

Delphi Harsh Environment Series (HES) Connection Systems

The Delphi Harsh Environment Series (HES) Connection Systems include circular connectors, terminals, and a rectangular 50 and 60 way header. The 24 shell size industry standard connector includes six terminal configurations (47, 31, 29, 23, 21, and 19). Delphi's circular connection systems are available with straight and right angle conduit wire dress covers on both receptacle and plug assemblies.

The HES Connection Systems provide higher current capability, improved sealing, higher terminal retention and a significant cost advantage compared to standard pin-and-sleeve systems. Delphi HES Connection Systems are also compatible with existing systems in the commercial and agricultural vehicle markets.

► Benefits

• Terminals

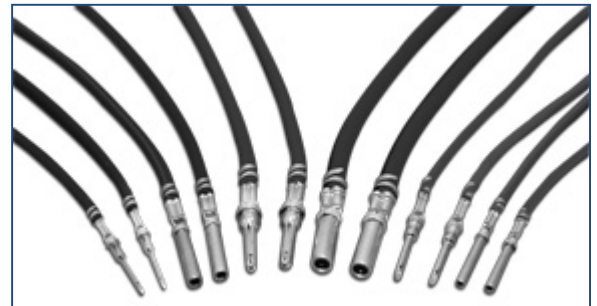
- High current performance is realized through the selection of high conductive materials
- Robust design with a stainless steel sleeve that provides stability and protection to contact interface area
- Overlapping wing design provides exceptional strain relief and larger outside diameter cable range capability
- Crimp stability over the terminal life with the use of tin in the crimp area
- Wide range of cable sizes accommodated with Delphi's crimp design
- Interchangeability with industry standard terminal products

• HES Circular Connectors

- Sealing performance exceeds expectations with recessed 3-rib design that will maintain sealing properties even if a tight wire dress is applied, providing better sealing capability up to 30% compared to existing designs
- Superior contact (terminal) retention performance virtually eliminates terminal unseats with a specialized finger design that results in better retention up to 40% when compared to existing designs
- Interchangeability with industry standard circular products
- Ergonomic design for ease of assembly and to maintain quality:
 - Arrows help simplify pre-engagement of locking collar for simplified mating
 - Visual lock engagement window
 - Color coded seals to distinguish between various cable diameters as well as terminal gender
 - Low torque engage
- Robust construction through sonic welding the seal retainer construction and using wave spring design that ensures the connection system maintains face seal compression, even when subjected to the high vibration commercial vehicle SAE J-2030 standard



HES Connection Systems



HES Terminals

• **Header System**

- Virtually eliminates unseats with Delphi’s two stage terminal retainer design
- High vibration design passes 29 Grms vibration specification
- Chemical resistant header face seals with the use of flourosilicone
- Built-in probing window protect the female terminal during the build process
- Over-torque bolt design protects the header when too much torque is applied
- True pin position is one of the tightest in the industry at 0.225 mm, ensuring easy mounting to a circuit board
- Interchangeability with industry standard products

▶ **Typical Applications**

Delphi Harsh Environment Series products are suited for the following industries:

- Agriculture
- Commercial vehicle
- Construction
- Marine
- Other harsh environment applications

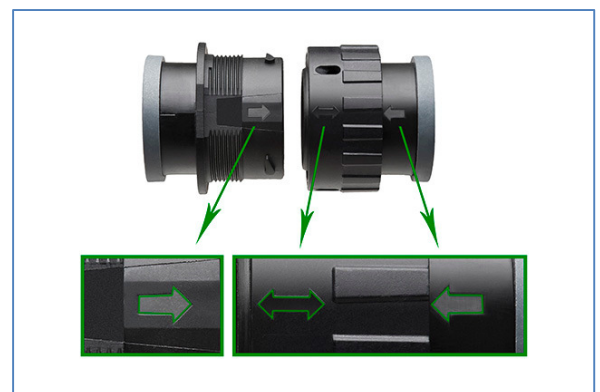
The HES circular design is ideally suited for making connections in a vehicle sheet metal firewall pass-through locations. Because of the rugged connection system design, they are well suited for engine compartments. HES headers are an ideal choice for high density device I/Os that are mounted directly to the engine.



HES Circular Connectors



HES Header System

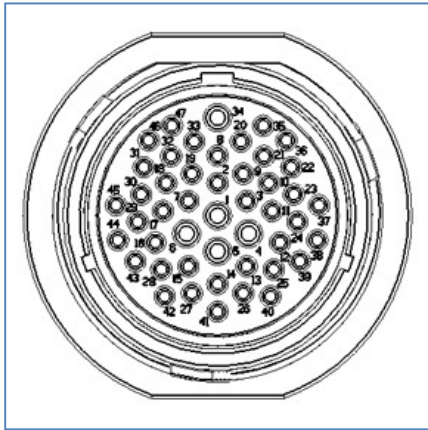


Arrows help simplify pre-engagement of locking collar for simplified mating

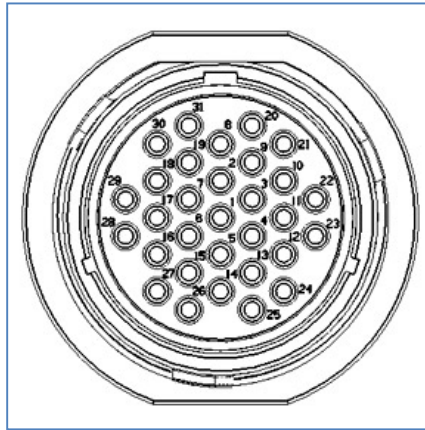
► **Specifications for Connectors and Terminals**

Contacts	Size 20 (1.0 mm) Size 16 (1.6 mm) Size 12 (2.4 mm)
Application Tooling	Delphi tooling available for each current configuration
Sealing Plugs	Size 20 and 16 Size 12
Operating Temperature	- 55°C to + 125°C
Durability	No electrical or mechanical defects after 100 cycles of engagement or disengagement (1000 cycles for the diagnostic connector)
Physical Shock	Withstands 50 Gs of mechanical shock in three axes without mechanical failure
Vibration	Sinusoidal vibration of 20 GRMS and random vibration of 12.4 GRMS without physical damage or loss of continuity
Sealing Capability	IP67 rating Withstands high pressure spray of 375 cycles of 1020 psi @ 150 gal/hr. Withstands water submersion of 3 feet without water intrusion
Cable Range for Optimal Sealing	Contact size: Blue Seal: Orange Seal: Size 20 (1.0) 1.10 - 2.40 mm 1.80 - 3.05 mm Size 16 (1.6) 1.30 - 2.85 mm 2.25 - 3.70 mm Size 12 (2.4) 2.45 - 3.60 mm 2.90 - 4.30 mm
Corrosion Resistance	No corrosion after exposure to 100 hrs of salt fog
Electrical	
Contact Current Rating	Contact Size: Max. Current (Amps): Size 20 18 Size 16 28 Size 12 40
Contact Resistance	10 mΩ for cable ≤ 18 Ga. 6.7 mΩ for cable > 16 Ga.
Dielectric Withstanding Voltage	1000 V AC
Insulation Resistance	Greater than 20 MΩ
Mechanical	
Contact Retention to Housing	Contact Size: Retention Force: Size 20 160 N Size 16 270 N Size 12 365 N
Mating Torque	Less than 4 Nm
Un-mating Torque	Less than 4 Nm
Physical	
Housing	Glass filled nylon
Seals	Silicone
Contact	Copper alloy
Female Terminal Hood	Stainless steel
Plating	Nickel and gold with tin in crimp area

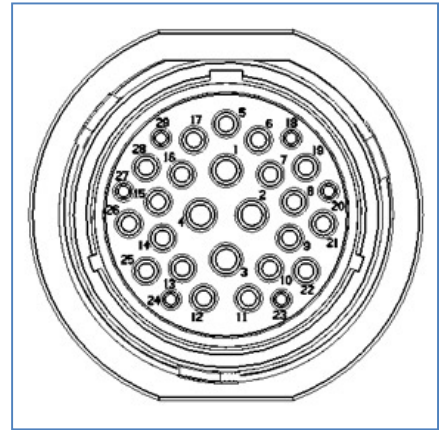
► **HES 24 Shell Terminal Patterns**



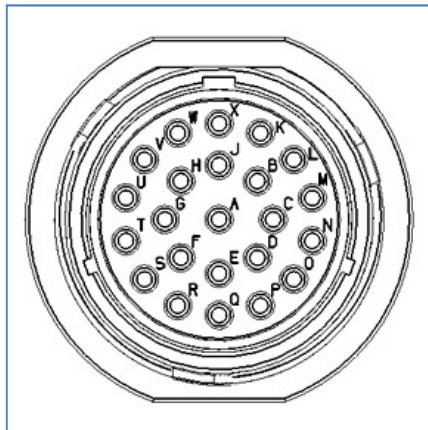
47 Way
42 size 20
5 size 16
Thin wall (blue seal)



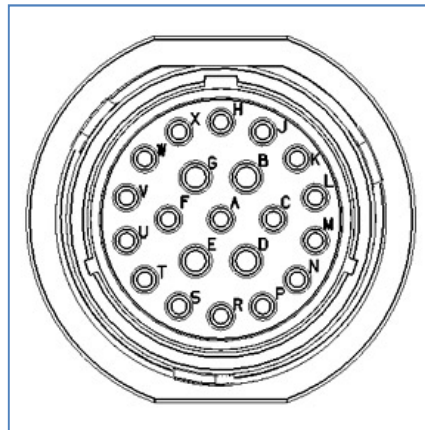
31 Way
31 size 16
Thin wall (blue seal)
Regular/heavy wall (orange seal)



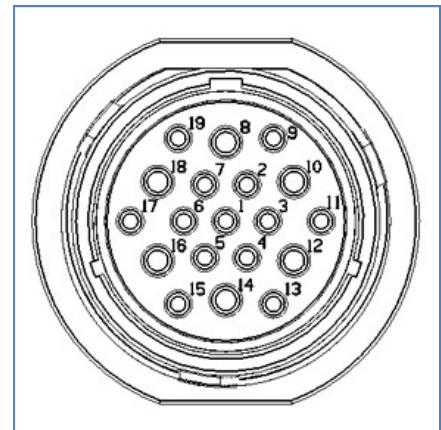
29 Way
6 size 20
19 size 16
4 size 12
Thin wall (blue seal)
Regular/heavy wall (orange seal)



23 Way
23 size 16
Thin wall (blue seal)
Regular/heavy wall (orange seal)



21 Way
17 size 16
4 size 12
Thin wall (blue seal)



19 Way
13 size 16
6 size 12
Thin wall (blue seal)

▶ **HES Assembly Part Numbers — Standard Configuration**

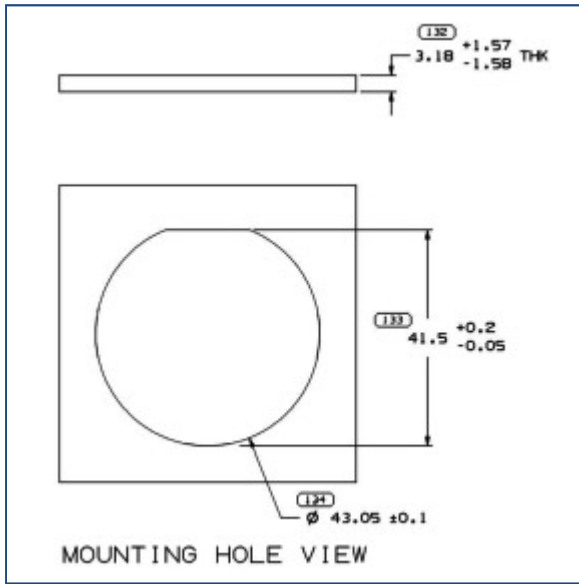
Description – HES Assembly	New Part Number	Old Part Number (backshell, non-backshell)	New Mating Part Number
47 Way M Asm Thin	15544324	13719103, 13653493	15544892
47 Way F Asm Thin	15544892	13719104, 13653492	15544324
31 Way M Asm Thin	15544325	13719105, 13667925	15544893
31 Way M Asm Thick	15544326	13719107, 13698338	15544894
31 Way F Asm Thin	15544893	13719106, 13667935	15544325
31 Way F Asm Thick	15544894	13719108, 13698339	15544326
29 Way M Asm Thin	15544327	13719109, 13697106	15544895
29 Way M Asm Thick	15544328	13719111, 13698344	15544896
29 Way F Asm Thin	15544895	13719110, 13697107	15544327
29 way F Asm Thick	15544896	13719112, 13698345	15544328
23 Way M Asm Thin	15544329	13719113, 13697104	15544897
23 Way M Asm Thick	15544330	13719115, 13698342	15544898
23 Way F Asm Thin	15544897	13719114, 13697105	15544329
23 Way F Asm Thick	15544898	13719116, 13698343	15544330
21 Way M Asm Thin	15544331	13719117, 13697102	15544899
21 Way M Asm Thick	15544332	13719119, 13698340	15544901
21 Way F Asm Thin	15544899	13719118, 13697103	15544331
21 Way F Asm Thick	15544901	13719121, 13698341	15544332
19 Way M Asm Thin	15544333	13719123, 13697108	15544902
19 Way M Asm Thick	15544334	13719125, 13698346	15544903
19 Way F Asm Thin	15544902	13719124, 13697109	15544333
19 Way F Asm Thick	15544903	13719126, 13698347	15544334

▶ **HES Assembly Part Numbers — Reverse Configuration**

Description – HES Assembly	New Part Number	Old Part Number (backshell, non-backshell)	New Mating Part Number
31 Way M Asm Thin	15544343	13765454, 13765449	15544348
31 Way M Asm Thick	15544344	13765455, 13765450	15544349
31 Way F Asm Thin	15544348	13765456, 13765452	15544343
31 Way F Asm Thick	15544349	13765457, 13765453	15544344
19 Way M Asm Thin	15544345	13765458, 13752444	15544350
19 Way M Asm Thick	15544346	13765459, 13765447	15544351
19 Way F Asm Thin	15544350	13765460, 13752445	15544345
19 Way F Asm Thick	15544351	13765461, 13765451	15544346

Light seal color represents female/sleeve terminal

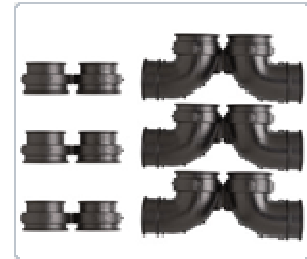
Dark seal color represents male/pin terminal



Mounting specification for the HES size 24 receptacle

► **Conduit Backshell Wire Dress**

Part Number	Conduit Size	Configuration
13767802	19	Wire dress straight
13767803	22	
13667839	25	
13767805	19	Wire dress right angle
13767806	22	
13667840	25	



HES non-threaded backshell conduit adaptors

► **Cavity Seal Plugs**

Part Number	Terminal Cavity
13756464	Size 20 and 16
13756465	Size 12

► **Miscellaneous Accessories**

Part Number	Description
13780240	Gasket
13813956	Gasket with adhesive
13752446	Shipping cover (reverse pin cover)
13668988	Shipping cover (standard pin cover)
15417623	Nut
13840220	Lock washer





HES plugs




► **Specifications for the 50/60 Way Header Connections**

Contacts	Size 20 (1.0 mm)
Sealing Plugs	Size 20 (Note: Different part number than HES circulars)
Operating Temperature	- 55°C to + 125°C
Physical Shock	Withstands 50 Gs of mechanical shock in three axes without mechanical failure
Vibration	29.4 Grms
Sealing Capability	IPX7
Corrosion Resistance	No corrosion after exposure to 100 hours of salt fog Chemical resistant flourosilicon face seal on the header
Electrical	
Contact Current Rating	Size 20: 18 amps maximum current
Contact Plating	Selective gold with tin in crimp area on the female contact Gold flash palladium on the header pins
Mechanical	
Contact Retention to Housing	Contact size: Retention force: Size 20 90 N
Physical	
Housing	High temperature, glass filled nylon
Seals	Flourosilicone face seals Silicone cable seals
Contact	Copper alloy
Plating	Female: Gold with tin in crimp area Male: Gold flash palladium

► **HES 50-way Header System**

Top Mount Header Part Number	Female Plug Connector Part Number	Index
		
13836626	13837191	1
13836627	13837192	2
13836628	13837193	3
13836629	13837194	4
13836630	13837195	5
13936631	13837196	6
13636632	13837197	7
13636633	13837198	8
13836634	13837199	9
13836635	13837200	10

▶ **HES 60-Way Header System**

Bottom Flange Mount Header Part Number	Top Mount Header Part Number	Female Plug Connector Part Number	Index
			
Available upon request	13836616	13837180	1
Available upon request	13836617	13837181	2
Available upon request	13836618	13837182	3
Available upon request	13836619	13837183	4
13806062	13836620	13837184	5
13806064	13836621	13837185	6
13806065	13836622	13837186	7
Available upon request	13836623	13837187	8
Available upon request	13836624	13837188	9
Available upon request	13836625	13837189	10

▶ **Miscellaneous HES 50/60 Way Header Accessories**

Part Number	Description
15475969	Backshell 60-way
15475968	Backshell 50-way
12129557	Cavity plug



HES Header Accessory

▶ **The Delphi Advantage**

Delphi is one of the world's leading automotive suppliers of advanced terminals, connectors, sealing, wiring and cable products. Delphi's deep understanding of various connection system technologies and the company's vast research and development capabilities have enabled continuing innovation.

Delphi is a source for high value solutions and our expertise is built into every product. Delphi has a thorough understanding of markets around the world and a global network of resources. Delphi relies on its global capabilities, consistent processes, and extensive testing to develop and manufacture a comprehensive offering of terminals, connectors, sealing, wiring and cable products. The result is that Delphi provides customers with robust, reliable products and world-class quality.