	15.8 mm	16.8 mm	20.4 mm	4.95 Ω (Ohm)



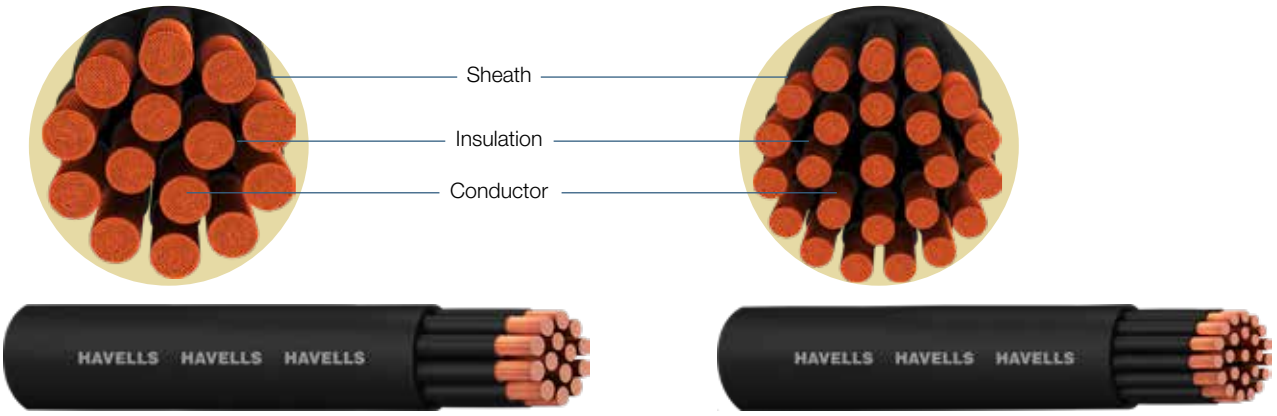
Basic Code	Nominal Cross Sectional area of conductor	Number Nominal Diameter of conductor strands*	Nominal Thickness of Insulation	Nominal Thickness of Sheath					Appx. Overall Diameter					Maximum Conductor Resistance per kiloMetre at 20 °C
				12 Core	14 Core	16 Core	19 Core	24 Core	12 Core	14 Core	16 Core	19 Core	24 Core	
	sq. mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	Ω (Ohm)
WHMFDSKB_X50	0.5 sq. mm	16 N/0.20 mm	0.6 mm	1.0 mm	1.1 mm	1.1 mm	1.1 mm	1.2 mm	11.6 mm	12.0 mm	12.7 mm	13.2 mm	15.4 mm	39.0 Ω (Ohm)
WHMFDSKB_X75	0.75 sq. mm	24 N/0.20 mm	0.6 mm	1.1 mm	1.1 mm	1.2 mm	1.2 mm	1.3 mm	12.4 mm	12.8 mm	13.8 mm	14.3 mm	16.8 mm	26.0 Ω (Ohm)
WHMFDSKB_1X0	1.0 sq. mm	32 N/0.20 mm	0.6 mm	1.1 mm	1.1 mm	1.2 mm	1.3 mm	1.4 mm	12.9 mm	13.7 mm	14.4 mm	15.1 mm	18.0 mm	19.50 Ω (Ohm)
WHMFDSKB_1X5	1.5 sq. mm	30 N/0.25 mm	0.6 mm	1.1 mm	1.2 mm	1.2 mm	1.3 mm	1.4 mm	14.20 mm	14.8 mm	15.8 mm	16.6 mm	19.4 mm	13.30 Ω (Ohm)
WHMFDSKB_2X5	2.5 sq. mm	50 N/0.25 mm	0.7 mm	1.3 mm	1.3 mm	1.4 mm	1.4 mm	1.5 mm	17.3 mm	18.0 mm	19.5 mm	20.4 mm	23.8 mm	7.98 Ω (Ohm)
WHMFDSKB_4X0	4.0 sq. mm	56 N/0.30 mm	0.8 mm	1.50 mm	1.50 mm	1.60 mm	1.60 mm	1.6 mm	20.6 mm	22.0 mm	23.8 mm	25.2 mm	28.5 mm	4.95 Ω (Ohm)

Note: Available in 100 Metre length with black outer sheath & in customize 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 metre above 6.00 sq. mm.
*Available in HRFR outer sheathing on Request.

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, Green, White & Yellow-Green
7 CORE & Above : Number printing on each core / Colour code as specified in IS:694



Three Core Flat PVC Insulated Copper Conductor Cable for Submersible use, 1100 Volt

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

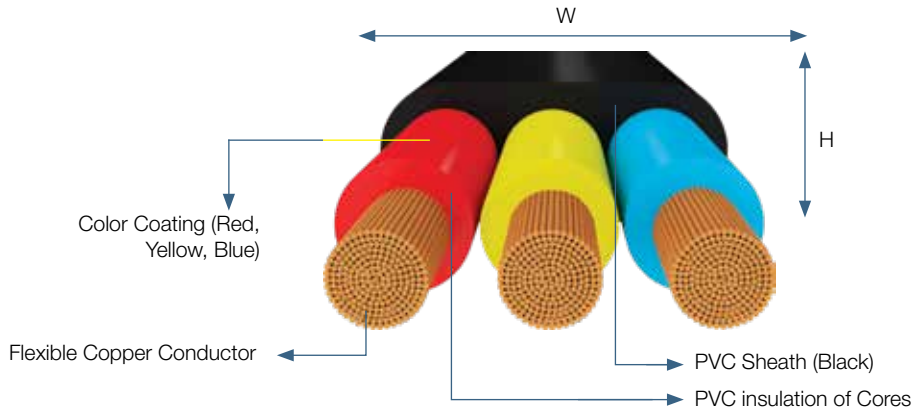
Excellent mechanical & electrical properties.

Progressive sequential length marking on every Metre.

Basic Code	Nominal area of conductor	*Number/ Size of Wire for each Core	Nominal Thickness of Insulation	Nominal Thickness of Sheath	SHEATH Approx Overall Dimension		Maximum Conductor Resistance at 20 °C	Current Carrying Capacity at 40 °C
					Width (W)	Height (H)		
	sq. mm	mm	mm	mm	(Nom.) mm	(Nom.) mm	Ω/km	A
WHPNDSKG 31X0	1.00 sq. mm	32 N/0.20 mm	0.6 mm	0.9 mm	9.4 mm	4.4 mm	19.50 Ω/km	11 A
WHPNDSKG 31X5	1.50 sq. mm	30 N/0.20 mm	0.6 mm	0.9 mm	10.1 mm	4.7 mm	13.30 Ω/km	13 A
WHPNDSKG 32X5	2.50 sq. mm	50 N/0.25 mm	0.7 mm	1.0 mm	12.2 mm	5.5 mm	7.98 Ω/km	18 A
WHPNDSKG 34X0	4.00 sq. mm	56 N/0.30 mm	0.8 mm	1.0 mm	14.6 mm	6.5 mm	4.95 Ω/km	24 A
WHPNDSKG 36X0	6.00 sq. mm	84 N/0.30 mm	0.8 mm	1.1 mm	16.2 mm	7.0 mm	3.30 Ω/km	31 A
WHPNDSKG 3010	10.00 sq. mm	80 N/0.40 mm	1.0 mm	1.4 mm	20.2 mm	8.5 mm	1.91 Ω/km	42 A
WHPNDSKG 3016	16.00 sq. mm	126 N/0.40 mm	1.0 mm	1.4 mm	23.4 mm	9.7 mm	1.21 Ω/km	57 A
WHPNDSKG 3025	25.00 sq. mm	196 N/0.40 mm	1.2 mm	2.0 mm	28.5 mm	11.7 mm	0.780 Ω/km	72 A
WHPNDSKG 3035	35.00 sq. mm	276 N/0.40 mm	1.2 mm	2.0 mm	32.1 mm	13.0 mm	0.554 Ω/km	90 A

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

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



Shielded Cables

21st Century is dedicated to Computer and Communication. When we are taking about communication there are too many things which are communicating with each other The communication may be Wired or Wire Less. When we talk of the signal around us means it is wire-less signal and too many signals with different frequencies are always around us (whether we are sitting in a Jungle or we are in metro cities). These free signals are tending to disturb or interfere the wires which are carrying the signals (interfacing multiple equipment / instrument / devices) and slowing down the speed of transmission between two interfaces. The whole interference phenomenon can be brought down to minimum only after applying SHIELDING around the interface cable. By earthing the shield, all the interfering signals can brought down to ground level or zero means minimum/no interference of external signal into the interfacing wires/cables. Some power cables are also shielded so that all electromagnetic radiations it is emitting are not disturbing other equipment or interface cables

Shielded Cable is an electrical cable of one or more insulated conductors enclosed by a common conductive layer. The shield may be composed of braided strands of copper (or other metal, such as aluminum), a non-braided spiral winding of copper tape, or a layer of conducting polymer. Usually this shield is covered with a jacket. The shield acts as a Faraday Cage to reduce electrical noise from affecting the signals, and to reduce electromagnetic radiation that may interfere with other devices. The shield minimizes capacitively coupled noise from other electrical sources. The shield must be applied across cable splices. In shielded signal cables the shield may act as the return path for the signal, or may act as screening only.

The best way to wire shielded cables for screening is to ground the shield at both ends of the cable. In airplanes, special cable is used with both, an outer shield to protect against lightning and an inner shield grounded at one end to eliminate hum from the 400 Hz power system

APPLICATION

The use of shielded cables in security systems provides some protection from power frequency and radio frequency interference, reducing the number of false alarms being generated. The best practice is to keep data or signal cables physically separated by at least 7.62 cm from ‘heavy’ power circuits which are in parallel.

Microphone or “signal” cable used in setting up PA and recording studios is usually shielded twisted pair cable. The twisted pair carries the signal in a balanced audio configuration.

The cable laid from the stage to the mixer is often multicore cable carrying several pairs of conductors.

Consumer use screened copper with one central conductor in an unbalanced configuration.

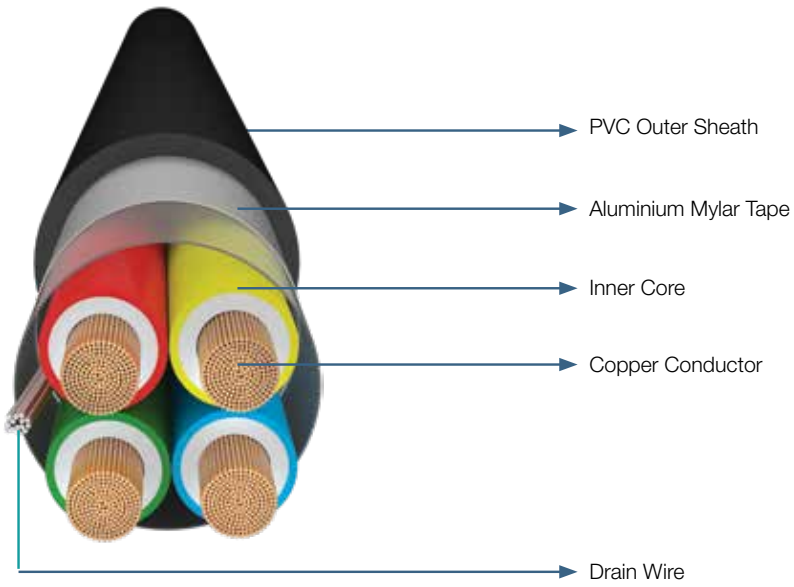
1100 Volt Flexible ABC Conductor, PVC Type D Insulated, Cores laid up, Overall Shielded by Al-mylar along with ATC drain wire & Overall PVC Type ST-3 Sheathed Cable

Particulars	Description		
No. of Cores	2 Core	3 Core	4 Core
Size of Cable	0.5 sq. mm, 0.75 sq. mm, 1.0 sq. mm, 1.5 sq. mm, 2.5 sq. mm, 4.0 sq. mm		
Rated Voltage	1100 V		
Conductor			
Material	Annealed Bare Copper Conductor Class - 5 as per IS:8130/84		
Nominal Cross Sectioal Area	0.5 sq. mm, 0.75 sq. mm, 1.0 sq. mm, 1.5 sq. mm, 2.5 sq. mm, 4.0 sq. mm		
Shape of Conductor	Flexible Circular		
Max. D.C. Resistance of Conductor at 20 °C	39.00 Ω/km, 26.00 Ω/km, 19.50 Ω/km, 13.30 Ω/km, 7.98 Ω/km, 4.95 Ω/km		
Insulation			
Material	PVC Type D as per IS:5831:84		
Nominal Thickness	0.6 mm, 0.6 mm, 0.6 mm, 0.6 mm, 0.7 mm, 0.8 mm		
Colour	Red, Yellow, Blue & Black		
Laying up	All Cores laid up together & made circular With Millinex Tape Wrapping		
Overall Screen			
Material & Type	Al-mylar tape along with 0.5 sq. mm ATC drain wire		
Outer Sheath			
Material	Extruded PVC Type ST3 as per IS 5831:84		
Nominal Thickness	0.9 mm, 0.9 mm, 0.9 mm, 0.9 mm, 1.0 mm, 1.0 mm		
Colour	Black		
Electrical Tests			
High Voltage Test at Room Temperature	To withstand 3.0 kVac for 5 min		
Core to Core	To withstand 3.0 kVac for 5 min		
Core to Screen	To withstand 1.0 kVac for 5 min		
Max. Conductor Temperature During Operation	70 °C		
Max. Conductor Temperature During Short Ckt.	160 °C		
Max. Short Ckt. Rating	0.058 kA/s, 0.086 kA/s, 0.115 kA/s, 0.173 kA/s, 0.288 kA/s, 0.460 kA/s		
Min. Permissible Bending Radius of Cable	12 X overall diameter of cable in mm		
Max. Safe Pulling Tension	5 kg / sq. mm of total conductor area		

Note: Sizes above 4 core are also available on request.
Shielded cable is available in FR as well as FRLSH outer sheath.
Shielded cable is also available with Braiding.

CABLE USAGE (Application)

- All Instruments
- Computer Internal Wiring
- Instruments Interfacing
- Instrument Power Supply Cable
- All Networking Stations
- All Central Control Rooms
- All Control Equipments
- Call Centres
- Solar Plants / Power Plants
- Medical Equipment's / Hospitals
- Research Centres
- Local Area Networking In All Commercial and Residential Places
- Aircrafts, Ships and In Space Crafts
- Mobile Towers, Wireless Systems



Solar Cables

INTRODUCTION

Solar photovoltaic industry gets more attention as the most promising environment- friendly industry, and it is expected to have the significant role in resolving the earth's energy problem. As production costs diminish, users increasingly view these energy sources as clean, cheap and reliable. In this background, the demand for "SOLAR CABLE", which is the current transmission medium of solar energy power generation, is expected to increase with the expansion of market.

SPECIAL PROPERTIES OF SOLAR CABLES

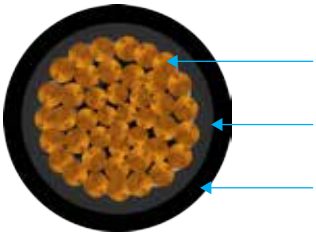
- **Lifetime reliability:** lasts up to 25 years even under tough external conditions.
- **Outdoor durability:** resists extreme temperatures (-40 °C to 120 °C maximum at the core) and ozone resistant.
- **UV resistance:** full protection against ultraviolet rays.
- **Halogen-free:** Low Smoke Emission & Low Toxicity/Corrosivity during fire.
- **Properties against fire:** flame retardant, fire retardant.
- **Flexibility and stripability:** for fast and easy installation.
- **Fully recyclable:** in accordance with new environmental regulations.
- **Easy installation** with color identification (black, red).
- **Suitable to common connector types.**
- **TÜV certified.**

CONSTITUENTS

Havells solar cables are manufactured with the following materials.

1. Annealed Tinned Copper Conductor
2. Cross Linked Polyolefin Compound
3. Cross Linked Polyolefin Compound

CONSTRUCTION OF SOLAR CABLES



*can be manufactured with Red/Black colour

REQUIRED FEATURES OF SOLAR CABLE

Chemical Features

- Weather resistant
- Resistant to mineral oils
- Resistant to acids & alkaline

Thermal Features

- Maximum conductor temperature of operation -120 °C during 20000 hours.
- Minimum operating temperature: - 40 °C

Electrical Features

- Voltage rating : 1.5 kV (1.8) kV dc / 0.6 kV/1.0 kV (1.2) kV ac
- High voltage test: 6.5 kV dc for 5 minutes.

Mechanical Features

- Resistant to Impact, tear & abrasion
- Minimum bending radius – 8 times of overall diameter
- Safe pulling force -50 N/sq. mm

TUV CERTIFICATE

TÜV INDIA

EN 50618:2014 Compliance

No.: 2223-8120606679-001

Client's reference - Technical file number: HIL/AWR/SOLAR/2022

Name & Address of the Manufacturer: HAVELLS INDIA LTD
A-461/462 & SP-215, 204, 204A
MIA, Alwar- 301 030
Rajasthan , INDIA

Product Nomenclature	:	*Cables for Photovoltaic System*
Type	:	*H1Z2Z2-K - 1Cx1.5 sq.mm to 1Cx240 sq.mm*
Rated Voltage	:	*DC 1.5KV*
Ambient Temperature	:	-40°C to 60°C
Max Temperature at Conductor	:	120°C
Color of Cable	:	Black Halogen free Cross-linked Compound

Review Results / Observations:

Based on the tests carried out, review of test reports –
The above product/s, generally comply with the safety requirements of the European standard:

EN 50618:2014 : ELECTRIC CABLES FOR PHOTOVOLTAIC SYSTEMS

Validity : 07 October 2025 (Subject to annual factory production control audit)

Date of Review : 07 October 2022

Ajinkya Patil
Manager - Product Certification

Dr. Vinodkumar Gupta
AVP – Product Certification & PTL

(This Statement of Confirmation is valid under the conditions stated overleaf)

Job no: 8120606679
Registered & Head Office: 801, Raheja Plaza I, LBS Marg, Ghatkopar (W), Mumbai 400 086 | Email: infoindia@tuv-nord.com Tel: +91-22-66477000
Website: www.tuv-nord.com/in Toll Free Number: 1800-209-0902

REQUIRED FEATURES OF SOLAR CABLE (As per BS EN 50618: 2014 TUV certified -2Pfg 1169)

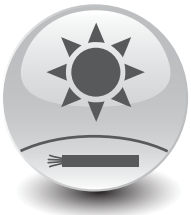
SIZE cross-sectional area in (sq. mm)	Max. Conductor D.C. Resistance at 20 °C (in Ω/km)	Average Diameter of Conductor (in mm)	Approximate Overall Diameter of cable (in mm)		Minimum Bending radius (in mm)	Current Rating for Single Cable Free in Air (A)	Short circuit current rating for 1 second duration (in kA)
1.5 sq. mm	13.7 Ω/km	1.46 mm	4.46 mm	4.86 mm	38.88 mm	30 A	0.189 kA
2.5 sq. mm	8.21 Ω/km	1.88 mm	4.88 mm	5.08 mm	42.24 mm	41 A	0.315 kA
4.0 sq. mm	5.09 Ω/km	2.41 mm	5.41 mm	5.61 mm	46.32 mm	55 A	0.504 kA
6.0 sq. mm	3.39 Ω/km	2.95 mm	5.95 mm	6.15 mm	50.64 mm	70 A	0.756 kA
10 sq. mm	1.95 Ω/km	3.86 mm	7.26 mm	7.66 mm	61.28 mm	98 A	1.26 kA
16 sq. mm	1.24 Ω/km	5.39 mm	8.79 mm	9.19 mm	73.52 mm	132 A	2.02 kA
25 sq. mm	0.795 Ω/km	6.73 mm	10.53 mm	11.13 mm	89.04 mm	176 A	3.15 kA
35 sq. mm	0.565 Ω/km	8.08 mm	11.88 mm	12.48 mm	99.84 mm	218 A	4.41 kA
50 sq. mm	0.393 Ω/km	9.69 mm	13.49 mm	14.09 mm	112.72 mm	276 A	6.30 kA
70 sq. mm	0.277 Ω/km	11.54 mm	15.34 mm	15.94 mm	127.52 mm	347 A	8.82 kA
95 sq. mm	0.210 Ω/km	13.25 mm	17.05 mm	17.85 mm	142.8 mm	416 A	11.97 kA
120 sq. mm	0.164 Ω/km	15.00 mm	18.80 mm	19.60 mm	156.8 mm	488 A	15.12 kA
150 sq. mm	0.132 Ω/km	16.77 mm	21.37 mm	22.37 mm	178.96 mm	566 A	18.90 kA
185 sq. mm	0.108 Ω/km	18.54 mm	23.54 mm	24.54 mm	196.32 mm	644 A	23.31 kA
240 sq. mm	0.0817 Ω/km	21.33 mm	26.33 mm	27.33 mm	218.64 mm	775 A	30.24 kA

TESTS & RATINGS OF SOLAR CABLES

Severe Weather Resistance

Maximum Conductor Temperature
120 °C[1] IEC 60216

Resistance to Extreme Temperatures
Minimum:-40 °C IEC 60811-1-4



Resistance to Ultraviolet
Rays (UV) UL 1581

Resistance to Ozone
IEC 60811-2-1

Resistance to Water Absorption
IEC 60811-1-3

Life Expectancy

Design Life Time 30 Years
IEC 60216

Mechanical Resistance

Impact Resistance
IEC 60811-1-4

Abrasion Resistance
EN 50305

Tear Resistance
IEC 61034-2

Severe Weather Resistance

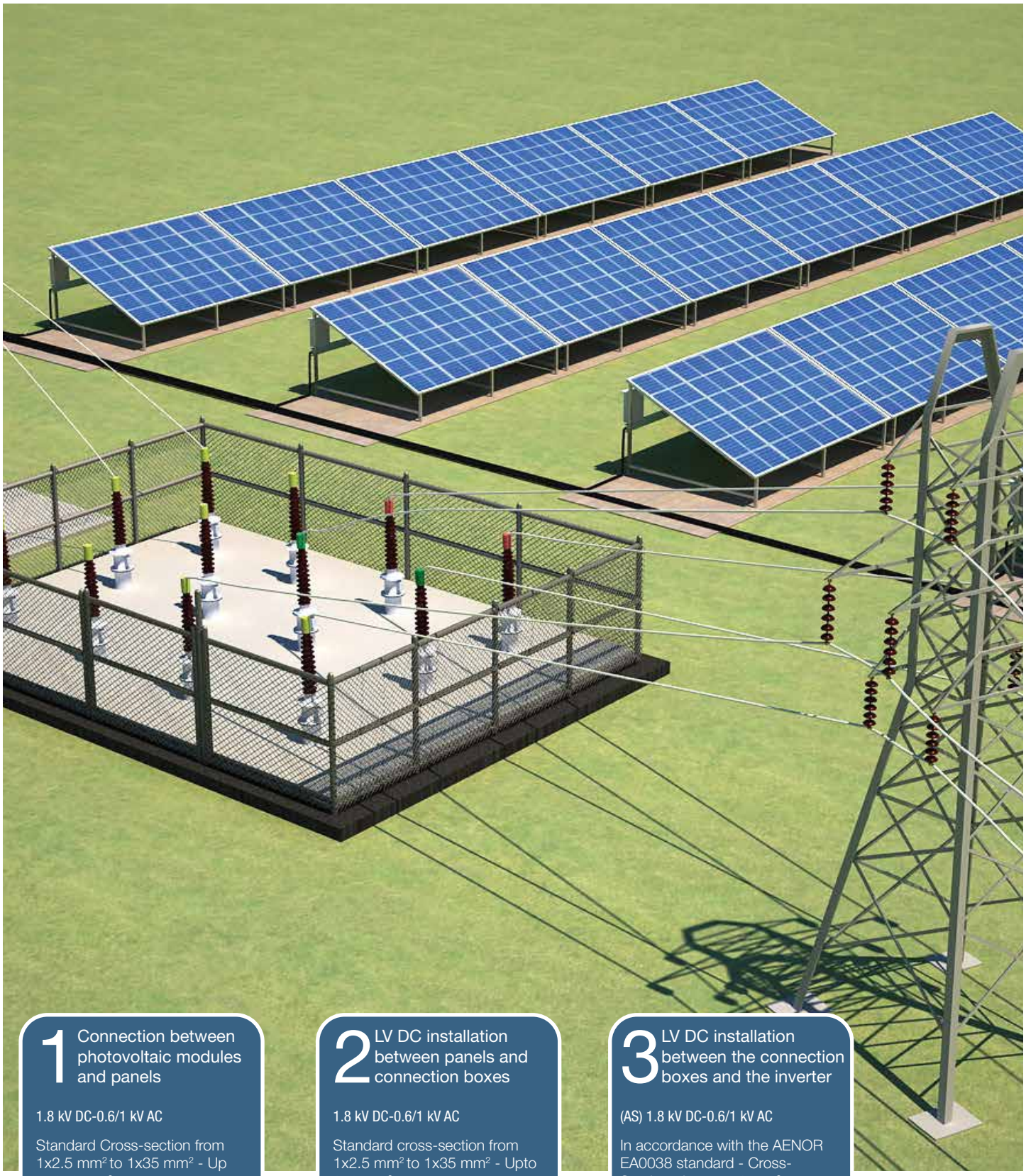
Environment-Friendly

Halogen Free
IEC 60754-1

Low Corrosive Gas Emission
IEC 60754-2

Low Smoke Opacity
IEC EN 61034-2

Non Fire Propagation
IEC 60332-3



1 Connection between photovoltaic modules and panels

1.8 kV DC-0.6/1 kV AC

Standard Cross-section from 1x2.5 mm^2 to 1x35 mm^2 - Up to 240 mm^2 upon customer request - TÜV certificate

2 LV DC installation between panels and connection boxes

1.8 kV DC-0.6/1 kV AC

Standard cross-section from 1x2.5 mm^2 to 1x35 mm^2 - Upto 240 mm^2 upon customer request - TÜV certificate

3 LV DC installation between the connection boxes and the inverter

(AS) 1.8 kV DC-0.6/1 kV AC

In accordance with the AENOR EA0038 standard - Cross-Sections from 1x16 mm^2 to 1x300 mm^2 - Armoured Cable

INSTALLATION TYPE

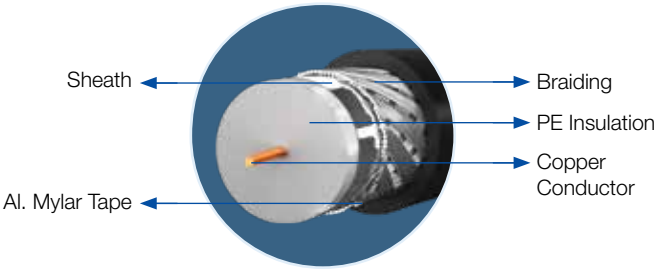
Co-Axial TV Cables

APPLICATION

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

CONSTRUCTION

Solid annealed bare copper conductor polyethylene 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-11, RG-59, RG-6
2	Inner Conductor	Solid Copper/CCS
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 PARAMetreS

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

Note: RG 6 also available in CCS.

CONSTRUCTION PARAMetreS

S. No.	Type Foam	RG-11 Foam	RG-59 Foam	RG-6 Foam	RG 6 CCS Foam
1	Inner Conductor	Solid Bare Copper	Solid Bare Copper	Solid Bare Copper	Copper Coated Steel
2	Nominal Diameter (mm)	1.63 mm ± 0.03 mm	0.80 mm ± 0.03 mm	1.02 mm ± 0.03 mm	1.02 mm ± 0.03 mm
3	Dielectric	Foam PE	Foam PE	Foam PE	Foam PE
4	Nominal Diameter (mm)	7.11 mm	3.55 mm	4.57 mm	4.57 mm
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	Nominal Coverage (%)	60%	60%	60%	60%
8	Jacket	PVC (Black)	PVC (Black)	PVC (Black)	PVC (Black)
9	Nominal Diameter (mm)	10.00 mm ± 0.20 mm	6.00 mm ± 0.10 mm	6.5 mm ± 0.10 mm	6.5 mm ± 0.10 mm

Note: Supplied in 90 m & 305 m 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-06/03 or as per customer requirenments.

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

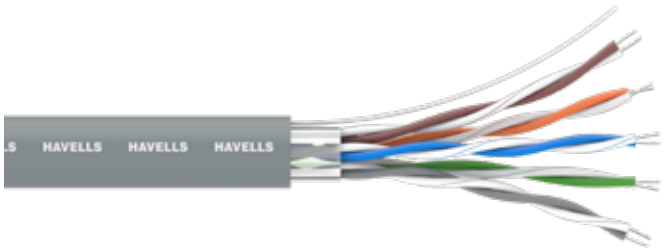
DESIGN / MATERIAL

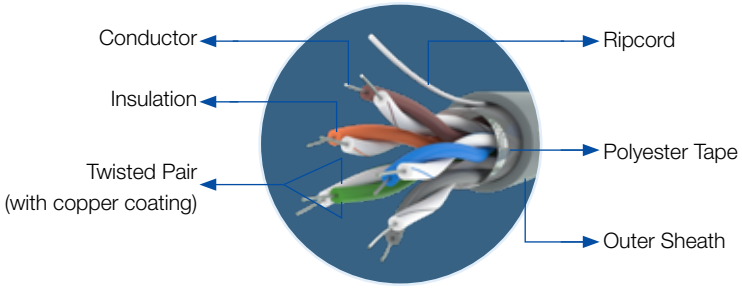
Conductor	:	Tinned copper
Insulation	:	PVC
Shielding	:	Over all shielded with polyester tape or copper wire braid (Manufactured against customer's orders only for economical runs.)
Sheathing	:	FR PVC
Conductor size Cable	:	0.4 mm, 0.5 mm, 0.6 mm
Configuration	:	1P, 2P, 3P, 4P, 5P, 6P, 10P, 20P

Note: Telephone Cable can also available with bare copper, polyethylene insulation FR-LSH/polyethylene sheathing & conductor sizes of 0.5 mm/ 0.6 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 impendence.
- 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 m length in carton packaging & 180 m 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 568 C.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 1000 MB/s
- Available in 305 m & 100 m Box packaging
- CAT 6 in 24 awg also available.

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

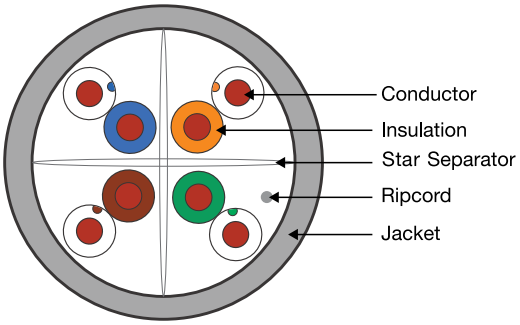
Mechanical Properties	
Outer Diameter	Nominal Diameter 6 mm ± 0.3 mm 4 twisted pair
Conductor Type	23 AWG bare annealed copper
Jacket Material	PVC
Standard Colour	Grey
Pulling Force	11.5 kg
Operating Tem. Ran.	–20 °C to +70 °C
Storage Tem. Ran.	0 °C to +50 °C

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

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



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

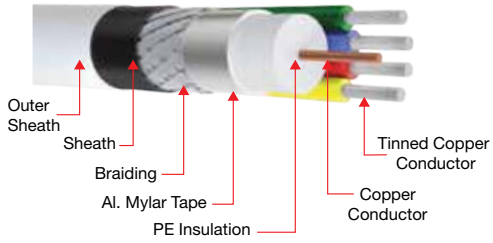
HAVELLS CCTV cables are designed to optimize the quality of video signals, which are transmitted through the Coaxial cable in the CCTV.

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 Aluminium Alloy and then jacketed with UV resistant property.

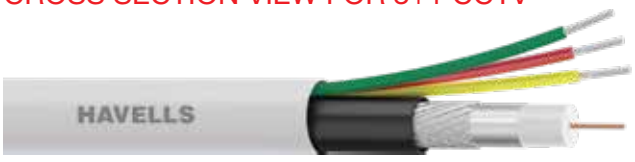
Topmost quality of construction of coaxial cable in HAVELLS CCTV cables ensures distortion free video signals and thus a clear picture over complete low frequency bandwidth of transmission in such applications.

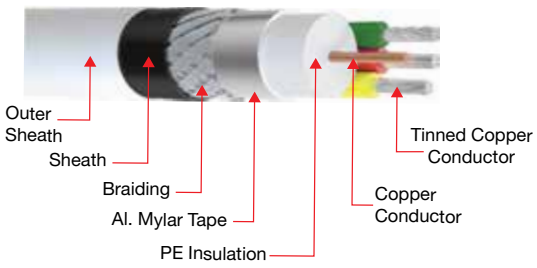
The impedance of coaxial cable is 75 ohm, which matches the CCTV equipment. This matching ensures adequate signal strength, no reflection and best picture quality.

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
Co-Axial Cable			
1.	**Conductor**		
	Material	Annealed Bare Copper	Annealed Bare Copper
	No. of Wire/ Diameter of Wire	1 N/0.60 mm ± 0.02 mm	1 N/0.60 mm ± 0.02 mm
2.	**Insulation**		
	Material	Polyethylene	Polyethylene
	Nominal Thickness of Insulation	0.35 mm	0.35 mm
	Diameter of Insulation	1.30 mm ± 0.10 mm	1.30 mm ± 0.10 mm
3.	**Overall Shielded (Braided)**		
	First Shield Material	Polyester Backed Al. Foil - 100%	Polyester Backed Al. Foil - 100%
	Second Shield Material	Aluminium Alloy Wire	Aluminium Alloy Wire
	Coverage	55%	55%
Coaxial Outer Sheath			
	Material	PVC	PVC
	Diameter of Sheath	2.80 mm ± 0.20 mm	2.80 mm ± 0.20 mm
Power Core			
1.	**Conductor**		
	Material	Annealed Bare Copper	Annealed Bare Copper
	No. of Wire/Diameter of Wire	7 N/0.15 mm ± 0.01 mm	7 N/0.15 mm ± 0.01 mm
2.	**Insulation**		
	Material	PVC Type-A	PVC Type-A
	Nominal Thickness of Insulation	0.40 mm	0.40 mm
	Diameter of Insulation	1.30 mm ± 0.10 mm	1.30 mm ± 0.10 mm
Outer Sheath			
1.	**Outer Sheath**		
	Material	FR PVC	FR PVC
	Nominal Thickness of Sheath	0.70 mm ± 0.10 mm	0.70 mm ± 0.10 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.

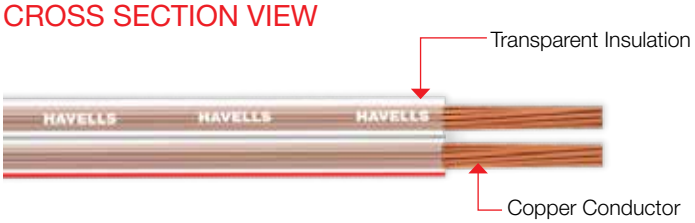
Packaging: Transparent Polywrapping in 100 m

Technical Requirement

Conductor		Insulation				
Size (sq. mm)	Maximum Conductor Resistance at 20 °C Ω/ km (Ohm per kiloMetre)	Thickness of Insulation (in mm)	Width (in mm)		Height (in mm)	
			Min.	Max.	Min.	Max.
2 x 0.50 sq.mm	39 Ω/km	0.60 mm	4.10 mm	4.30 mm	2.05 mm	2.10 mm
2 x 0.75 sq.mm	26 Ω/km	0.60 mm	4.50 mm	4.60 mm	2.24 mm	2.28 mm
2 x 1.00 sq.mm	18.1 Ω/km	0.70 mm	5.30 mm	5.40 mm	2.60 mm	2.70 mm
2 x 1.50 sq.mm	12.1 Ω/km	0.80 mm	6.20 mm	6.40 mm	3.06 mm	3.11 mm

CONSTRUCTION DETAILS: The twin parallel cable have the following construction with different coloring of insulation.

CROSS SECTION VIEW



Alwar Plant

REGIONAL & BRANCH OFFICES:

NORTH - REGIONAL OFFICE: Corporate Office: QRG Towers, 2D, Sector-126, Expressway, Noida-201304, Tel: 0120-3331000, **Delhi:** 011-47676700, 23888200, **Chandigarh:** 0172-4232400-401, **Dehradun:** 0135-6670202, **Haldwani:** 05946-222935/222933, **Noida / Haryana:** 0120-3331000, **Ludhiana:** 0161-4676000/24, **Amritsar:** 0183-5202400/401, **Jammu:** 0191-2478330, 2479330, **Sri Nagar:** 0194-2459248, **Jaipur:** 0141-4211000, 4211011, **Jodhpur:** 9214201640/41, **Lucknow:** 0522- 4921600/4921649, **Kanpur:** 0512-6710400

EAST - REGIONAL OFFICE: Kolkata: ICC Tower, 5th Floor, 4 India Exchange Place, Kolkata-700001, Tel: 033-40129851/52, **Bhubaneshwar:** 0674-6668101/102/103/104, **Guwahati:** 0361-2458923, 2134521, **Siliguri**: 0353-2525907, **Ranchi:** 0651-2244861, 2244862, 2244864, 2244868, 2244869, **Jamshedpur:** 0657-6542492, 09234369436, **Patna:** 0612-2207221, 2207222, 2207223, 2655518

WEST - REGIONAL OFFICE: Mumbai: 1271, Solitaire Corporate Park, Bldg. No. 12, 7th Floor, Andheri - Ghatkopar Link Road, Chakala, Andheri (East), Mumbai- 400093. Tel: 022 - 67298600-602, **Ahmedabad:** 079-40061111, 40060738/740, **Indore:** 0731-4219444/4219422, 0731-2572340, **Rajkot:** 0281-2481112, 2921212, **Nagpur:** 0712-2240932, 2242692, 2242699 **Pune:** 020-26056175-76, **Raipur:** 0771-4243400/01, **Surat:** 0261-2350137, 9979890137, **Jabalpur:** 0761-4064491, **Bhopal:** 0755-4271544, 0755-4011025,

SOUTH - REGIONAL OFFICE: Chennai: Sigapi Achi Building, No. 18/3, 6th Floor, Rukmani Lakshmipathy Road, Egmore, Chennai-600008, Tel: 044-42280600, 605, **Bangalore:** 080-49075000, **Coimbatore:** 0422-4550200/282, **Hyderabad:** 040-27533372, 27533355, 27533632, **Cochin:** 0484-4099000, **Calicut:** 0495-4019193/4/5, **Trivandrum:** 0471-4015323, **Vizag:** 0891-6514339, **Vijayawada:** 0866-2546161/62/67/68/69, **Hubli:** 0836-4248660

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