

# Overview Connection Technology on Printed Circuit Boards

## What is THR ?

Through hole technology became popular in the 1950s with the resurgence of the second generation computer and continued its popularity until surface mount technology was developed. Surface mount technology then gained popularity over the through hole technology and became a standard thereafter.

In the beginning, every printed circuit board was assembled using Through Hole Technology. All components were inserted through holes drilled in the circuit boards and soldered either by hand or on the wave.

Over the years, the process was automated and the reflow soldering method with automated assembling (Pick & Place) became widely accepted especially with the enforcement of lead free soldering (RoHS).

Nowadays many electronic components are already surface mounted. A much higher density of components and many more connections per component are possible on a printed circuit board without holes.

Some components, such as terminal blocks, plug connectors, switches or electrolytic capacitors, still had to be soldered on the wave or by hand on the printed circuit board, because they were not suitable for the high mechanical and thermal load.

Due to a mixture of through hole and surface mount components, the soldering process could not be automated completely and therefore incurred greater production costs. To rectify the problem, the components, which were not suitable for this kind of processing, had to be made compatible for the reflow soldering method.

This gave rise to the SMarTconn family of products through which WECO was able to identify and subsequently invent technical solutions to successfully resolve these problems:

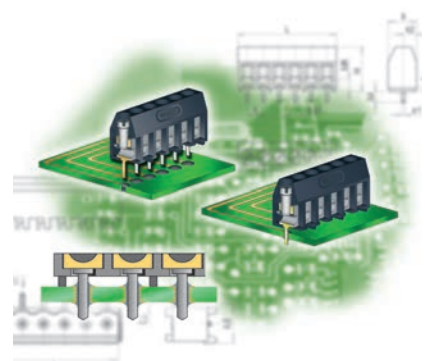
1. The through hole reflow technology (THR) was steadily developed and addressed the through-hole reflow applications.
2. The patented product program in genuine SMD technology was invented. Terminal blocks and plug connectors from a size of 3.5 mm pitch and larger could now be surface-mounted.

### The Through Hole Reflow Process ...

The through hole reflow process enables the automated assembling and the reflow soldering technique normally used on surface mount components to be applied to THR components as well.

### ... or the "Pin-in-Paste"-Method

The basis for the integration of THR components in the reflow soldering process is the pin in paste procedure. Precondition for the use of THR components is a printed circuit board with drillings and a correctly cut out and positioned template. Soldering paste is laid via a screen printing system in order to receive an appropriate borehole filling. The arising amount of pushed through solder paste is intended. The components are then placed on the PCB. The pins of the components dip into the holes and push the solder paste through the holes to the other side of the PCB. The action of pushing the solder paste through the holes forms a characteristic match head around each pin. This is followed by the reflow



soldering process. The solder joints created are mechanically and electrically comparable to the classical wave soldering process.

### Conclusion

With THR devices, the integration of electrical components into the reflow soldering process enables the production of a single soldering process. This approach is beneficial in substantially reducing production cost and results in process optimisation. In addition, the THR device high-temperature-resistant thermoplastic body is configured for RoHS-compliant production, resulting in the possibility of variant reductions.

## What is SMD?

„SMD“ is the abbreviation for Surface Mounted Devices and reunite all surface-assembled components on one circuit board. Often certain manufacturers of electronic and electrical components also use the term “SMD” for THR (Through Hole Reflow) components, but unlike thru hole devices that require drilling holes through which the pins go through the board and are soldered underneath, SMD components are positioned on the PCB surface and soldered afterwards. No more need for holes in the printed circuit board.

### History of the SMD

The beginnings of surface mount technology go back to the 1960s, but only became widely used in the 1980s. Mid 1980s, the production of conventional leaded devices soldered directly on the circuit path became a standard.

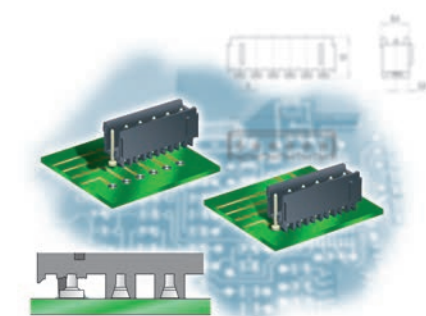
Surface mounted devices (SMD) made it possible to increase the number of components and therefore contributed to many more connections per component. Furthermore, SMD components can be placed on both sides of a printed circuit board. Components are usually secured temporarily with adhesive on the lower side of the PCB, and as soon as the adhesive is hardened, the printed circuit board can be turned upwards to populate the other side. This is followed by the soldering process.

### WECO SMD terminals and plug connectors

To fully take advantage of a pure SMD production, the customer needs a wide product range of SMD components. This should include terminals and plug connectors. SMD terminal blocks and plug connectors are undoubtedly a good deal more difficult to achieve than components which are not exposed to a mechanical load, as for example resistors and condensers.

The most important criterion is good and durable soldering at the printed circuit board level. A terminal block or a plug connector has a substantially larger volume than conventional „chip components“ and offers a much larger attack region in order to lever the component off the PCB surface. Therefore soldering connections only at the pins would not be sufficient, and additional reinforcement would be required. Often the problem is resolved by providing additional support with lugs or with separate screw fixation. From our point of view, this is not an ideal solution because using pure SMD technology drillings in a printed circuit board should be avoided. WECO's range of SMD terminal blocks and plug connectors (pinstrips) are equipped with lateral soldering cylinders, which are placed off-center in order to create a counter anchoring to the pins. Thus, the pins do not have to carry the entire departure load. In addition, these soldering cylinders create a larger soldering surface and achieve a reliable adhesive force on the printed circuit board.

A further challenge in SMD technology for terminal blocks and plug connectors starting at sizes of 3.5 mm pitch and larger, is to ensure an accurate soldering connection of the pins over the entire length of the component. Deviations of the components, within



given tolerances, linear extensions under thermal load during the soldering process and unevenness of the PCB surface, all contribute to factors of mismatch.

To correct this problem, WECO developed the patented principle of movable soldering elements. WECO's line of SMD terminals and plug connector are equipped with soldering pins and anchor elements, called “floating anchors”. This ensures a freedom of movement in both lateral and vertical directions, which in turn ensures excellent co-planarity performance.

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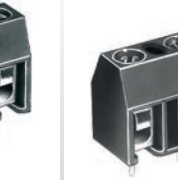
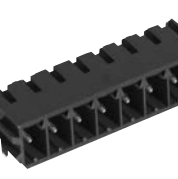








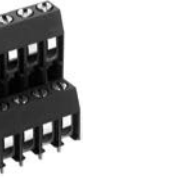








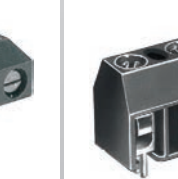








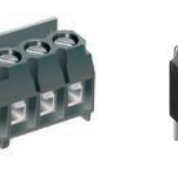











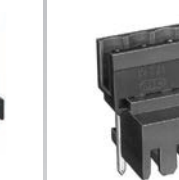










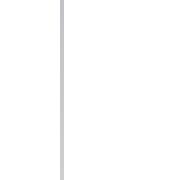










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# Extract of connection technology on PCBs



Pitch	3,5 mm				5 mm							5,08 mm				7,5 mm		10 mm	10,16 / 12,7 mm	
Series	Series 110		Series 210	Series 93	Series 93	Series 120	Series 140	Series 95	Series 95 / Series 115	Series 97	Series 97	Series 97	Series 121	Series 141	Series 94	Series 96	Series 122	Series 97	Series 91	Series 158/159
Rated cross section	1,5 mm²		1 mm²	1 mm²	- - -	2,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	2,5 mm²	2,5 mm²	- - -	2,5 mm²	1,5 mm²	1,5 mm²	2,5 mm²	2,5 mm²	2,5 mm²	4 mm²	10 mm²
Approvals	 300 V/8 A/30-16 AWG <sup>1)</sup> 300 V/8 A/30-16 AWG <sup>1)</sup>		300 V/10 A/30-16 AWG 300 V/10 A/30-16 AWG	300 V/10 A/26-16 AWG 300 V/10 A/26-16 AWG	150 V/6 A 150 V/6 A	300 V/15 A/26-12 AWG <sup>1)</sup> 300 V/15 A/26-12 AWG <sup>1)</sup>	300 V/10 A/30-14 AWG 300 V/15 A/30-14 AWG	300 V/15 A/26-14 AWG 300 V/15 A/26-14 AWG	300 V/10 A/26-14 AWG <sup>1)</sup> 300 V/10 A/26-14 AWG <sup>1)</sup>	300 V/20 A/22-12 AWG <sup>2)</sup> 300 V/20 A/26-12 AWG <sup>2)</sup>	300 V/20 A/22-12 AWG 300 V/20 A/26-12 AWG	300 V/10 A 300 V/10 A	300 V/15 A/26-12 AWG <sup>1)</sup> 300 V/15 A/26-12 AWG <sup>1)</sup>	300 V/10 A/30-14 AWG 300 V/15 A/30-14 AWG	300 V/15 A/26-14 AWG 300 V/15 A/26-14 AWG	300 V/20 A/22-12 AWG 300 V/20 A/26-12 AWG	300 V/15 A/26-12 AWG 300 V/15 A/26-12 AWG	300 V/15 A/22-12 AWG 300 V/20 A/26-12 AWG	300 V/25 A/18-10 AWG 300 V/25 A/22-10 AWG	 300 V/60 A/20-6 AWG
Type of product	<b>110-A-111</b>  <b>1</b> 2-24 poles	<b>210-A-111</b>  <b>1</b> 2-24 poles	<b>930</b>  <b>1</b> 2-24 poles	<b>931-SLR-THR</b>  <b>1</b> <b>6</b> 2-16 poles	<b>120-A-111</b>  <b>2</b> 2-24 poles	<b>140-A-111</b>  <b>2</b> 2-24 poles	<b>950</b>  <b>2</b> 2-32 poles	<b>950-FL-DS</b>  <b>2</b> 2-24 poles	<b>970</b>  <b>2</b> 2-32 poles	<b>971</b>  <b>2</b> 2-32 poles	<b>971-SLR-SMD-1,3</b>  <b>2</b> <b>6</b> 2-12 poles	<b>121-A-111</b>  <b>3</b> 2-24 poles	<b>141-A-111</b>  <b>3</b> 2+3 poles	<b>940</b>  <b>3</b> 2-32 poles	<b>960</b>  <b>3</b> 2-32 poles	<b>122-A-111</b>  <b>4</b> 2-12 poles	<b>977</b>  <b>4</b> 2-8 poles	<b>910</b>  <b>5</b> 2-12 poles	<b>158-A-111</b>  <b>5</b> 2-12 poles	
<b>110-M-211</b>  <b>1</b> 2-24 poles	<b>210-A-121</b>  <b>1</b> 2-24 poles	<b>930-THR</b>  <b>1</b> <b>6</b> 2-12 poles	<b>931-SLT-SMD-1,3</b>  <b>1</b> <b>6</b> 2-16 poles	<b>120-D-121</b>  <b>2</b> 2-24 poles	<b>140-A-126-SMD</b>  <b>2</b> <b>6</b> 2-12 poles	<b>950-D-SMD-DS</b>  <b>2</b> <b>6</b> 2-12 poles	<b>950-RFL-DS</b>  <b>2</b> 2-12 poles	<b>970-EN</b>  <b>2</b> 4-24 poles	<b>971-LH</b>  <b>2</b> 2-12 poles	<b>971-SLR-THR</b>  <b>2</b> <b>6</b> 2-12 poles	<b>121-C-111</b>  <b>3</b> 2-24 poles	<b>141-A-121</b>  <b>3</b> 2+3 poles	<b>940-T</b>  <b>3</b> 2+3 poles	<b>961</b>  <b>3</b> 2-32 poles	<b>122-D-111</b>  <b>4</b> 2-12 poles	<b>977-OPSG</b>  <b>4</b> 2-19 poles	<b>910-Y</b>  <b>5</b> 2-12 poles	<b>158-A-211</b>  <b>5</b> 2-12 poles		
<b>110-M-221-THR</b>  <b>1</b> <b>6</b> 2-12 poles	<b>210-A-126-SMD</b>  <b>1</b> <b>6</b> 2-12 poles	<b>931</b>  <b>1</b> 2-24 poles	<b>931-SLR-THR-1,1</b>  <b>1</b> <b>6</b> 2-16 poles	<b>120-M-151</b>  <b>2</b> 4-48 poles	<b>140-B-111</b>  <b>2</b> 2+3 poles	<b>950-THR</b>  <b>2</b> <b>6</b> 2-12 poles	<b>958-FLDS</b>  <b>2</b> 2-8 poles	<b>970-LH</b>  <b>2</b> 2-12 poles	<b>971-THM</b>  <b>2</b> 2+3 poles	<b>971-SLS</b>  <b>2</b> 2-24 poles	<b>121-M-121</b>  <b>3</b> 2-24 poles	<b>141-C-111</b>  <b>3</b> 2+3 poles	<b>941</b>  <b>3</b> 2-32 poles	<b>964-T</b>  <b>3</b> 2+3 poles	<b>122-M-111</b>  <b>4</b> 2-12 poles	<b>977-T</b>  <b>4</b> 2+3 poles				
<b>110-P-215</b>  <b>1</b> 4-44 poles	<b>210-A-SMD</b>  <b>1</b> <b>6</b> 2-12 poles	<b>934-THR-DS</b>  <b>1</b> <b>6</b> 2-24 poles	<b>931-SLR-THR-1,3</b>  <b>1</b> <b>6</b> 2-16 poles	<b>120-M-191</b>  <b>2</b> 2-24 poles	<b>140-C-111</b>  <b>2</b> 2-24 poles	<b>951-LH</b>  <b>2</b> 2-12 poles	<b>950-SLS</b>  <b>2</b> 2-24 poles	<b>970-THR</b>  <b>2</b> <b>6</b> 2-12 poles	<b>974-D-SMD</b>  <b>2</b> <b>6</b> 18-12 AWG 2-12 poles	<b>971-SLT-SMD</b>  <b>2</b> <b>6</b> 2-12 poles	<b>121-M-161</b>  <b>3</b> 4-48 poles		<b>941-T</b>  <b>3</b> 2+3 poles	<b>968</b>  <b>3</b> 2-32 poles	<b>122-M-121</b>  <b>4</b> 2-12 poles			<b>159-A-111</b>  <b>5</b> 2-12 poles		
<b>110-V-215</b>  <b>1</b> 2-22 poles		<b>938-FLDS</b>  <b>1</b> 6 A/28-20 AWG 2-16 poles	<b>931-FST</b>  <b>1</b> poles	<b>120-M-221-SMD</b>  <b>2</b> <b>6</b> 2-12 poles		<b>951-THG</b>  <b>2</b> 2+3 poles	<b>115-F-111</b>  <b>2</b> 2-12 poles	<b>970-TX..</b>  <b>2</b> 1 poles		<b>971-SLW</b>  <b>2</b> 2-24 poles								<b>159-A-211</b>  <b>5</b> 2-12 poles		

Catalogues

1

Pitch 3,5 mm

2

Pitch 5 mm

3

Pitch 5,08 mm

4

Pitch 7,5 mm

5

Pitch >10 mm

6

SMD & THR

1)

AWG information not valid for pin strips

2)

AWG information not valid for socket terminals (...FB)

Technical modification reserved.

For detailed information please see our data sheet on...

Catalogues

**1** Pitch 3,5 mm

**2** Pitch 5 mm

**3** Pitch 5,08 mm

**4** Pitch 7,5 mm

**5** Pitch >10 mm

**6** SMD & THR

<sup>1)</sup> AWG information not valid for pin strips

<sup>2)</sup> AWG information not valid for socket terminals (...FB)

Technical modification reserved.  
For detailed information please see our data sheet on [www.wecogroup.com](http://www.wecogroup.com)



# Overview Europe type connectors

## Accessories

**Jumper**  
302-J, 323-J, 324-J, 327-J



Jumpers for the electrical connection of adjacent poles. Applicable for terminal strips of the series 302 to 327.

**Cover cap**  
A-323



Cover cap which provides in combination with the base plate B-323 a safe-to-touch protection of the series 322 and 323.

**Base plate**  
B-323



Base plate which provides in combination with the cover cap A-323 a safe-to-touch protection of the series 322 and 323.

**Marking strips**  
BST



Marking strips for our terminal strips of the series 302, 322, 323, 324, 326 and 327 to identify the individual pole connections.

**Insulation receptacles**  
ISO



Insulation receptacles in various colours and sizes for isolating receptacles.

## Options

**Marking**



We mark the lead connections of our terminal strips according to your specifications upon request. Two lettering options are available: At the screw guidance or in between the screw guidances (does not apply for series 302).

Our products are marked by means of inkjet printers. Micro-sized ink droplets are shot accurately to the point and guided by an electric field thus creating the high-precision print – very much like a printed pattern generated by a common matrix printer.

**Colours**



WECO offers a wide range of housing colours. Besides our standard housing colours, you can choose between many other colours. Please contact us for further information.

**Screws**



Our standard products are fitted with slotted screws. On enquiry and customer's request, we also offer screws with Phillips/Pozidrive or +/- screw heads.

Further materials: Standard screws are made of steel; also screws out of various materials, e.g. brass, are available on request.

## Household Appliance Standard DIN EN/IEC 60335-1

### What is the household appliance standard all about?

The household appliance standard DIN EN/IEC 60335-1:2012-10 standardizes the safety features of electrical appliances for household and commercial use whose rated voltages do not exceed 250 V for single-phase appliances and 480 V for other appliances.

### Which aspects of the household appliance standard are particularly important for WECO products?

**Chapter 30: Heat- and flame-resistance.** Components made of non-metallic materials holding active components (e.g. connection elements) in position must be resistant against ignition and fire propagation.

Electrical appliances are divided into several classes. Depending on their application, they are tested according to different methods.

Most WECO products meet the requirements for unattended appliances with currents > 0.2 A. These requirements stipulate the glow-wire resistance test for non-metallic materials and refer to other glow-wire tests.

These flame-resistance requirements shall prevent self-ignition of unattended appliances. On the market, they are designated as "no flame".

### Who is affected by this household appliance standard?

The standard is applicable for manufacturers of electric and electronic components in household appliances, such as terminals and switches, e.g. in:

- Dishwashers, washing machines,

refrigerators

- Kitchen stoves, microwaves
- Small household appliances, such as mixers, coffee machines

Also affected is unattended equipment used in small and medium-sized enterprises, particularly:

- Pump components
- Illuminant components
- Industrial and commercial cleaning equipment
- Hair salon equipment etc.

### WECO products are compliant with the glow-wire test of the household appliance standard!

For the white goods market segment, WECO Contact GmbH offers an extensive range of PC board terminals and PC board plug connectors which meet the flame-resistance requirements of the Household Appliance Standard DIN EN/IEC 60335-1.

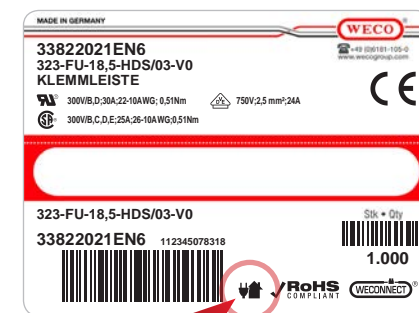
Molding materials used by WECO are tested and VDE-approved according to the glow-wire test requirements specified in DIN EN/IEC 60335-1. This applies for all standard WECO colors!

WECO products made of these molding materials are:

- All products with PC board connection technology, except for versions with higher number of poles such as series 95..., 96.. and 97...,
- terminal strips (catalogue 7), if purchased made of V-0 molding material (for unprinted versions, the part number ends with "EN6"),
- other products. Feasibility must be checked individually.



WECO "no flame" products are designated with a small symbol on our label:



### Our customer service

WECO takes technical support and after-sale service for our customers very seriously.

For your information, we have therefore compiled a list of all manufacturer products affected by the household appliance standard on our website. At a glance, you can gather information on whether your appliances are affected or not.

The list is also a valuable tool for both our sales staff and our field reps, helping them to resolve unclear issues in project meetings, and enabling them to optimally support the customer.

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www.wecogroup.com



# Extract of Europe type connectors



Series	Socket terminal strips								Plug-in terminal strips											
Pitch	8 mm	8 mm	10 mm	10 mm	11,5 mm	14,5 mm	14,5 mm	14,5 mm	8 mm	8 mm	8 mm	8 mm	8 mm	8 mm	10 mm	10 mm	10 mm	10 mm	11,5 mm	
Rated Cross Section	1,5 mm²	1,5 mm²	2,5 mm²	2,5 mm²	4 mm²	10 mm²	16 mm²	16 mm²	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	1,5 mm²	2,5 mm²	2,5 mm²	2,5 mm²	2,5 mm²	4 mm²	
Approvals	20 A/300 V/20-12 AWG 20 A/300 V/20-12 AWG 17,5 A/450 V/1,5 mm²	10 A/300 V/20-12 AWG 20 A/300 V/26-12 AWG 17,5 A/250 V/1,5 mm²	30 A/300 V/22-10 AWG 25 A/300 V/26-10 AWG 24 A/450 V/2,5 mm²	30 A/300 V/22-10 AWG 25 A/300 V/26-10 AWG 24 A/750 V/2,5 mm²	35 A/300 V/22-8 AWG 40 A/300 V/22-10 AWG 32 A/450 V/4 mm²	50 A/300 V/14-8 AWG 55 A/300 V/14-8 AWG 57 A/750 V/10 mm²	80 A/300 V/14-4 AWG 80 A/300 V/14-6 AWG 76 A/750 V/16 mm²	65 A/600 V/14-6 AWG 80 A/600 V/14-6 AWG 76 A/750 V/16 mm²	6 A/300 V/20-14 AWG 6 A/300 V/26-12 AWG - - -	10 A/300 V/22-14AWG 6 A/300 V/26-12 AWG - - -	10 A/300 V/22-14 AWG 10 A/300 V/26-14 AWG - - -	7 A/300 V/20-14 AWG 10 A/300 V/26-12 AWG - - -	6 A/300 V/20-14 AWG 10 A/300 V/26-12 AWG - - -	10 A/300 V/22-14 AWG 10 A/300 V/26-12 AWG - - -	20 A/300 V/18-12 AWG 15 A/300 V/26-10 AWG - - -	20 A/300 V/18-12 AWG 15 A/300 V/26-10 AWG - - -	20 A/300 V/18-12 AWG 15 A/300 V/26-10 AWG - - -	20 A/300 V/18-12 AWG 20 A/300 V/26-10 AWG - - -	25 A/150 V/18-10 AWG 20 A/300 V/26-10 AWG - - -	
Type of product	<b>302</b>  1-12 poles	<b>302-N</b>  1-12 poles	<b>323</b>  1-12 poles	<b>323-FU-16,5</b>  1-12 poles	<b>324</b>  1-12 poles	<b>326</b>  1-12 poles	<b>327</b>  1-12 poles	<b>327-FU</b>  1-12 poles	<b>302-FB</b>  2-12 poles	<b>302-NFB</b>  2-12 poles	<b>302-FLW-DS</b>  2-12 poles	<b>302-FBG</b>  2-12 poles	<b>302-STB</b>  2-12 poles	<b>302-NSTB</b>  2-12 poles	<b>321-B</b>  2-12 poles	<b>322-FBG</b>  2-12 poles	<b>323-FB</b>  2-12 poles	<b>323-PHFBW</b>  2-12 poles	<b>324-STFB</b>  2-12 poles	
	<b>302-G</b>  UR/VDE: without CSA: 15 A / 26-14 AWG 2-12 poles			<b>323-FU-18,5</b>  1-12 poles	<b>324-FU</b>  UR: 14-8 AWG VDE: 750 V 1-12 poles						<b>302-NFLW-DS</b>  2-12 poles		<b>302-STB</b>  2-12 poles	<b>302-NSTB</b>  2-12 poles	<b>321-S</b>  2-12 poles	<b>322-STFS</b>  2-12 poles	<b>323-STFB</b>  UR: without 2-12 poles		<b>324-STFS</b>  2-12 poles	
Series	Screw/solder terminal strips					Screw/plug terminal strips	Tab and screw connector blocks	Plug connectors												
Pitch	3,5 mm	5 mm	8 mm	10 mm	10 mm	10 mm	10 mm	5 mm												
Rated Cross Section	1 mm²	1,5 mm²	1,5 mm²	2,5 mm²	2,5 mm²	1,5 mm² <sup>1)</sup> 2,5 mm² <sup>2)</sup>	2,5 mm² <sup>1)</sup> 1 mm² <sup>2)</sup>	1,5 mm²												
Approvals	10 A/300 V/26-16 AWG 10 A/300 V/26-16 AWG	15 A/300 V/26-14 AWG 15 A/300 V/26-14 AWG	6 A/300 V/20-14 AWG 10 A/300 V/26-14 AWG	- - - 20 A/300 V/26-10 AWG	10 A/300 V/20-12 AWG 20 A/300 V/22-10 AWG	10 A/300 V/16-10 AWG 10 A/300 V/20-10 AWG	- - - 6 A/300 V/22-10 AWG	7 A/300 V/26-14 AWG 7 A/300 V/26-14 AWG												
Type of product	<b>931-A-LFDS</b>  2-12 poles	<b>951-A-LFDS</b>  2-12 poles	<b>302-LF-DS</b>  1-12 poles	<b>321-LFS</b>  1-12 poles	<b>322-LFS</b>  1-12 poles	<b>820</b>  1-12 poles	<b>322-A-2,8</b>  1-12 poles	<b>951-B-SV</b>  2-12 poles												
			<b>302-NLF-DS</b>  UR: without 1-12 poles					<b>971-FBS</b>  UR: 20 A/300 V/22-12AWG CSA: 20 A/300 V/26-12AWG 2-24 poles						<b>302-SVG</b>  UR: without 2-12 poles	<b>302-NSLP</b>  2-12 poles		<b>322-SVG</b>  2-12 poles			
															<b>302-NSLW</b>  2-12 poles		<b>322-SVW</b>  2-12 poles			

1) Screw connection

2) Plug connection

Technical modification reserved.  
For detailed information please see  
our data sheet on  
[www.wecogroup.com](#)

<sup>1)</sup> Screw connection  
<sup>2)</sup> Plug connection  
Technical modification reserved.  
For detailed information please see  
our data sheet on  
[www.wecogroup.com](http://www.wecogroup.com)