Innovation and Connectivity Solutions

Company Profile
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Connectivity Market Future? It Will Be “Prêt-à-Porter”

The trend of the connectivity and wiring market all over the world is to reduce costs and wasted time. For most machinery and plants wiring time is one of the main costs; moreover in many cases complex circuits, even if well designed, need to be cabled and tested on machine board by skilled workers.

As a consequence of the above described situation, in recent years the tendency is to use more and more cabled connectors and distribution boxes to simplify the wiring assembly. Advantages are:

- almost any worker without experience can mate connectors together
- during maintenance, spare parts can be substituted easily and quickly without mistakes

On the other hand, if traditional machinery cabling system is split into several small circuits, the cost of connectors, extension cables and distribution boxes could become excessive.

Shield offer modular solutions that can be tailored to suit the machinery. Spider box is a new generation of distribution box. It is a modular system: simple connections or complex bonded junctions according to the client’s design can be wired and over-moulded with an efficient cost/quality rate; up to 25 cable connections with multiple wires can be linked together.

This kind of distribution box may also contain custom electronic circuits for peripheral control devices. Advantages of Shield’s solution in respect to competitor’s distribution box:

- reduction in number of machinery spare parts
- significant reduction of overall dimensions
- more simple BOM (Bill Of Material) for machine manufacturers
- total costs reduction (labour + material)

The following images show some examples of available combinations, but the possible designs are virtually without limits because modular blocks can be mixed in almost any way.

SD2A5N7 Shield hybrid wiring: direct cables + M8 / M12 side mounting sockets. It is a modular spider splitter. The picture shows a distribution box with 4 blocks of direct cable exits and 1 block of M12 connectors. The number of blocks can vary from 1 to 5, any block can include up to 4 direct cables or two M8 / M12 sockets. Cover caps are available for temporarily unused sockets.
SD3A5N7 Shield hybrid wiring: direct cables + M8 / M12 top mounting sockets. Modular spider splitter. The picture shows a distribution box with 5 blocks. The number of blocks can vary from 1 to 5.

SD305. Triple distribution box with M12 connectors. Top and side assembling. The picture shows a distribution box with 5 blocks. The number of blocks can vary from 1 to 5.

SK202 with triple signal connector. This item is part of a Shield set. The triple connectors can be assembled on a standard distribution box and manage the signals of three sensors each socket way. The picture shows a distribution box with 2 blocks. The number of blocks can vary from 1 to 5.

SP17 3N7 Splitter complete with different connectors, according to customer design. The picture shows a spider box with 3 blocks. The number of blocks can vary from 1 to 6.
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SP17 3N7 Splitter complete with different connectors, according to customer design. The picture shows a spider box with 3 blocks. The number of blocks can vary from 1 to 6.

SP17 6N7. Splitter with angled exit. The picture shows a spider box with 6 blocks. The number of blocks can vary from 1 to 6.

SP17 3P7. Splitter complete with different connectors, according to customer design. The picture shows a spider box with 3 blocks. The number of blocks can vary from 1 to 6.

SP17 6P7. Splitter with straight exit. The picture shows a spider box with 6 blocks. The number of blocks can vary from 1 to 6.
Examples of distribution boxes.

Classic distribution box family with 4, 6, 8 or 10 socket connectors. Sockets can be M8 or M12. Caps for unused sockets are available. Control male connector can be 7/8" or M23 of 14, 19 or 25 poles. This solution allows to easily change the box without unwiring the whole system. The picture shows type SK205PD.

These series are extremely multipurpose. SK2HxPD: double line M12 + 7/8" sockets, built-in male 7/8" control connector. SK3HxPD: triple line M12 + 7/8" sockets, built-in male 7/8" control connector. Solutions with 3 or 4 or 5 modules. The male control connector can be 14-pole, 19-pole or 25-pole. Standard or customized connection circuits. The image shows a solution with 5 modules: the SK2H5PD distribution box with 5-pole M12 sockets + 7/8" socket, built-in 19-pole 7/8" male control connector.

SK3FxPD is a distribution box family with triple line of output connectors. The output connectors in the same box may be of different sizes and poles quantity. Control male connector is 7/8" or M23 of 14, 19 or 25 poles. Caps for dust protection are available. Advantages:
- reduction of boxes quantity
- no more need of adaptors
- possibility to prevent connection mistake using different socket sizes and codings.
C series
Complete series of Din 43650 connectors for electrovalves are available to be added to the spider box wiring.

R series – M12 and M8 connectors
Complete series of IEC 61076 M12 and M8 connectors for sensors are available to be added to the spider box wiring.

H series – 7/8” and M23 connectors
Complete series of 7/8” or M23 threaded middle power connectors are available to be added to the spider box wiring.

Shield is a complete solution provider for wiring.
Upon customer request, commercial connectors (i.e.: Tyco, Amphenol, Molex, Veam ITT Cannon, Deutsch, FCI, Delphy, Souriau, Hirose) can be assembled on spider or distribution box to deliver a totally finished wiring.
Moreover Shield technology permits over-moulding commercial connectors to get an IP67 wired product.
Shield History and Innovation

The Company was established in 1984 by the two brothers Roberto and Renato Pogliani, with the objective of manufacturing Din electrovalve connectors with screw terminals.

Since the beginning the Company’s mission was driven by the desire to design and produce innovative connectivity solutions. Shield’s target for new items is usually to create a better product that can reduce customer’s assembling time and possible assembly mistakes.

The innovative ideas arise always with a careful analysis of the final application and a close contact with users. This statement is so much understood at Shield that on some occasions Shield have internally studied and manufactured automated machinery for their own production lines. The main target was not only to make something not easy to find by any supplier, but also to experience the nature of problems for machine assembly.

As an example of Shield’s innovation, the following is a partial list of landmark designs that have been pioneered by Shield during the past years:

<table>
<thead>
<tr>
<th>Period</th>
<th>Item</th>
<th>Innovation description</th>
<th>Competition reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>Din electrovalve connector with screw or crimp terminals</td>
<td>Removing of the expensive fixing screw between contact-holder and housing. It was substituted by a snap closure.</td>
<td>Many competitors followed the solution in a short period of time.</td>
</tr>
<tr>
<td>1985</td>
<td>Din electrovalve connector with crimp terminals</td>
<td>Up to that moment in the market there were only screw connectors for that application.</td>
<td>MPM (now owned by Molex) copied the solution.</td>
</tr>
<tr>
<td>1987</td>
<td>Magnetic switch for pneumatic cylinders</td>
<td>This was a product created in Germany by Bosch and Festo many years before. Shield introduced a reliable new version at reasonable price to Italian cylinder manufacturers. Switches and connectors have since demonstrated to be a winning combination for marketing success.</td>
<td>MPM made the same application after a few years.</td>
</tr>
<tr>
<td>1988</td>
<td>Bi-directional Led in electrovalve connector</td>
<td>Shield introduced bi-directional Led for this kind of connector. Up to that moment the market offered only filament lamps because end users did not like to polarise wiring when using DC voltage.</td>
<td>Later the same solution was followed by many competitors</td>
</tr>
<tr>
<td>1988</td>
<td>Din electrovalve connector with cable and built-in frontal gasket</td>
<td>The electrovalve connector frontal gasket has always been a problem for final users. During maintenance it was often lost or improperly re-assembled. The solution was found over-moulding the connector with an elastomeric material.</td>
<td>Other Companies adopted a similar solution later.</td>
</tr>
<tr>
<td>1990</td>
<td>Magnetic switch with connector</td>
<td>One of the first magnetic switches with connector in the market. Moreover it was the smallest and simplest in that period. The connector was totally designed with a new concept to fit the market requirements. It is still in production after 20 years. Photo FEK.</td>
<td>Similar solutions adopted by many competitors.</td>
</tr>
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| 1999   | Din electrovalve connector with screw or crimp terminals | New contact-holder design. Many innovative solutions built into this connector, the main are:  
- built-in frontal gasket  
- built-in central screw gasket  
- IP67 guaranteed  
- integral internal electrical insulation  
- the same contact-holder can accept crimp or screw terminals  
- for screw terminals the wire is protected by a pressure plate  
- improved terminal contact in comparison to the rest of the market | Patented. Some competitors came out with similar solutions, but not with the same quality. |
| 2002   | M8 - M12 series connector |  
- Built-in gasket.  
- Innovative anti vibration system.  
Photo RDLF | Patented |
| 2004   | Top assembling micro magnetic switch | The innovation was to put the fixing screw in the rear side of the switch, to have many advantages during the assembling.  
Photo FPA and FPH. | Other companies have now a similar solution. |
| 2008   | Modular spider box | Moulded splitters in the market are always of big dimensions or dedicated to a specific application.  
Shield spider box is a modular solution, it is designed in such a way that it can be used for a large number of different applications; the overall dimensions are reduced to the minimum.  
Photo SD275N7 | Some similar products in the market, but with not the same quality |
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<td>2008</td>
<td>7/8” connector</td>
<td>• Built-in gasket.</td>
<td>Patented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Innovative anti vibration system.</td>
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<td></td>
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<td>Photo HDL series</td>
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| 2009  | Modular distribution box with M8 / M12 sockets                      | Similar distribution boxes are already diffused in the market and made by many competitors. Shield innovation has been to offer a modular product to fit better the customer requirements. Advantage examples:  
  • M8 and M12 sockets are available mixed in the same box in any position  
  • Plugs and sockets can be requested in the same box, in any position, therefore supply voltage and output ports can be designed with more freedom.  
  • M12 sockets with 8 poles are now available  
  • Modules with bigger multi-poles and power connectors (7/8” or M23) are available as well. Photo SK205 and SK335 | Reaction not yet known |
| 2009  | Modular spider box with mixed cable, M8 or M12 sockets              | Modular technology allows continuous new shapes and applications. Photo SD205, SD305, SD3A5 | Reaction not yet known |
| 2010  | Spider and distribution box with electronic components             | There is more and more market requirement to integrate electronic circuits into the spider box. This solution allows delocalising of electronic devices to peripheral control islands. | Reaction not yet known |
Unique Factory for Unique Design

The Company
Shield is an Italian company based in Cavaglietto, a 30 minute drive from Malpensa airport. Our 5,000 m² premises are situated within a total area of 43,000 m². Open spaces, efficient modern machinery for plastic injection moulding, both horizontal and vertical, lathes for brass component turning, cable cutting, pick-and-place for SMD electronics and automated assembly procedures allow products to be manufactured in both large batches or small customised lots, whilst maintaining a favourable cost/quality ratio, competitive prices and short lead times. The company has been organized with SAP’s ERP integrated system for years. It permits control from the administrative point and throughout the production process. Final products are packed, numbered and dated by a system which assures the identification of the lot of the goods.

Quality Control
The company is certified ISO9001.

Design and Research
Our engineers are always engaged in designing new items and production systems to obtain higher quality at competitive prices.

Tooling Unit
The internal tool workshop makes prototype production easy, guarantees product realization according to our clients’ requirements and facilitates manufacturing and constant maintenance of tools.

All in One Site.
The whole Company is located in a single site in Cavaglietto. All the main components of the products are designed, tested and manufactured inside the factory. These characteristics are a huge advantage to increase production know-how. The activity of Research and Development can be also constantly carried out using tools, materials, machinery and workforce experience within the same factory.
Innovation Details under the Lens

Double Valve Connector – Special Design for Honeywell.
In the early nineties, Honeywell division Combustion Control (Holland) asked Shield to study a connector series able to satisfy their needs.
The new connector had to fit 2 electrovalves at the same time; the big problem was that the distance between the electrovalves had a very large tolerance: about 2 mm. The solution was found using a joining bridge of soft elastomeric material between the two electrovalves. Still now in production after 20 years.

Special Shape Connector with Rectifier – Special Design for Honeywell.
In 1995 Honeywell required a connector with a bridge rectifier and safety resistor. Again the solution was completely designed and produced by Shield. Copied by many competitors and still now in production.

Special Electrovalve Connector Series – Design for Emerson.
In 2002 Emerson Electric, Division Alco (Germany) wanted to introduce a new marketing offer for a large part of their refrigeration products: valves, pressure switches and mini motors.
Shield designed more than 50 items of different type, size, cable length or cable quality, identifying Emerson needs and suggesting solutions.
Standard Electrovalve Connector – Field Attachable.
This design is patented and no competitors are producing a connector with this quality. The contact-holder is made with two materials, moulded together with a single moulding process.
The central skeleton is a hard material. It is the part of the body that carry terminal contacts and keep the structure rigid.
The rest is a soft elastomeric material. The functions of this element are three:

- unloseable frontal gasket:
  with traditional electrovalve connectors there is a possibility of losing the frontal gasket during maintenance;
  built-in gasket also permits easier assembly

- unloseable gasket under the head of the central fixing screw:
  traditional electrovalve connectors have no gasket in this position;
  built-in gasket permits a genuine IP67 water seal and the advantage that it cannot be lost, even after maintenance.

- integral internal electrical insulation:
  the main central screw, when passing throughout the contact-holder is totally insulated;
  traditional electrovalve connectors have a design that requires a slot along the screw passage, this slot could allow an internal electrical wire to come into contact with the metal fixing screw;
  it is a design that should not be allowed, since this screw can be touched from outside, the supply voltage could be up to 240 V and in some case the application could even be for domestic appliances.
Special Box with Electronic Circuit - Examples of Possible Application.
Some of our customers need to incorporate a considerable number of electronic components inside the box body.
In these cases Shield can design the product starting from the circuit layout, alternatively customers can include their own circuit in a box extension.

- Fig.1: one of SMD circuits developed by Shield upon customer’s request; this example shows a 6-motor driver.
- Fig.2: one of available distribution boxes with M12 and 7/8” or M23 connectors.
- Fig.3: standard low profile distribution box, which can include small dimensioned electronic circuits; side view; the thickness can be 9 or 13 mm according to the volume of internal components.
- Fig.4: distribution box with extension box; it can include larger sized electronic circuits; side view; inside the extension box, end customers can include their own circuit and link it to the upper distribution box.

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Fig.1

Fig.2

Fig.3

Fig.4
Innovative Products Need Innovative Commercial Communication.

When a product is new in the market, it is necessary to properly inform engineers and designers about its advantages and availability. With the recent communication changes, each day people receive much more information material than in the past. The main problem is to get reader attention in a market full of competitor’s catalogues, newsletters and internet sites.

Shield is dedicating efforts to this matter. The target is to publish material that is easy to read. Particular attention is dedicated to:

- images have to be clear, coloured and frequent
- text must be clear and descriptive, but as short as possible
- technical pages are better described using tables and technical drawings

Latest and Future Developments

The market is showing appreciation for the spider box and distribution box because they simplify machinery and plant wiring. The possibility of market expansion is huge. There are a wide range of fields that have already started to use them, such as:

- hydraulic, pneumatic and electrical industrial automation
- industrial illumination systems, Led illumination nets
- trucks and industrial road vehicles, trains, ships
- construction equipment
- earth-moving machines

The integration of electronic circuits into the spider box has also been requested in a good number of cases. This solution allows delocalizing of electronic devices to peripheral control islands. It is important to note that electronic integration possibilities are not limited to bus technology; on the contrary there are many simple and complex circuits for different specific applications. This means that there is a huge market that cannot be satisfied by standard distribution box or bus distribution box.

It is interesting to underline that not many companies can compete with Spider box production. The technology necessary to design and produce them is not easy if the complete assembling process is not carried out within the same factory plant. That means to own the technology of plastic injection moulding, brass turning, terminal crimping, electronic SMD soldering, cable working and various assembling. Some attempts have been made already by a few companies, but without significant success.