

**Figure 1:** The first direct connector in the world with a push-in spring connection allows application-specific device designs with just a few PCB layouts

## Direct connection adaptivity

### SKEDD direct connection technology makes device design more flexible

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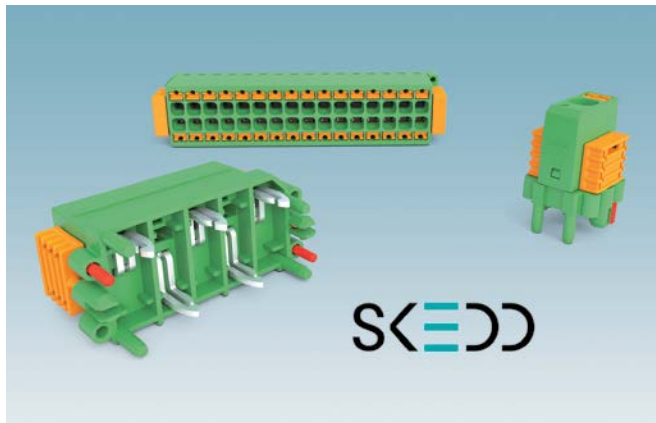
#### Executive summary

Intelligent automation structures, such as HVAC systems in building technology or compact controllers in industrial applications, require functionally embedded systems. This poses a challenge to device manufacturers to develop universally operational solutions for specific tasks and ambient conditions. SKEDD direct connection technology is the next innovation in PCB connection technology (Figure 1).

Increased device flexibility – that is to say, adaptability – means that fewer versions need to be produced and made available, and overall unit costs are lower. PCBs and connection components are the central nervous system of electronics and as such have a large impact on the performance and flexibility of electrical devices.

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**Figure 2: Single- and double-row direct connectors offer solutions for countless applications such as climate control systems, smoke and fire alarms or large household appliances**

## More flexibility thanks to SKEDD technology

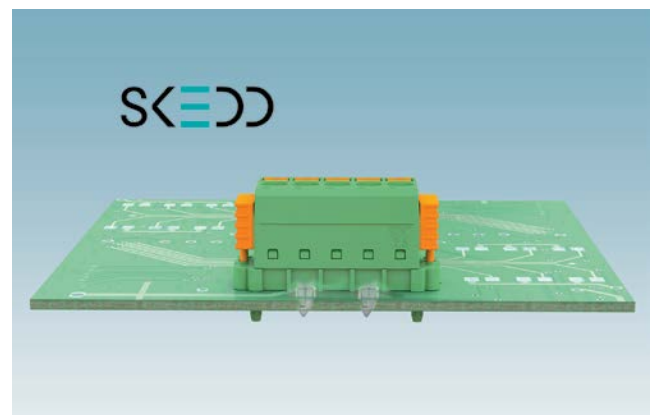
The innovative direct connection technology SKEDD – Swedish for “it is done” – makes direct pluggable and detachable PCB connections at any position on the PCB possible for the first time. New PCB connectors featuring SKEDD technology eliminate the need for headers. They can be plugged directly onto the PCB by hand, via tin-plated through-holes. The advantage: In the past, the electronics manufacturer needed to combine application-specific connection technology such as PCB terminal blocks or headers with the PCB using a permanent soldering process. SKEDD direct connection technology makes this process unnecessary; only the corresponding plated through-holes need to be provided in the PCB manufacturing process. In this way, the PCB does not become thermally loaded again.

Currently, many PCBs are processed first in an SMD reflow solder method, and PCB terminal blocks or headers are soldered on as the second step in a wave soldering process. Eliminating the second soldering process will reduce process and component costs. This also makes all logistics and materials planning for the headers unnecessary. It also reduces equipment costs and feeder space requirements when using the SMD soldering process. When the header is eliminated from the board, there is more space for additional components. In an ideal case, additional modules can even be produced on a single system without conversion.

## Reliable mechanical connection

Both PCB and device manufacturers see immediate benefits from this technology. In addition to saving costs, they can now use a single PCB layout for different device designs – and still implement flexible application-specific connections for signal, data or power transmission (Figure 2).

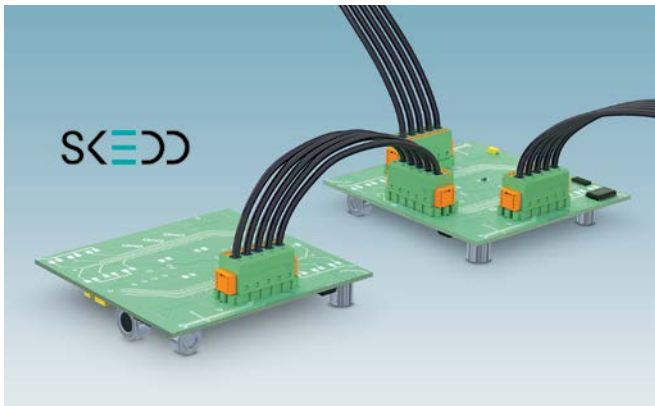
SKEDD contacts are an improvement on press-in technology, and they place no special requirements on the PCB. The contact zone consists of two flexible contact members that are easy to bend outward and that are adapted optimally to the PCB plated through-holes. When inserting the contact into the plated through-hole, the contact members are pressed together – thereby ensuring a secure mechanical and electrical connection. Lateral body-bound rivets on the connector increase the mechanical stability as well. The interlock is designed for standard PCBs with a thickness of 0.063 in. and allows for up to 25 mating/unmating cycles (Figure 3).



**Figure 3: SKEDD contacts consist of two flexible contact members that are easy to bend outward and that are adapted optimally to the plated through-bore-holes**

## Tests in accordance with the railway equipment and household appliances standards

In addition to the required approval and qualification tests, SKEDD direct connectors meet the highest requirements of mechanical and electrical safety. For example, both single- and double-row connectors are qualified for special fire protection requirements in accordance with DIN EN 60335-1 (“Household and similar electrical appliances - Safety”). This standard



**Figure 4: SKEDD direct connectors are suited for connections on the bottom of the PCB or for internal device wiring**

includes household appliances such as dishwashers, washing machines and portable cooking appliances, drives for awnings and blinds, heating units, climate systems and heating and cooling circulation pumps in private and commercial areas.

Two tests prove the capability of the electrical components and the polyamide insulating material used. First, a glow-wire with a temperature of 850°C is applied to the material for 30 seconds. The Glow-Wire Flammability Index (GWFI) test is successfully passed if the test plate continues to glow less than 30 seconds after removing the glow-wire. The second test establishes the Glow-Wire Ignition Temperature (GWIT). For this test, a glow-wire with a temperature of 775°C is held to the plastic test plate. The material may glow briefly, but for less than 5 seconds, and it may not ignite.

Single-row connectors are also qualified and approved for PCBs with HAL surfaces (Hot Air Levelling, surface protection) in accordance with DIN EN 61373 ("Railway applications – Rolling stock equipment – Shock and vibration tests"). These standards place high demands on the vibration-proof and shock-proof capabilities of devices and components used in trains. For this test, the connectors were exposed to 15 hours – five hours per spatial axis – of random vibrations with a frequency of 1 to 150 Hz and an effective acceleration of up to 5.72 m/s<sup>2</sup>. Interruption of the contact may not exceed 1 µs during this process.

## A wide range of solutions

The standardized tests attest to how reliable the direct connection technology functions, even under demanding ambient conditions and high safety requirements. SKEDD direct connectors are suited for classic industrial applications as well as for applications in building automation and railway technology.

SKEDD PCB connectors offer solutions for countless applications such as climate control in rail vehicles, smoke and fire alarms or large household appliances. Both series feature tool-free push-in spring connections: This means that both solid and stranded conductors with ferrules can be connected without opening the spring interface. The integrated test points enable convenient function checks when loaded.

## Single- and double-row direct connectors

### The advantages at a glance:

- Flexible positioning on the PCB
- Easy to plug in by hand and create vibration-proof connection
- Reduced component and process costs
- Tool-free, time-saving connection with push-in technology
- Intuitive operation, thanks to color-coded push button
- Quick and convenient testing using integrated testing option
- Single- and double-row designs for up to 32 connection positions

	SDDC 1.5	SDC 2.5
<b>Contact arrangement</b>	Double row	Single row
<b>Centerline spacing</b>	3.5 mm	5.0 mm
<b>Current</b>	8 A	12 A
<b>Voltage</b>	160 V (IEC) 300 V (UL)	320 V (IEC) 300 V (UL)
<b>Number of positions</b>	2-16 (4-32 contacts)	1-16
<b>Conductor cross section (solid and stranded conductors)</b>	24-16 AWG	24-12 AWG

Designed for conductor cross sections up to 12 AWG, the single-row direct connectors are suited for voltages up to 320 V. The double-row connectors offer an efficient connection solution specifically for signal densities that are often high in measuring, control and regulation technology (Figure 4).

## Conclusion

Tool-free, reliable and process-efficient – the combination of push-in spring connection and SKEDD direct connection technology offers new flexibility in device wiring. SKEDD connectors do not require headers and can be plugged in

directly by hand in tin-plated through-holes. This enables PCB and device manufacturers to implement countless device designs with application-specific connections for signals, data and power using just a few PCB layouts.

Various tests have proven it: Whether for applications with high vibration requirements like railway technology or with special fire protection requirements like in household device technology – Phoenix Contact's direct connectors with SKEDD technology are an interesting new solution.

## ABOUT PHOENIX CONTACT

Phoenix Contact develops and manufactures industrial electrical and electronic technology products that power, protect, connect, and automate systems and equipment for a wide range of industries. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 50 international subsidiaries, including Phoenix Contact USA in Middletown, Pa.

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