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PRODUCT OVERVIEW

# **Harnessflex® EVO™ Conduit Systems** for safeguarding critical wiring in heavy-duty electric vehicles

***Harnessflex®***  
SPECIALIST CONDUIT SYSTEMS





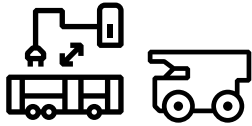
**Harnessflex®**  
**EVO™**  
(Electric Vehicle Orange) specialist range for full EV (electric vehicle) industry compliance.



## Harnessflex® EVO™

(Electric Vehicle Orange) conduit systems

Electric Vehicle Orange (EVO™) conduit systems for safeguarding critical wiring in heavy-duty electric vehicles.



Harnessflex EVO™ (Electric Vehicle Orange) conduit is flexible nylon (PA6) conduit suitable for electric vehicle applications.

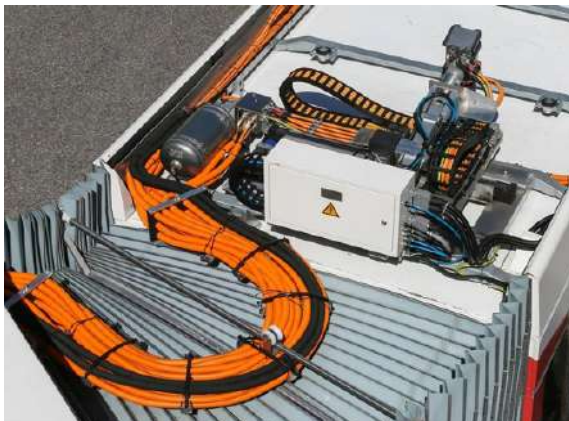
### Heavy automotive cable protection systems

Protection from damage by mechanical abrasion, excessive cable strain, corrosive salts and liquid ingress.

Built for use in a wide range of EV applications including electric cars, buses, trucks, lorries, trams and trains.

### High voltage connectors

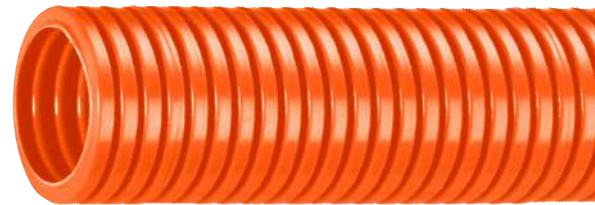
Connectors that easily integrate into high and low voltage wiring and are proven to withstand abrasion, stress, vibration, corrosive conditions and higher vehicle running temperatures. Testing – Form, Fit and Function.



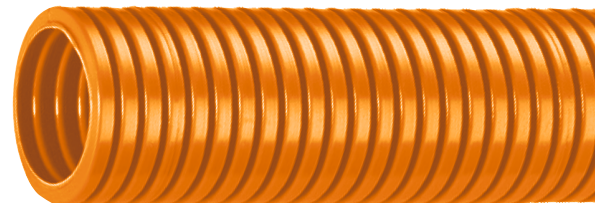
— 01 Co-Polyester (CPC) dynamic conduit.

— 02 Nylon (PA6 - NC and CTPA) conduit.

— 01



— 02



### Reliable complete system integration for EV wiring protection

Featuring our signature vibration friendly profile (VFP) as standard, as well as UV and heat stabilisation as standard, Harnessflex EVO™ conduit systems minimise the risk of electrical failure whilst also protecting crucial HV connectors.

# Harnessflex®

## Conduit systems

Harnessflex® conduit systems are built for performance, designed to protect critical wiring in harnesses on HGVs, off-road vehicles and other heavy automotives.

—  
01 Light, Medium and Standard weight flexible conduit for a wide range of wiring harness applications and environments.

Harnessflex® has the largest range of flexible conduits, sealed fittings, hinged connector interfaces and Y&T pieces, anywhere in the global cable protection market. Constantly evolving through innovation driven by some of the most demanding automotive industry sectors, Harnessflex products are designed to be used together as a system for easy installation and complete wiring harness protection.

Featuring a unique vibration friendly profile (VFP) as standard, as well as UV and heat stabilisation as standard, Harnessflex® conduit systems provide 10-150% greater life expectancy in dynamic or vibrating applications, when compared with other products. This maximises the productivity of the system being protected, whilst minimising the risk of electrical failure.



From fit-and-forget CPC conduit systems offering unbeatable dynamic performance, to our X-Temp™ range that is designed and tested to withstand extreme temperatures, Harnessflex® can provide a solution for most applications and environments.

### Features & benefits:

- High flexibility and fatigue life - continuous performance over a long product lifespan
- Protects critical cables with very high abrasion, impact and shock resistance
- Specialist ranges for use in extreme high and low temperatures
- Range includes products with IP40-IP69 rating, as well as self-extinguishing and low fire hazard capabilities and fittings offering reduction options
- VFP as standard, delivering minimal cable abrasion
- Designed to maximise tensile strength and reduce together with all Harnessflex® connector interface, Y&T and joining system installations
- 100% inspected and tested



### Harnessflex® Standard

A comprehensive range of cable protection products for heavy automotive 12V and 24V systems.



### Harnessflex® X-Temp™

Protection at temperatures between 200°C to -50°C with high vibration, dynamic conditions.



### Harnessflex® EVO™

(Electric Vehicle Orange) specialist range for full EV (electric vehicle) industry compliance.



# Product selection guide

## EVO™ conduit systems



Product selection guide

Type	NC	CTPA	CPC
Conduit material	Polyamide 6	Polyamide 6	Co-Polyester
Conduit weight	Standard	Light	Medium
Slit version available	•	•	-
<b>Temperature range</b>			
Long term static min.	-40°C	-40°C	-50°C
Long term static max.	+120°C	+120°C	+135°C
Short term (3000 hrs)	+150°C	+135°C	+150°C
Short term (200 hrs)	+175°C	+150°C	+175°C
<b>Characteristics</b>			
UV resistance	■■■■■	■■■■■	■■■■■
Flexibility	■■■■□	■■■■■	■■■■■
Fatigue life	■■■■■	■■■■□	■■■■■
Ext. wear resistance	■■■■■	■■■■■	■■■■□
Self extinguishing	•	•	•
Halogen free	•	•	•
Low smoke toxicity	•	•	•
<b>Approvals</b>			
CE	•	•	•
UL94 V0	-	-	-
UL94 V2	-	-	•
UL94 HB	•	•	-
R118	•	-	-
RoHS Compliant	•	•	•
ADR Approved	•	-	-
(ELV) EU200/53/EC	•	•	•
<b>Chemical resistance*</b>			
IRM 903 (ASTM Oil No.2)	S	S	S
Diesel Oil	S	S	S
Ethylene Glycol (Anti-freeze)	S	S	S
Lubricating Oil	S	S	S
Methyl Alcohol	L	L	S
Parafin Oil	S	S	S
Petrol	S	S	S
Sodium Chloride	S	S	S
Sodium Hydroxide (10%)	S	S	S
Transformer Oil	S	S	S
Urea	S	S	NT
Vegetable Oil	S	S	S
Sea (Water)	S	S	S

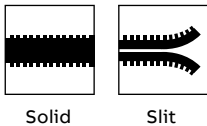
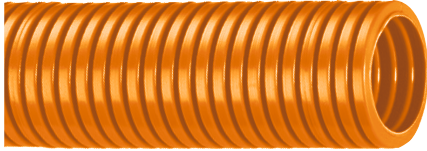
Key: S = Suitable / L = Limited Suitability / U = Unsustainable / NT = Not Tested

Maximum Performance = ■■■■■

\*All chemicals tested for resistance at 23°C.

## NC Standard weight, polyamide 6

### General purpose conduit



Solid

Slit

#### Description

Flexible standard weight nylon (PA6) conduit is a general-purpose conduit suitable for automotive harness applications. Able to withstand extremes of temperatures and resistant to automotive oils and solvents. It is extremely tough and has a very high impact strength and high fatigue life.

#### Applications

NC standard weight conduit is extensively used in harnesses on HGV and off road vehicle applications where a superior protection against impact and mechanical shock is preferred. The conduit is used for both chassis and engine applications and can be used in a wide range of temperatures. Polyamide 6 is highly resistant to all hydrocarbon based oils and fluids and many types of solvents.

#### NC Standard weight

Materials: Polyamide 6

Approvals	IP Rating	Appropriate fitting	Temperature range	UV resistance
ADR Approved (Sealed fittings)	IP40 NC Slit (IP40 only)	Hinged fittings	Long term: -40°C to +120°C	Very high (Black)
UL94 HB rated			Short term: +150°C	
CE Mark to the Low Voltage Directive	IP67	Sealed fittings	<b>Fire performance</b>	
RoHS Compliant to 2011/65/EU	IP68 (2 bar 30 mins)	Sealed fittings	Self extinguishing	
Reg 118			Low smoke toxicity	
Conforms with End of Life Vehicle directive (ELV) EU200/53/EC	<b>Degree of mechanical protection</b>		Halogen free	
	High flexibility & fatigue life			
	Very high abrasion, impact and shock resistance			
	Suited to high risk impact applications			



#### Dimensions

	Solid Part No.	Slit Part No.	Conduit size			Nominal O/D A (mm)	Min. bore B (mm)	Min. static bend radius C (mm)	Reel length (m)
			NC	NW	US				
	NC06	NC06-S	06	4.5	–	7.1	4.5	5.0	100
	NC08	NC08-S	08	7.5	¼	10.0	6.5	15.0	100
	NC10	NC10-S	10	8.5	¼	11.5	8.4	15.0	100
	NC12	NC12-S	12	10	⅝ <sub>16</sub>	13.0	9.9	20.0	100
	NC16	NC16-S	16	13	⅜	16.0	11.8	30.0	100
	NC20	NC20-S	20	17	½	21.2	16.6	35.0	50
	NC25	NC25-S	25	22	¾	25.6	21.3	40.0	50
	NC28	NC28-S	28	23	¾	28.5	22.6	45.0	50
	NC30	NC30-S	30	26	1	31.6	26.0	50.0	50
	NC32	NC32-S	32	29	1	34.5	28.8	55.0	50
	NC40	NC40-S	40	36	1 ¼	42.5	34.8	65.0	25
	NC50	NC50-S	50	48	1 ½	54.5	46.9	70.0	25

Colours available: Black ● RAL 9005 / Orange ● RAL 2003 / \*Other colour options available, subject strictly to MOQ.

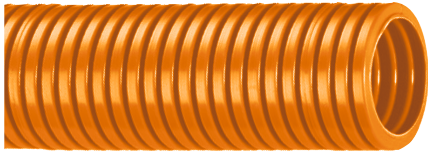
To order quote part number & reel length, e.g. NC06/100m. For slit conduit options add -S to part number, e.g. NC06-S/100m.

For colours other than standard Black also add colour, i.e. /OR for Orange conduit, e.g. NC06/OR/100m.

Bulk coil lengths over 200m are also available.

## CTPA Lightweight, polyamide 6

### Extra flexible conduit



Solid



Slit

#### Description

Extra flexible lightweight nylon (PA6) conduit is a general-purpose conduit suitable for electrical loom applications. Able to withstand extremes of temperatures and resistant to automotive oils and solvents. It is extremely tough and has a medium impact strength and high fatigue life.

#### Applications

CTPA lightweight conduit is extensively used in general purpose, lightweight electrical loom applications. Polyamide 6 is highly resistant to all hydrocarbon based oils and fluids and many types of solvents.

#### CTPA Lightweight

Materials: Polyamide 6

Approvals	IP Rating	Appropriate fitting	Temperature range	UV resistance
CE Mark to the Low Voltage Directive	<b>IP40</b>	Hinged fitting	Long term: -40°C to +120°C	Very high (Black)
UL94 HB rated	<b>IP67</b>	Sealed fittings	Short term: +150°C	
RoHS Compliant to 2011/65/EU	<b>Degree of mechanical protection</b>		<b>Fire performance</b>	
Conforms with End of Life Vehicle directive (ELV) EU200/53/EC	High flexibility & fatigue life		Self extinguishing	
	Medium impact resistance - suited to lower impact risk applications		Low smoke toxicity	
			Halogen free	



#### Dimensions

	Solid Part No.	Slit Part No.	Conduit size			Nominal O/D A (mm)	Min. bore B (mm)	Min. static bend radius C (mm)	Reel length (m)
			NC	NW	US				
	CTPA08	CTPA08-S	08	7.5	¼	10.0	6.5	10.0	100
	CTPA10	CTPA10-S	10	8.5	¼	11.5	8.7	15.0	100
	CTPA12	CTPA12-S	12	10	⅜	13.0	10.1	20.0	100
	CTPA16	CTPA16-S	16	13	⅜	16.0	11.8	35.0	100
	CTPA20	CTPA20-S	20	17	½	21.2	16.9	45.0	50
	CTPA25	CTPA25-S	25	22	¾	25.6	21.3	45.0	50
	CTPA28	CTPA28-S	28	23	¾	28.5	23.1	45.0	50
	CTPA32	CTPA32-S	32	29	1	34.5	28.8	55.0	50
	CTPA40	CTPA40-S	40	36	1 ¼	42.5	35.0	65.0	25
	CTPA50	CTPA50-S	50	48	1 ½	54.5	46.0	90.0	25

Colours available: Black ● RAL 9005 / Orange ● RAL 2003 / \*Other colour options available, subject strictly to MOQ.

To order quote part number & reel length, e.g. CTPA08/100m. For slit conduit options add -S to part number, e.g. CTPA08-S/100m.

For colours other than standard Black also add colour, i.e. /OR for Orange conduit, e.g. CTPA08/OR/100m.

Bulk coil lengths over 200m are also available.

## CPC Medium weight, co-polyester

### Dynamic conduit



Solid

#### Description

Dynamic and extra flexible medium weight, co-polyester conduit suitable for automotive harness applications. Able to withstand extremes of temperatures and resistant to automotive oils and solvents. It is extremely tough and has a very high impact strength and fatigue life.

#### Applications

A low smoke, low toxicity conduit, CPC has excellent high and low temperature properties, making it ideal for harness applications such as engine, body section and chassis. CPC is resistant to hydrocarbons, greases, fuels and oils.

#### CPC Medium weight

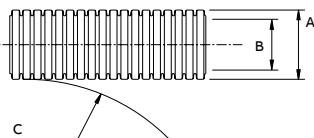
Materials: FR Co-Polyester

Approvals	IP Rating	Appropriate fitting	Temperature range	UV resistance
CE Mark to the Low Voltage Directive	<b>IP40</b>	Hinged fitting	Long term: -50°C to +135°C	Very high
UL94 V2 rated	<b>IP67</b>	Sealed fittings	Short term: +175°C	
RoHS Compliant to 2011/65/EU	<b>Degree of mechanical protection</b>		<b>Fire performance</b>	
Conforms with End of Life Vehicle directive (ELV) EU200/53/EC	Very high flexibility & fatigue life		Self extinguishing	
	Very high abrasion, impact and shock resistance at low temperatures		Low smoke toxicity	
			Halogen free	



#### Dimensions

Solid Part No.	Conduit size			Nominal O/D A (mm)	Min. bore B (mm)	Min. static bend radius C (mm)	Reel length (m)
	NC	NW	US				
CPC08	08	7.5	¼	9.8	6.2	20.0	100
CPC12	12	10	5/16	13.0	9.4	25.0	100
CPC16	16	13	¾	16.0	11.0	30.0	50
CPC20	20	17	½	21.2	16.1	40.0	50
CPC25	25	22	¾	25.3	21.0	45.0	50
CPC28	28	23	¾	28.5	22.5	45.0	50
CPC32	32	29	1	34.5	27.2	55.0	50
CPC40	40	36	1 ¼	42.5	34.2	60.0	25
CPC50	50	48	1 ½	54.5	46.9	70.0	25

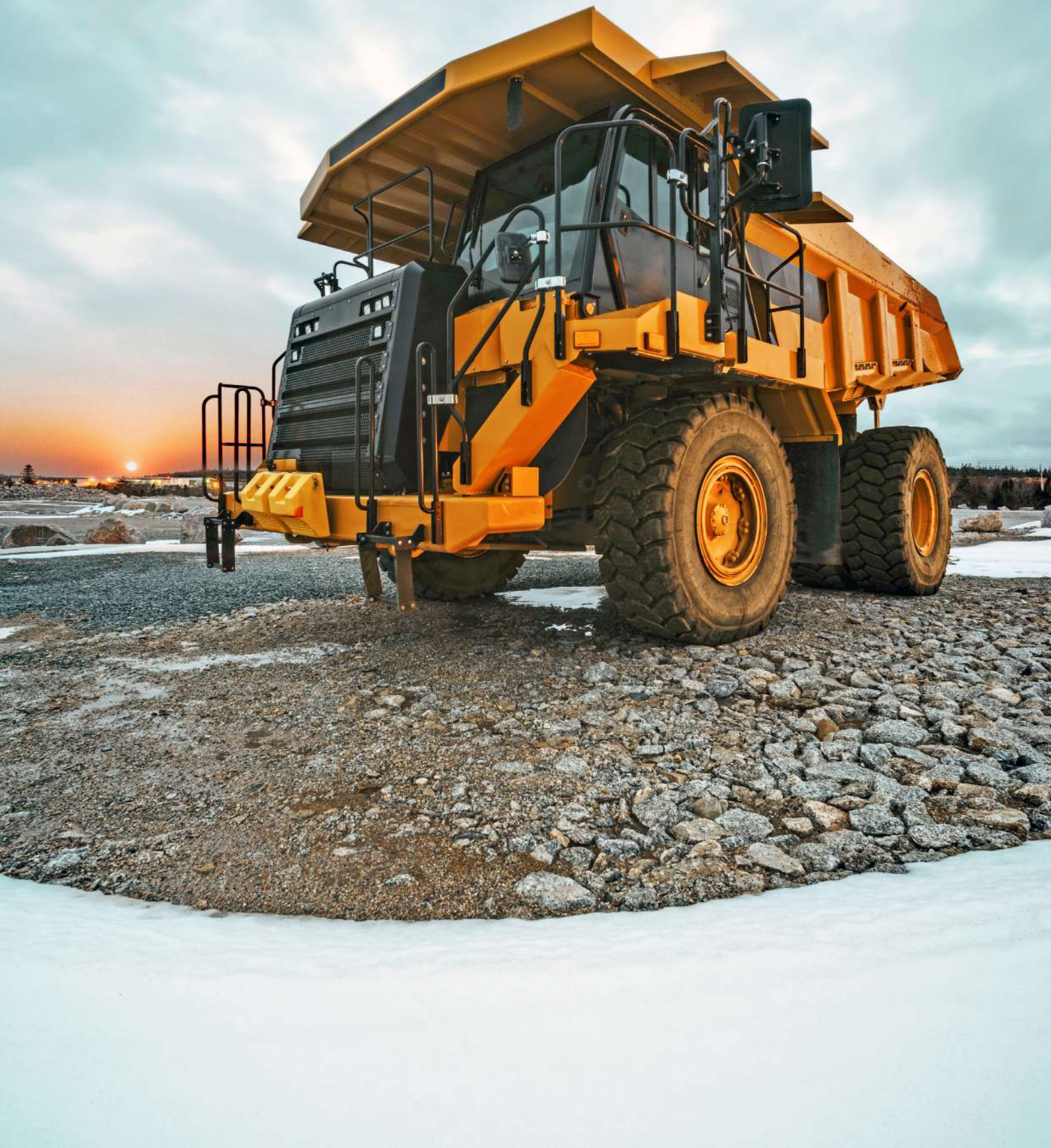


Colours available: Black ● RAL 9005 / Orange ● RAL 2017 / To order quote part number & reel length, e.g. CPC08/100m.  
For colours other than standard Black also add colour, i.e. /OR for Orange conduit, e.g. CPC08/OR/100m.



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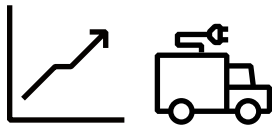
Connectors are often left exposed, leaving them open to intrusion, excessive strain and impact damage.



# Harnessflex® EVO™ conduit systems

## Talking about EV connector risks

With countries across the globe looking to tackle climate change through less carbon emissions and greater sustainability, the shift towards electric modes of transport is ever-growing.



- 01 No strain relief present.
- 02 Exposed HV cable.
- 03 Extra engineering required.
- 04 Compromise of connector seals.
- 05 Debris intrusion hotspot.
- 06 Management of bulky cables.

**With the electric vehicle (EV) industry** projected to see compounded annual growth (CAGR) of 21.1% over the next 10 years, we can soon expect to see more electric cars, buses, trucks, trams and trains in our cities.

With electric vehicles soon to become the norm, it is important that their reputation for reliability is maintained. Electric vehicles contain significant critical wiring that facilitates their operation. Therefore, the optimum level of cable protection is absolutely crucial in order to maintain the vehicle's productivity.

Without the right cable protection system in place, electric vehicles may become prone to critical electrical failure which will cause them to breakdown, resulting in timetable disruptions and repair costs.

One of the key areas at risk is the vital link between cable and connector. Without robust backshell protection, cables running into connectors are often left exposed, leaving them open to intrusion, excessive strain and impact damage - all of which can lead to electrical faults and vehicle failure.

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## EVO™ High voltage connectors

### HV Connector interfaces

**Features & benefits:**

- Supports connector Ingress Protection (IP) performance
- Isolates and reduces cable movement
- Provides cable-connector interface with high mechanical protection
- Provides connector to cable strain relief
- High pull-off strength - conduit corrugations sit tightly into joiner junctions
- Enhanced abrasion and vibration protection
- External fit for unrestricted bore and quick assembly
- Tamperproof, integrated clip system as standard
- Safe for use with 1000V AC and 1500V DC

**Applications:**

- For use with high voltage connectors
- Power Distribution Units (PDU)
- Motor Control Units (MCU)
- Invertors
- DC Drive Motors
- In-wheel Motors
- E-Axles
- High Voltage Battery Packs
- Hybrid Systems
- Static Power Systems
- Marine

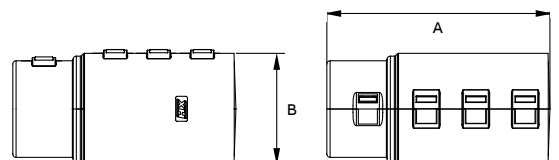
01 EVO™ High voltage connectors HV Connector interfaces.

01



EVO™ high voltage connectors for use with Amphenol Powerlok high voltage connectors

Part No.	Connector Series		Connector Series	Dimensions (mm)	
	NC	NW		A	B
CI25-PL300	25	22	Amphenol Powerlok 300 (1 Pos)	67.7	33.8
CI28-PL300	28	23	Amphenol Powerlok 300 (1 Pos)	68.5	33.8


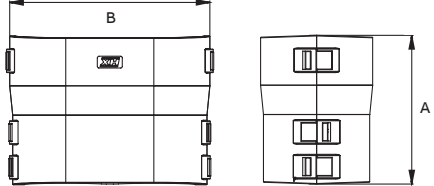


## EVO™ High voltage connectors

### HV Connector interfaces


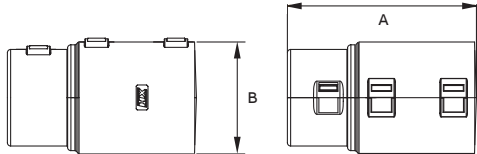
EVO™ high voltage connectors for use with Amphenol Powerlok high voltage connectors

Part No.	Connector Series		Connector Series	Dimensions (mm)	
	NC	NW		A	B
CI25-PL282-PL300	25	22	Amphenol Powerlok 300 (2 Pos)	50.7	38.2
CI28-PL282-PL300	28	23	Amphenol Powerlok 300 (2 Pos)	50.7	38.2


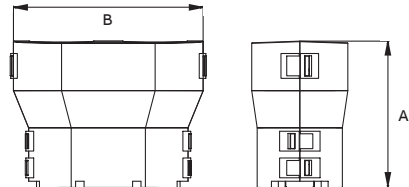
EVO™ high voltage connectors for use with Amphenol Powerlok high voltage connectors

Part No.	Connector Series		Connector Series	Dimensions (mm)	
	NC	NW		A	B
CI25-PL18-G2	25	22	Amphenol Powerlok 300 G2 (1 Pos)	59.5	34.2
CI28-PL18-G2	28	23	Amphenol Powerlok 300 G2 (1 Pos)	59.5	34.2


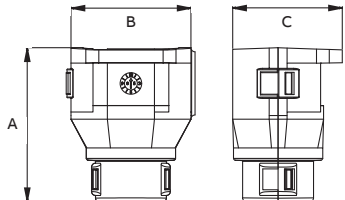
EVO™ high voltage connectors for use with Amphenol Powerlok high voltage connectors

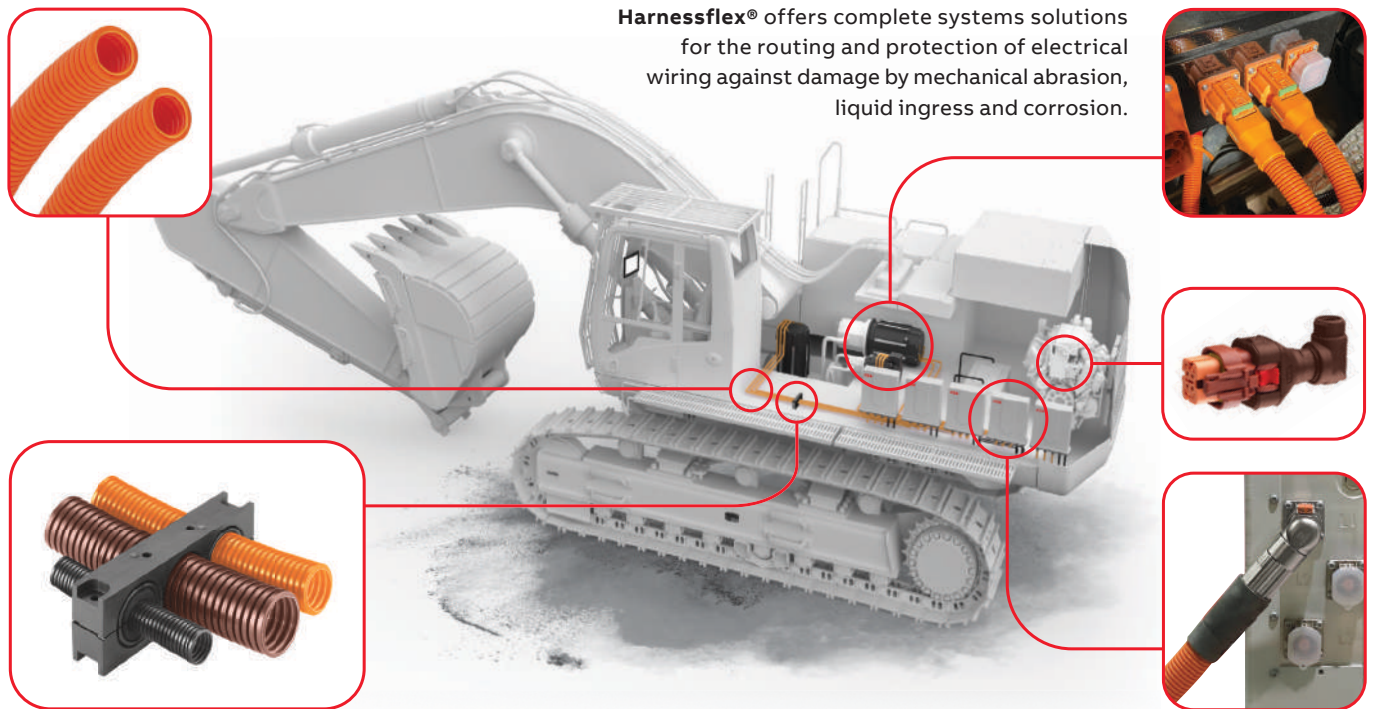
Part No.	Connector Series		Connector Series	Dimensions (mm)	
	NC	NW		A	B
CI25-PL182-G2	25	22	Amphenol Powerlok 300 G2 (2 Pos)	59.7	76.6
CI28-PL182-G2	28	23	Amphenol Powerlok 300 G2 (2 Pos)	59.7	76.6

EVO™ high voltage connectors for use with TE HVA280-3 high voltage connectors

Part No.	Connector Series		Connector Series	Dimensions (mm)		
	NC	NW		A	B	C
CI16-HVA280-3	16	13	TE HVA280	42.9	33.4	30.6



## ABB products for construction equipment electrification:

### Mobile controllers X90

B&R continues to open up new possibilities in mobile automation with its innovative X90 mobile controllers. The comprehensive set of standardised components is perfect for implementing flexible automation concepts. The heart of the X90 mobile control system is a powerful ARM processor and multi-function I/O channels. Basic features include interfaces for CAN, Ethernet and the real-time POWERLINK bus system.

The B&R Hypervisor can turn your PC into a high-end embedded controller with processor speeds up to 2.8 GHz.

### Harnessflex EVO™ Conduit

Suitable for electric vehicle applications, Harnessflex Electric Vehicle Orange Conduit (EVO™) is flexible nylon that is able to withstand extremes of temperatures and resistant to automotive oils and solvents.

### AMXE Motors

Compact, permanent magnet synchronous motors for high efficiency propulsion and auxiliary usage:

- Power levels from 20 to 520 kW.
- Speed range up to 8000 rpm.
- Four different frame sizes
- Shaft and flange dimensions in wide range available

As a further advantage, the motor shaft and the flange can be selected to fit already existing interfaces.

### BORDLINE® ESS

- Designed according to ABB's long experience in the transportation business
- Based on Lithium-Titanate (LTO) battery cells
- Best in class in safety, lifetime, power and performance
- Compact and lightweight solution
- Easy connectivity and ready-to-install
- Suitable for multi-string systems with paralleling
- Efficient thermal management based on liquid cooling

### NextGen Drive

The next generation drive using a 3-level IGBT topology is most efficient, most universal and motor friendliest topology today:

- 3-level topology reduces harmonic motor losses (-75%) at the same switching frequency and reduces voltage stress on motor winding
- Flexibility to separate the drive and motor with cables and full flexibility for different motor types
- Inherent fault tolerance
- Reduces risk of motor bearing currents through reduced common mode voltage

### HES880 mobile drive

Compact and rugged, features and benefits of the HES880 include:

- Inverter for traction motor and generator up to 510 kW continuous and up to 760 kW peak electrical power
- Three different frame sizes with voltage from 320 to 750 VDC – 350, 600 and 900 A as maximum currents
- Bi-directional line converter for grid connectivity
- DC/DC converter for battery, super capacitor or fuel cell, up to 620 kW
- The same module can be used as a line converter, motor inverter or DC/DC converter
- Easy to install, only plug connectors



# Harnessflex® Interconnect system

The Harnessflex Interconnect System enables easy linking between Harnessflex® fittings and connector interfaces to conduit braiding, sleeving and heat shrink.



01 Harnessflex® Interconnect system (example).

Compatible with Harnessflex Multi-Function Clips or Ty-Rap® cable ties, the **Harnessflex Interconnect System** is available for all conduit outlet sizes NC08 to NC40 (excluding NC10).

Without the right cable protection system in place, electric vehicles may become prone to critical electrical failure which will cause them to breakdown, resulting in timetable disruptions and repair costs.

One of the **key areas at risk** is the vital link between cable and connector. Without robust backshell protection, cables running into connectors are often left exposed, leaving them open to intrusion, excessive strain and impact damage - all of which can lead to electrical faults and vehicle failure.

**Features & benefits:**

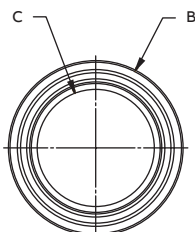
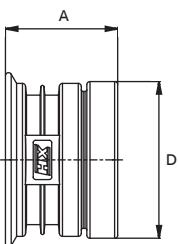
- Compatible with all Harnessflex® hinged fittings
- Compatible with all Harnessflex connector interfaces
- Can be easily secured with either Ty-Fast® cable ties or Harnessflex Multi-Function clips (see compatible parts below)
- Smooth cable entry & bore
- Easy assembly
- -40C to +120C
- CE Mark to the low voltage directive
- RoHS Compliant to 2015/863/EU
- Conforms with end of life vehicle directive (ELV) EU200/53/EC

## Ty-Fast®



Harnessflex® Interconnect system

Part No.	Compatible with	Nominal dimensions (mm)			
		A	B	C	D
MSA08	CCSB08	17.0	13.5	5.7	NC08 / NW7.5
MSA10	CCSB10	19.5	14.3	6.3	NC10 / NW8.5
MSA12	CCSB12	17.8	15.7	7.6	NC12 / NW10
MSA16	CCSB16	17.7	18.8	10.9	NC16 / NW13
MSA20	CCSB20	17.5	23.9	14.5	NC20 / NW17
MSA25	CCSB25	18.2	28.3	19.0	NC25 / NW22
MSA28	CCSB28	18.1	30.9	21.6	NC28 / NW23
MSA32	CCSB32	19.0	36.8	27.5	NC32 / NW29
MSA40	CCSB40	21.6	44.8	33.8	NC40 / NW36





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