

Harnessflex

Harnessflex® Specialty Conduit Systems

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Harnessflex® Specialty Conduit Systems

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Thomas & Betts

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Overview

About Harnessflex® — OEM Design Culture

Harnessflex is a leading designer and manufacturer of flexible conduit systems and connector interfaces, protecting critical electrical and electronic wiring assemblies in the automotive industry, principally focused on chassis and engine manufacturers within bus, truck, agricultural vehicle and heavy machinery markets. Manufacturers who have to meet stringent emission regulations and improved machine reliability requirements are replacing traditional cable protection methods with our conduit systems.

With literally thousands of combinations, the Harnessflex® system offers the complete solution for routing and protection of electrical wiring against damage by mechanical abrasion, liquid ingress and corrosive salts. The use of connector interfaces ensures that there are no vulnerable connectors exposed to the elements, impact of foreign bodies and jet washing, which could so easily cause malfunction and failure, compromising the operation of a vehicle.

Our success has come from our systematic commitment to providing an extensive range of high-grade quality components. Combining a full range of slit and un-slit conduit, fittings and connectors, we also offer the largest range of hinged system components and connector interfaces within the industry.

Global Market

Manufacturers of vehicle harnesses operate on a truly global scale. Harnessflex® products can be found on vehicles and engines throughout the world in Africa, America, Australia, Europe, the Middle East and the Far East, and we have been working with our global customers for many years.

Applications

The Harnessflex® system is suitable for use on vehicles in a wide variety of markets and geographical locations. We provide harness solutions for:

- Agricultural vehicles
- Construction vehicles
- Engine manufacturers
- Harness manufacturers
- Truck and bus manufacturers
- Tanker and trailer manufacturers
- Specialist vehicle components
- Military vehicles

Selection Table for Conduit

		CONDUITS							
		NC (POLYAMIDE 6)	CTPA (POLYAMIDE 6)	HNC (POLYAMIDE 11)	CPC (FR CO-POLYESTER)	PP (POLYPROPYLENE)	DSPP (FR POLYPROPYLENE)	PKC (POLYETHERETHERKETONE)	HTC* (POLYPHENYLENE SULPHIDE)
CATALOG PAGE(S)		E-340	E-341	E-342	E-342	E-343	E-343	E-344	E-344
STATIC TEMP. (°C)	MIN.	-40	-40	-50	-45	-20	-20	-60	-45
	MAX.	120	120	110	135	90	90	260	200
UV RESISTANCE		■■■■■	■■■■■	■■■■■	■■■■■	■■□□	■■■□	■■■■■	■■■■■
FLEXIBILITY		■■■□	■■■□	■■■■■	■■■□	■■■■■	■■■□	■■■■■	■■□□*
FATIGUE LIFE		■■■□	■■■□	■■■■■	■■■□	■■■■■	■■■■■	■■■□	■■□□*
HALOGEN FREE		✓	✓	✓	✓	✓	✓	✓	✓
SELF EXTINGUISHING		✓	✓	✓	✓	—	✓	✓	✓
EXTERNAL WEAR RESISTANCE		■■■■■	■■□□	■■■□	■■■□	■■□□	■■□□	■■■■■	■■■■■
SLIT VERSION AVAILABLE		3	3	—	—	—	Slit only	—	—
CHEMICAL RESISTANCE	IRM 903 (ASTM OIL NO. 2)	S	S	S	S	S	S	S	S
	DIESEL OIL	S	S	S	S	S	S	S	S
	ETHYLENE GLYCOL (ANTIFREEZE)	S	S	S	S	S	S	S	S
	LUBRICATING OIL	S	S	S	S	S	S	S	S
	METHYL ALCOHOL	L	L	S	S	S	S	S	S
	PARAFIN OIL	S	S	S	S	S	S	S	S
	PETROL	S	S	S	S	S	S	S	S
	SODIUM CHLORIDE	S	S	S	S	S	S	S	S
	SODIUM HYDROXIDE (10%)	S	S	S	S	S	S	S	S
	TRANSFORMER OIL	S	S	S	S	S	S	S	S
	UREA	S	S	S	NT	NT	NT	S	S
	VEGETABLE OIL	S	S	S	S	S	S	S	S
	SEA (WATER)	S	S	S	S	S	S	S	S

Key: S = Suitable, L = Limited Suitability, U = Unsustainable, NT = Not Tested. All chemicals tested for resistance at 33° C. Maximum Performance = ■■■■■ * HTC is a pliable conduit system for static applications.

Overview

Ingress Protection (IP) Ratings

Harnessflex® hinged systems are rated at IP40.

Harnessflex® sealed systems are rated at IP66, IP67, IP68 (2bar for 30 mins.) and IP69k only when using Harnessflex® conduit.

Product Specifications

All Harnessflex® fittings are manufactured from polyamide 66 (PA 66) and are black in color. Other colors and materials can be made available to achieve specific customer requirements.

Product data sheets and dimension charts are available for the full Harnessflex® range — contact Thomas & Betts Technical Support.

Design Data

Harnessflex® products are developed using the following CAD systems:

- PTC® Pro-ENGINEER® Wildfire® 2 and 3
- Autodesk Inventor® V10, V11 and 2008
- Autodesk AutoCAD® 2006, 2007 and 2008

Drawing files are available in the following CAD formats (as well as the versatile PDF format): DWG, DXF, DWF, IGES, STEP, STL, PRT, ASM, IPT, IAM.

Pre-Production Samples

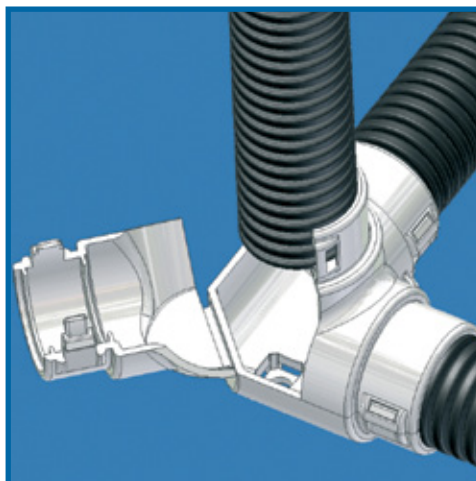
From CAD data, we are able to produce accurate representations of final manufactured products, using a 3D printing process.

Prototype fittings are typically produced in duraform PA, a material that gives similar performance in tests to PA 66.

Prototype extrusions can be manufactured in a variety of materials — contact Thomas & Betts Technical Support for details.

Our pre-production process allows a design to be validated before a product is tooled for manufacture.

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Conduits

NC and NC Slit Standard Weight Polyamide 6 General-Purpose Conduit

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

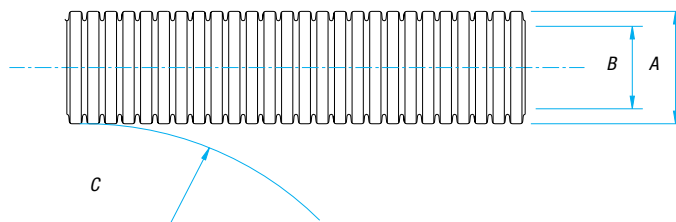
Solid NC conduits provide protection against mechanical shock and ingress of water while maintaining their form through tight bend radii.

Applications

NC standard weight is extensively used in harnesses on HGV, off-road vehicles and marine 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 is designed for connection to all Harnessflex® sealed and hinged system fittings.

NC conduits are available in a range of popular sizes. The standard color is black with other colors, including orange for hybrid vehicles, available on request.



NC Conduit

CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH (M)
	(NC)	(NW)	A	B	C	
NC06	06	4.5	7.1	4.5	5	100
NC08	08	7.5	10.0	6.5	15	100
NC10	10	8.5	11.5	8.4	15	100
NC12	12	10	13.0	9.9	20	100
NC16	16	13	16.0	11.8	30	100
NC20	20	17	21.2	16.6	35	50
NC25	25	22	25.6	21.3	40	50
NC28	28	23	28.5	22.6	45	50
NC32	32	29	34.5	28.8	55	50
NC40	40	36	42.5	34.8	65	25
NC50	50	48	54.5	46.9	70	25

For orange conduit, add /OR. For red conduit, add /RD. Example: NC20/OR/50m.

NC Slit Conduit

CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH (M)
	(NC)	(NW)	A	B	C	
NC06-S	06	4.5	7.1	4.5	5	100
NC08-S	08	7.5	10.0	6.5	15	100
NC10-S	10	8.5	11.5	8.4	15	100
NC12-S	12	10	13.0	9.9	20	100
NC16-S	16	13	16.0	11.8	30	100
NC20-S	20	17	21.2	16.6	35	50
NC25-S	25	22	25.6	21.3	40	50
NC28-S	28	23	28.5	22.6	45	50
NC32-S	32	29	34.5	28.8	55	50
NC40-S	40	36	42.5	34.8	65	25
NC50-S	50	48	54.5	46.9	70	25

For orange conduit, add /OR. For red conduit, add /RD. Example: NC20-S/RD/50m.

Hints & Tips

KWIKCUT is the ideal cutting tool for all non-metallic conduits up to 32mm.

Cutting Instructions

Place the conduit between the cutting blade and lower support, squeeze the handles and rotate the conduit for a clean, easy cut.

Spare blades are available.

Catalog Numbers

KWIKCUT

KWIKCUT-Blade

Conduits

CTPA and CTPA Slit Lightweight Polyamide 6 General-Purpose Conduit

Flexible lightweight nylon (PA6) conduit is a general-purpose conduit suitable for automotive harness applications. It can withstand extremes of temperatures and resists automotive oils and solvents. It is extremely tough and has a high-impact strength and fatigue life.

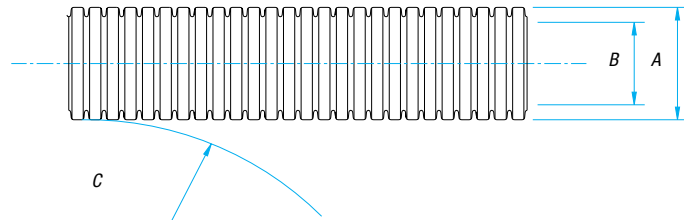
CTPA conduits provide protection against mechanical shock and ingress of water while maintaining their form through tight bend radii.

Applications

Lightweight convoluted tube used for interior harnesses, offering limited mechanical protection, abrasion resistance and enhanced aesthetics of the harness.

Extremely light and flexible.

Resistant to oils and solvents.



CTPA Conduit

CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
CTPA08	08	7.5	10.0	6.5	10	100
CTPA10	10	8.5	11.5	8.7	15	100
CTPA12	12	10	13.0	10.1	20	100
CTPA16	16	13	16.0	11.8	35	100
CTPA20	20	17	21.2	16.9	45	100
CTPA25	25	22	25.6	21.3	45	100
CTPA28	28	23	28.3	23.1	45	100
CTPA32	32	29	34.5	28.8	55	100
CTPA40	40	36	42.5	35.0	65	50
CTPA50	50	48	54.3	46.5	75	50

For orange conduit, add /OR. For red conduit, add /RD. Example: CPTA10/OR/100m.

CTPA Slit Conduit

CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
CTPA08-S	08	7.5	10.0	6.5	10	100
CTPA10-S	10	8.5	11.5	8.7	15	100
CTPA12-S	12	10	13.0	10.1	20	100
CTPA16-S	16	13	16.0	11.8	35	100
CTPA20-S	20	17	21.2	16.9	45	100
CTPA25-S	25	22	25.6	21.3	45	100
CTPA28-S	28	23	28.3	23.1	45	100
CTPA32-S	32	29	34.5	28.8	55	100
CTPA40-S	40	36	42.5	35.0	65	50
CTPA50-S	50	48	54.3	46.5	75	50

For orange conduit, add /OR. For red conduit, add /RD. Example: CTPA08-S/RD/100m.

Hints & Tips

KWIKCUT is the ideal cutting tool for all non-metallic conduits up to 32mm.

Cutting Instructions

Place the conduit between the cutting blade and lower support, squeeze the handles and rotate the conduit for a clean, easy cut.

Spare blades are available.

Catalog Numbers

KWIKCUT

KWIKCUT-Blade

Conduits

HNC Standard Weight Polyamide 11, Low-Temperature Extra-Flexible Conduit

HNC standard weight conduit is made from polyamide 11 and is specially formulated to meet the environmental and mechanical requirements for the exterior of working vehicles.

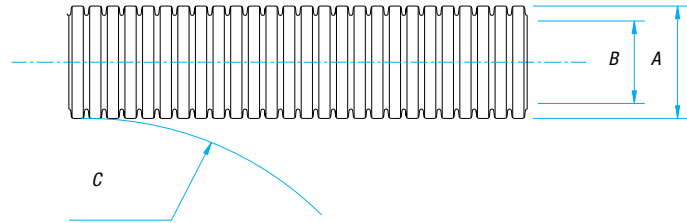
HNC conduit also provides protection against mechanical shock and ingress of water while maintaining its form through tight bend radii. It is specifically designed to cope with extremes of temperature combined with repeated movement and vibration.

Applications

HNC conduit is used in applications requiring repeated flexing coupled with low-temperature impact toughness.

Robotics and rapid- or continuous-motion applications demanding high fatigue life and extra flexibility are covered by HNC, which is also used in low-temperature environments.

HNC standard weight conduit is designed for connection to all Harnessflex® hinged and sealed fittings.



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
HNC08	08	7.5	10.0	6.2	15	100
HNC12	12	10	13.0	9.9	25	100
HNC16	16	12	15.8	11.7	30	100
HNC20	20	17	21.2	16.6	35	50
HNC25	25	22	25.3	21.0	40	50
HNC28	28	23	28.5	21.7	45	50
HNC32	32	29	34.5	27.7	55	50
HNC40	40	36	42.5	35.5	60	25
HNC50	50	48	54.5	46.6	70	25

CPC Medium Weight (FR Co-polyester) Flame-Retardant Conduit

CP standard weight conduit is made from flame-retardant co-polyester, which is a halogen free, low smoke and very low toxicity material. It has excellent high- and low-temperature properties.

CP conduits provide protection against mechanical shock and ingress of water while maintaining their form through tight bend radii. This material demonstrates excellent chemical resistance to greases, hydrocarbons, fuels and oils.

Applications

CP is used in applications requiring low fire hazard performance. It is lightweight and retains its flexibility at extremes of temperature. CP is designed for use in the interior and exterior of vehicles and marine passenger cabins.

CP is designed for connection to all Harnessflex hinged and sealed fittings.

Hints & Tips

KWIKCUT is the ideal cutting tool for all non-metallic conduits up to 32mm.

Cutting Instructions

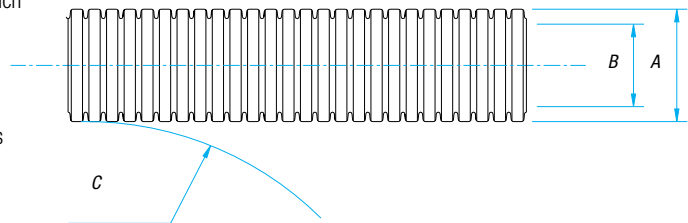
Place the conduit between the cutting blade and lower support, squeeze the handles and rotate the conduit for a clean, easy cut.

Spare blades are available.

Catalog Numbers

KWIKCUT

KWIKCUT-Blade



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
CPC08	08	7.5	9.8	6.2	20	50
CPC12	12	10	13.0	9.4	25	50
CPC16	16	13	16.0	11	30	50
CPC20	20	17	21.2	16.1	40	50
CPC25	25	22	25.3	21.0	45	50
CPC28	28	23	28.5	22.5	45	50
CPC32	32	29	34.5	27.2	50	50
CPC40	40	36	42.5	34.2	55	25
CPC50	50	48	54.1	46.0	65	25

Conduits

Modified PP Medium Weight Polypropylene Conduit

PP is a flexible conduit made from polypropylene.

PP conduits provide very good acid resistance, very good flexibility and a very high fatigue life.

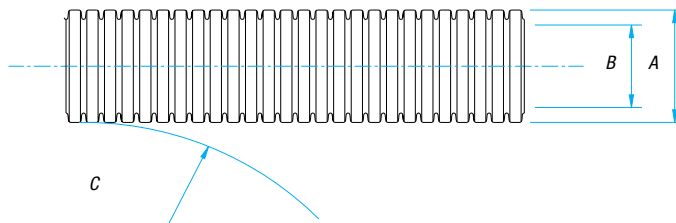
Applications

PP is used in lighter applications where compression strength and LFH are not so important. The main strength of this conduit is its acid resistance.

PP is halogen free and not self-extinguishing.

PP conduits are available in a range of popular sizes, in black only.

PP is designed for connection to all Harnessflex® sealed and hinged system fittings.



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
PP08	08	7.5	10.0	6.4	15	100
PP12	12	10	13.0	9.6	25	50
PP16	16	13	16.2	11.2	35	50
PP20	20	17	21.2	16.9	35	50
PP25	25	22	25.6	21.5	40	50
PP28	28	23	28.5	23.2	45	50
PP32	32	29	34.5	29.1	50	50

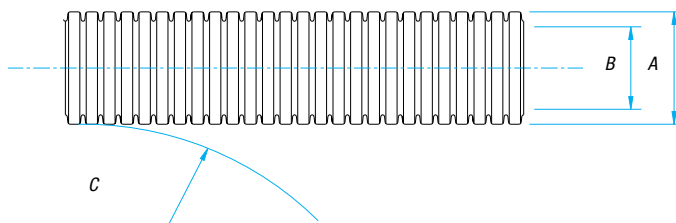
Deep Section Modified Slit PP Medium Weight Polypropylene Conduit

DSPP conduit is made from a halogen-free, flame-retardant material.

DSPP slit conduits provide protection against mechanical shock while maintaining their form through tight bend radii.

Applications

DSPP has a deep section to maintain the conduit shape during bending. Conduits are supplied in slit form to facilitate rapid cable installation and are designed for connection to all Harnessflex® hinged fittings.



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH
	(NC)	(NW)	A	B	C	(M)
DSPP08	08	7.5	10.0	6.6	10	100
DSPP12	12	10	13.0	8.5	18	100
DSPP16	16	13	16.2	11.1	32	100
DSPP20	20	17	21.2	15.0	40	100
DSPP28	28	23	28.5	21.7	50	100
DSPP32	32	29	34.5	27.7	58	50
DSPP40	40	36	42.5	34.6	80	25
DSPP50	50	48	54.5	46.5	100	25

Conduits

PKC Standard Weight Polyketone Super-Low Fire Hazard Conduit

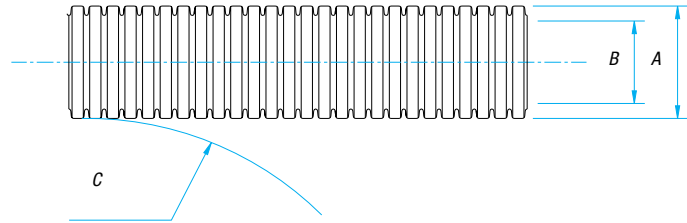
Super-Low Fire Hazard PK is a standard weight conduit, which offers superior mechanical strength as well as high radiation and chemical protection in extreme temperatures. It is a unique product manufactured from a special polymer, for use in the most demanding applications.

Peek is a truly high performance conduit.

Applications

This flexible conduit, with its high specification performance, is used in some of the most demanding applications.

It is often found in aerospace, off-shore, military, heat treatment, nuclear, petrochemical and marine applications.



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH (M)
	(NC)	(NW)	A	B	C	
PKC12	12	10	13.0	10.0	35	25
PKC16	16	13	15.8	11.9	45	25
PKC20	20	17	21.2	16.6	60	25
PKC28	28	23	28.5	21.7	65	25
PKC32	32	29	34.5	27.7	80	25

HTC High-Temperature Conduit

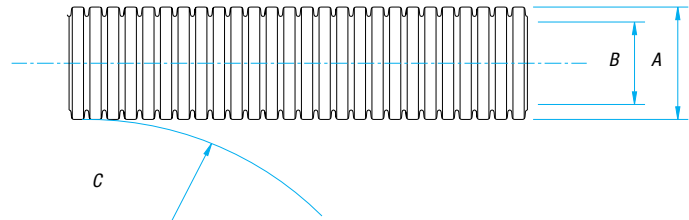
A pliable conduit suitable for static applications where elevated temperatures are present. It features high compression strength and excellent chemical resistance and is made from specially modified PPS.

Applications

This conduit has been developed for use in engine areas where elevated temperatures occur. Suitable for long-term exposure to 200° C.

NEW

Contact Thomas & Betts Technical Support for full details and availability.



CAT. NO.	CONDUIT SIZE		NOMINAL O/D MM	MIN. BORE MM	MIN. STATIC BEND RAD. MM	REEL LENGTH (M)
	(NC)	(NW)	A	B	C	
HTC12	12	10	13.0	10.0	40	25
HTC16	16	13	15.8	11.9	45	25
HTC20	20	17	21.2	16.5	65	25
HTC25	25	22	25.6	21.3	75	25
HTC28	28	23	28.5	22.7	85	25
HTC32	32	29	34.5	28.8	100	25
HTC40	40	30	42.5	35.2	120	25
HTC50	50	48	54.5	46.5	140	25

Hinged Connectors

Hinged Interfaces

Hinged fittings allow for protection of cables at breakouts, harness servivability and for the conduit system to self level. They are designed to protect against high-pressure washing, excessive cable strain and mechanical abrasion. Variety, flexibility and assembly speed are inherent in all Harnessflex® fittings.

Quality and Standards

Manufacturing is controlled in accordance with BS EN ISO 9001, while ongoing testing and approval to international standards (UL®, TUV, LCIE) provides additional confidence required to specify appropriate Harnessflex® products across the widest variety of automotive applications — including hazardous or aggressive environments.

Conduit has the following approvals:

- FMVSS 302 Ford flammability specification for conduit
- NFR13-903 French automotive conduit specification
- UL Recognized American electrical conduit specification

All components comply with End of Life Vehicle (ELV) directive EU2000/53/EC. Harnessflex® hinged fittings also comply with ISO14001 Environmental Standards.

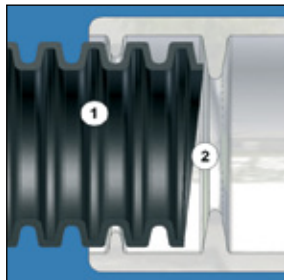
Capabilities

Our internal design team is able to offer unique solutions specific to our customers' applications. Using the latest 3D CAD modeling software, we are able to communicate new product designs quickly and efficiently. Prototype parts can be quickly made to order to enable product evaluation early on in the design cycle.

If you have a need for a dedicated hinged fitting, contact Thomas & Betts Technical Support to discuss your requirement.

Design Features

1. Radiused internal form of conduit protects cables from abrasion.
2. Internal backstop (found on all hinged fittings) alleviates any potential problems caused by unevenly cut conduit.



Hints and Tips

1. Multiple breakouts can be achieved from any NC20, NC25 or NC28 exit using our ST splitter range. See **page E-365** for details.
2. JPS and EPS fittings can be used as conduit enlargers or reducers.
3. Combining multiple XPS fittings (**page E-349**) creates a self-leveling manifold, ideal for engine bay or transmission applications.



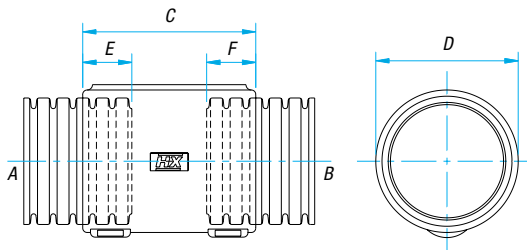
Hinged Connectors

External Hinged Joiners

One-piece joiner and elbow hinged fittings allow a variety of conduit size variations.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

Can be used as a reducer as well as an enlarger.



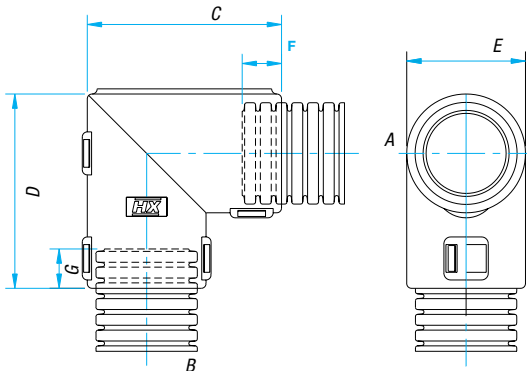
CAT. NO.	CONDUIT SIZES				DIMENSIONS (MM)			
	(NC)		(NW)		C	D	E	F
	A	B	A	B				
JPS1212	12	12	10	10	36	16	10	10
JPS1612	16	12	13	10	36	21	10	10
JPS1616	16	16	13	13	36	21	10	10
JPS2008	20	08	17	7.5	38	26	12	10
JPS2012	20	12	17	10	38	26	12	10
JPS2016	20	16	17	13	38	26	12	10
JPS2020	20	20	17	17	38	26	12	12
JPS2520	25	20	22	17	39	33	12	12
JPS2525	25	25	22	22	39	33	13	13
JPS2820	28	20	23	17	39	33	13	13
JPS2825	28	25	23	22	39	33	13	13
JPS2828	28	28	23	23	39	33	13	13

External Hinged Elbows

One-piece joiner and elbow hinged fittings allow a variety of conduit size variations.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

Can be used as a reducer as well as an enlarger.



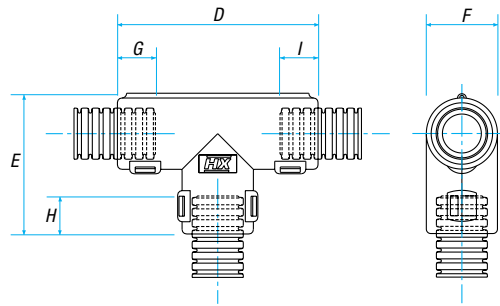
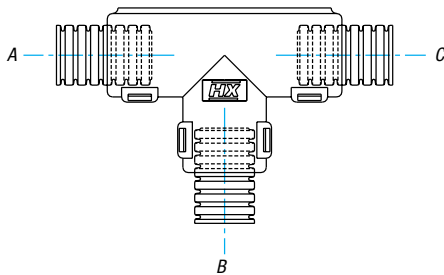
CAT. NO.	CONDUIT SIZES				DIMENSIONS (MM)					
	(NC)		(NW)		C	D	E	F	G	
	A	B	A	B						
EPS08S08	08	08	7.5	7.5	38	29	20	10	10	
EPS12S12	12	12	10	10	38	29	20	10	10	
EPS0820	08	20	7.5	17	41	41	25	10	12	
EPS1608	16	08	10	7.5	34	34	21	10	10	
EPS1612	16	12	13	10	34	34	21	10	10	
EPS1616	16	16	13	13	34	34	21	10	10	
EPS2012	20	12	17	10	41	41	26	10	10	
EPS2016	20	16	17	13	41	41	26	12	10	
EPS2020	20	20	17	17	41	41	26	12	12	
EPS2520	25	20	22	17	48	48	33	13	12	
EPS2525	25	25	22	22	48	48	33	13	13	
EPS2812	28	12	23	10	48	48	33	13	10	
EPS2816	28	16	23	13	48	48	33	13	10	
EPS2820	28	20	23	17	48	48	33	13	12	
EPS2825	28	25	23	22	48	48	33	13	13	
EPS2828	28	28	23	23	48	48	33	13	13	
EPS28-70-25	N/A	N/A	N/A	N/A	51	37	16	N/A	N/A	

Hinged Connectors

External Hinged T-Pieces

One-piece symmetrical three-junction fittings allow a variety of conduit size variations.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.



CAT. NO.	CONDUIT SIZES			NOMINAL DIMENSIONS (MM)								
	(NC)			(NW)			D	E	F	G	H	I
	A	B	C	A	B	C						
TPS080808	08	08	08	7.5	7.5	7.5	45.2	31.1	17	10	10	10
TPS081208	08	12	08	7.5	10	7.5	45.2	31.1	17	10	10	10
TPS081612	08	16	12	7.5	13	10	45.2	31.1	17	10	10	10
TPS100808	10	08	08	8.5	7.5	7.5	45.2	31.1	17	10	10	10
TPS101010	10	10	10	8.5	8.5	8.5	45.2	31.1	17	10	10	10
TPS101012	10	10	12	8.5	8.5	13	45.2	31.1	17	10	10	10
TPS120808	12	08	08	10	7.5	7.5	45.2	31.1	17	10	10	10
TPS120812	12	08	12	10	7.5	10	45.2	31.1	17	10	10	10
TPS121010	12	10	10	10	8.5	8.5	45.2	31.1	17	10	10	10
TPS121012	12	10	12	10	8.5	10	45.2	31.1	17	10	10	10
TPS121208	12	12	08	10	10	7.5	45.2	31.1	17	10	10	10
TPS121210	12	12	10	10	10	7.5	45.2	31.1	17	10	10	10
TPS121212	12	12	12	10	10	10	45.2	31.1	17	10	10	10
TPS121612	12	16	12	10	13	10	45.2	31.1	21	10	10	10
TPS160808	16	08	08	13	7.5	7.5	49.1	34.8	21	10	10	10
TPS160812	16	08	12	13	7.5	10	49.1	34.8	21	10	10	10
TPS160816	16	08	16	13	7.5	13	49.1	34.8	21	10	10	10
TPS161012	16	10	12	13	8.5	10	49.1	34.8	21	10	10	10
TPS161016	16	10	16	13	8.5	13	49.1	34.8	21	10	10	10
TPS161212	16	12	12	13	10	10	49.1	34.8	21	10	10	10
TPS161216	16	12	16	13	10	13	49.1	34.8	21	10	10	10
TPS161608	16	16	08	13	13	7.5	49.1	34.8	21	10	10	10
TPS161612	16	16	12	13	13	10	49.1	34.8	21	10	10	10
TPS161616	16	16	16	13	13	13	49.1	34.8	21	10	10	10
TPS162012	16	20	12	13	17	10	49.1	34.8	21	10	10	10
TPS162016	16	20	16	13	17	13	49.1	34.8	21	10	10	10
TPS200816	20	08	16	17	7.5	13	56.5	41.0	26	12	10	10
TPS200820	20	08	20	17	7.5	17	56.5	41.0	26	12	10	12
TPS201016	20	10	16	17	8.5	13	56.5	41.0	26	12	10	10
TPS201020	20	10	20	17	8.5	17	56.5	41.0	26	12	10	12
TPS201216	20	12	16	17	10	13	56.5	41.0	26	12	10	10
TPS201220	20	12	20	17	10	17	56.5	41.0	26	12	10	12
TPS201612	20	16	12	17	13	10	56.5	41.0	26	12	10	10
TPS201616	20	16	16	17	13	13	56.5	41.0	26	12	10	10
TPS201620	20	16	20	17	13	17	56.5	41.0	26	12	10	12
TPS202012	20	20	12	17	17	10	56.5	41.0	26	12	12	10
TPS202016	20	20	16	17	17	13	56.5	41.0	26	12	12	10
TPS202020	20	20	20	17	17	17	56.5	41.0	26	12	12	12

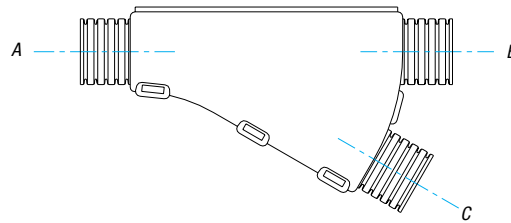
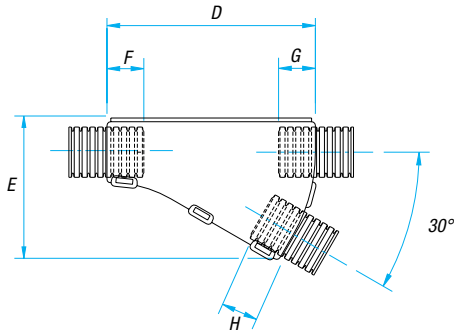
CAT. NO.	CONDUIT SIZES			NOMINAL DIMENSIONS (MM)								
	(NC)			(NW)			D	E	F	G	H	I
	A	B	C	A	B	C						
TPS202516	20	25	16	17	22	13	64.5	48.5	33	12	13	10
TPS250820	25	08	20	22	7.5	17	64.5	48.5	33	13	10	12
TPS250825	25	08	25	22	7.5	22	64.5	48.5	33	13	10	13
TPS251025	25	10	25	22	8.5	22	64.5	48.5	33	13	10	13
TPS251220	25	12	20	22	10	17	64.5	48.5	33	13	10	12
TPS251225	25	12	25	22	10	22	64.5	48.5	33	13	10	13
TPS251620	25	16	20	22	13	17	64.5	48.5	33	13	10	12
TPS251625	25	16	25	22	13	22	64.5	48.5	33	13	10	13
TPS252020	25	20	20	22	17	17	64.5	48.5	33	13	12	12
TPS252025	25	20	25	22	17	22	64.5	48.5	33	13	12	13
TPS252520	25	25	20	22	22	17	64.5	48.5	33	13	13	12
TPS252525	25	25	25	22	22	22	64.5	48.5	33	13	13	13
TPS280820	28	08	20	23	7.5	17	64.5	48.5	33	13	10	12
TPS280828	28	08	28	23	7.5	23	64.5	48.5	33	13	10	13
TPS281020	28	10	20	23	8.5	17	64.5	48.5	33	13	10	12
TPS281028	28	10	28	23	8.5	23	64.5	48.5	33	13	10	13
TPS281220	28	12	20	23	10	17	64.5	48.5	33	13	10	12
TPS281225	28	12	25	23	10	22	64.5	48.5	33	13	10	13
TPS281228	28	12	28	23	10	23	64.5	48.5	33	13	10	13
TPS281620	28	16	20	23	13	17	64.5	48.5	33	13	10	12
TPS281625	28	16	25	23	13	22	64.5	48.5	33	13	10	13
TPS281628	28	16	28	23	13	23	64.5	48.5	33	13	10	13
TPS282020	28	20	20	23	17	17	64.5	48.5	33	13	12	12
TPS282025	28	20	25	23	17	22	64.5	48.5	33	13	12	13
TPS282028	28	20	28	23	17	23	64.5	48.5	33	13	12	13
TPS282525	28	25	25	23	22	22	64.5	48.5	33	13	13	13
TPS282528	28	25	28	23	22	23	64.5	48.5	33	13	13	13
TPS282828	28	28	28	23	23	23	64.5	48.5	33	13	13	13
TPS321625	32	16	25	29	13	22	72.0	55.3	39	13	10	13
TPS321632	32	16	32	29	13	29	72.0	55.3	39	13	10	13
TPS322532	32	25	32	29	22	29	72.0	55.3	39	13	10	13
TPS322025	32	20	25	29	17	22	72.0	55.3	39	13	12	13
TPS322028	32	20	28	29	17	23	72.0	55.3	39	13	12	13
TPS322032	32	20	32	29	17	29	72.0	55.3	39	13	12	13
TPS322525	32	25	25	29	22	22	72.0	55.3	39	13	13	13
TPS322532	32	25	32	29	22	29	72.0	55.3	39	13	13	13
TPS323225	32	32	25	29	29	22	72.0	55.3	39	13	13	13
TPS323232	32	32	32	29	29	29	72.0	55.3	39	13	13	13

Hinged Connectors

External Hinged Y-Pieces

One-piece asymmetrical three-junction fittings allow a variety of conduit variations.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.



CAT. NO.	CONDUIT SIZES			NOMINAL DIMENSIONS (MM)							
	(NC)			(NW)			D	E	F	G	H
A	B	C	A	B	C						
YPS080808	08	08	08	7.5	7.5	7.5	55	37	10	10	10
YPS080812	08	08	12	7.5	7.5	10	55	37	10	10	10
YPS081208	08	12	08	7.5	10	7.5	55	37	10	10	10
YPS101010	10	10	10	8.5	8.5	8.5	55	37	10	10	10
YPS120808	12	08	08	10	7.5	7.5	55	37	10	10	10
YPS120810	12	08	10	10	7.5	8.5	55	37	10	10	10
YPS121010	12	10	10	10	8.5	8.5	55	37	10	10	10
YPS121208	12	12	08	10	10	7.5	55	37	10	10	10
YPS121210	12	12	10	10	10	8.5	55	37	10	10	10
YPS121212	12	12	12	10	10	10	55	37	10	10	10
YPS160812	16	08	12	13	7.5	10	55	40	10	10	10
YPS161010	16	10	10	13	8.5	8.5	55	40	10	10	10
YPS161208	16	12	08	13	10	7.5	55	40	10	10	10
YPS161210	16	12	10	13	10	8.5	55	40	10	10	10
YPS161212	16	12	12	13	10	10	55	40	10	10	10
YPS161608	16	16	08	13	13	7.5	55	40	10	10	10
YPS161610	16	16	10	13	13	8.5	55	40	10	10	10
YPS161612	16	16	12	13	13	10	55	40	10	10	10
YPS200808	20	08	08	17	7.5	7.5	43	37	12	10	10
YPS201208	20	12	08	17	10	7.5	43	37	12	10	10
YPS201210	20	12	10	17	10	8.5	43	37	12	10	10
YPS201212	20	12	12	17	10	10	43	37	12	10	10
YPS201608	20	16	08	17	13	7.5	48	40	12	10	10
YPS201612	20	16	12	17	13	10	48	40	12	10	10
YPS201616	20	16	16	17	13	13	64	48	12	10	10
YPS202008	20	20	08	17	17	7.5	56	45	12	10	10
YPS202010	20	20	10	17	17	8.5	58	45	12	12	10
YPS202012	20	20	12	17	17	10	58	45	12	12	10
YPS202016	20	20	16	17	17	13	64	48	12	12	10
YPS252012	25	20	12	22	17	10	54	49	13	12	10

CAT. NO.	CONDUIT SIZES			NOMINAL DIMENSIONS (MM)							
	(NC)			(NW)			D	E	F	G	H
A	B	C	A	B	C						
YPS252016	25	20	16	22	17	13	54	49	13	12	10
YPS252020	25	20	20	22	17	17	54	49	13	12	12
YPS252508	25	25	08	22	22	7.5	67	56	13	12	10
YPS252510	25	25	10	22	22	8.5	67	56	13	13	10
YPS252512	25	25	12	22	22	10	67	56	13	13	10
YPS252516	25	25	16	22	22	13	67	56	13	13	10
YPS252520	25	25	20	22	22	17	77	60	13	13	12
YPS252525	25	25	25	22	22	22	91	67	13	13	13
YPS282012	28	20	12	23	17	10	54	49	13	12	10
YPS282016	28	20	16	23	17	13	54	49	13	12	10
YPS282020	28	20	20	23	17	17	54	49	13	12	12
YPS282512	28	25	12	23	22	10	67	56	13	13	10
YPS282516	28	25	16	23	22	13	67	56	13	13	10
YPS282520	28	25	20	23	22	17	77	60	13	13	12
YPS282525	28	25	25	23	22	22	91	67	13	13	13
YPS282808	28	28	08	23	23	7.5	67	56	13	13	10
YPS282812	28	28	12	23	23	10	67	56	13	13	10
YPS282816	28	28	16	23	23	13	67	56	13	13	10
YPS282820	28	28	20	23	23	17	77	60	13	13	12
YPS282825	28	28	25	23	23	22	91	67	13	13	13
YPS282828	28	28	28	23	23	23	91	67	13	13	13
YPS322032	32	20	32	29	17	29	100	77	13	12	13
YPS322516	32	25	16	29	22	13	100	75	13	13	10
YPS322520	32	25	20	29	22	17	100	76	13	13	12
YPS322525	32	25	25	29	22	22	100	79	13	13	13
YPS322532	32	25	32	29	22	29	100	82	13	13	13
YPS323216	32	32	16	29	29	13	100	75	13	13	10
YPS323220	32	32	20	29	29	17	100	76	13	13	12
YPS323225	32	32	25	29	29	22	100	79	13	13	13
YPS323232	32	32	32	29	29	29	100	82	13	13	13

Hinged Connectors

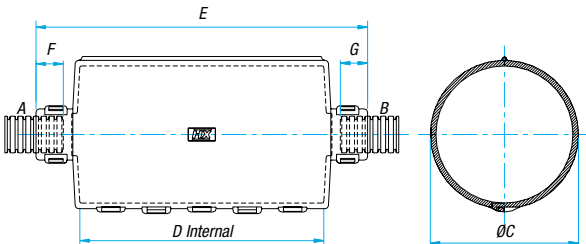
External Hinged Protective Shrouds

One-piece cover providing protection for in-line connectors, fuse links, circuit breakers and splicing areas.

The CPS shrouds can be used as a harness datum, due to the integrated cable tie/fir tree facility.

The strong construction allows for the protection of delicate connections, or as an alternative when an interface/backshell isn't available.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.



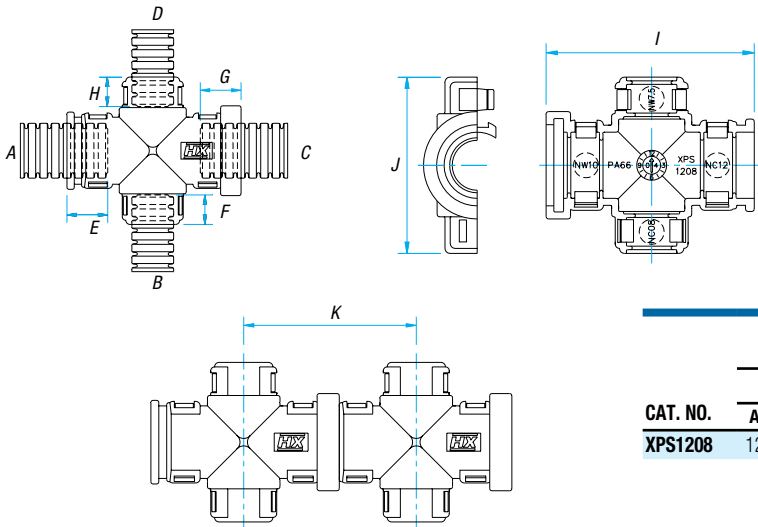
CAT. NO.	INTERNAL DIAMETER (MM)	CONDUIT SIZES								
		(NC)				(NW)				
		A	B	C	D	E	F	G		
CPS341212	35	12	12	10	10	38	73	100	10	10
CPS421212	43	12	12	10	10	47	77	104	10	10
CPS421616	43	16	16	13	13	47	77	104	10	10
CPS421620	43	16	20	13	17	47	77	104	10	12
CPS422020	43	20	20	17	17	47	77	104	12	12

X-Pieces

Two-piece symmetrical four-junction fittings enable a variety of conduit size combinations.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, several fittings can be snapped together to provide multiple outlets without the need of short conduit joints.



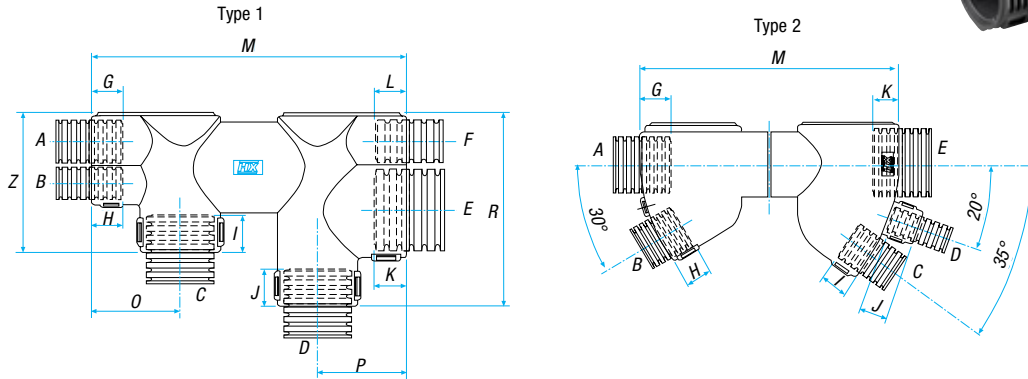
CAT. NO.	CONDUIT SIZES								CONDUIT ENGAGEMENT				OVERALL DIMENSIONS		
	(NC)				(NW)				(MM)				I	J	K
	A	B	C	D	A	B	C	D	E	F	G	H			
XPS1208	12	08	12	08	10	7.5	10	7.5	9.5	7.0	9.5	7.0	42	35.5	38.0

Hinged Connectors

Custom Hinged Manifolds

One-piece hinged fittings designed to suit specific project or application requirements.

For Blanking Caps, see **page E-365**.



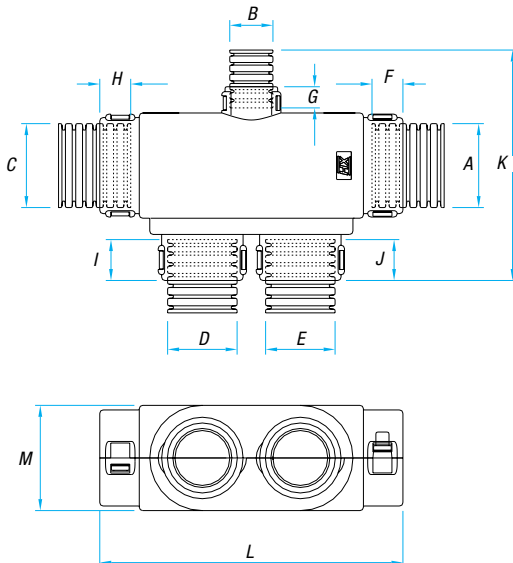
CAT. NO.	TYPE	CONDUIT SIZE (NC)						CONDUIT ENGAGEMENT (MM)						OVERALL DIMENSIONS (MM)						WEIGHT (G)
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R		
MPS100	1	12	08	20	20	25	12	10	10	12	12	13	12	98	43	28	28	59	22	
MPS101	2	20	16	16	08	25	—	12	10	10	10	13	—	97	—	—	—	—	23	
MPS102	2	16	08	16	08	25	—	10	10	10	10	13	—	97	—	—	—	—	23	
MPS103	2	16	16	16	08	25	—	10	10	10	10	13	—	97	—	—	—	—	23	

Split Manifolds

Two identical half shells snap together to create a five-way conduit manifold.

This fitting works with different types of slit and unslit conduit, including NC, CPTA, modified PP and deep section PP.

Additional configurations are possible (dependent on volume). Contact Thomas & Betts Technical Support for details.



CAT. NO.	CONDUIT SIZE (NC)						OVERALL DIMENSIONS (MM)						
	A	B	C	D	E	F	G	H	I	J	K	L	M
MPS121212-2020	12	12	12	20	20	10	7	10	10	10	59	92	32
MPS122812-2020	12	28	12	20	20	10	12	10	10	10	67	92	32
MPS201220-2020	20	12	20	20	20	12	7	12	10	10	59	92	32
MPS202820-2020	20	28	20	20	20	12	12	12	10	10	67	92	32
MPS251225-2020	25	12	25	20	20	11	7	11	10	10	59	92	32
MPS252825-2020	25	28	25	20	20	11	12	11	10	10	67	92	32

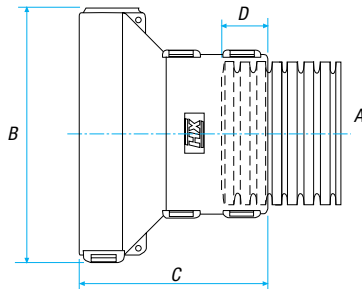
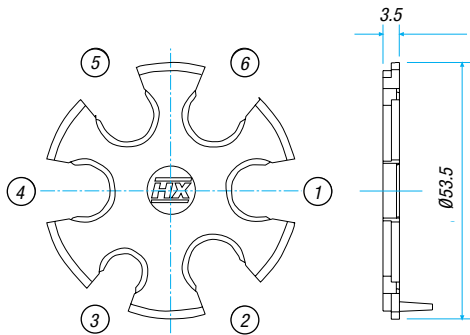
Hinged Connectors

In-Line Hinged Circular Manifolds

One-piece straight fittings providing in-line “customized” combinations of multiple conduit breakouts.

ST breakout disk configurations can be made to order. For more details, contact Thomas & Betts Technical Support.

For CPC Interface, see **page E-366**.



In-Line Hinged Circular Manifolds — Standard

CAT. NO.	CONDUIT		NOMINAL DIMENSIONS (MM)		
	A	B	C	D	
CI20-A31	NC20	NW17	62	45	12
CI25-A31	NC25	NW22	62	45	13
CI32-A31	NC32	NW29	62	45	13

In-Line Hinged Circular Manifolds — Breakout Type

CAT. NO.	1	2	3	4	5	6
ST31-100	NC08	NC08	NC08	BLANK	NC08	NC08
ST31-101	NC12	NC12	NC08	BLANK	BLANK	NC12
ST31-102	NC08	NC08	NC08	NC08	NC08	NC08

Interfaces

Interfaces

Vehicle electrical system faults are often traced to problems at the cable entry points of electrical connectors. Harnessflex® connector interfaces are designed to protect against high-pressure washdown, excessive cable strain and mechanical abrasion. Variety, flexibility and assembly speed are inherent in all Harnessflex® fittings.

Quality and Standards

Manufacturing is controlled in accordance with BS EN ISO 9001, while ongoing testing and approval to international standards (UL® Recognition, TUV, LCIE) provides additional confidence required to specify appropriate Harnessflex® products across the widest variety of automotive applications — including hazardous or aggressive environments.

Conduit has the following approvals:

- FMVSS 302 Ford flammability specification for conduit
- NFR13-903 French automotive conduit specification
- UL® Recognized American electrical conduit specification

All components comply with End of Life Vehicle (ELV) directive EU2000/53/EC. Harnessflex® interfaces also comply with ISO14001 Environmental Standard.

Capabilities

Harnessflex works closely with many blue chip companies to develop protection for electrical connectors (a critical area of an engine harness).

Our experienced internal design team uses 3D CAD modeling software to produce various concepts for customer approval.

Once a design is selected, a prototype of the interface can be quickly supplied to enable a pre-production harness assembly.

These prototype parts can be used for validation purposes, due to the close approximation of properties of the material used in the prototyping process and polyamide 66 used in our injection-molded components (see **page E-382** for material specification).

With Harnessflex's history of connector interface design and our understanding of customers requirements, we are well placed to produce custom solutions that integrate any electrical connector into a harness design.

Hints and Tips

1. Interfaces can be used in areas where electrical connectors are vulnerable to high-pressure washing.
2. Our interfaces offer strain relief to crimped contacts.
3. When our 90° swivel elbows are used with interfaces, they allow the harness to self level.
4. Using our part number CI-MF-90 with a standard 90° swivel fitting, a 180° swivel bend is possible.



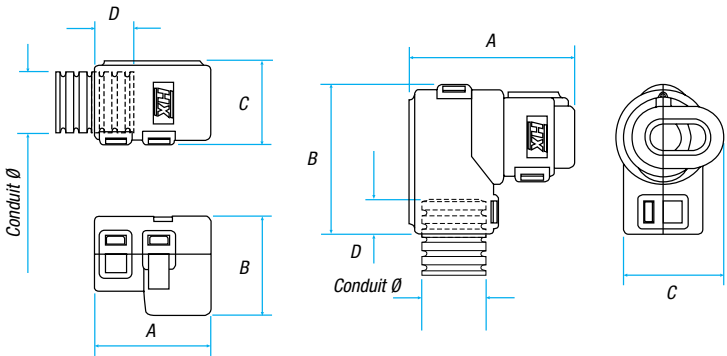
Interfaces

External Hinged Connector Interfaces — AMP Superseal®

These single-junction straight and 90° elbow fittings provide high-integrity connections between AMP Superseal® connectors and Harnessflex® conduit systems.

The fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.



External Straight Connector Interface External 90° Elbow Connector Interface

Configurations

CAT. NO. STRAIGHT INTERFACE	CAT. NO. 90° ELBOW SWIVEL INTERFACE	CONDUIT SIZE		CONNECTOR TYPE
		(NC)	(NW)	
CI08-AS1	CI08-90-AS1	08	7.5	AMP Superseal 1-Way
CI08-AS2	CI08-90-AS2	08	7.5	AMP Superseal 2-Way
CI08-AS3	CI08-90-AS3	08	7.5	AMP Superseal 3-Way
CI08-AS4	CI08-90-AS4	08	7.5	AMP Superseal 4-Way
CI10-AS2	CI10-90-AS2	10	8.5	AMP Superseal 2-Way
CI10-AS3	CI10-90-AS3	10	8.5	AMP Superseal 3-Way
CI10-AS4	CI10-90-AS4	10	8.5	AMP Superseal 4-Way
CI12-AS1	CI12-90-AS1	12	10	AMP Superseal 1-Way
CI12-AS2	CI12-90-AS2	12	10	AMP Superseal 2-Way
CI12-AS3	CI12-90-AS3	12	10	AMP Superseal 3-Way
CI12-AS4	CI12-90-AS4	12	10	AMP Superseal 4-Way

Nominal Dimensions

CAT. NO. STRAIGHT INTERFACE	A	B	C	D	CAT. NO. 90° ELBOW SWIVEL INTERFACE	A	B	C	D
CI08-AS2	22.4	20.5	18	10	CI08-90-AS2	33.3	30.3	18	10
CI08-AS3	22.4	26.5	18	10	CI08-90-AS3	33.3	30.3	18	10
CI08-AS4	34	33	18	10	CI08-90-AS4	37	30.3	18	10
CI10-AS2	34	21	20	10	CI10-90-AS2	35	38	19	10
CI10-AS3	34	27	20	10	CI10-90-AS3	35	38	19	10
CI10-AS4	34	33	20	10	CI10-90-AS4	41.2	38	19	10
CI12-AS1	23.6	16.1	18	10	CI12-90-AS1	33.3	30.3	18	10
CI12-AS2	22.4	20.5	18	10	CI12-90-AS2	33.3	30.3	20.5	10
CI12-AS3	22.4	26.5	18	10	CI12-90-AS3	33.3	30.3	26.7	10
CI12-AS4	34	33	19	10	CI12-90-AS4	37	30.3	33	10

AMP Superseal is a registered trademark of the Whitaker Corporation.

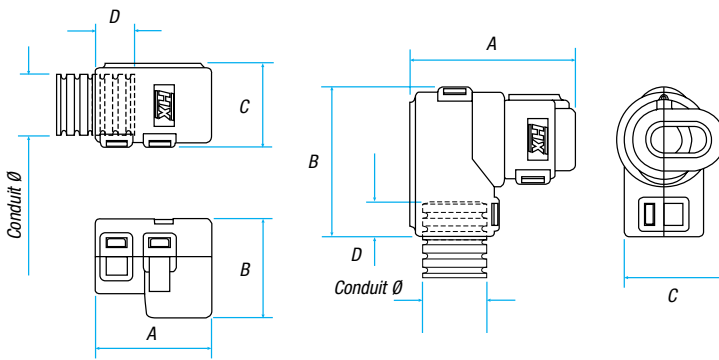
Interfaces

External Hinged Connector Interfaces — AMP Junior and Mini Timer

These single-junction straight and 90° elbow fittings provide high-integrity connections between AMP Junior Timer or Mini Timer and Harnessflex® conduit systems.

The fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.



External Straight Connector Interface

External 90° Elbow Connector Interface

Configurations

CAT. NO. STRAIGHT INTERFACE	CAT. NO. 90° ELBOW SWIVEL INTERFACE	CONDUIT SIZE		CONNECTOR TYPE
		(NC)	(NW)	
AMP Junior Timer Interfaces				
CI08-AM2	CI08-90-AM2	08	7.5	AMP Junior Timer 2-Way
CI08-AM3	CI08-90-AM3	08	7.5	AMP Junior Timer 3-Way
CI08-AM4	CI08-90-AM4	08	7.5	AMP Junior Timer 4-Way
CI10-AM2	CI10-90-AM2	10	8.5	AMP Junior Timer 2-Way
CI10-AM3	CI10-90-AM3	10	8.5	AMP Junior Timer 3-Way
CI10-AM4	CI10-90-AM4	10	8.5	AMP Junior Timer 4-Way
CI12-AM2	CI12-90-AM2	12	10	AMP Junior Timer 2-Way
CI12-AM3	CI12-90-AM3	12	10	AMP Junior Timer 3-Way
CI12-AM4	CI12-90-AM4	12	10	AMP Junior Timer 4-Way
AMP Mini Timer Interfaces				
CI12-X01	CI12-90-X01	12	10	AMP Mini Timer 1-Way

Nominal Dimensions

CAT. NO. STRAIGHT INTERFACE	DIMENSIONS (MM)				CAT. NO. 90° ELBOW SWIVEL INTERFACE	DIMENSIONS (MM)			
	A	B	C	D		A	B	C	D
AMP Junior Timer Interfaces									
CI08-AM2	24.9	21.3	18	10	CI08-90-AM2	35.7	30.3	21.3	7
CI08-AM3	24.9	27.2	18	10	CI08-90-AM3	35.7	30.3	27.2	7
CI08-AM4	37	32	19	10	CI08-90-AM4	39.5	30.3	32	7
CI10-AM2	37	21	19	10	CI10-90-AM2	37.5	38	21.3	10
CI10-AM3	37	27	19	10	CI10-90-AM3	37.5	38	27.2	10
CI10-AM4	37	32	19	10	CI10-90-AM4	41.2	38	32	10
CI12-AM2	24.9	21.3	18	10	CI12-90-AM2	35.7	30.3	21.3	7
CI12-AM3	24.9	27.2	18	10	CI12-90-AM3	35.7	30.3	27.2	7
CI12-AM4	37	32	19	10	CI12-90-AM4	39.5	30.3	32	7
AMP Mini Timer Interfaces									
CI12-X01	34	16.2	19.6	10	CI12-90-X01	37	30.3	19	10

Interfaces

External Hinged Connector Interfaces — AMPSEAL 16®

This range of straight and 90° elbow fittings offers a compact and high-integrity connection between AMPSEAL® automotive connectors and Harnessflex® conduit systems.

These interfaces provide complete cable protection right up to the connector. They also provide strain relief and protection from high-pressure washing, helping to maintain the sealing integrity of the connector.

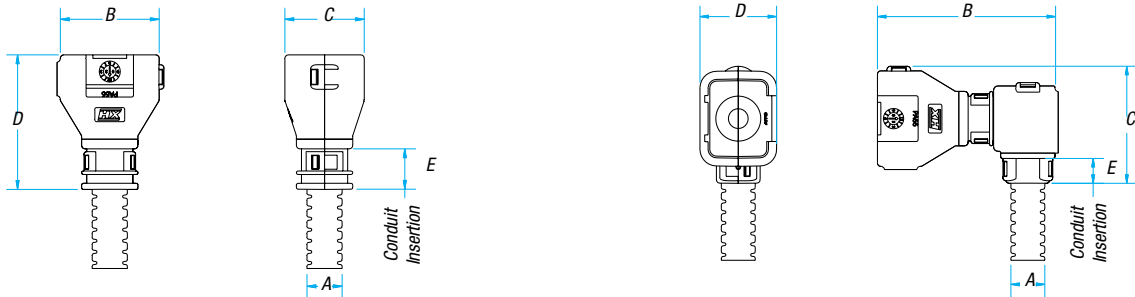
The 90° elbow allows the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

For connector catalog number reference table, see **page E-384**.

NEW

Swivel elbows for NC16 (NW13) are now available for all connector interfaces. Contact Thomas & Betts Technical Support for full details.



CAT. NO.	CONNECTOR	CONDUIT SIZE		DIMENSIONS (MM)			
		A	B	C	D	E	
AMPSEAL 16® Straight Interfaces							
CI08-AT2PL	2-Way	NC08	23	18	34	12	
CI08-AT3PL	3-Way	NC08	28	18	33	11	
CI08-AT4PL	4-Way	NC08	29	23	39	13	
CI12-AT4PL	4-Way	NC12	29	23	37	11	
CI12-AT6PL	6-Way	NC12	29	23	37	11	
CI12-AT8PL	8-Way	NC12	32	23	37	11	
CI12-AT12PL	12-Way	NC12	41	23	37	11	
CI16-AT8PL	8-Way	NC16	32	23	37	11	
CI16-AT12PL	12-Way	NC16	41	23	37	11	
CI20-AT20PL	20-Way	NC20	41	23	48	12	
AMPSEAL 16® 90° Elbow Interfaces							
CI08-90-AT2PL	2-Way	NC08	49	32	20	7.1	
CI08-90-AT3PL	3-Way	NC08	49	34	20	7.1	
CI08-90-AT4PL	4-Way	NC08	53	34	23	7.1	
CI12-90-AT2PL	2-Way	NC12	49	32	20	7.1	
CI12-90-AT3PL	3-Way	NC12	49	34	20	7.1	
CI12-90-AT4PL	4-Way	NC12	53	35	23	7.1	

CAT. NO.	CONDUIT SIZE		DIMENSIONS (MM)			
	(NC)	(NW)	B	C	D	E
CI08-90-AT2LP	08	7.5	37.3	25	17	7.1
CI08-90-AT2LR	08	7.5	37.3	25	20	7.1
CI08-90-AT3LP	08	7.5	39.8	29	17.1	7.1
CI08-90-AT3LR	08	7.5	39.8	29	17.1	7.1
CI08-90-AT4LP	08	7.5	40.8	29.4	20.6	7.1
CI08-90-AT4LR	08	7.5	40.8	29.4	20.6	7.1
CI08-90-AT6LP	08	7.5	42.8	29.4	22.5	7.1
CI08-90-AT6LR	08	7.5	42.8	29.4	22.5	7.1
CI12-90-AT2LP	12	10	38	23	20	7.1
CI12-90-AT2LR	12	10	38	23	20	7.1
CI12-90-AT3LP	12	10	40.2	27.1	17.1	7.1
CI12-90-AT3LR	12	10	40.2	27.1	17.1	7.1
CI12-90-AT4LP	12	10	41.1	27.5	20.6	7.1
CI12-90-AT4LR	12	10	41.1	27.5	20.6	7.1
CI12-90-AT6LP	12	10	43.1	27.5	22.5	7.1
CI12-90-AT6LR	12	10	43.1	27.5	22.5	7.1
LP = Plug LR = Receptacle						
CI08-TY002	08	7.5	26	22.3	22.5	6
CI08-90TY002	08	7.5	36	32	22.5	7.1

Ampseal 16 is a registered trademark of the Whitaker Corporation.

Interfaces

External Hinged Connector Interfaces — Deutsch® DT Series

Our single-junction straight and 90° elbow fittings provide high-integrity connections between Deutsch® DT connectors and Harnessflex® conduit systems.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

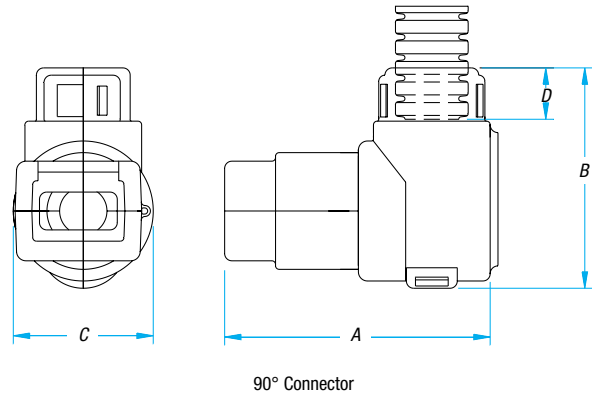
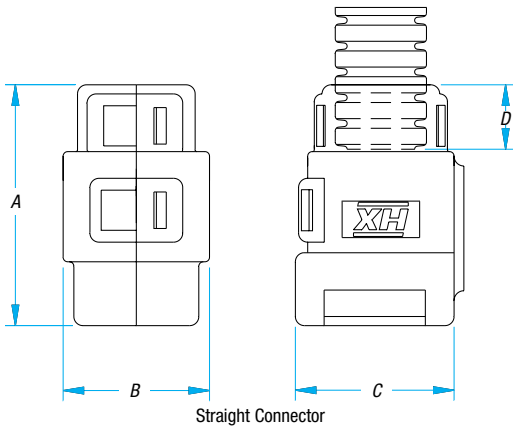
In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.

The functionality of a connector when attached to a Harnessflex® product depends on the application, installation and operational criteria determined by the user.

For connector part number reference table, see **page E-384**.

NEW

Swivel elbows for NC16 (NW13) are now available for all connector interfaces. Contact Thomas & Betts Technical Support for full details.



Configurations

CAT. NO. STRAIGHT INTERFACE	CAT. NO. 90° ELBOW SWIVEL INTERFACE	CONDUIT SIZE		CONNECTOR TYPE
		(NC)	(NW)	
CI08-DT2	CI08-90-DT2	08	7.5	2-Way
CI08-DT3	CI08-90-DT3	08	7.5	3-Way
CI08-DT4	CI08-90-DT4	08	7.5	4-Way
CI08-DT6	CI08-90-DT6	08	7.5	6-Way
CI12-DT2	CI12-90-DT2	12	10	2-Way
CI12-DT3	CI12-90-DT3	12	10	3-Way
CI12-DT4	CI12-90-DT4	12	10	4-Way
CI12-DT6	CI12-90-DT6	12	10	6-Way
CI12-DT8	CI12-90-DT8	12	10	8-Way
—	CI12-90-DT12	12	10	12-Way
—	CI16-90-DT8	16	13	8-Way
CI16-DT12	CI16-90-DT12	16	13	12-Way

Nominal Dimensions

CAT. NO. STRAIGHT INTERFACE	DIMENSIONS (MM)				CAT. NO. 90° ELBOW SWIVEL INTERFACE	DIMENSIONS (MM)			
	A	B	C	D		A	B	C	D
CI08-DT2	26	16	18	7	CI08-90-DT2	36	30	19	7
CI08-DT3	30	22	24	12	CI08-90-DT3	44	30	23	7
CI08-DT4	42	18	27	12	CI08-90-DT4	48	30	25	7
CI08-DT6	42	22	27	12	CI08-90-DT6	48	34	25	7
CI12-DT2	26	16	18	7	CI12-90-DT2	36	30	19	7
CI12-DT3	29	22	24	7	CI12-90-DT3	44	30	23	7
CI12-DT4	40	18	27	7	CI12-90-DT4	48	30	25	7
CI12-DT6	40	22	27	10	CI12-90-DT6	48	34	25	7
CI12-DT8	40	25	30	10	CI12-90-DT8	63	37	30	10
—	—	—	—	—	CI12-90-DT12	68	36	38	10
—	—	—	—	—	CI16-90-DT8	63	37	30	10
CI16-DT12	44	24	40	10	CI16-90-DT12	68	36	38	10

Deutsch is a registered trademark of Deutsch Group.

Interfaces

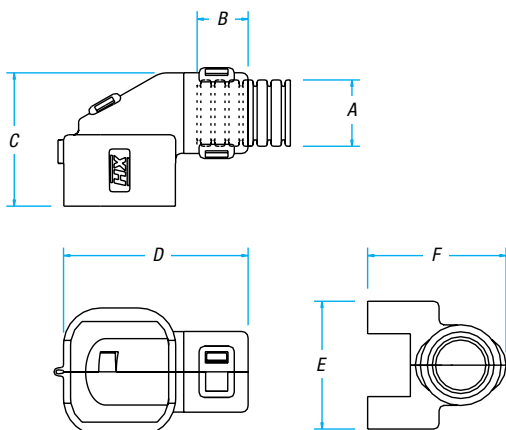
External Hinged Connector Interfaces — Deutsch® DTP04 Series

Our compact 90° elbow fittings provide a dual orientation high-integrity connection between the Deutsch® DTP04 and Harnessflex® conduit systems.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

The 16-90-DTP04 adapter will snap into the outlet of a 16mm hinged fitting, including types “Y” (YPS), “T” (TPS), elbows (EPS) and joiners (JPS).

For connector catalog number reference table, see **page E-384**.

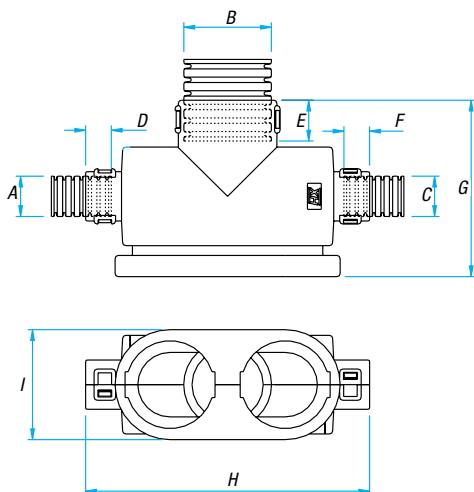


CAT. NO.	CONDUIT SIZE A		NOMINAL DIMENSIONS (MM)				
	(NC)	(NW)	B	C	D	E	F
C112-90-DTP04	12	7.5	10	27	37	25	28
16-90-DTP04	—	—	—	27	35	25	27

External Hinged Connector Interfaces — Deutsch® DRC50 Series

Two identical half shells snap together onto the twin outlets of the Deutsch® DRC50 interface, creating a three-way conduit fitting.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.



CAT. NO.	CONDUIT SIZES			NOMINAL DIMENSIONS (MM)											
	(NC)			(NW)			A	B	C	D	E	F	G	H	I
C1121212-DRC50	12	12	12	10	10	10	8	8	8	8	50	92	36		
C1122812-DRC50	12	28	12	10	23	10	8	10	8	8	58	92	36		
C1201220-DRC50	20	12	20	17	10	17	10	8	10	10	50	92	36		
C1202820-DRC50	20	28	20	17	23	17	10	10	10	10	58	92	36		
C1251225-DRC50	25	12	25	22	10	22	10	8	10	10	50	92	36		
C1252825-DRC50	25	28	25	22	23	22	10	10	10	10	58	92	36		

Deutsch is a registered trademark of Deutsch Group.

Interfaces

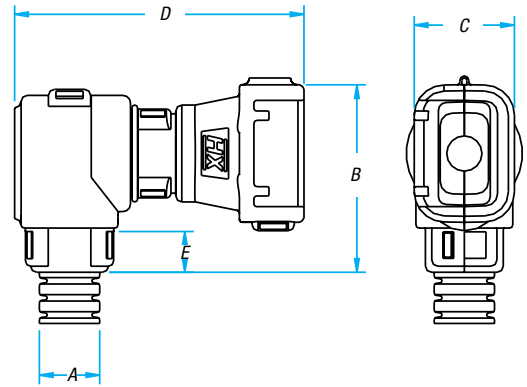
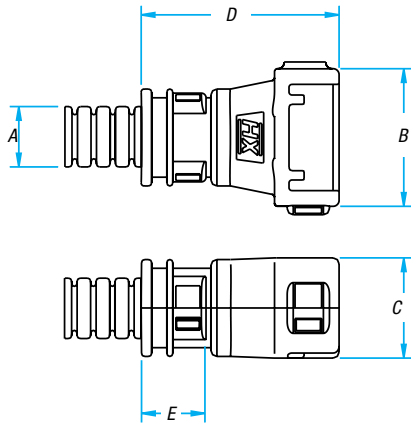
FCI Automotive Apex® Hinged Interfaces

Single-junction, straight and 90° elbow fittings provide high-integrity connections between FCI Apex® connectors or Junior Timer connectors and Harnessflex® conduit systems.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.

For connector part number reference table, see **page E-384**.



FCI Automotive Apex® Straight Interfaces

CAT. NO.	CONNECTOR	CONDUIT SIZE A		NOMINAL DIMENSIONS (MM)			
		(NC)	(NW)	B	C	D	E
CI08-FCI02	2-Way	08	7.5	25	17	33	12
CI08-FCI03	3-Way	08	7.5	34	17	34	12
CI08-FCI04	4-Way	08	7.5	39	17	34	12
CI12-FCI02	2-Way	12	10	25	17	27	7
CI12-FCI03	3-Way	12	10	35	17	29	7
CI12-FCI04	4-Way	12	10	38	17	29	7
CI12-FCI14	14-Way	12	10	53	26	34	10
CI16-FCI14	14-Way	16	13	53	26	59	10
16-FCI14	14-Way	n/a	n/a	53	26	33	n/a
CI17-FCI10	10-Way	17	n/a	39.2	25.5	44	10.6
CI25-FCI50	50-Way	25	22	56	37	50.7	13

Apex is a registered trademark of FCI.

FCI Automotive Apex® 90° Elbow Swivel Interfaces

CAT. NO.	CONNECTOR	CONDUIT SIZE A		NOMINAL DIMENSIONS (MM)			
		(NC)	(NW)	B	C	D	E
CI08-90-FCI02	2-Way	08	7.5	31	19	48	10
CI08-90-FCI03	3-Way	08	7.5	35	19	49	10
CI08-90-FCI04	4-Way	08	7.5	38	19	49	10
CI12-90-FCI02	2-Way	12	10	32	19	48	10
CI12-90-FCI03	3-Way	12	10	37	19	49	10
CI12-90-FCI04	4-Way	12	10	38	19	49	10
CI08-90-FCI14	14-Way	08	7.5	38	24	57	10
CI12-90-FCI14	14-Way	12	10	38	24	57	10
CI16-90-FCI14	14-Way	16	13	38	24	57	10
CI08-90-FCS02	2-Way SICMA	08	7.5	30	19	33	10

Interfaces

External Hinged Connector Interfaces — Bosch® Compact

Single-junction, straight and 90° elbow fittings provide high-integrity connections between various Bosch compact connectors and Harnessflex conduit systems.

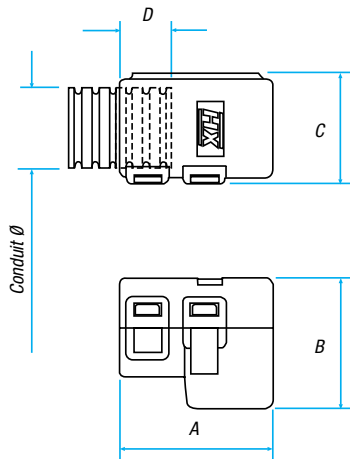
These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.

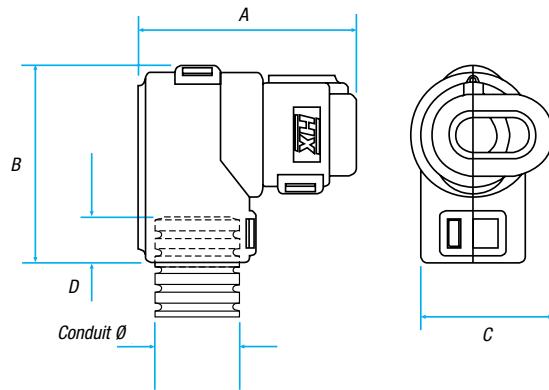
For connector part number reference table, see **page E-384**.

NEW

Swivel elbows for NC16 (NW13) are now available for all connector interfaces. Contact Thomas & Betts Technical Support for full details.



External Straight Connector Interface



External 90° Elbow Connector Interface

Configurations

CAT. NO. STRAIGHT INTERFACE	CAT. NO. 90° ELBOW SWIVEL INTERFACE	CONDUIT SIZE		CONNECTOR TYPE
		(NC)	(NW)	
CI08-BC2	CI08-90-BC2	08	7.5	2-Way
CI08-BC3	CI08-90-BC3	08	7.5	3-Way
CI08-BC4	CI08-90-BC4	08	7.5	4-Way
CI12-BC2	CI12-90-BC2	12	10	2-Way
CI12-BC3	CI12-90-BC3	12	10	3-Way
CI12-BC4	CI12-90-BC4	12	10	4-Way
CI28-BC40	—	28	23	40-Way

Bosch is a registered trademark of Robert Bosch GmbH.

Nominal Dimensions

CAT. NO. STRAIGHT INTERFACE	DIMENSIONS (MM)				CAT. NO. 90° ELBOW SWIVEL INTERFACE	DIMENSIONS (MM)			
	A	B	C	D		A	B	C	D
CI08-BC2	25	21.3	18	10	CI08-90-BC2	33.3	30.3	20.5	10
CI08-BC3	25	26.7	18	10	CI08-90-BC3	33.3	30.3	26.7	10
CI08-BC4	25	29	18	10	CI08-90-BC4	37	30.3	33	10
CI12-BC2	25	21.3	18	10	CI12-90-BC2	33.3	30.3	20.5	10
CI12-BC3	25	26.7	18	10	CI12-90-BC3	33.3	30.3	26.7	10
CI12-BC4	25	29	18	10	CI12-90-BC4	37	30.3	33	10
CI28-BC40	44.4	40	—	—	—	—	—	—	—

Interfaces

External Hinged Connector Interfaces — Delphi Series

Single-junction, straight and 90° elbow fittings provide high-integrity connections between various Delphi series connectors and Harnessflex® conduit systems.

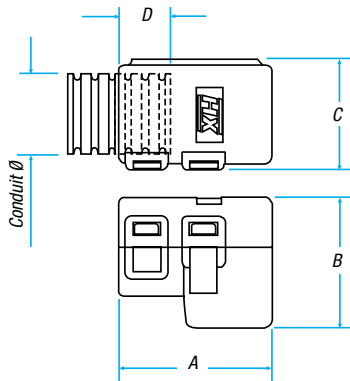
These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.

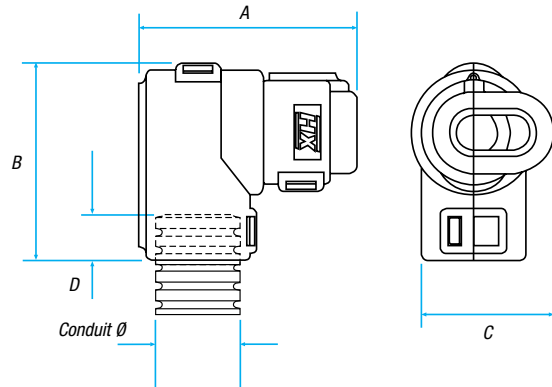
For connector part number reference table, see **page E-384**.

NEW

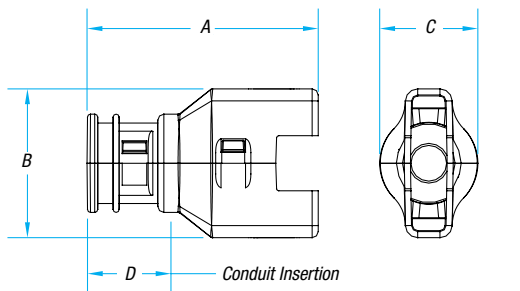
Swivel elbows for NC16 (NW13) are now available for all connector interfaces. Contact Thomas & Betts Technical Support for full details.



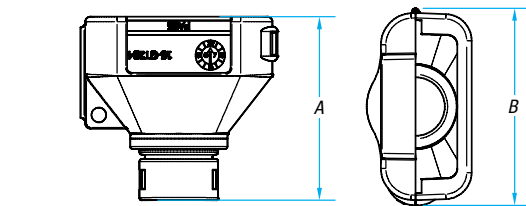
External Straight Connector Interface



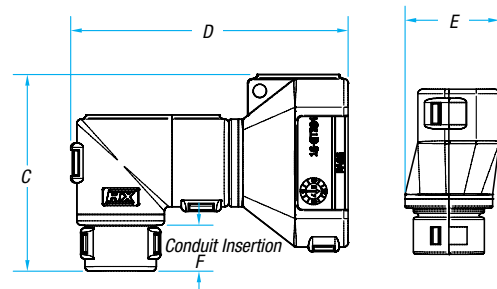
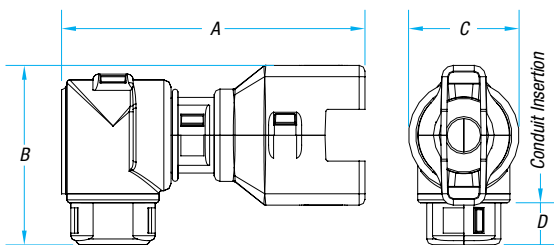
External 90° Elbow Connector Interface



GT153 Connector Interface



GT284 Connector Interface



Interfaces

External Hinged Connector Interfaces — Delphi Series (continued)



Configurations

CAT. NO. STRAIGHT INTERFACE	CAT. NO. 90° ELBOW SWIVEL INTERFACE	CONDUIT SIZE		CONNECTOR TYPE
		(NC)	(NW)	
CI08-DE001	CI08-90-DE001	08	7.5	2-Way
CI08-MP2	CI08-90-MP2	08	7.5	2-Way
CI08-MP3	CI08-90-MP3	08	7.5	3-Way
CI08-MMP2	C108-90-MMP2	08	7.5	2-Way
—	CI12-90-MP2	12	10	2-Way
—	CI12-90-MP3	12	10	3-Way
—	CI12-90-MMP3	12	10	2-Way
CI08-WP2	CI08-90-WP2	08	7.5	2-Way
—	CI12-90-WP2	12	10	2-Way
CI08-PTD2	CI08-90-PTD2	08	7.5	2-Way
—	CI12-90-PTD2	12	10	2-Way
CI08-GT153	CI08-90-GT153	08	7.5	—
—	CI12-90-GT153	12	10	—
12-GT284	CI12-90-GT284	12	10	—
16-GT284	CI16-90-GT284	16	13	—

Nominal Dimensions

CAT. NO. STRAIGHT INTERFACE	DIMENSIONS (MM)				CAT. NO. 90° ELBOW SWIVEL INTERFACE	DIMENSIONS (MM)			
	A	B	C	D		A	B	C	D
CI08-DE001	18	17	17	6	CI08-90-DE001	32	30	17.5	7.3
CI08-MP2	20	16	28.9	12.3	CI08-90-MP2	35	42	29.5	7.3
CI08-MP3	43	20	28	10	CI08-90-MP3	56.9	30	20	10
CI08-MMP2	30	17	18	10	CI08-90-MMP2	45	30	19	7.3
—	—	—	—	—	CI12-90-MP2	20	42	30.5	7.3
—	—	—	—	—	CI12-90-MP3	56.9	31	20	10
—	—	—	—	—	CI12-90-MMP2	—	—	—	—
CI08-WP2	31.3	16.1	28.3	10	CI08-90-WP2	45.2	33.3	19.5	10
—	—	—	—	—	CI12-90-WP2	45.2	34.3	19.5	10
CI08-GT153	38	24	16	10	CI08-90-GT153	53	31	19	7
—	—	—	—	—	CI12-90-GT153	53	32	19	10
CI08-PTD2	20.2	20.5	18	14.7	CI08-90-PTD2	33.8	30	22	10
—	—	—	—	—	CI12-90-PTD2	33.8	21	22	10
12-GT284	37.3	21.3	40	29.5	CI12-90-GT284	62.6	44.4	—	10
16-GT284	37.3	21.3	40	29.5	CI16-90-GT284	62.6	44.4	—	—

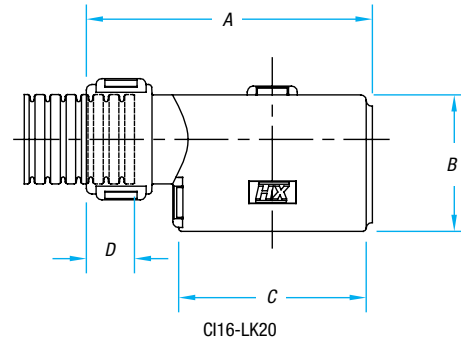
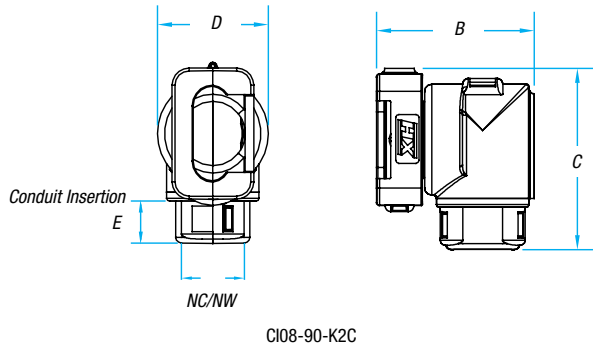
Catalog Numbering System Reference

REF.	CONNECTOR SYSTEM
MP <i>To suit Metripack</i>	Delphi Metri-Pack
MMP <i>To suit Metripack</i>	Delphi Metri-Pack
WP <i>To suit Weatherpack</i>	Delphi Weatherpack
PTD	Power Timer
GT	Delphi Metri-Pack Series 150 and 180

Interfaces

Kostal® Hinged Interfaces

Clip-on elbow interface for Kostal® in-line connector.



Kostal® 90° Elbow Swivel Interfaces

CAT. NO.	CONDUIT SIZE (A)		DIMENSIONS (MM)			
	(NC)	(NW)	B	C	D	E
90° ELBOW SWIVEL INTERFACE						
CI08-90-K2C	08	7.5	27.4	30	19.5	10
CI08-90-K3C	08	7.5	27.4	31.4	19.5	10
CI12-90-K2C	12	10	27.4	31	19.5	10
CI12-90-K3C	12	10	27.4	32.4	19.5	10

Kostal® is a registered trademark of Leopold Kostal GmbH & Co. KG.

Kostal® Straight Interface

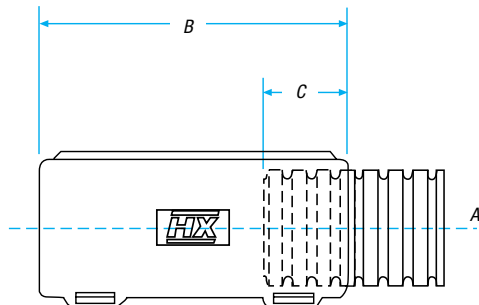
CAT. NO.	CONDUIT SIZE (A)		DIMENSIONS (MM)			
	(NC)	(NW)	B	C	D	E
STRAIGHT INTERFACE						
CI16-LK20	16	13	51	28	34	10

PG Thread LK20

CAT. NO.	THREAD TYPE	THREAD LENGTH	A/F	I.D.
		MM	MM	MM
PG21-LK20	PG21	12.2	37.8	22.6

Millflex Hinged ABS Interfaces

Clip-on straight interface for Millflex ABS connectors.

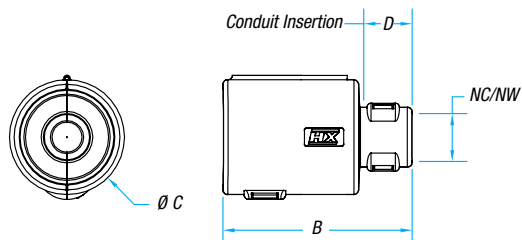


CAT. NO.	CONDUIT SIZE (A)		DIMENSIONS (MM)	
	(NC)	(NW)	B	C
CI08-MF2	8	7.5	35.6	10
CI10-MF2	10	8.5	35.6	10
CI12-MF2	12	10	35.6	10

Interfaces

DIN 72585 Hinged Interface

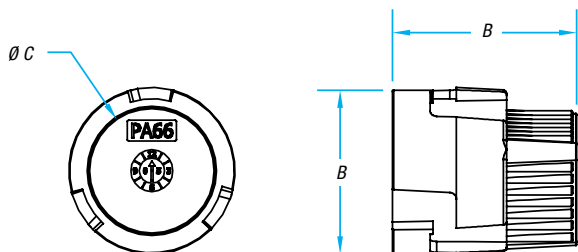
Circular interface to fit DIN 72585 style connectors.
Connector is free to swivel after interface is installed.



CAT. NO.	CONDUIT SIZE		DIMENSIONS (MM)		
	(NC)	(NW)	B	C	D
C108-72585	08	7.5	40.9	24.9	10
C112-72585	12	10	40.9	24.9	10

IP67 Blanking Plug

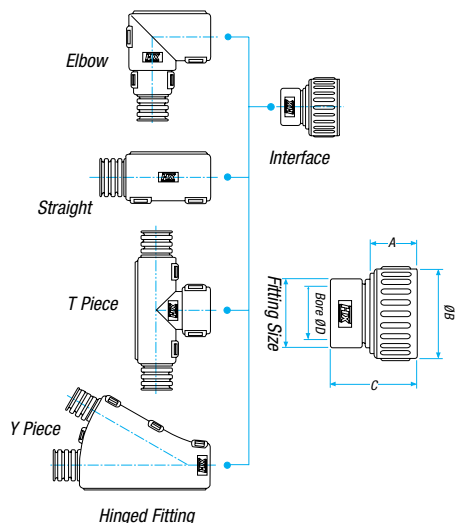
Plastic IP67 blanking plug to seal female DIN 72585 circular connectors.
Prevents the ingress of water/dust during transport or harness storage.



CAT. NO.	DIMENSIONS (MM)		
	A	B	C
BP72585	26.3	23.8	17.8

Interfaces for Circular Connectors

Fitting provides connection between electrical circular connectors and hinged conduit system. Due to the innovative design, the interface can freely rotate without any harness movement. These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.



Configurations

INTERFACE BODY	SHELL SIZE	FITTING SIZE		THREAD SIZE
		(NC)	(NW)	
NEPA14-16	14	16	13	1/16"-20 UNEF
NEPA16-20	16	20	17	1/16"-20 UNEF
NEPA24-28	24	28	23	1/16"-18 UNEF
C120-CCU100	18/16	20	17	1"-20 UNEF
C120-CCU119	18/16	20	17	1/16"-18 UNEF
C128-CCU131	24	28	23	1/16"-18 UNEF
C128-CCU138	24	28	23	1/16"-18 UNEF

Nominal Dimensions

INTERFACE BODY	SHELL SIZE	FITTING SIZE		DIMENSIONS (MM)			
		(NC)	(NW)	A	B	C	D
NEPA14-16	14	16	13	14.4	25.3	25.0	12.5
NEPA16-20	16	20	17	14.4	30.0	26.3	16.4
NEPA24-28	24	28	23	17.0	42.0	29.8	22.8
C120-CCU100	18/16	20	17	11	30.0	26.0	16.4
C120-CCU119	18/16	20	17	11	33.0	26.0	16.5
C128-CCU131	24	28	23	13	41.5	30.0	22.8
C128-CCU138	24	28	23	13	41.5	30.0	22.8

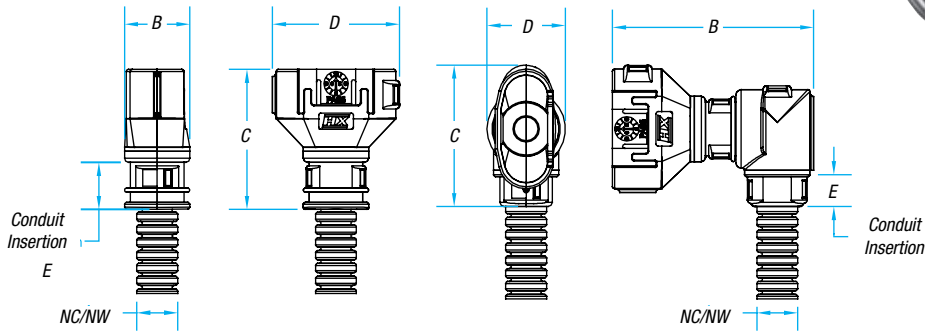
Interfaces

Sumitomo® 4-Way Interface

Single-junction, straight and 90° elbow fittings provide high-integrity connections between Sumitomo® connectors and Harnessflex® conduit systems.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

In addition, 90° elbow versions allow the conduit to swivel 360° around the connector housing, sufficient to avoid the problems associated with one-piece interfaces of overflexing due to movement or vibration.



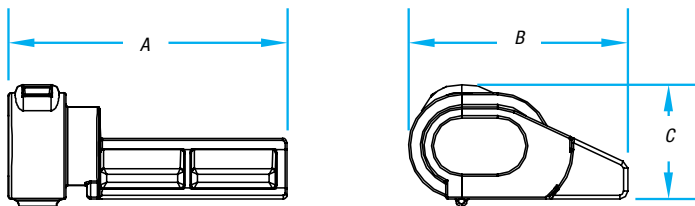
Sumitomo® is a registered trademark of Sumitomo Electric Industries, Ltd.

CAT. NO.	CONDUIT SIZE		DIMENSIONS (MM)			
	(NC)	(NW)	B	C	D	E
CI08-SU4	08	7.5	16.2	29.4	35.0	12.3
CI08-90-SU4	08	7.5	48.2	19.6	34.4	7.3

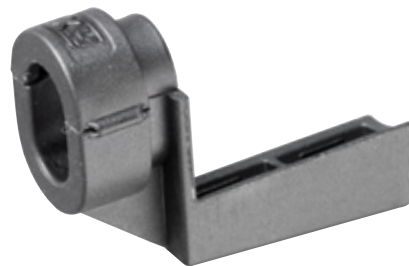
Note: 180° versions are available.

Kostal® Inhibitor

Clip-on inhibitor for 2-way Kostal® interface, to provide easy and correct harness installation.



Kostal® is a registered trademark of Leopold Kostal GmbH & Co. KG.



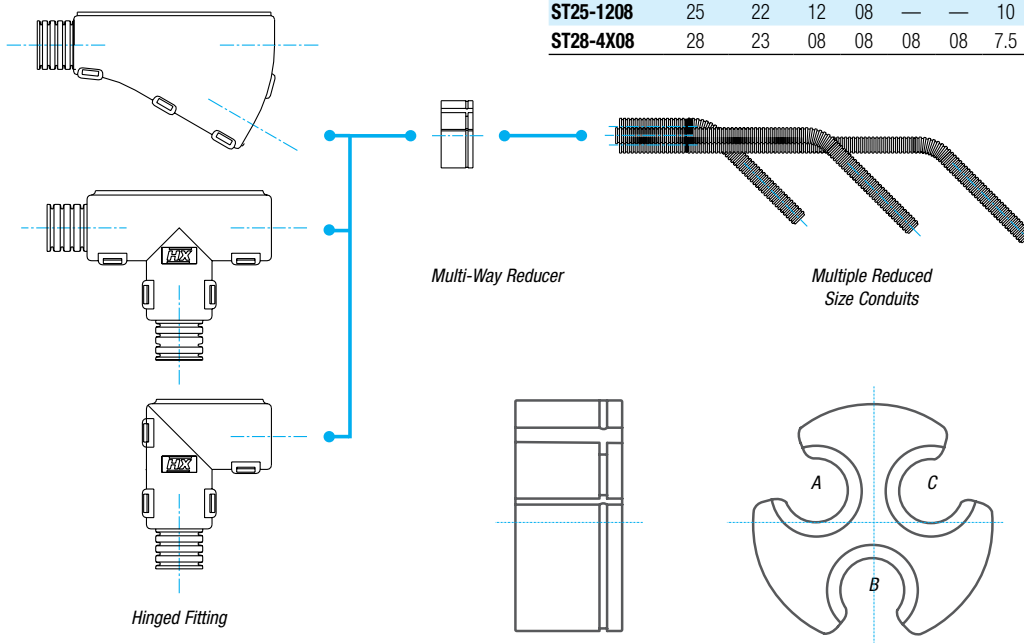
CAT. NO.	CONDUIT SIZE		DIMENSIONS (MM)		
	(NC)	(NW)	A	B	C
K2I-LH	N/A	N/A	35.3	27.7	15.4

Interfaces

Multi-Way Reducers

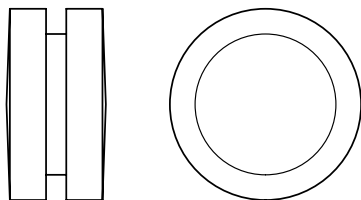
One-piece, multi-way breakout inserts provide reducing options to a variety of conduit sizes from a single hinged fitting junction.

These reducers can accommodate all types of slit and unslit conduit and may be used with all Harnessflex® hinged fittings.



CAT. NO.	FROM CONDUIT SIZE		TO CONDUIT SIZES (NC)				TO CONDUIT SIZES (NW)			
	(NC)	(NW)	A	B	C	D	A	B	C	D
ST20-2X08	20	17	08	08	—	—	7.5	7.5	—	—
ST20-12	20	17	12	—	—	—	10	—	—	—
STN25-3X08	25	22	08	08	08	—	7.5	7.5	7.5	—
ST25-12	25	22	12	08	—	—	10	—	—	—
ST25-1208	25	22	12	08	—	—	10	7.5	—	—
ST28-4X08	28	23	08	08	08	08	7.5	7.5	7.5	7.5

Blanking Caps

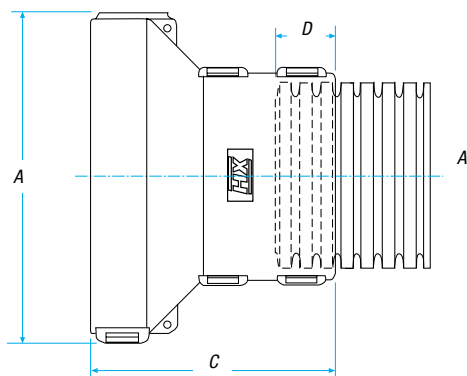


CAT. NO.	CONDUIT SIZE	
	(NC)	(NW)
BPST08	08	7.5

Interfaces

AMP CPC Hinged Interfaces

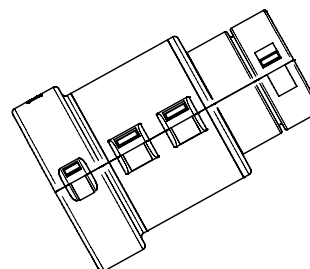
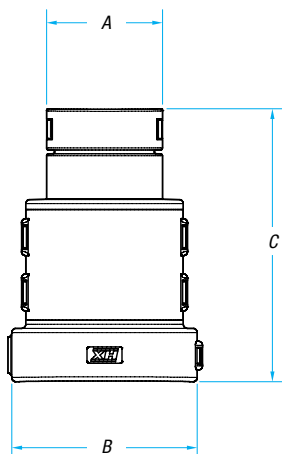
Clip-on straight interfaces for AMP CPC 31 pole circular connectors.



CAT. NO.	CONDUIT SIZE (A)		DIMENSIONS (MM)		
	(NC)	(NW)	B	C	D
CI16-A31	16	13	62	45	10
CI20-A31	20	17	62	45	12
CI25-A31	25	22	62	45	13
CI32-A31	32	29	62	45	13

AMP TYCO Hinged Interfaces

Clip-on straight interfaces for AMP TYCO 62 connectors.



CAT. NO.	CONDUIT SIZE (A)		DIMENSIONS (MM)	
	(NC)	(NW)	B	C
28-TY62	28	23	45.1	66.4

Sealed Fittings

Sealed Fittings

A wide range of sealed fittings rated at IP66, IP67, IP68 (2bar 30 mins.) and 69k are available and complete the product offering for vehicle wiring applications.

Quality and Standards

Manufacturing is controlled in accordance with BS EN ISO 9001, while ongoing testing and approval to international standards (UL® Recognition, TUV, LCIÉ) provides additional confidence required to specify appropriate Harnessflex products across the widest variety of automotive applications — including hazardous or aggressive environments.

Conduit has the following approvals:

- FMVSS 302 — Flammability specification for conduit
- NFR13-903 — French automotive conduit specification
- UL® Recognized American electrical conduit specification

Sealed fittings have the following approvals when used with NC solid conduit:

- NFR13-903
- UL® Recognized

All components comply with End of Life Vehicle (ELV) directive EU2000/53/EC. Harnessflex® Sealed Fittings also comply with ISO14001 Environmental Standard.

Capabilities

Our internal design team offers unique solutions specific to our customers' applications. Using the latest 3D CAD modeling software, we are able to communicate new product designs quickly and efficiently.

Prototype parts can be quickly made to order to enable product evaluation early on in the design cycle.

If you have a need for a dedicated sealed fitting, contact Thomas & Betts Technical Support to discuss your requirements.

Hints and Tips

1. The anti-vibration spring clips can be released easily if access is needed — no tool required.
2. In order to maintain the IP rating of the sealed fittings, face sealing washers must be used with all threaded fittings.
3. By using an SC swivel clamping ring ([page E-378](#)), an IP40 rotating joint can be achieved.
4. Our sealed T and X pieces and our sealed manifolds have inspection covers, which can be removed during installation to aid cable routing.



Sealed Fittings

Straight Fittings

Our straight compression-type fittings incorporate fixed or swivel male threads to provide connection to knockouts and threaded entries.

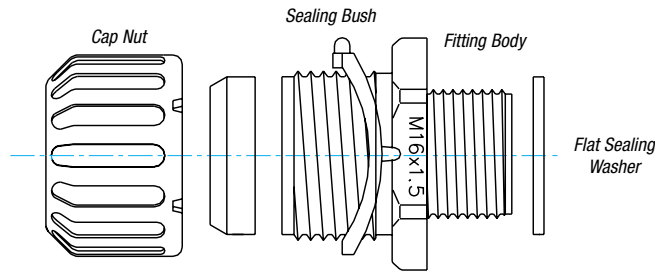
These fittings are designed for use with all types of slit and unslit conduit, thus maintaining maximum conduit bore.

See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

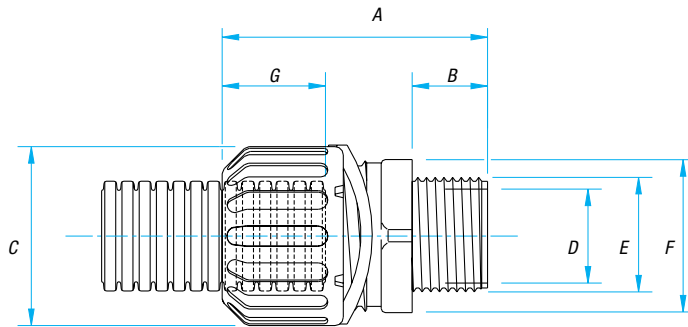
Order fitting bodies, cap nuts and sealing bushing separately.



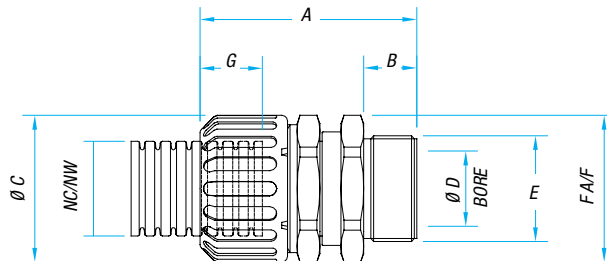
Straight Fitting Configurations



Straight Fitting



Straight Swivel Fitting



Sealed Fittings

Straight Fittings

CAT. NO. FITTING BODY	CAP NUT	SEALING BUSHING	CONDUIT SIZES			DIMENSIONS (MM)			MIN. BORE	THREAD	A/F SIZE	
			(NW)	(NC)	THREAD SIZE	A	B	C			D	E
Metric Versions												
AB12-M16	CN07	SRN07	10	8.5	M16x1.5	34	12	23	11	M16x1.5	22	17
AB12-M20	CN07	SRN07	10	8.5	M20x1.5	37	14	23	15	M20x1.5	27	17
AB12-M16	CN09	SRN09	12	10	M16x1.5	34	12	26	11	M16x1.5	22	17
AB12-M20	CN09	SRN09	12	10	M20x1.5	37	14	26	15	M20x1.5	27	17
AB16-M16	CN11	SRN11	16	13	M16x1.5	35	12	26	11	M16x1.5	27	17
AB16-M20	CN11	SRN11	16	13	M20x1.5	37	14	26	15	M20x1.5	27	11
AB20-M20	CN16	SRN16	20	17	M20x1.5	39	14	31	15	M20x1.5	30	20
AB25-M25	CN21	SRN21	25	22	M25x1.5	43	15	39	19	M25x1.5	38	21
AB25-M25	CN28	SRN28	28	23	M25x1.5	43	15	39	19	M25x1.5	38	21
AB32-M32	CN32	SRN29	32	29	M32x1.5	49	16	46	26	M32x1.5	46	27
AB40-M40	CN36	SRN36	40	36	M40x1.5	59	16	58	31	M40x1.5	59	35
AB50-M50	CN48	SRN48	50	48	M50x1.5	59	16	72	41	M50x1.5	73	35

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

PG Versions

AB12-PG09	CN07	SRN07	10	8.5	PG09	32	10	23	10	PG09	22	17
AB12-PG11	CN07	SRN07	10	8.5	PG11	32	10	23	14	PG11	22	17
AB12-PG13	CN07	SRN07	10	8.5	PG13.5	32	10	23	16	PG13.5	22	17
AB12-PG09	CN09	SRN09	12	10	PG09	32	10	23	10	PG09	22	17
AB12-PG11	CN09	SRN09	12	10	PG11	32	10	23	14	PG11	22	17
AB12-PG13	CN09	SRN09	12	10	PG13.5	32	10	26	16	PG13.5	27	17
AB16-PG09	CN11	SRN11	16	13	PG09	32	10	26	10	PG09	27	17
AB16-PG11	CN11	SRN11	16	13	PG11	32	10	26	14	PG11	27	17
AB16-PG13	CN11	SRN11	16	13	PG13.5	32	10	26	16	PG13.5	27	17
AB20-PG16	CN16	SRN16	20	17	PG16	35	11	31	18	PG16	30	20
AB25-PG21	CN21	SRN21	25	22	PG21	40	12	39	23	PG21	38	21
AB25-PG21	CN28	SRN28	28	23	PG21	40	12	39	23	PG21	38	21
AB32-PG29	CN32	SRN32	32	29	PG29	45	12	46	31	PG29	46	27
AB40-PG36	CN36	SRN36	40	36	PG36	55	12	58	38	PG36	59	35
AB50-PG48	CN48	SRN48	50	48	PG48	55	12	72	50	PG48	73	35

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

Part numbers for NPT and PF threads available on request.

Swivel Metric Versions

ABS12-M16	CN07	SRN07	10	8.5	M16x1.5	44.5	11	23	12	M16x1.5	24	17
ABS12-M20	CN07	SRN07	10	8.5	M20x1.5	44.5	11	23	12	M20x1.5	24	17
ABS12-M16	CN09	SRN09	12	10	M16x1.5	44.5	11	23	12	M16x1.5	24	17
ABS12-M20	CN09	SRN09	12	10	M20x1.5	44.5	11	23	12	M20x1.5	24	17
ABS16-M16	CN11	SRN11	16	13	M16x1.5	46.5	12	26	12	M16x1.5	30	20
ABS16-M20	CN11	SRN11	16	13	M20x1.5	44.5	11	26	12	M20x1.5	30	20
ABS20-M20	CN16	SRN16	20	17	M20x1.5	47	11	31	16	M20x1.5	33	22.5
ABS25-M25	CN21	SRN21	25	22	M25x1.5	52	12	39	19	M25x1.5	42.5	22.5
ABS25-M25	CN28	SRN28	28	23	M25x1.5	52	12	39	19	M25x1.5	42.5	22.5
ABS32-M32	CN32	SRN29	32	29	M32x1.5	58.5	17	46.5	26.5	M32x1.5	51	26

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

Other thread options available, including PF, PG, NPT and UNEF — contact Thomas & Betts Technical Support for further information.

Sealed Fittings

90° Elbows

Our 90° compression-type fittings incorporate fixed or swivel male threads to provide connection to knockouts and threaded entries.

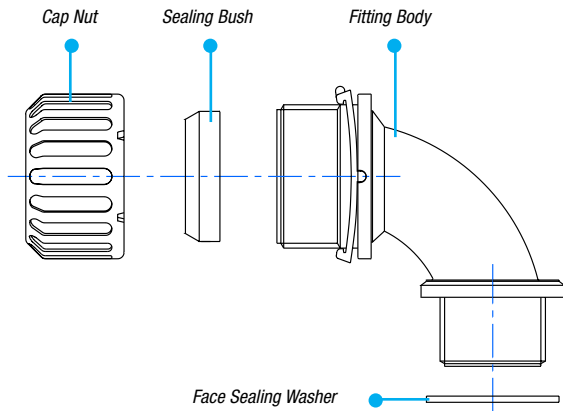
These fittings are designed for use with all types of slit and unslit conduit, thus maintaining maximum conduit bore.

See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

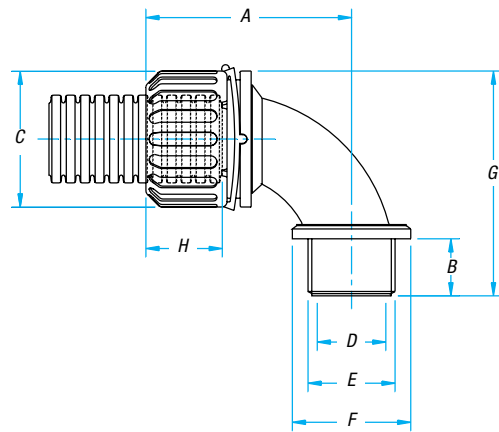
Order elbow bodies, cap nuts and sealing bushes separately.



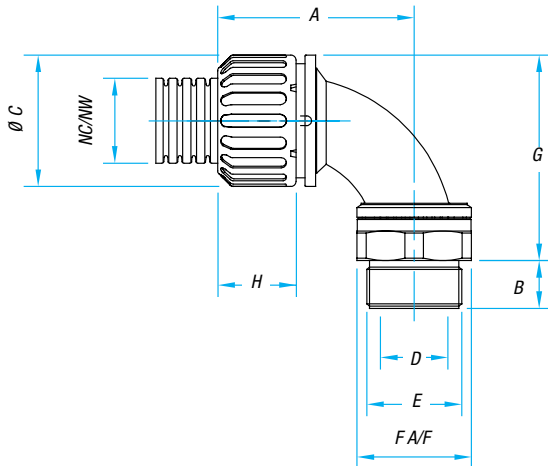
90° Elbow Configurations



90° Fitting Dimensions



90° Swivel Fitting Dimensions



Sealed Fittings

90° Elbows

CAT. NO. ELBOW BODY	CAP NUT	SEALING BUSHING	FACE SEALING WASHER	CONDUIT SIZES		THREAD SIZE	DIMENSIONS (MM)			MIN. BORE D	THREAD			
				(NW)	(NC)		A	B	C		E	F	G	H
Metric Versions														
AB12-M16-90	CN07	SRN07	SWM16	10	8.5	M16x1.5	46	12	23	11	M16x1.5	19	46	17
AB12-M16-90	CN09	SRN09	SWM16	12	10	M16x1.5	46	12	23	11	M16x1.5	19	46	17
AB12-M20-90	CN09	SRN09	SWM20	12	10	M20x1.5	46	12	23	11	M20x1.5	19	46	17
AB16-M16-90	CN11	SRN11	SWM16	16	13	M16x1.5	46	12	26	15	M16x1.5	22	48	17
AB16-M20-90	CN11	SRN11	SWM20	16	13	M20x1.5	46	13	26	15	M20x1.5	27	49	17
AB20-M20-90	CN16	SRN16	SWM20	20	17	M20x1.5	47	13	31	15	M20x1.5	27	51	20
AB25-M25-90	CN21	SRN21	SWM25	25	22	M25x1.5	56	15	39	20	M25x1.5	33	62	21
AB25-M25-90	CN28	SRN28	SWM25	25	23	M25x1.5	56	15	39	20	M25x1.5	33	62	21
AB32-M32-90	CN32	SRN29	SWM32	32	29	M32x1.5	66	16	46	26	M32x1.5	40	76	27
AB40-M40-90	CN36	SRN36	SWM40	40	37	M40x1.5	77	16	59	34	M40x1.5	48	93	35
AB50-M50-90	CN48	SRN48	SWM50	50	50	M50x1.5	94	16	72	40	M50x1.5	59	114	35

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

PG Versions

AB12-PG09-90	CN07	SRN07	SWPG09	10	8.5	PG09	46	10	23	11	PG09	22	44	17
AB12-PG09-90	CN09	SRN09	SWPG09	12	10	PG09	46	10	23	11	PG09	22	44	17
AB16-PG11-90	CN11	SRN11	SWPG11	16	13	PG11	46	10	26	14	PG11	25	46	17
AB16-PG13-90	CN11	SRN13	SWPG13	16	13	PG13.5	46	10	26	14	PG13.5	25	46	17
AB20-PG16-90	CN16	SRN16	SWPG16	20	17	PG16	46	12	31	15	PG16	28	50	20
AB25-PG21-90	CN21	SRN21	SWPG21	25	22	PG21	56	12	39	22	PG21	36	59	21
AB25-PG21-90	CN28	SRN21	SWPG21	28	23	PG21	56	12	39	22	PG21	36	59	21
AB32-PG29-90	CN32	SRN29	SWPG29	32	29	PG29	66	12	46	29	PG29	44	72	27
AB40-PG36-90	CN36	SRN36	SWPG36	40	37	PG36	79	12	58	39	PG36	54	89	35
AB50-PG48-90	CN48	SRN48	SWPG48	50	50	PG48	94	12	72	51	PG48	68	110	35

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

Swivel Metric Versions

ABS12-M16-90	CN07	SRN07	SWM16	10	8.5	M16x1.5	45	12	23	12	M16x1.5	24	45	17
ABS16-M16-90	CN11	SRN11	SWM16	16	13	M16x1.5	46	12	26	12	M16x1.5	24	46	17
ABS20-M20-90	CN16	SRN16	SWM20	20	17	M20x1.5	48	11	31	16	M20x1.5	27	48	20
ABS25-M25-90	CN21	SRN21	SWM25	25	22	M25x1.5	56	12	39	19	M25x1.5	34	59	21
ABS32-M32-90	CN32	SRN29	SWM32	32	29	M32x1.5	66	17	46	26	M32x1.5	42	71	27
ABS40-M40-90	CN36	SRN36	SWM40	40	37	M40x1.5	76	18	59	35	M40x1.5	54	90	35
ABS50-M50-90	CN48	SRN48	SWM50	50	50	M50x1.5	92	16	72	45	M50x1.5	70	112	35

Note: Order fitting bodies, cap nuts and sealing bushings separately.

Note: Dimensions are in mm and refer to an overall assembly.

Other thread options available, including PF, PG, NPT and UNEF — contact Thomas & Betts Technical Support for further information.

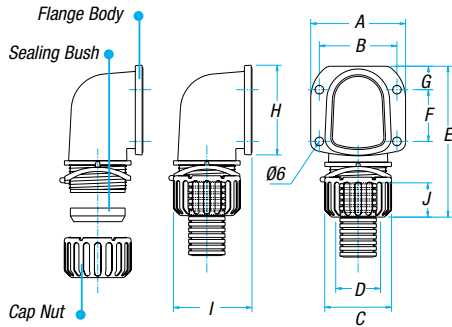
Sealed Fittings

90° Flanges

90° elbow compression type-fittings provide a four-hole panel mounting facility. These fittings are designed for use with all types of slit and unslit conduit, thus maintaining maximum conduit bore.

See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

Note: For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers.



CAT. NO. FLANGE BODY	CAP NUT	SEAL BUSHING	CONDUIT SIZE	
			(NC)	(NW)
AB32-F90	CN32	SRN29	32	29
AB40-F90	CN36	SRN36	40	37
AB50-F90	CN48	SRN48	50	50

Nominal Dimensions (mm)

CAT. NO. FLANGE BODY	A	B	C	MIN. BORE	E	F	G	H	I	J
				D						
AB32-F90	66	54	46	36	95	36	17	63	53	27
AB40-F90	86	73	63	46	115	30	27	77	64	35
AB50-F90	86	73	73	59	125	30	30	86	77	35

Note: Dimensions refer to an overall assembly.

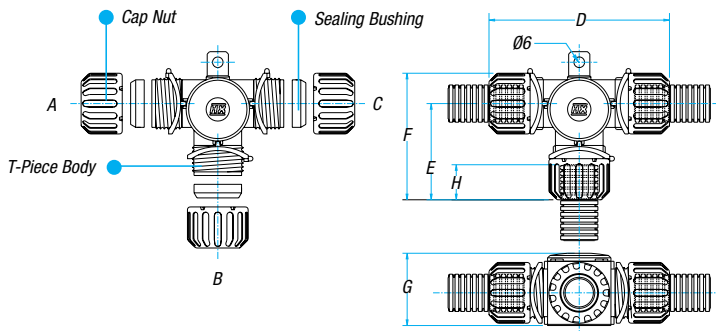
T-Pieces

Symmetrical, three-junction compression-type fittings provide a variety of conduit size configurations.

These fittings are designed for use with all types of slit and unslit conduit, thus maintaining maximum conduit bore. See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

Accessories

For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers. Order T-piece bodies, cap nuts and sealing bushings separately.



CAT. NO. T-PIECE (WITH BRACKET)	CAT. NO. T-PIECE (NO BRACKET)	CAP NUT	SEAL BUSHING	CONDUIT SIZE					
				(NC)			(NW)		
				A	B	C	A	B	
—	TP12	CN07	SRN07	10	10	10	8.5	8.5	
—	TP12	CN09	SRN09	12	12	12	10	10	
—	TP16	CN11	SRN11	16	16	16	13	13	
TPB20	TP20	CN16	SRN16	20	20	20	17	17	
TPB28	TP28	CN21	SRN21	25	25	25	22	22	
TPB28	TP28	CN28	SRN28	228	28	28	23	23	
TPB32	TP32	CN32	SRN29	32	32	32	29	29	

Note: Order T-piece bodies, cap nuts and sealing bushings separately.

Nominal Dimensions (mm)

CAT. NO. T-PIECE (WITH BRACKET)	CAT. NO. T-PIECE (NO BRACKET)	MIN. BORE D	E	F	G
—	TP12	68	50	39	27
—	TP16	69	51	38	31
TPB20	TP20	80	58	43	35
TPB28	TP28	95	71	52	43
TPB32	TP32	109	84	61	51

Note: Dimensions refer to an overall assembly.

Sealed Fittings

X-Piece

Symmetrical four-junction compression-type fitting provide a variety of conduit size configurations.

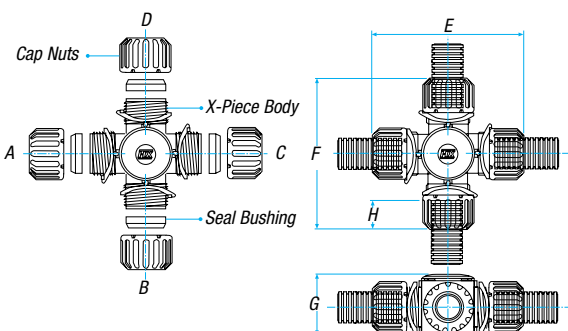
These fittings are designed for use with all types of unslit conduit, thus maintaining maximum conduit bore.

See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

Accessories

For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers.

Order X-piece bodies, cap nuts and sealing bushings separately.



CAT. NO. X-PIECE	CAP NUT	SEAL BUSHING	CONDUIT SIZE							
			(NC)				(NW)			
			A	B	C	D	A	B	C	D
XP20	CN16	SRN16	20	20	20	20	17	17	17	17

Note: Order T-piece bodies, cap nuts and sealing bushes separately.

Nominal Dimensions (mm)

CAT. NO. X-PIECE	E	D	G	H
XP20	80	80	35	20

Note: Dimensions refer to an overall assembly.

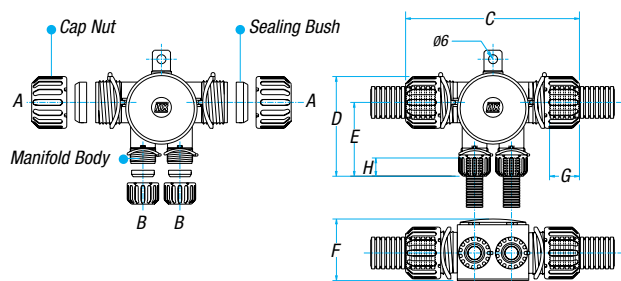
Manifolds

Asymmetrical four-junction compression fittings designed for use with all types of unslit conduit, thus maintaining maximum conduit bore.

Accessories

For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers.

Order manifold bodies, cap nuts and sealing bushings separately.



CAT. NO. MANIFOLD BODY	CAP NUT		SEAL BUSHING		CONDUIT SIZE			
	A	A	A	B	(NC)		(NW)	
	A	A	A	B	A	B	A	B
TPM2512	CN21	CN07	SRN21	SRN07	25	10	22	8.5
TPM2512	CN21	CN21	SRN21	SRN09	25	12	22	10
TPM2512	CN28	CN28	SRN28	SRN07	28	10	23	8.5
TPM2512	CN28	CN28	SRN28	SRN09	28	12	23	10

Note: Order T-piece bodies, cap nuts and sealing bushes separately.

Nominal Dimensions (mm)

CAT. NO. MANIFOLD BODY	C	D	E	F	G	H
TPM2512	105	74	55	40	21	17

Note: Dimensions refer to an overall assembly.

Sealed Fittings

Circular UNEF Connector Interfaces

Straight compression-type fittings provide connection between military style circular connections and conduit systems.

These fittings are designed for use with all types of unslit conduit, thus maintaining maximum conduit bore.

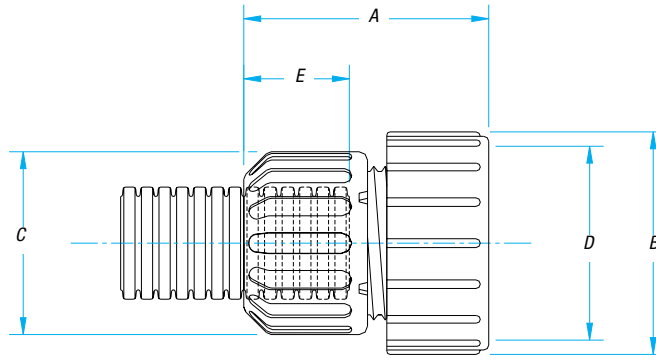
See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

Accessories

For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers.

Order interface bodies, cap nuts and sealing bushes separately.

Specials available upon request. Please contact Thomas & Betts Technical Support for further details.



Nominal Dimensions (mm)

CAT. NO.	INTERFACE BODY	SEAL CAP NUT	BUSHING	FACE SEALING WASHER	CONDUIT SIZE		
					(NC)	(NW)	THREAD SIZE
MPA01	CN07	SRN07	SWPG07	SWPG07	10	8.5	5/8"-24 UNEF
MPA01	CN09	SRN09	SWPG07	SWPG07	12	10	5/8"-24 UNEF
MPA02	CN09	SRN09	SWM16	SWM16	12	10	7/8"-24 UNEF
MPA03	CN16	SRN16	SWM20	SWM20	20	17	1"-20 UNEF
MPA04	CN16	SRN16	SWPG16	SWPG16	20	17	1 1/8"-18 UNEF
MPA05	CN21	SRN21	SWM25	SWM25	25	22	1 1/8"-18 UNEF
MPA05	CN28	SRN28	SWM25	SWM25	28	23	1 1/8"-18 UNEF
MPA06	CN07	SRN07	SWM20	SWM20	10	8.5	1"-20 UNEF
MPA07	CN09	SRN09	SWPG16	SWPG16	12	10	1 1/8"-18 UNEF
MPA08	CN07	SRN07	SWPG09	SWPG09	10	8.5	3/4"-20 UNEF
MPA08	CN09	SRN09	SWPG09	SWPG09	12	10	3/4"-20 UNEF

Note: Order T-piece bodies, cap nuts and sealing bushes separately.

CAT. NO.	INTERFACE BODY	A	B	C	THREAD SIZE	
					D	E
MPA01		30	24	23	5/8"-24 UNEF	17
MPA03		33	36	31	1"-20 UNEF	20
MPA04		32	37	31	1 1/8"-18 UNEF	20
MPA05		37	44	39	1 1/8"-18 UNEF	21
MPA08		30	32	23	3/4"-20 UNEF	17
MPA10		34	32	23	1 1/8"-24 UNEF	17
MPA11		32	35	31	1 1/8"-20 UNEF	20

Note: Dimensions refer to an overall assembly.

Sealed Fittings

Solenoid Connector Interfaces

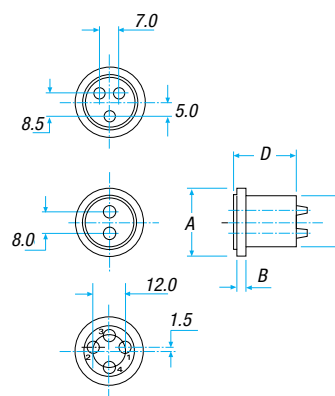
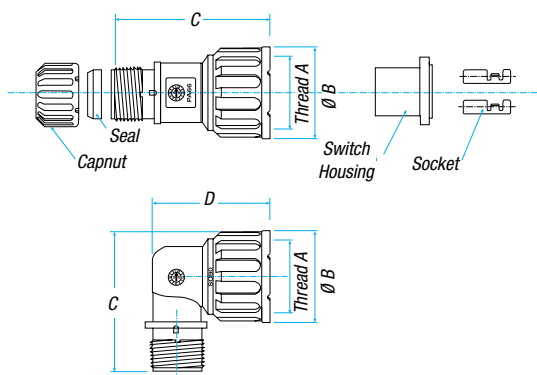
Use screw-thread straight and elbow connectable interfaces for circular solenoids, sensors and switches.

These fittings are designed for use with all types of unslit conduit, thus maintaining maximum conduit bore.

See **page E-376** for details on reducing options that enable each straight fitting to accommodate a variety of conduit sizes.

Accessories

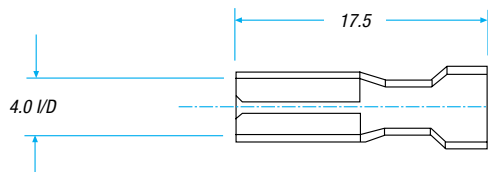
For extending the capability of sealed fittings, contact Technical Support regarding clamping rings, end sleeves/end caps, grommet seals, locknuts, face sealing washers and thread reducers/enlargers.



CAT. NO.	THREAD	NOMINAL DIMENSIONS (MM)				NUT COLOR
		A	B	C	D	
ELBOW FITTING						
SC-M24-90	M24x1.0	31	38.5	40.5	Black	
SC-M27-90	M27x1.0	34	40	40.5	Gray	

CAT. NO.	THREAD	NOMINAL DIMENSIONS (MM)				NUT COLOR
		A	B	C	D	
STRAIGHT FITTING						
SC-M24-S	M24x1.0	31	53	—	Black	
SC-M27-S	M27x1.0	34	54	—	Gray	

CAT. NO.	SUITABLE FOR CONNECTOR TYPE	NUMBER OF PINS	DIMENSIONS (MM)			
			A	B	C	D
RSG02	M27	2	25.0	3.5	18.7	23.0
RSG03	M27	3	25.3	3.5	18.0	21.0
RSG04	M27	4	25.3	3.5	18.7	23.0
RSG05	M24	2	22.5	3.5	18.0	23.0
RSG06	M24	3	22.3	3.5	18.0	21.0

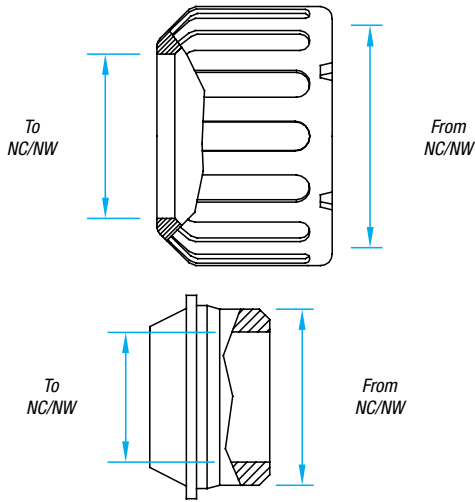


RSGP01 Socket

CAT. NO.	DESCRIPTION
RSGP01	Single
RSGP01-C	Chain Form

Sealed Fittings

Cap Nuts and Reducing Bushings



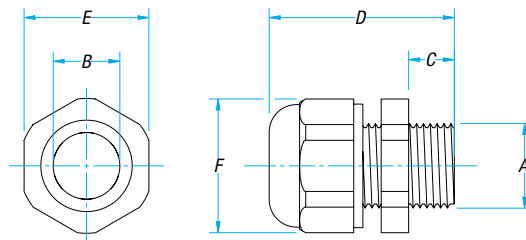
CAT. NO. CAP NUT	CAT. NO. REDUCING SEALING BUSHING	FROM CONDUIT SIZE		TO CONDUIT SIZE	
		(NC)	(NW)	(NC)	(NW)
CN09-08	RSB12-08	12	10	08	7.5
CN11-08	RSB16-08	16	13	08	7.5
CN11-12	RSB16-12	16	13	12	10
CN16-08	RSB20-08	20	17	08	7.5
CN16-12	RSB20-12	20	17	12	10
CN16-16	RSB20-16	20	17	16	13
CN21-12	RSB25-12	25	22	12	10
CN21-16	RSB25-16	25	22	16	13
CN21-20	RSB25-20	25	22	20	17
CN21-12	RSB28-12	28	23	12	10
CN21-16	RSB28-16	28	23	16	13
CN21-20	RSB28-20	28	23	20	17
CN32-20	RSB32-20	32	29	20	17
CN32-25	RSB32-25	32	29	25	22
CN32-28	RSB32-28	32	29	28	23

Cable Glands

Straight compression-type IP68 5bar cable glands incorporate fixed male threads to provide secure cable connections through knockouts and threaded entries.

Accessories

For extending the capability of Harnessflex® cable glands, see [page E-377](#) for locknuts, face sealing washers and blanking plugs for unused entries.



Metric Versions

CAT. NO.	THREAD	CABLE OD RANGE	A/F SIZE			
			A	B	C	D
CGS-M16	M16x1.5	4.0–10.0	9	34.5	21	23.5
CGS-M20	M20x1.5	6.0–12.0	10	37	24	27
CGS-M25	M25x1.5	13.0–18.0	11	40	30	33
CGS-M32	M32x1.5	17.0–25.0	12	49	41	45.5
CGS-M40	M40x1.5	24.0–32.0	13	55	50	55.5
CGS-M50	M50x1.5	24.0–38.5	12	65	60	68
CGS-M63	M63x1.5	35.0–44.0	12	67	70	79

PG Versions

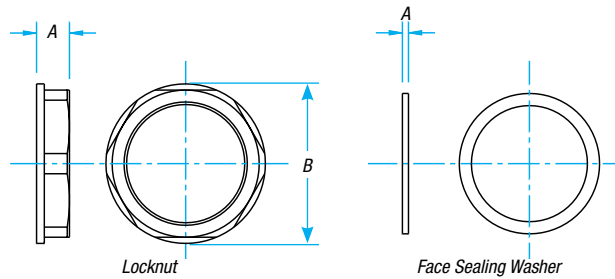
CAT. NO.	THREAD	CABLE OD RANGE	A/F SIZE			
			A	B	C	D
CGS-PG07	PG7	2.0–6.5	8	31	17	19
CGS-PG09	PG9	4.0–10.0	8	33.5	21	23.5
CGS-PG11	PG11	6.0–12.0	8	35	24	27
CGS-PG13	PG13.5	6.0–12.0	9	36	24	27
CGS-PG16	PG16	10.0–14.0	10	38.5	27	30
CGS-PG21	PG21	13.0–18.0	11	40	30	33
CGS-PG29	PG29	17.0–25.0	11	48	41	45.5
CGS-PG36	PG36	24.0–32.0	13	55	50	55.5

Notes: Dimensions are in mm. OD = outside diameter.

Sealed Fittings

Locknuts and Face Sealing Washers

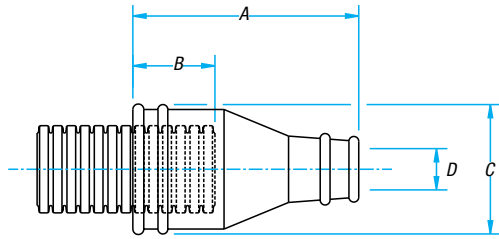
Non-metallic locknuts, face sealing washers and blanking plugs designed for use with Harnessflex® cable glands, enclosures and sealed fittings to connect to knockouts and threaded entries.



CAT. NO.	THREAD SIZE	A	B (A/F)
Locknuts			
LNP-M16	M16x1.5	7	19
LNP-M20	M20x1.5	8	23
LNP-M25	M25x1.5	9	28
LNP-M32	M32x1.5	9	36
LNP-M40	M40x1.5	10	46
LNP-M50	M50x1.5	10	60
LNP-PG07	PG07	5	19
LNP-PG09	PG09	5	22
LNP-PG11	PG11	5	24
LNP-PG13	PG13.5	6	27
LNP-PG16	PG16	6	30
LNP-PG21	PG21	7	36
LNP-PG29	PG29	7	46
LNP-PG36	PG36	9	56
LNP-PG48	PG48	9	59
Face Sealing Washers			
SWM16	M16	1.5	—
SWM20	M20	1.5	—
SWM25	M25	1.5	—
SWM32	M32	1.5	—
SWM40	M40	1.5	—
SWM50	M50	1.5	—
SWPG07	PG07	1.2	—
SWPG09	PG09	1.2	—
SWPG11	PG11	1.2	—
SWPG13	PG13.5	1.2	—
SWPG16	PG16	1.2	—
SWPG21	PG21	1.2	—
SWPG29	PG29	1.2	—
SWPG36	PG36	1.2	—
SWPG48	PG48	1.2	—

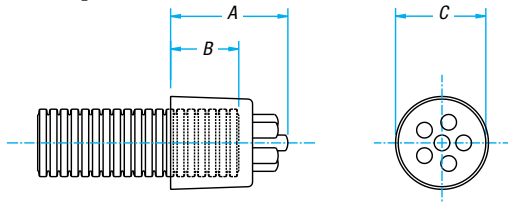
Sealed Fittings

End Sleeves



CAT. NO.	CONDUIT SIZE		OUTLET DIA. RANGE	NOMINAL DIMENSIONS (MM)		
	(NC)	(NW)		A	B	C
ESN12	12	10	4-8	28	17	19
ESN16	16	13	5-9	35	17	23
ESN20	20	17	7-14	42	20	28
ESN25	25	22	9-17	50	21	31
ESN28	28	23	14-22	50	21	34
ESN32	32	29	16-32	53	27	40
ESN40	40	36	16-30	56	35	50

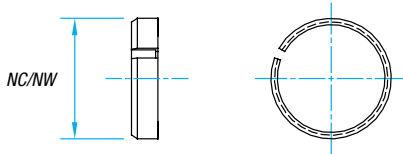
End Caps



CAT. NO.	CONDUIT SIZE		OUTLET DIA. RANGE	NOMINAL DIMENSIONS (MM)		
	(NC)	(NW)		A	B	C
EK03-08	10	8.5	3	19	13	14
EK05	12	10	5	22	14	17

Swivel C Rings

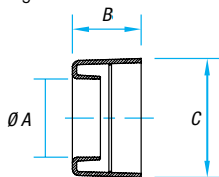
Replaces SRN seal to provide a rotating joint.



CAT. NO.	CONDUIT SIZE		OUTLET DIA. RANGE	NOMINAL DIMENSIONS (MM)		
	(NC)	(NW)		A	B	C
SC16	16	13	—	—	—	—
SC20	20	17	—	—	—	—
SC28	28	23	—	—	—	—
SC32	32	29	—	—	—	—
SC40	40	36	—	—	—	—
SC50	50	48	—	—	—	—

End Caps

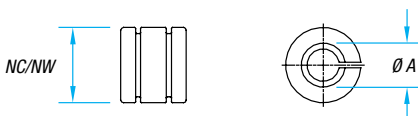
Push-in one-piece fitting leaves a smooth exit from conduit when fittings not used.



CAT. NO.	CONDUIT SIZE		OUTLET DIA. RANGE	NOMINAL DIMENSIONS (MM)		
	(NC)	(NW)		A	B	C
CES12	12	10	—	8	15	16
CES16	16	13	—	9.5	15	18
CES20	20	17	—	13.5	18	25
CES28	28	23	—	20.5	20	32
CES32	32	29	—	25.7	20	38
CES40	40	36	—	32.3	25	46
CES50	50	48	—	43.7	25	58

Smooth Entry Grommet

One-piece slit insert provides abrasion protection for cables passing through a hinged fitting junction where conduit is not used.



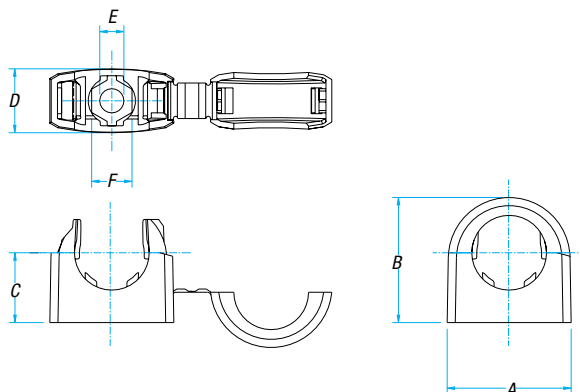
CAT. NO.	CONDUIT SIZE		OUTLET DIA. RANGE	NOMINAL DIMENSIONS (MM)		
	(NC)	(NW)		A	B	C
SEG12	12	10	—	8	—	—
SEG20	20	17	—	16	—	—

Sealed Fittings

Conduit Clips

One-piece non-metallic conduit clips provide secure mounting points for conduit systems within a Harnessflex® system.

These fittings are designed to snap together over all types of slit and unslit conduit, thus maintaining maximum conduit bore.

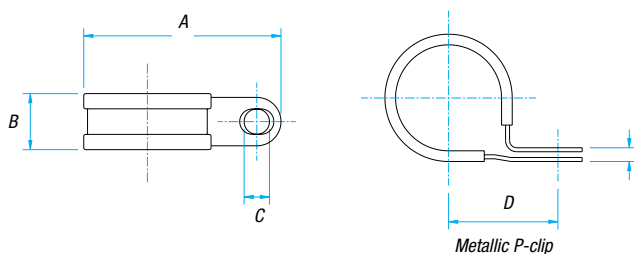


CAT. NO/ CLIP	CONDUIT SIZE						FIXING HOLE SIZE E	A/F COUNTER- BORE SIZE F
	(NC)	(NW)	A	B	C	D		
HCB08	08	7.5	23	23	13	12	4	8
HCB12	12	10	23	23	13	12	4	8
HCB16	16	13	27	27	15	14	5	9
HCB20	20	17	34	35	20	18	6	10
HCB28	28	23	44	44	23	21	6	10
HCB32	32	29	53	52	27	23	6	10
HCB40	40	36	65	63	32	27	6	10
HCB50	50	48	81	77	39	32	6	10

P-Clips

One-piece, metallic P-clips provide secure mounting points for conduit systems within a harness installation.

These clips are designed to accommodate all Harnessflex® slit and unslit conduits.



CAT. NO. P-CLIP	CONDUIT SIZE			FIXING HOLE SIZE			
	(NC)	(NW)	A	B	C	D	E
PCS10	10	8.5	31	13	5	16	1.5
PCS12	12	10	33	13	5	17	1.5
PCS16	16	13	36	13	5	19	1.5
PCS20	20	17	41	13	5	21	1.5
PCS25	25	22	45	13	5	23	1.5
PCS32	32	29	53	13	5	27	1.5
PCS40	40	36	76	25	14	38	2.4
PCS50	50	48	86	25	14	43	2.4

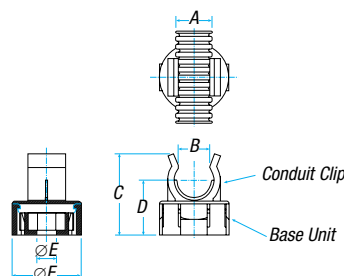
Modular Conduit Clips

One-piece, non-metallic conduit clips provide secure mounting points for conduit systems within a harness installation.

The base unit provides a strong and secure location, while rotating conduit clip prevents detachment through vibration.

These clips are designed to snap together and securely locate Harnessflex® slit and unslit conduits.

Order base unit and conduit clip separately.



CAT. NO. CONDUIT CLIP	BASE UNIT	DIMENSIONS (MM)						COLOR	
		A	B	C	D	E	F		
MCS22-08	MCB22	NC08	NW7.5	7	22	16	6.2	22	Black
MCS22-12	MCB22	NC12	NW10	10	25	17.5	6.2	22	Gray

Technical Information

Storage Recommendation for Polyamide Products

Polyamide is widely and successfully used for products in the electrical and electronics industries. Thanks to its excellent mechanical and physical properties over a wide range of application temperatures and its very good weather resistance, polyamide can be used to make products for interior and external use that meet the most stringent of demands.

As a hygroscopic material, polyamide has the ability to absorb moisture in molecular form into the plastic matrix. As the moisture content goes up, product properties may change slightly. Absorbed water acts as a plasticizer, reducing strengths and moduli and increasing the toughness of the polyamide.

Although at room temperature the stiffness and strength of PA6 is more reduced by the moisture uptake than those of PA66, this difference can be considered to be non-significant. PA6 absorbs more water than PA66, especially under high humidity conditions. But the resulting dimensional change is still of a similar order.

The following chart shows how the moisture content of polyamides comes into balance with the ambient air in a normal climate of 50% relative humidity and 23° C:

Material	In air (23° C/50% rh)
Polyamide 6	3.0–3.5% by weight
Polyamide 66	2.5–3.0% by weight

To maintain balanced moisture content, Harnessflex recommends storing products under the following conditions:

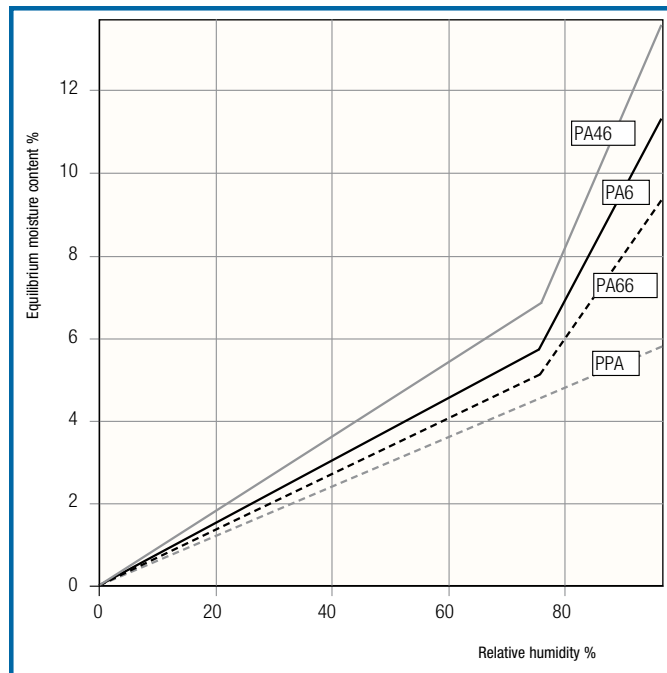
Storage temp.	Processing temp.	Rel. humidity
18° C to 30° C	>18° C	>30%

At lower processing temperatures and in particular when subjected to unnatural drying, corrugated pipes display increased flexural rigidity.

In the very dry winter months, the moisture balance may go down slightly as the material releases moisture to the environment (owing to lower relative humidity). Compared to temperate outdoor conditions at around 0° C (40–80% rh), the humidity in heated rooms may drop by half to below 20% rh if no humidification is present. Even extremely dry regions such as the Sahara Desert record average humidity of 20% to 60% rh.

If products from an outside environment are brought into a heated processing area, the change in climate may suddenly cause temporary de-moisturization around the edges. After one or two days in the processing area, a natural balance will be restored.

Observing this storage recommendation ensures optimum processability and material properties.



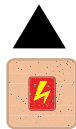
Technical Information

Ingress Protection (IP) Rating according to EN 60529/DIN 40050

IP suitability ratings are a system for classifying the degree of protection provided by enclosures of electrical equipment. The higher the number, the greater the degree of protection; they apply ONLY to properly installed equipment. The numerals stand for the following:



The first digit stands for:
Protection against Dust



The second digit stands for:
Protection against Water



Protection against Solid Bodies

Degree of protection for persons against access to hazardous parts inside the enclosure and/or against the ingress of solid foreign objects.

-  **0** No protection
-  **1** Objects greater than 50mm, accidental touch by hands
-  **2** Objects greater than 12mm, accidental touch by fingers
-  **3** Objects greater than 2.5mm, e.g. tools/wires
-  **4** Objects greater than 1mm, e.g. tools/wires/ small wires
-  **5** Protected against dust; limited ingress (no harmful deposits)
-  **6** Totally protected against dust (dust-tight)

Protection against Water

Degree of protection of equipment inside enclosures against damage from the ingress of water.

-  **0** No protection
-  **1** Protected against vertically falling drops of water
-  **2** Protected against direct sprays of water up to 15° from vertical
-  **3** Protected against sprays of water to 60° from vertical
-  **4** Protected against water sprayed from all directions; limited ingress permitted
-  **5** Protected against low-pressure jets of water from all directions; limited ingress permitted
-  **6** Protected against strong-pressure jets of water, heavy seas; limited ingress permitted
-  **7** Protection against the effects of immersion between 15cm–1m
-  **8** Protection against long periods of immersion under a quoted pressure (e.g. 2bar at 24 hours)
-  **9k** IP69k automotive standard DIN40050 and signifies resistance to high-pressure jets of water (up to 80bar) from any angle

Technical Information

Nylon (PA6)

Used on all Harnessflex® NC and CTPA nylon conduits

Properties	Test Method	Value	Unit
General			
Density	ISO 1183	1.13	g/cm3
Melting Point	ISO 11357-1/-3	220	°C
Mechanical			
Tensile Strength	ISO 527	55 (Con)	MPa
Elongation at Break	ISO 527	>50 (Con)	%
Youngs Modulus	ISO 527	3100 (Dry)	MPa
Charpy Impact Strength	ISO 179	DNB (Dry)	kJ/m2
Charpy Notched Impact Strength		11 (Dry)	kJ/m2
IZOD Impact Strength	ISO 180C	DNB (Dry)	kJ/m2
IZOD Notched Impact Strength	ISO 180A	4 (Dry)	kJ/m2
Thermal			
Heat Distortion Temperature-A	ISO 75	100	°C
Heat Distortion Temperature-B	ISO 75	>200	°C
Flammability			
Flammability	UL® 94	HB	N/A
Electrical			
Dielectric Strength	IEC 243	14 (Dry)	MV/m
Surface Resistivity	IEC 93	15 (Dry)	log10Ω
Volume Resistivity	IEC 93	15 (Dry)	log10Ω
Comparative Tracking Index	IEC 112	>600	V

Notes: DNB = Did not break, Dry = Dry as molded, Con = Conditioned 168 hours @ 23° C, 50% rh All tests undertaken at 23° C where applicable.

Chemical Resistance: Nylon 6 Harnessflex conduits are resistant to all underbonnet oils, greases, fuels, cleaning fluids and synthetic fluids.

Like all Nylons, they are resistant to weak acids but not resistant to strong or oxidizing acids.

Approvals: NC conduits are approved to different standards, including NFR 13-903.

Others are manufacturer specific or are new developments and may not be approved to certain standards. Please contact Technical Support for specific inquiries.

PEEK™ (PolyEtheretherKetone)

Used on PKC conduit

Properties	Test Method	Value	Unit
General			
Density	ISO 1183	1.32	g/cm3
Melting Point	DEC	343	°C
Mechanical			
Tensile Strength	ISO 527	97	MPa
Elongation at Break	ISO 527	<60	%
Youngs Modulus	ISO 527	3600	MPa
Charpy Impact Strength, 2mm Notch	ISO 179	35	kJ/m2
Charpy Impact 0.25mm Notch	ISO 179	8.2	kJ/m2
IZOD Impact Strength	ISO 180	DNB	kJ/m2
IZOD Impact Strength 0.25mm Notch	ISO 180	6.4	kJ/m2
Thermal			
Heat Distortion Temperature-A	ISO 75	152	°C
Heat Distortion Temperature-B	ISO 75		°C
Flammability			
Flammability	UL® 94	V-0	N/A
Electrical			
Dielectric Strength	IEC 243	190	kV/m-1
Surface Resistivity	IEC 93		
Volume Resistivity	IEC 93	4.9	1016Ω cm
Comparative Tracking Index	IEC 112	150	V

Notes: DNB = Did not break, All tests undertaken at 23° C where applicable.

This linear aromatic polymer is semi-crystalline and is widely regarded as the highest performance thermoplastic material currently available. A summary of key physical properties is as follows:

High Temperature Performance: PEEK™ polymer and compounds typically have a glass transition temperature of 143° C and a melting temperature of 343° C and a continuous use temperature of 260° C (UL 746B).

Wear Resistance: PEEK™ polymer has excellent friction and wear properties exhibiting outstanding wear resistance over wide ranges of pressure, velocity, temperature and counterfacial roughness.

Chemical Resistance: PEEK™ polymer has excellent resistance to a wide range of chemical environments, even at elevated temperatures. The only common environment which dissolves PEEK™ polymer is concentrated sulphuric acid.

Fire, Smoke and Toxicity: PEEK™ polymer is highly stable and requires no flame-retardant additives to achieve a V-0 rating at 1.4mm thickness. The composition and inherent purity of the material results in extremely low smoke and toxic gas emission in fire situations.

Hydrolysis Resistance: PEEK™ polymer and compounds are not chemically attacked by water or pressurized steam. Components which are constructed from these materials retain a high level of mechanical properties when continuously conditioned in water at elevated temperatures and pressures.

Electrical Properties: The electrical properties of PEEK™ polymer are maintained over a wide frequency and temperature.

Nylon (PA66) – Heat Stabilized

Used on all Harnessflex un-reinforced nylon fittings

Properties	Test Method	Value	Unit
General			
Density	ISO 1183	1.14	g/cm3
Melting Point	ISO 1218	263	°C
Mechanical			
Tensile Strength	ISO 527	95 (Dry)	MPa
Elongation at Break	ISO 527	23 (Dry)	%
Youngs Modulus	ISO 527	3400 (Dry)	MPa
Flexural Modulus	ISO 178	2850 (Dry)	MPa
Charpy Impact Strength	ISO 179	DNB (Dry)	kJ/m2
Charpy Notched Impact Strength		6 (Dry)	kJ/m2
IZOD Impact Strength	ISO 180C	DNB (Dry)	kJ/m2
IZOD Notched Impact Strength	ISO 180A	5 (Dry)	kJ/m2
Thermal			
Heat Distortion Temperature @1.8Mpa	ISO 75-2	85	°C
Heat Distortion Temperature @ 0.45MPa	ISO 75-2	230	°C
Flammability			
Flammability	UL® 94	V-0	N/A
Flammability	UL® 94	V2	N/A
Glow Wire Flammability @ 1.5mm	IEC 695-2-1/2	850 (Con)	°C
Electrical			
Dielectric Strength	IEC 243	60 (Dry)	MV/m
Surface Resistivity	IEC 60093	1E+15	Ω
Volume Resistivity	IEC 60093	1E+15	Ω.cm
Comparative Tracking Index	IEC 60112	600	V

Notes: DNB = Did not break, Dry = Dry as molded, Con = Conditioned 168 hours @ 23° C, 50% RH All tests undertaken at 23° C where applicable.

Chemical Resistance: Nylon (PA66) Harnessflex fittings are resistant to all underbonnet oils, greases, fuels, cleaning and synthetic fluids.

Like all Nylons, they are resistant to weak acids but not resistant to strong or oxidizing acids.

Approvals:

Individual parts are approved to different standards, including NFR 13-903. Others are manufacturer specific or are new developments and may not be approved to certain standards. Please contact Technical Support for specific inquiries.

Technical Information

Nylon (PA66) - 30% Glass Fiber Filled

Used on SC-M27 and SC-M24 swivel nuts

Properties	Test Method	Value	Unit
General			
Density	ISO 1183	1.36	g/cm ³
Moisture Absorption (1) ①	Sim. to ISO 62	1.6	%
Mechanical (2)			
Tensile Stress at Yield/Break (3)	ISO 527	195	N/mm ²
Elongation at Break	ISO 527	3	%
Modulus of Elasticity (4)	ISO 527	10000	N/mm ²
IZOD Notched Impact Strength	ISO 180/1A	@ +23°C	13
		@ -30° C	10
Thermal			
Heat Deflection Temperature (HDT)	ISO 75/A	250	°C
Ball Pressure Test	IEC 60695-10-2	>200	°C
Flammability			
Flammability (1.6mm thickness)	UL® 94	HB	
Oxygen Index	ISO 4589	24	%
Glow Wire Test Extinguishing Time (5)	IEC 60695-2-1/1	<15	s
Hot Wire Ignition (HWI) (1.5mm thickness)	IEC 60695-2-20	>15	s
High-Current Arc Ignition (HA) (0.7mm thickness)	IEC 60947	>120	No. of arcs
Electrical (2)			
Dielectric Strength	IEC 60243-1	>30	kV/mm
Specific Surface Resistivity	IEC 60093	1015	Ω
Specific Volume Resistivity	IEC 60093	1015	Ω.cm
Dielectric Constant	IEC 60250	@ 100 Hz	3.8
		@ 1 MHz	3.5
Dissipation Factor	IEC 60250	@ 100 Hz	90
		@ 1 MHz	160
Comparative Tracking Index	IEC 60112	600	V
Electrolytic Corrosion	IEC 60426	A1.2	—

Key:

- Moisture absorption, saturation at +23° C and 50% rh (ref. DIN 53495).
- Dry as molded.
- Test speed 5mm/min.
- Test speed 1mm/min.
- Glow wire applied during 30 secs, temperature 750° C, thickness 1.6mm.

Thermoplastic Elastomer TPV

Used on sealing products

A polypropylene-based elastomer designed primarily for demanding automotive applications. This material exhibits excellent compression set, flex fatigue and high- and low-temperature performance.



Properties	Test Method	Value	Unit
General			
Density	ISO 1183	0.96	g/cm ³
Hardness Shore A (5 sec.)	ISO 868	56	—
Brittleness Temperature	ISO 812	-62	°C
Flammability	UL® 94	HB	—
Stress/Strain Properties	ISO 37 (II)		
Flow Direction			
Tensile Strength		3.8	MPa
Modulus 100%		2.7	MPa
Elongation at Break		280	%
Cross Direction			
Tensile Strength		5.1	MPa
Modulus 100%		1.9	MPa
Elongation at Break		470	%
Tear Strength (Cross Direction)			
Trouser	ISO 34 A	7	kN/m
Un-nicked Angle	ISO 34 B (a)	22	kN/m
Compression Set	ISO 815		
72h/23° C		22	%
72h/70° C		26	%
72h/100° C		34	%
Hot Air Aging			
1000h/125° C	ISO 188		
Change in Hardness		2	pts
Retention Tensile Strength		90	%
Retention — Elongation at Break		96	%
336h/150° C			
Change in Hardness		0	pts
Retention Tensile Strength		90	%
Retention Elongation at Break		87	%
Volume Swell			
72h/100° C Water	ISO 1817	+3	%
168h/100° C ASTM Oil 1		+43	%
168h/100° C Ref. Fuel B		+91	%

Notes: Tests are conducted on injection-molded plaques. All tests undertaken at 23° C where applicable.

Chemical Resistance: TPV fittings are resistant to water, acids, ethanol, glycerol, methanol and propanol, hydraulic brake fluid and antifreeze. Large volume swell (>60%) is experienced with certain oils and fuels.

Approvals: Individual parts are approved to different standards, including NFR 13-903. Others are manufacturer specific or are new developments and may not be approved to certain standards. Please contact Technical Support for specific inquiries.

Technical Information

Connector Catalog Number Reference

CAT. NO.	REF. NO.	NOTES	CAT. NO.	REF. NO.	NOTES	CAT. NO.	REF. NO.	NOTES	CAT. NO.	REF. NO.	NOTES
CI08-180-K2C			CI08-AS1	282079-2	•	CI12-90-AM3	1-827578-1	•	CI12-AT6PL	776433-1	•
CI08-72585			CI08-AS2	282080-1	•	CI12-90-AM4	281804-1	•	CI12-AT8PL	776494-1	•
CI08-90-AM2	347887-3	•	CI08-AS3	282087-1	•	CI12-90-AS1	282079-2	•	CI12-BC2	1 928 403 137	◆
CI08-90-AM3	1-827578-1	•	CI08-AS4	282088-1	•	CI12-90-AS2	282080-1	•	CI12-BC3	1 928 403 110	◆
CI08-90-AM4	281804-1	•	CI08-AT2PL	776427-1	•	CI12-90-AS3	282087-1	•	CI12-BC4	1 928 403 112	◆
CI08-90-AS1	282079-2	•	CI08-AT3PL	776427-1	•	CI12-90-AS4	282088-1	•	CI12-DT2	DT06-2S	▼
CI08-90-AS2	282080-1	•	CI08-AT4PL	776487-1	•	CI12-90-AT2LP	776427-1	•	CI12-DT3	DT06-3S	▼
CI08-90-AS3	282087-1	•	CI08-AT6PL	776433-1	•	CI12-90-AT2LR			CI12-DT4	DT06-4S	▼
CI08-90-AS4	282088-1	•	CI08-BC2	1 928 403 137	◆	CI12-90-AT2PL	776427-1	•	CI12-DT6	DT06-6S	▼
CI08-90-AT2LP	776427-1	•	CI08-BC3	1 928 403 110	◆	CI12-90-AT3LP	776427-1	•	CI12-DT8	DT06-8SA	▼
CI08-90-AT2LR			CI08-BC4	1 928 403 112	◆	CI12-90-AT3LR			CI12-FCI02		
CI08-90-AT2PL	776427-1	•	CI08-DE001	12078090		CI12-90-AT3PL	776427-1	•	CI12-FCI03		
CI08-90-AT3LP	776427-1	•	CI08-DT2	DT06-2S	▼	CI12-90-AT4LP	776487-1	•	CI12-FCI04		
CI08-90-AT3LR			CI08-DT3	DT06-3S	▼	CI12-90-AT4LR			CI12-FCI14		
CI08-90-AT3PL	776427-1	•	CI08-DT6	DT06-6S	▼	CI12-90-AT4PL	776487-1	•	CI12-MF2		
CI08-90-AT4LP	776487-1	•	CI08-F2W			CI12-90-AT6LP	776433-1	•	CI12-WP2		
CI08-90-AT4LR			CI08-FCI02			CI12-90-AT6LR			CI12-X01		
CI08-90-AT4PL	776487-1	•	CI08-FCI03			CI12-90-BC2	1 928 403 137	✓	CI16-90-AT8PL	776494-1	•
CI08-90-AT6LP	776433-1	•	CI08-FCI04			CI12-90-BC3	1 928 403 110	✓	CI16-90-DT12	DT06-12SA	▼
CI08-90-AT6LR			CI08-GT153			CI12-90-BC4	1 928 403 112	✓	CI16-90-DT8	DT06-8SA	▼
CI08-90-BC2	1 928 403 137	◆	CI08-GT153-Z			CI12-90-DT12	DT06-12SA	▼	CI16-90-FCI14		
CI08-90-BC3	1 928 403 110	◆	CI08-MF2			CI12-90-DT2	DT06-2S	▼	CI16-AT12PL	776494-1	•
CI08-90-BC4	1 928 403 112	◆	CI08-MMP2			CI12-90-DT3	DT06-3S	▼	CI16-AT8PL	776494-1	•
CI08-90-DE001			CI08-MP2			CI12-90-DT4	DT06-4S	▼	CI16-DT12	DT06-12SA	▼
CI08-90-DT2	DT06-2S	▼	CI08-MP3			CI12-90-DT6	DT06-6S	▼	CI16-DT8	DT06-8SA	▼
CI08-90-DT2C			CI08-NV001			CI12-90-DT8	DT06-8SA	▼	CI16-FCI14		
CI08-90-DT3	DT06-3S	▼	CI08-PTD2			CI12-90-DTP04			CI16-LK20		
CI08-90-DT4	DT06-4S	▼	CI08-SU4			CI12-90-FCI02			CI17-FCI10		
CI08-90-DT6	DT06-6S	▼	CI08-TY002	184002-1	✓	CI12-90-FCI03			CI201220-DRC50		
CI08-90-FCI02			CI08-WP2			CI12-90-FCI04			CI202820-DRC50		
CI08-90-FCI03			CI08-WS2			CI12-90-FCI14			CI20-A31		
CI08-90-FCI04			CI10-90			CI12-90-GT153			CI20-AT12PL	776494-1	•
CI08-90-FCI14			CI10-90-AM2	347887-3	•	CI12-90-K2C			CI251225-DRC50		
CI08-90-FCS02			CI10-90-AM3	1-827578-1	•	CI12-90-K3C			CI252825-DRC50		
CI08-90-GT153			CI10-90-AM4	281804-1	•	CI12-90-MMP2			CI25-A31		
CI08-90-K2C			CI10-90-AS2	282080-1	•	CI12-90-MP2			CI25-FCI50		
CI08-90-K3C			CI10-90-AS3	282087-1	•	CI12-90-MP3			CI28-90-25		
CI08-90-MMP2			CI10-90-AS4	282088-1	•	CI12-90-WP2			CI28-BC40		
CI08-90-MP2			CI10-AM2	347887-3	•	CI12-90-X01			CI28-CCU138		
CI08-90-MP3			CI10-AM3	1-827578-1	•	CI12-AM2	347887-3	•	CI32-A31		
CI08-90-NV001			CI10-AM4	281804-1	•	CI12-AM3	1-827578-1	•	CI-DT2C		
CI08-90-PTD2			CI10-AS2	282080-1	•	CI12-AM4	281804-1	•	CI-FCS02		
CI08-90-S			CI10-AS3	282087-1	•	CI12-AS1	282079-2	•	CI-K2C		
CI08-90-SU4			CI10-AS4	282088-1	•	CI12-AS2	282080-1	•	CI-K3C		
CI08-90-WP2			CI10-MF2			CI12-AS3	282087-1	•	CI-MF-90		
CI08-AM2	347887-3	•	CI121212-DRC50			CI12-AS4	282088-1	•	CIS-90		
CI08-AM3	1-827578-1	•	CI122812-DRC50			CI12-AT12PL	776494-1	•			
CI08-AM4	281804-1	•	CI12-90-AM2	347887-3	•	CI12-AT4PL	776487-1	•			

• All Color and Wire Variants ◆ All Bosch Compact Variants ▼ All Color Variants ✓ All Color and Key Variants