DEUTSCH

ENVIRONMENTALLY SEALED CONNECTORS FOR ELECTRONIC MODULES

TECHNICAL MANUAL

A STEP AHEAD

Introduction

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Deutsch I.P.D. has been a major supplier of heavy-duty interconnection systems designed for low energy electric circuits required to function in severe environments since the early 1970's. Starting with a series of straight pins that could be utilized in standard environmentally-sealed wire to wire connectors, Deutsch engineers have developed complete families of heavy-duty, sealed P.C.B. headers that are designed to carry both power and data circuits. This Deutsch interconnection technology has been field proven on such programs as the Caterpillar, PEEC, ADEM, Cummins - **PACE** and ENCORE, the Mack - **V-MAC** electronically controlled diesel engines.

As the heavy-duty, truck, bus and off-highway industry is in the midst of an electronic revolution, Deutsch engineers are dedicated to continue the development of P.C.B. Header Interconnections Technology that will provide the complete system reliability required in operating and maintaining tomorrow's heavy-duty electronically equipped vehicles.

This Deutsch I.P.D. general purpose manual provides technical information on four different Deutsch connector families. Each series is designed for wire to printed circuit board applications. Several optional product accessories and guides will aid O.E.M. electronic system designers. Deutsch has the right interconnection system for the job.

P.C.B. INTERCONNECTION DESIGNERS NOTES

The following designer notes are presented for the consideration and discussion of the O.E.M. electronic systems designer during the selection of the P.C.B. interconnection phase.

I. Eliminating long term vibration problems.
II. Contact platings for low energy - low voltage application.
III. When to specify 5 P.S.I. connectors.
IV. Signal integrity vs EMI/RFI, fretting.

DETUSCH P.C.B. Interconnection System

FEATURES	BENEFITS
Rugged Thermoplastic Housings	Abuse proof and meets solder flow equipment requirements.
Silicone Seals	Superior environmental sealing against moisture and other contamination detrimental to electronic circuits.
Integral Wire Seals	Installed as part of the connector. Eliminates loose components and reduces wire preparation costs.
Rear Insertion - Rear Removal	Eliminates any wire threading through the connector assembly costs. Allows for easy initial assembly and easy repairs in the field.
-55 C to +125 C Operating Temperature	Engine/engine compartment rated.
Thermal Cycle Tested	Meets product "useful life" or "lifetime" objectives.
Heavy Duty Rated	Designed and developed for heavy duty electronically equipped vehicles.
Crimp type Solid Contacts	Eliminates soldering of wire terminations.
Terminal Plating Options of Nickel, Tin or Gold	Meets the demand of selected data transmission or power distribution circuits.
High Density Pin Counts Available	Up to 80 terminals meet most electronic design demands.
P.C.B. Molded in Terminals	Eliminates loose pins, potted or epoxy header construction
Selection of Terminal Styles	Right angle, straight or solder pot terminations are available.
Profit Minded	Reduced total installed costs.

GENERAL PERFORMANCE SPECIFICATIONS

Dielectric Withstanding Voltage:
Current leakage less than 2 milliamps at 1500 VAC.

Socket Crimp Tensile Strength:
#16 Size Contacts 25 lbs.
#20 Size Contacts 20 lbs.

Solid Contact Resistance Strength (type):

Wire (AWG)	Test Current	Millivolt Drop*
20	7.5	60
16	13	60

*Less drop through wire.

Temperature:
Operating at temperatures from -55 C to +125 C.

Durability:
No electrical or mechanical defects after 100 cycles of engagement or disengagement.

Physical Shock:
No unlocking, unmating or other unsatisfactory result during or after 50 g's in each of three mutually perpendicular planes. No electrical discontinuities longer than 1 microsecond. MIL-STD 202, Method 213, Condition "C".

Contact Current Rating:
125° Continuous

Contact Size	Max. Current
#20	7.5 amps
#16	13 amps

Vibration:
Maintains continuity and exhibits no mechanical or physical damage during or while subject to a sinusoidal vibration, having an amplitude of .060 in D.A. and the frequency varied linearly between limits of 10 to 2000 to 10 Hz with a maximum force of 20 g's. No electrical discontinuities longer than 1 microsecond.

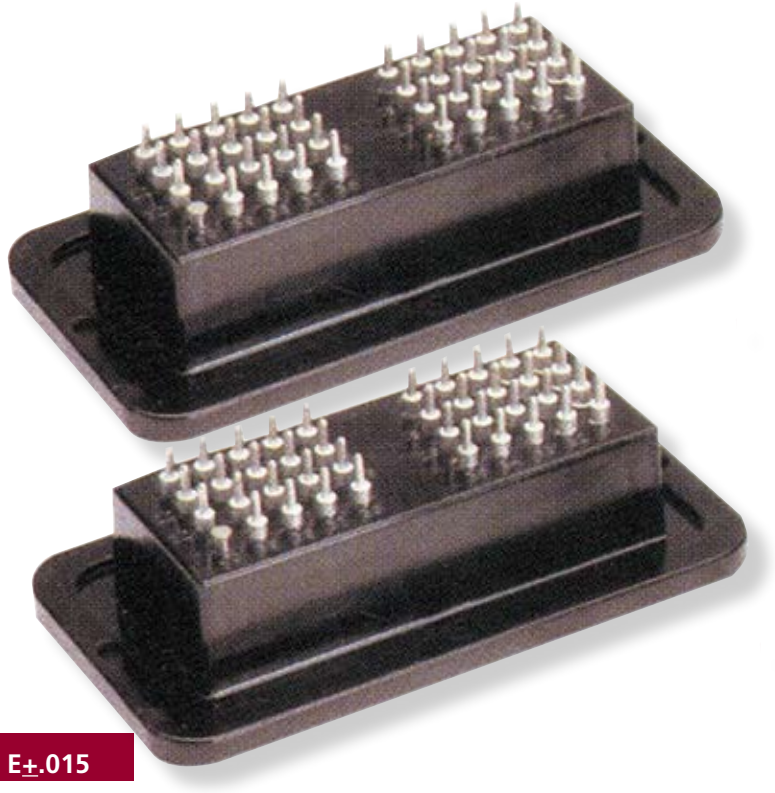
Moisture Resistance:
Water does not penetrate seals when submerged in 3 feet of water. Meets requirements of DIN 40050 IP6K9K.

Insulation Resistance:
1000 megohms min. at 25 C.

Corrosion Resistance:
Connectors show no evidence of corrosion after exposure to 48 hours of salt spray per MIL-STD 1344 method 1001.

Fluid Resistance:
Connectors show no damage when exposed to most fluids used in industrial applications.

DRC10 Series Straight (Reduced Diameters) Pins

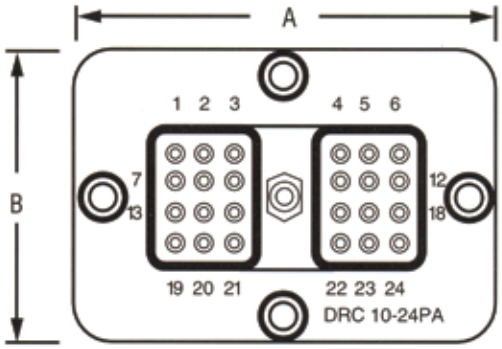


The DRC10 Series housing is a rugged thermoplastic that meets most flow solder equipment requirements and is engine compartment rated at operating temperatures of -55 C to +125 C.

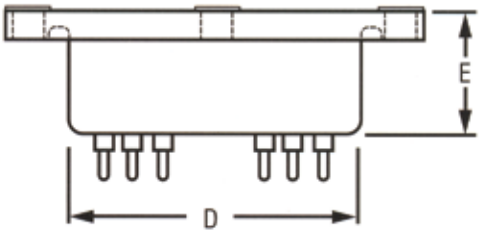
By specifying -A004 modification to the DRC10 Series of P.C.B. mounting receptacles, straight (reduced diameter) pins are supplied for those applications requiring direct terminal to board mountings. These pins are tin plated for ease of soldering and are directly molded into the receptacle housing for reliable long term performance purposes. Gold plated straight pins are available for those dry circuits that require this option.

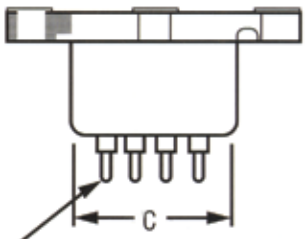
Envelope:
(Size 24 shown for reference only)

PART NUMBER	A	B	C	D	E±.015
DRC10-24PA-A004	3.050	2.098	1.128	2.080	.895
DRC10-40P-A004	3.840	2.098	1.168	2.920	.855



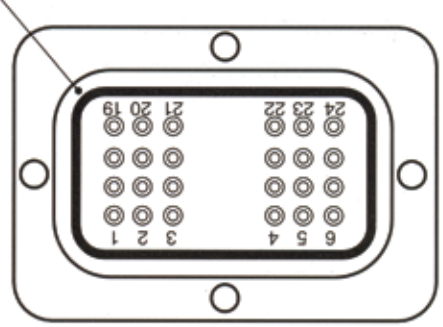
(ENGAGING VIEW)





CONTACT TAIL .060Ø

SEAL GROVE



Materials:
Housing: Thermoplastic
Grommet: Silicone Elastomer
Standoff: Stainless Steel
Contacts: Molded-In Copper Alloy
Tin Plated, Solder POT Standard (Gold Optional - See modifications)
Mtg. Seal: Supplied Separately

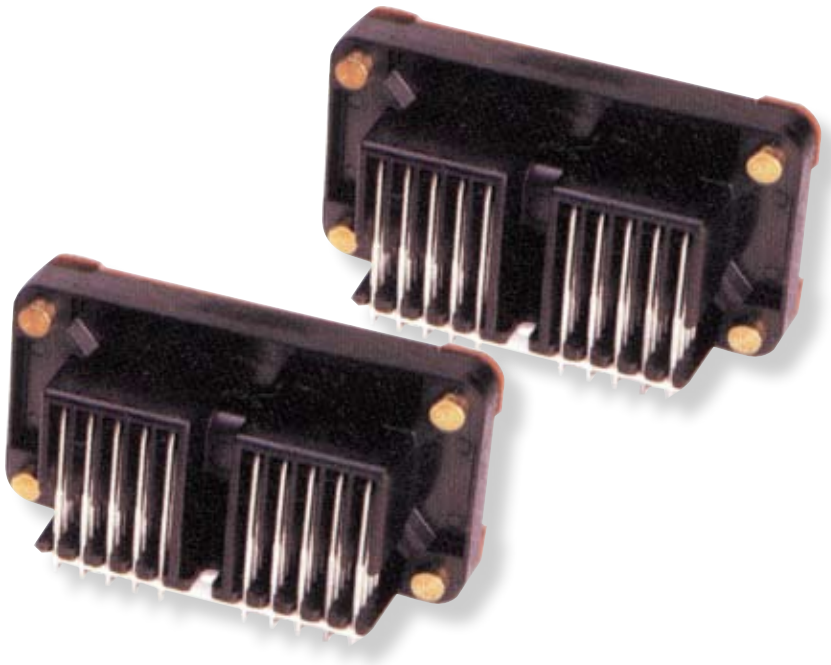
Mating Plugs:
24 Pin: DRC16 - 24SA
40 Pin: DRC16 - 40S

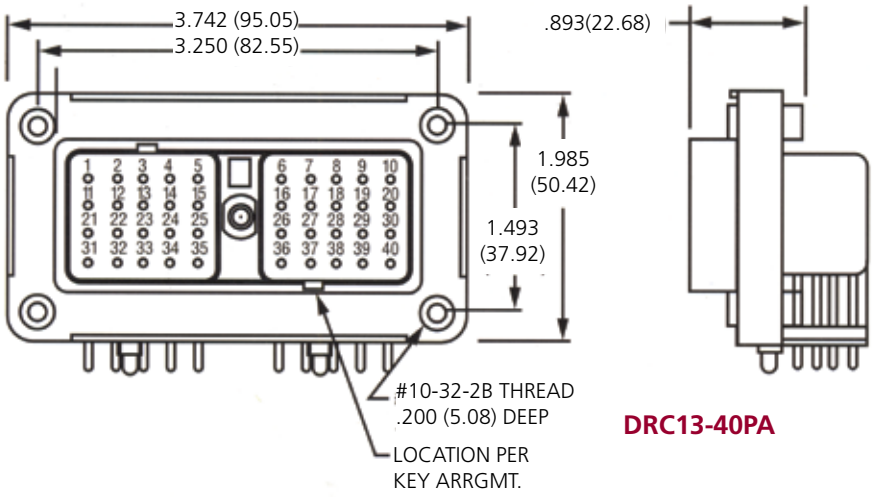
Modifications:
AG02: Some Terminals Gold Plated
A004: Tin Plated PCB Pins

Keying Positions:
Position "A" supplied as standard. Alternate positions B, C & D are available in size 24 only.

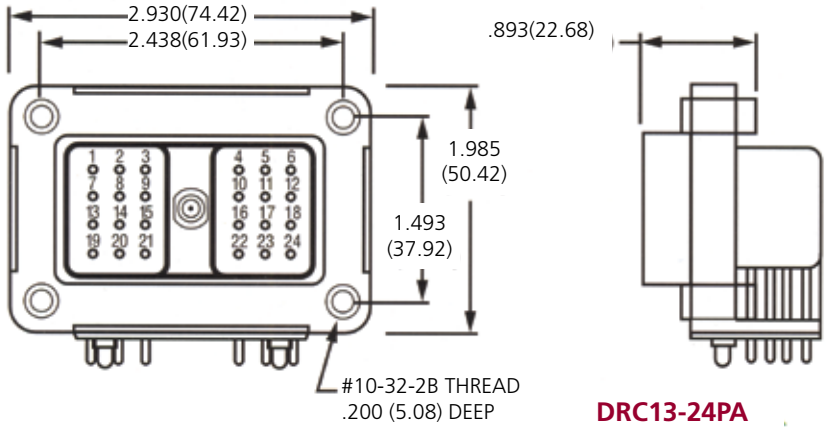
P.C.B. Mounting:
Consult factory for P.C.B. mounting details and pin locations.

DRC13 Series Right Angle Terminations





DRC13-40PA



DRC13-24PA

The DRC10 Series of sealed P.C.B. headers is the most rugged product line of electronic connectors manufactured today. Designed for externally mounted electronic modules, the DRC13 Series is completely environmentally sealed when mated and utilizes high performance thermoplastics that withstand engine and transmission environments.

The DRC Series is available with a higher number of terminal counts. Insert arrangements of 24 and 40 contacts are tooled and field-proven. Deutsch engineers selected all DRC 13 insert arrangements to utilize "size 16" contacts, thus meeting most electronic wiring demands in the heavy-duty industry.

Both tin and gold plated terminals are offered. Selected modifications are assigned to combine tin and gold within the same arrangement to reduce the costs of both power and data circuits within the same package.

All terminals are molded into a heavy-duty thermoplastic housing, selected to meet flow-solder assembly criteria. The seal between the housing and the designed flange has a silicone gasket that is designed to prevent moisture and other contaminants harmful to electronic systems from entering the module casing.

Envelope
(Sizes 24 & 40 shown)

Materials
Housing: Thermoplastic
Standoff: Stainless Steel
Contacts: Molded-in Copper Alloy Tin Plated
(Gold Optional - See Modification)
PCB Pins Standard
Mounting Seal: Silicone (Supplied Standard)

Mating Plugs
24 Pin: DRC16 - 24SA
40 Pin: DRC18 - 40SA

Modifications
G002: Only outside terminal rows are gold plated.
CO23: 5mm^2 Threaded Insert Mounting Holes.

Keying Positions
Position "A" supplied as standard.
Alternate positions B, C, & D are available.

P.C.B. Mounting
Consult factory for P.C.B. mounting details and pin positions

DRC23 Series Right Angle Miniature

New to the Deutsch I.P.D. line of P.C.B. Headers is the DRC23 Series. Specifically designed with size 20 contacts, this miniature version of the DRC13 Series will accept wire sizes of AWG 16 thru 20 (0.60 - 1.0 mm²). A contact current rating of 7.5 amps is specified with an operating temperature range of -55 C to +125 C. Deutsch engineers designed the header housing to be scoop-proof, thus preventing any damage of bent or broken contacts at the mating interface.

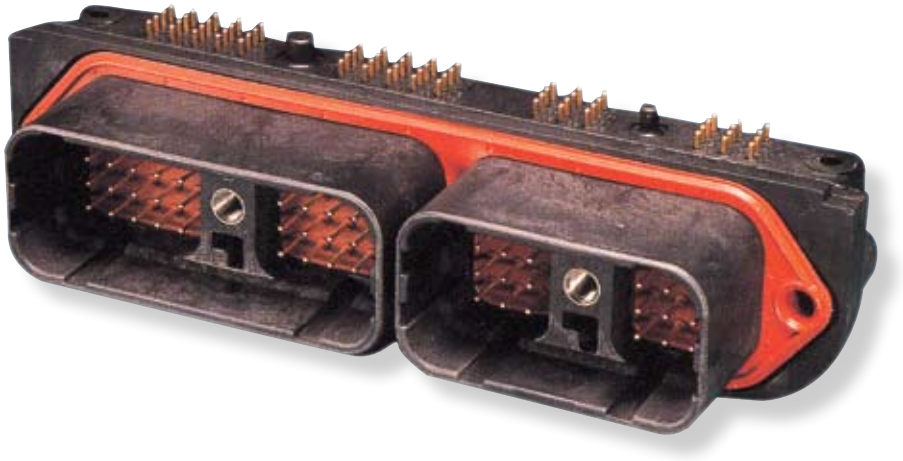
As with most all Deutsch P.C.B. interconnection systems, the contacts are molded into the thermoplastic housing, thus eliminating any potting materials that may cause problems during thermal cycling.

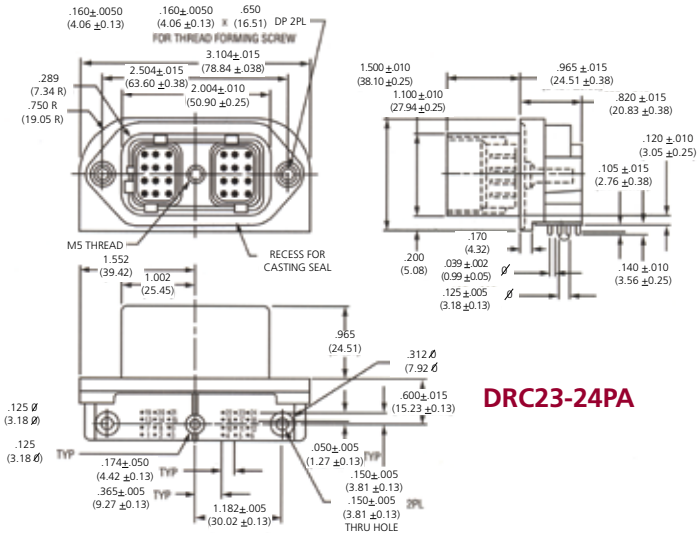
The DRC23 Series is available with four (4) keying positions, whereby mismating will not occur whenever the connectors are mounted side by side or in a modular mounting plate.

The DRC23 Series 40 pin header and 24 pin header are of a modular design.

Each can be mounted in a standard flange which provides durable sealing of either header. Custom flanges can be developed around customer needs for mounting hole location or multiple header mounting.

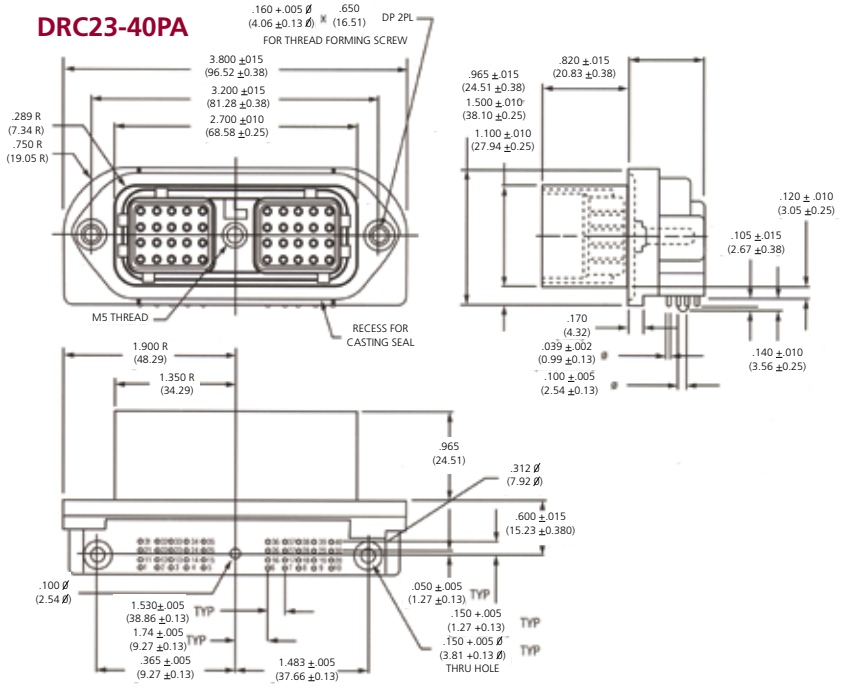
The new Deutsch DRC23 Series P.C.B. Header is indeed designed to meet the challenge of the heavy-duty truck, bus and off-highway electronic revolution.





DRC23-24PA

DRC23-40PA



Materials

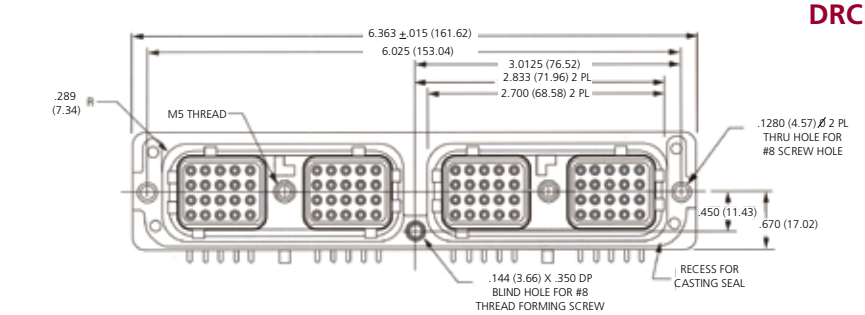
Housing: Thermoplastic
Seal: Silicone Elastomer
Standoff: Stainless Steel
Contacts: Molded-In Copper Alloy Gold Plated (Tin Optional) PCB Pins Standard
Mtg Seal: Silicone (Supplied Std.)

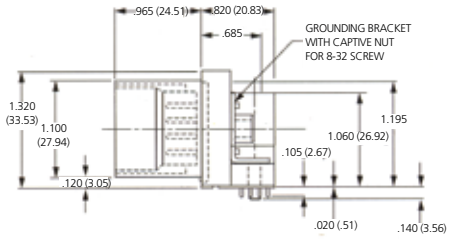
Mating Plugs

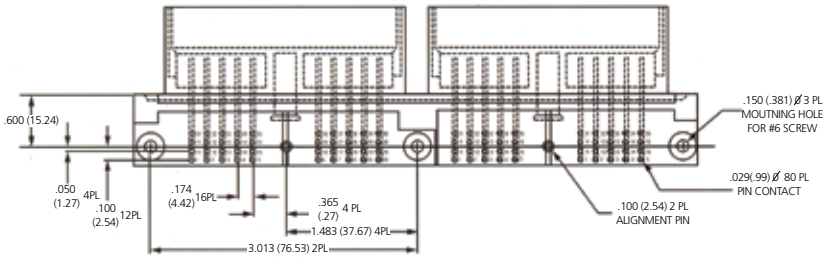
24 Pin: DRC26-24S*
40 Pin: DRC26-40S*
64 Pin: DRC26-64S*
80 Pin: DRC26-80S*

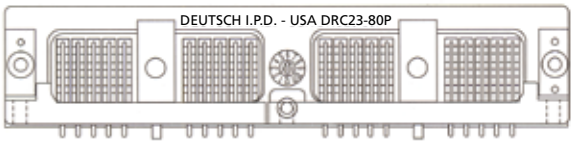
***Keying Positions:** Position "A" supplied as standard. Alternate positions B,C,& D are available.

DRC 23-80P

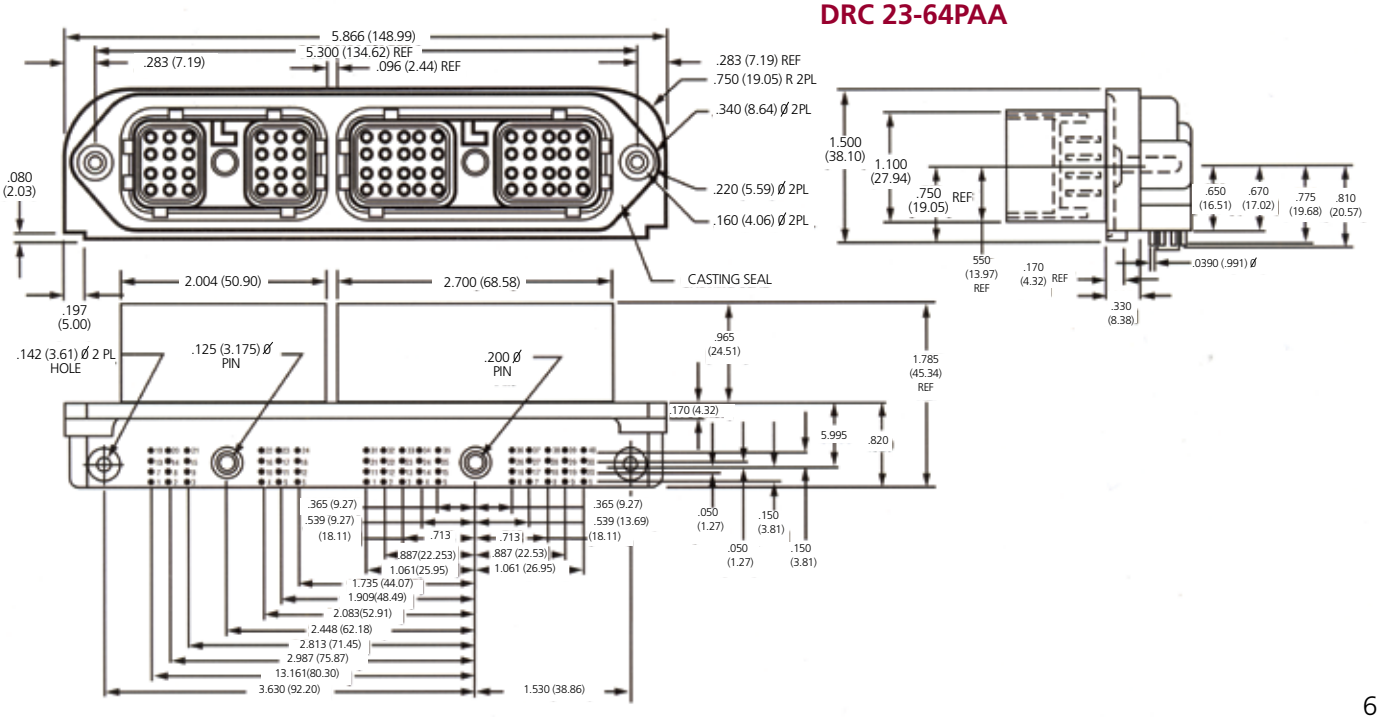








DRC 23-64PAA



HD10 Series Straight (Reduced Diameter Pins)

The Deutsch HD10 Series of P.C.B. mounting receptacles are designed to mount mid-board, utilizing four screws. The surface of the receptacle flange is elevated to allow good solder flow between the board and receptacle housing during assembly. The terminals are straight and reduced to .020" diameter, thus providing a good clearance for the trace pattern. The receptacle housing and terminals are molded together using a thermoplastic that meets flow-soldering requirements. The housing's cylindrical wall structure allows for "O" Ring sealing usually designed in conjunction with the module casting.

The HD10 mating plug is completely environmentally sealed. This protects the electronic circuits from moisture, sand, dust, oils, grease, road salt or any other contaminants encountered in heavy-duty operation.

The contact system is designed for size 16 crimp type contacts that accept 18, 16 and 14 AWG (0.75 - 2.0 mm^2) wires. Presently, the HD10 - P.C.B. mounting receptacles are tooled on two sizes, a nine (9) and a six (6) pin.

Envelope
(Sizes 6 & 9 shown)

Materials
Housing: Thermoplastic
Contacts: Molded-In Copper Alloy
Nickel Plated
Mtg Seal: Standard "O" Rings may be used

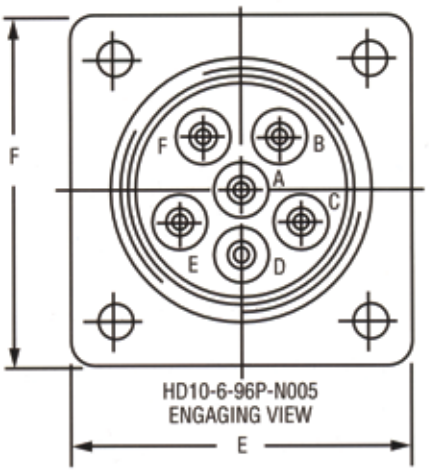
Mating Plugs
6 Pin: HD16 - 6 - 96S
9 Pin: HD16 - 9 - 96S

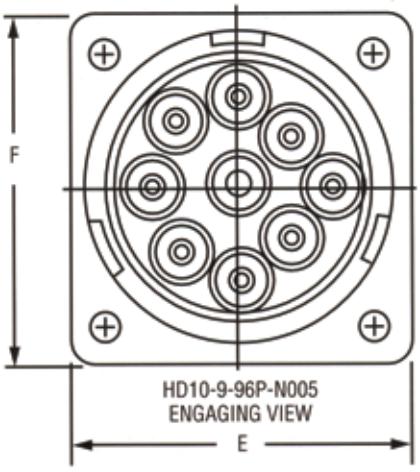
Modifications
N005: Straight reduced diameter pins supplied as standard.

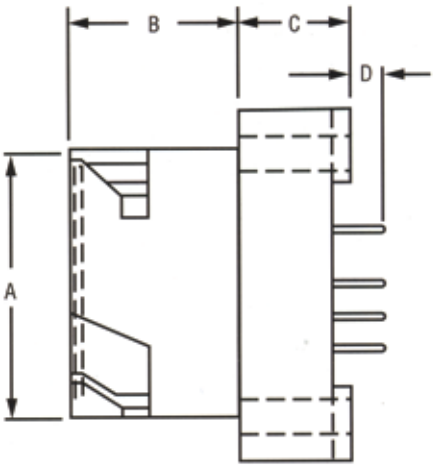
Keying Positions
Not Available.

P.C.P. Mounting
Consult factory for P.C.B. mounting details and pin positions.

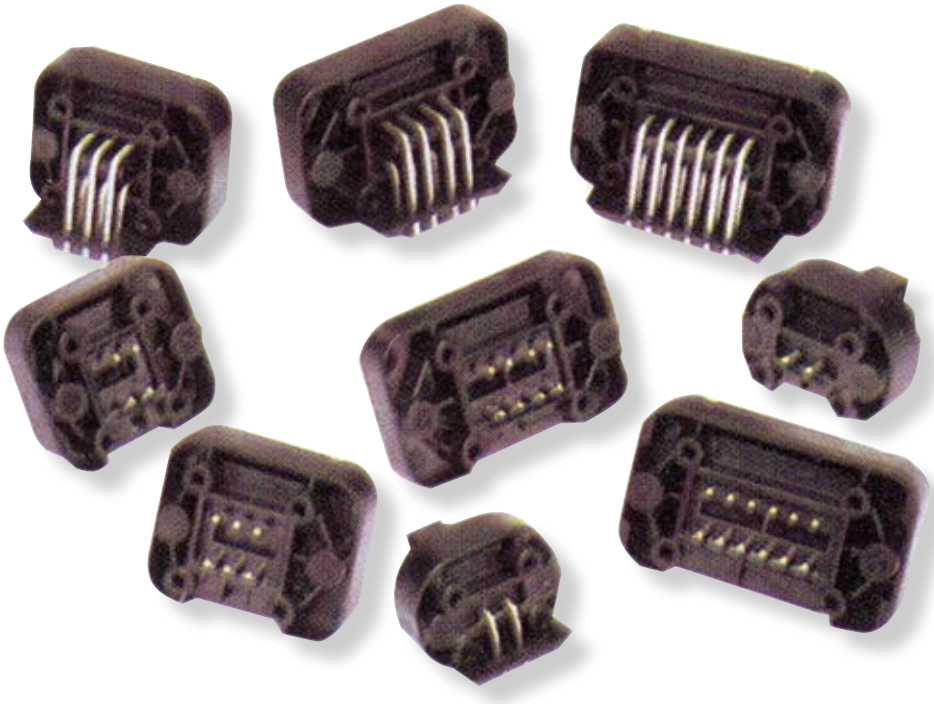
PART NUMBER	A	B	C	D	E	F
HD10-6-96P-N005	1.141	.747	.518	.142	1.500	1.500
HD10-9-96-N005	1.281	.750	.518	.139	1.500	1.500







DT13/15 Series Right Angle

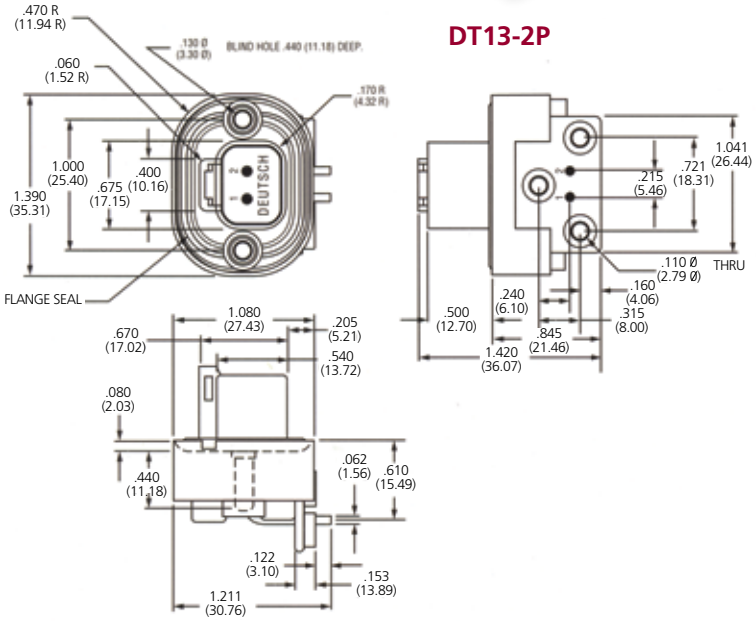


Deutsch I.P.D. engineers have developed the DT13/15 Series of P.C.B. headers for those applications requiring a budget-minded - low pin count connector. Designed in 2, 4, 6, 8 and 12 pin arrangements and utilizing the size 16 contact, the DT13/15 Series fills the need for many heavy-duty rated electronic sensor and small module applications.

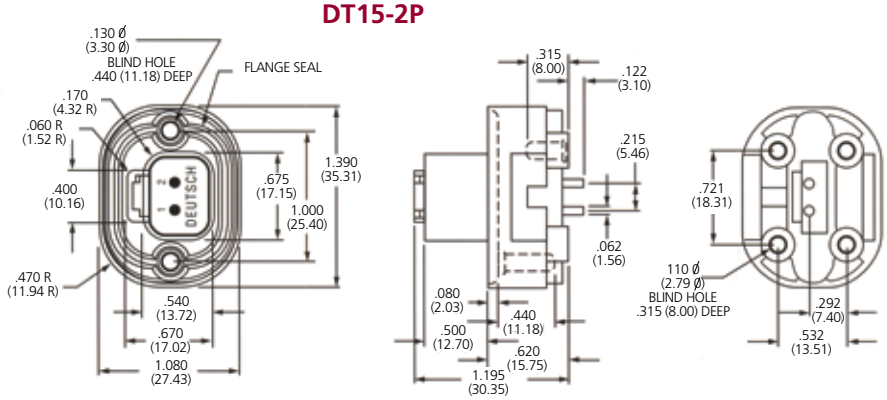
Designed for application flexibility, the DT13 Series is supplied with (90°) right angle terminations. As the DT15 Series denotes straight pins, the solid copper alloy pins are molded-in providing excellent vibration/shock reliability that is required in the truck, bus and off-highway industry.

The DT13/15 headers mate with the Deutsch DT06 Series plugs, which may be specified with precision formed contacts for a low total cost installation.

DT13-2P



DT15-2P



Materials

Housing: Thermoplastic
Contacts: Molded-In Copper Alloy Tin Plated
(Gold Optional - Consult Factory)
Mtg. Seal: Silicone

P.C.B. Mounting

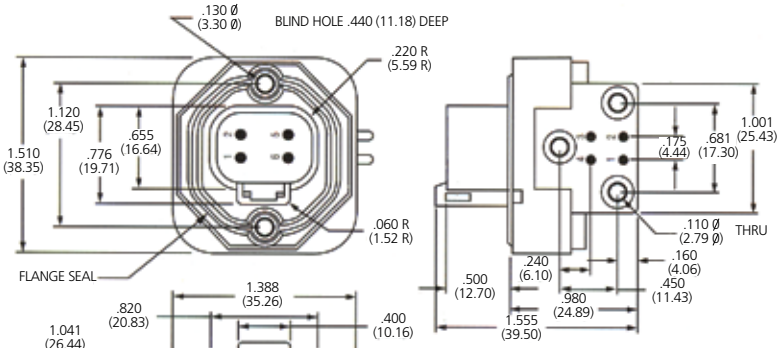
Consult factory for P.C.B. mounting details and pin positions.

Mating Plugs

2 Pin: DT06 - 2S
4 Pin: DT06 - 4S
6 Pin: DT0-6 - 6S
8 Pin: DT06 - 08S*
12 Pin: DT06 - 12S*

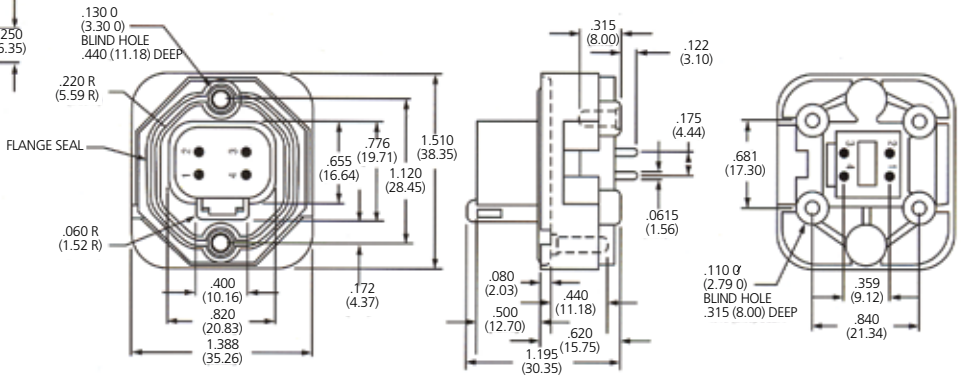
***Keying Positions**: Position "A" supplied as standard. Alternate positions B, C, & D are available.

DT13/15 Series Right Angle

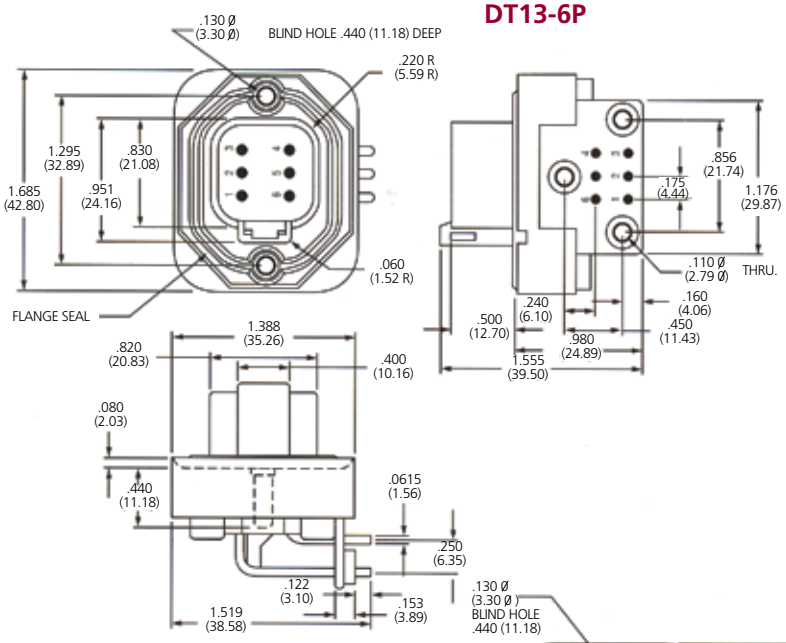


DT13-4P

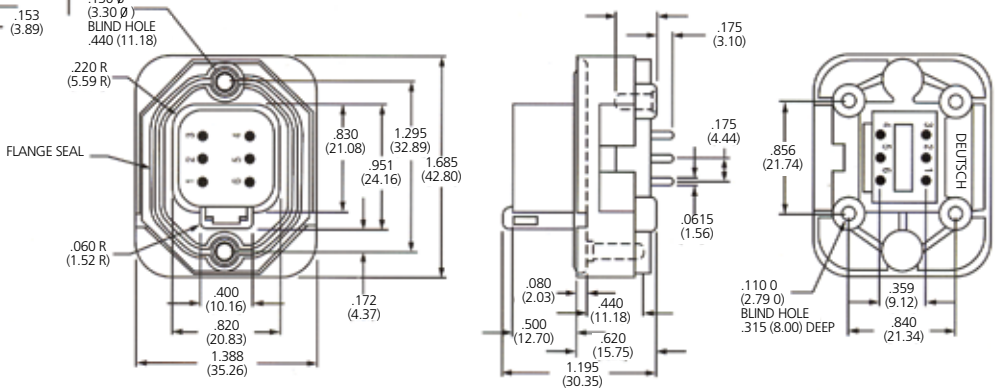
DT15-4P



DT13-6P

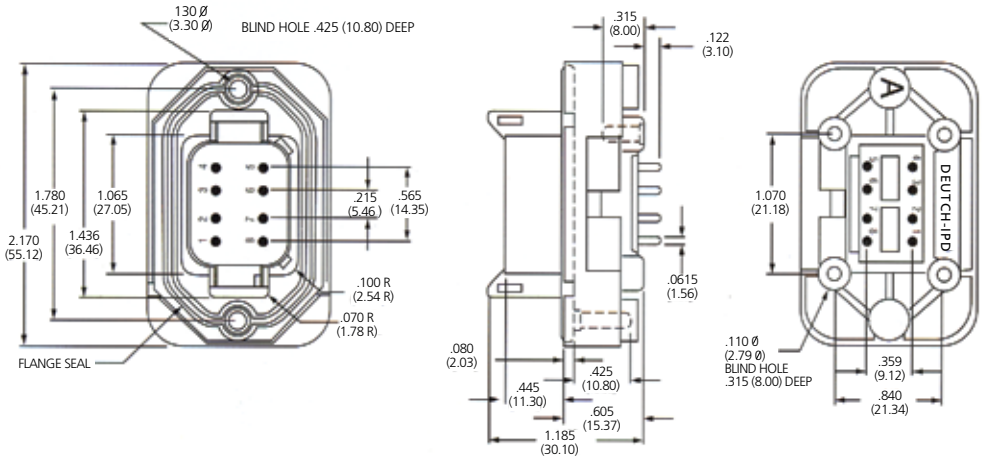


DT15-6P

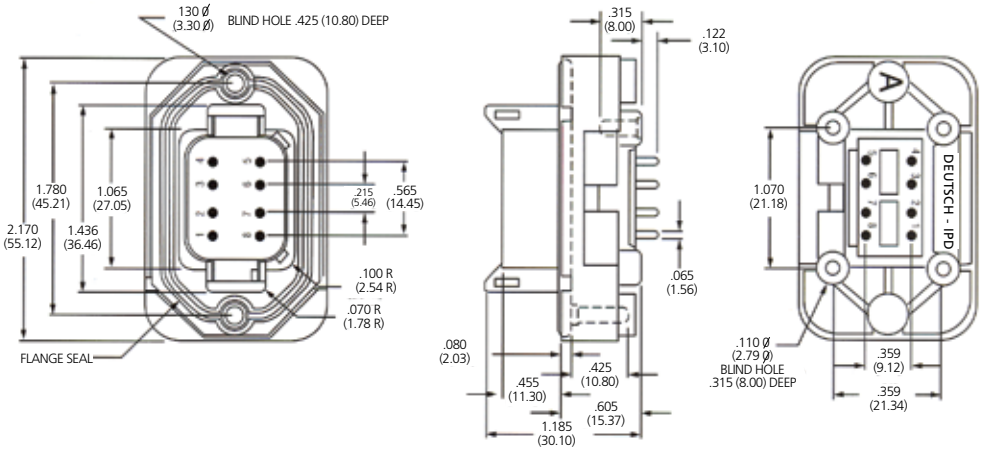


DT13/15 Series Right Angle

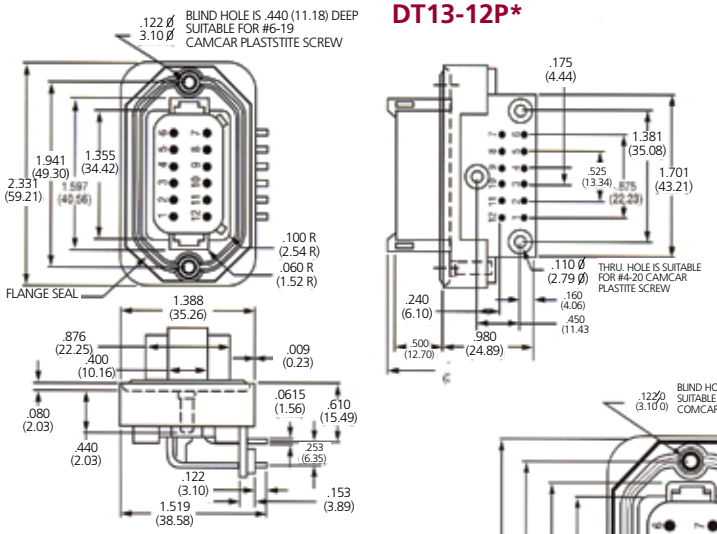
DT13-08P*



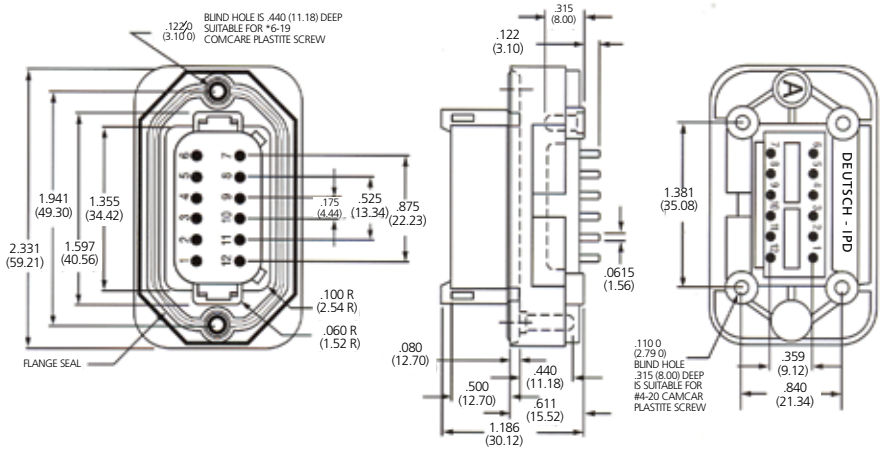
DT15-08P*



DT13-12P*



DT15-12P*



***Keying Positions**

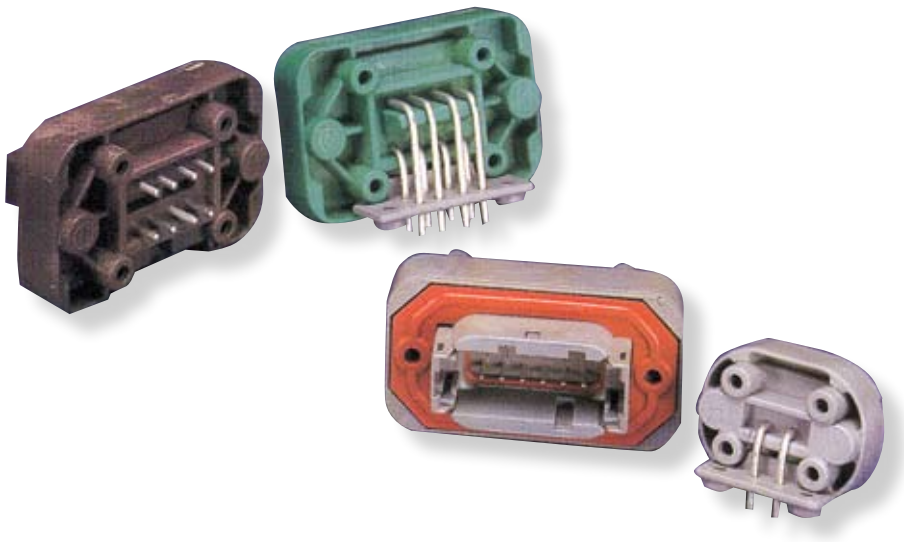
Position "A" supplied as standard.
Alternate positions B,C & D are available.

DTM 13/15 Right Angle

Low cost solutions for data transmission terminations to PCB's are available with the Deutsch DTM13/15 Series interconnects. Based on the world class field proven design of the Deutsch "DT" Series the DTM offers size 20 contacts (7.5 amp capacity) with improved sealing. Everywhere signal level circuits are critical, when even a slight degradation of signal is critical, the Deutsch DTM Series provide a low cost highly reliable termination solution, while maintaining the same performance as our DT series.

For flexibility, Deutsch designed the DTM13 to offer a 90° extended pin and the DTM15, a straight extended pin. Each series offers molded-in solid, copper alloy contacts that provide excellent shock/vibration reliability.

The DTM13/15 mate with DTM06 series plugs. These plugs can be specified to terminate either solid or low cost stamped and formed contacts.



Materials

Housing: Thermoplastic
Contacts: Molded-In Copper Alloy
Tin Plated (Gold Optional - Consult Factory)
Mtg Seal: Silicone

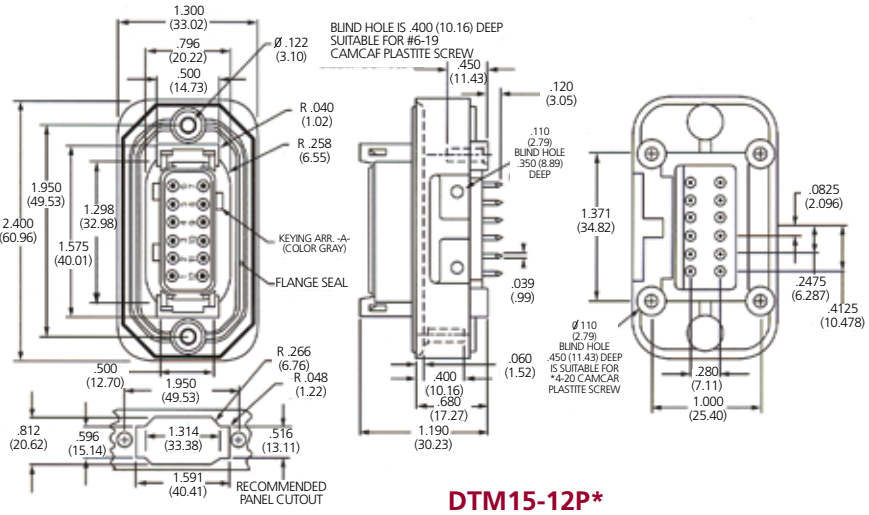
P.C.B. Mounting

Consult factory for P.C.B. mounting details and pin positions.

Mating Plugs

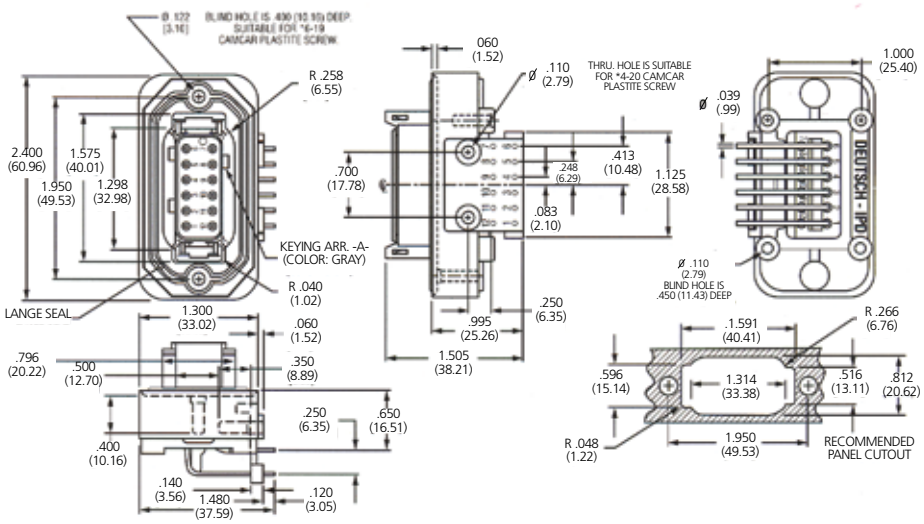
12 Pin: DTM06-12S*

*Position "A" supplied as standard. Alternate positions B, C, & D are available.



DTM15-12P*

DTM13-12PA



P.C.B. Extended Pins for Circular Connectors

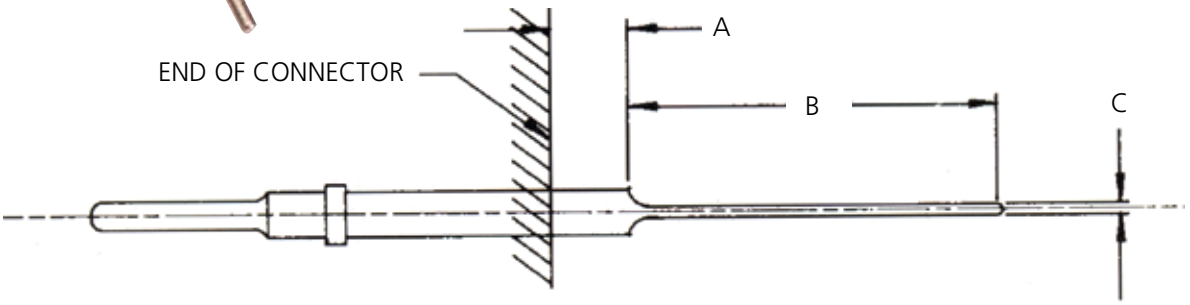
In many electronic module designs, the selection of standard field serviceable receptacles utilizing insertable and removable contacts provides solutions of design flexibility and reduced costs. Deutsch I.P.D has available a complete line of straight-reduced diameter extended pins that may be installed in any of the Deutsch family of field serviceable connectors. These solid copper alloy pins may be specified in tin or gold plating and assembled in HD30, HDP20, HD10, DRC or DT receptacles. By utilizing the tooled and readily available insert arrangements of these five connector series, the electronic designer is provided a wide selection to meet his application needs. Consult the Deutsch I.P.D. Series catalogs for a complete review of connector types and insert arrangements offered.

Material

Copper Alloy
90: Tin
31: Gold

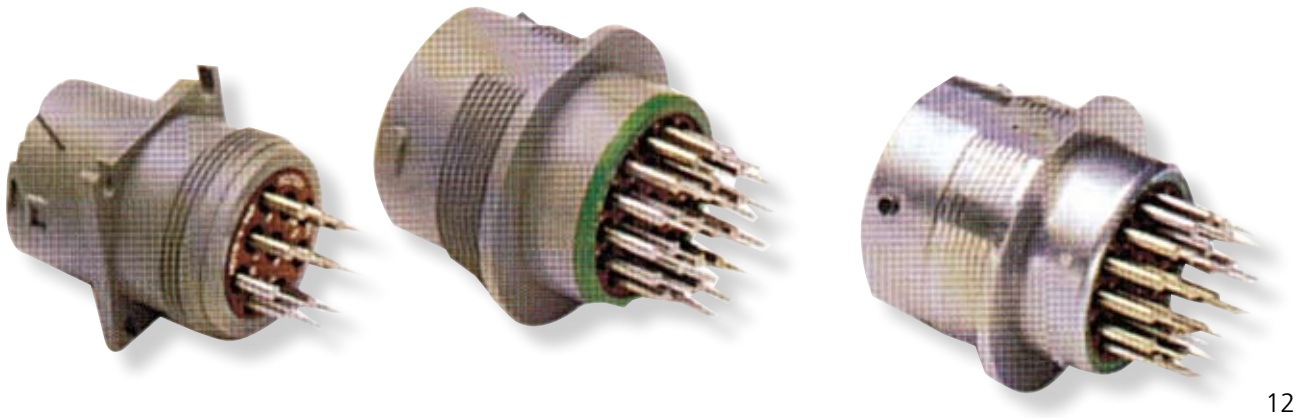
P.C.B. Mounting

Consult factory for P.C.B. mounting details and pin positions.

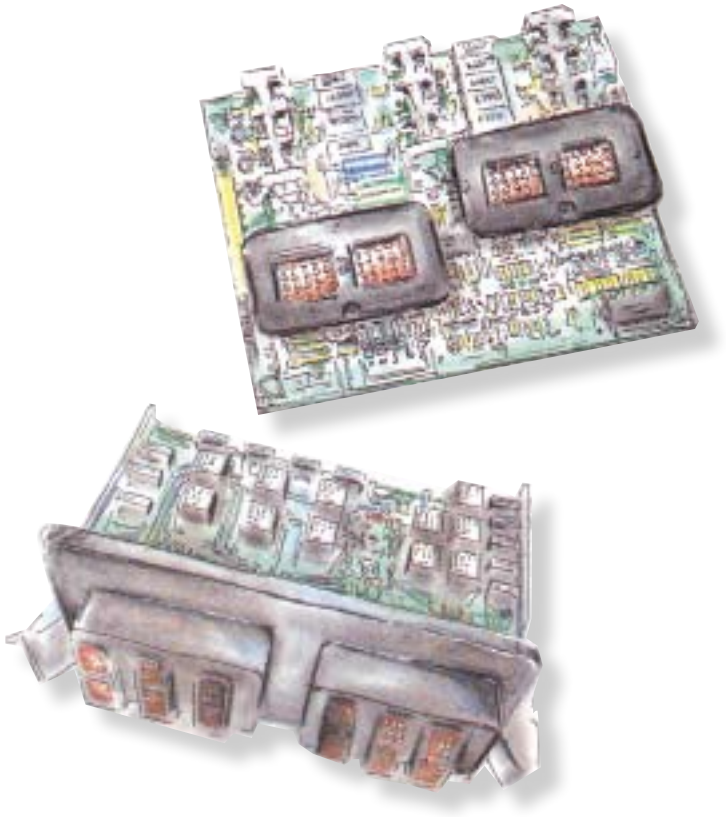


PART NUMBER	HD30	HD10	DRC	DT	B+.010	C+.005
0460-208-16**	.361	.375	.237	.523	.248	.025
0460-241-16**	.366	.380	.242	.528	.160	.040
0460-244-16**	.037	.051	N/A	.199	.400	.041
0460-245-12**	.085	.099	N/A	.247	.500	.041

**See material list for plating options.



Electronic Module Designer Notes Signal Integrity



The integrity of the signals going through the connector become more important as more circuits carry data rather than simply distribute power. Add to the data signal such effects as vibration and EMI and the integrity of the electrical system can easily hinge on the performance of the connector.

Deutsch connectors are designed to handle all environmental conditions typically seen on heavy-duty equipment. Design considerations have been given for temperature, vibration and high current levels to exist simultaneously in a connector with no performance degradation. In this way, no de-rating of our specification levels is required.

Deustch also has designed a number of solutions for applications that require protection against EMI/RFI which can affect data signals at higher data rates. These solutions include ferrite, capacitor to ground networks, T networks and n type networks. This range of solutions offer customers the flexibility to include the solution that best meets their needs.

Electronic Module Designer Notes Eliminating Long Term Vibration Problems

A critical concern when applying connectors to printed circuit boards is the long term durability as it relates to temperature cycling and vibration. Initial success has proven in some cases to mask problems that will tend to plague the application over time. Many times the specific problems seen are not the root cause of the failure.

A typical heavy-duty application uses either a straight extended pin connector or a connector with pins that are bent 90^0 to the axis of the connector. Where the connector mates with the board, there is a feature which is a mechanical attachment for the connector to the pc board independent of the solder. The engaging end of the connector normally goes through an opening in the box that houses the pc board. The connector is then attached to the box during which time a seal of some type is used to prevent moisture intrusion into the box.

The design of the box, the pc board, the connector and the seal must account for the forces that will be generated by temperature cycling and vibration. The main concern is that it is undesirable to have the pc board flexed in service. It is equally undesirable to have the soldered terminal on the connector under stress in service and an allowance must be made to assure that stress between the pc board and connector does not prevent the seal from performing. There are a variety of methods that can be used to provide a successful design. These methods include having the pc board loose in the box and then pot the box with a flexible sealant after the sealing flange is attached to the box. Another possibility would be to reflow the solder after the board and connector are mounted in the box. There are several other good approaches to solving these problems and providing a trouble free installation. Consult Deutsch application engineers.

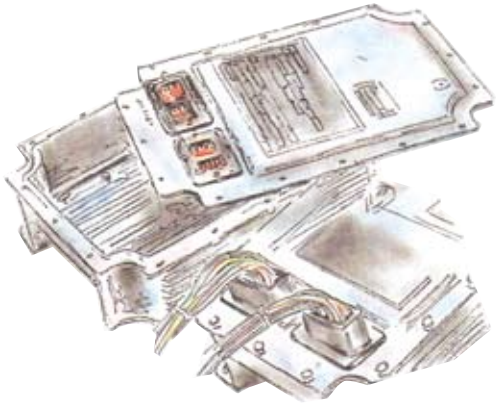
Electronic Module Designer Notes Low Voltage Circuits

There are an increasing number of applications on heavy-duty vehicles that are either data input or data output to an integrated circuit. The typical designs of integrated circuits create a situation where the voltage range on the analog signal to the IC ranges from 0 volts to a maximum of 5 volts. These signals require special consideration in the connector selection. The primary problem is that the plating used on typical heavy-duty applications is designed to operate at battery voltage. The nickel and tin type platings that are used are not designed for voltage levels less than 5 volts. When these platings are used in these applications they perform acceptably when they are first installed on the vehicle. Over time and with the addition of heat and vibration, a layer of oxidation forms on the surface of the plating. When a voltage is applied, there is not sufficient voltage to pierce through the oxidation and allow the current to flow. This creates an open circuit. The solution in many cases is to use a terminal that is plated with gold. The small additional cost for the gold plated terminal can dramatically improve the reliability of the electronic system.

A system designer must consider several factors in order to determine if gold plating should be used. These factors include ambient temperature, vibration levels and the duty cycle on the particular circuit.

Electronic Module Designer Notes Air Tight Connections

There exist several applications where there is a desire to prevent air from penetrating an enclosure. One of these applications is on electronic boxes. In order to prevent a requirement to fill the box with potting, some applications simply put a light conformal coat on the board. Additional protection against oxidation can be achieved by sealing the box against air penetration after it is assembled and tested. A previous barrier to this application was the connector interface. A flange seal does a good job of preventing air migration at the flange, but in many designs, air can migrate through the pin terminal area. This air can bring water vapor with it and this vapor can condense on the board.



Deutsch has several designs that offer a seal around the terminal which prevents any air leakage through the connector at up to a 5 p.s.i. pressure differential. This pressure specification covers applications at all altitude pressure differential around the world.

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