



# SINGLE WIRE SEALS AND CAVITY PLUGS

for the Automotive Industry

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## Single Wire Seals

The single wire seal (SWS) are a rubber element with three interfaces:

- Wire
- Contact
- Cavity

### Seal to wire interface

The SWS is automatically placed on the wire where the outer diameter is within a well-defined range.

The wire size is linked to the hole dimension of the SWS and is smaller in diameter in order to have geometrical interference needed to create the sealing.

Seal geometry with two lips is generally adopted to provide a point-distributed sealing pressure against the cable.

This geometry allows three main advantages:

- Multiple sealing surfaces are better than a continuous sealing surface due to possible cable shape defects.
- The inner lip profile assures good sealing even when the wires are bent.
- Fluid pressure drops occurs from the first lip to the second lip. For this reason, fluid infiltration is avoided.

### Seal to contact interface

The contact barrels close and retain the SWS without generating cuts on the surfaces. The assembly operation is fully automatic.

### Seal to cavity interface

The seal crimped onto the contact is inserted into the cavity. The difference between the outer diameter of the seal and the cavity diameter generates a radial compression of the rubber element and the consequent sealing pressure at the interface. This interference causes additional closure pressure on the wire interface increasing the tightness level towards the cable.

Most single wire seal designs use a three-lip configuration. Such designs creates three layers of redundant sealing. SWS elements are generally made of silicone rubber; this rubber offers high mechanical resistance and can work in a very wide window of operating temperatures. The material hardness is typically specified as 40-50 Shore A (ShA) durometer. This range is optimal in providing the necessary compression, tear resistance, and durability properties required for the automotive applications.

Lubrication is often necessary to facilitate the wire passage through the seal during the automatic crimping process and to reduce the force and the risk of damage when the seal element is inserted in the cavity of the connector housing. The amount of oil in the rubber is generally between 1% and 5% in weight.

## Cavity Plug

The cavity plug is used to seal a cavity where no contact is used. The geometrical profile is fully from the single wire seal element with the exception that it does not have an inner hole for wire.

Rubber material selection is very often limited to the silicone rubber with a ShA hardness range that is generally between 50 and 60; lubricant in the rubber raw material is generally not requested in order to increase the seal retention into cavity, as there is not any mechanical constraint for this rubber element.

## Single Wire Seals

Product (Example)	Cavity Diameter (mm)	Wire Cross Section (mm <sup>2</sup> )	Wire Diameter (mm) min. - max.	Material	Hardness Shore „A“	Color	Part Number
 967067-2	3.45	0.20 - 0.35	0.90 - 1.40	Silicone	50	Yellow	967067-2
		0.50 - 0.75	1.40 - 1.90	Silicone	50	Green	967067-1
		3.50	2.80 - 3.20	Silicone	40	Brown	638865-1
 963530-1	3.60	0.12 - 0.90	1.02 - 2.11	Silicone	30	Blue	794758-1
		0.20 - 0.35	0.90 - 1.20	Silicone	50	Green	1718705-1
		0.20 - 0.35	0.90 - 1.20	Silicone	50	Red	1718705-2
		0.35 - 0.50	1.20 - 1.60	Silicone	50	Black	964971-1
		0.35 - 0.50	1.20 - 1.60	Silicone	50	Red	1393457-2
		0.35 - 0.50	1.20 - 1.60	Silicone	50	Blue	1394133-1
		0.50 - 0.75	1.40 - 1.90	Silicone	50	Gray	963530-1
		0.30 - 0.50	1.40 - 1.70	Silicone	60	Gray	316867-1
		0.50 - 0.75	1.40 - 1.90	Silicone	50	Green	1-967067-1
		0.50 - 0.75	1.40 - 2.00	Silicone	50	Gray	1393457-1
		0.85	2.20 - 2.50	Silicone	50	Brown	2005673-4
		1.00	1.90 - 2.40	Silicone	50	Yellow	964972-1
		1.25	2.10 - 2.40	Silicone	40	Brown	2219708-4
		1.50	2.20 - 2.40	Silicone	50	Orange	2112323-1
		1.50 - 2.00	1.35 - 1.90	Silicone	50	Red	2098582-1
1.50 - 2.00	1.40 - 1.80	NBR *)	50	Black	2138898-1		
 963142-1	4.00	0.20 - 0.35	0.90 - 1.30	Silicone	50	Gray	963142-2
		0.50 - 0.75	1.40 - 2.10	Silicone	50	Black	963142-1
		1.50 - 2.00	1.40 - 2.10	Silicone	50	Blue	963142-3
 900324-4	4.40	0.20 - 0.35	1.10 - 1.30	Silicone	40	Orange	347681-1
		0.20 - 0.50	1.40 - 2.10	NBR *)	40	Black	2822356-1
		0.20 - 0.50	1.40 - 2.40	NBR *)	38	Black	2822352-1
		0.30 - 0.50	1.40 - 1.90	Silicone	50	Yellow/Green	900324-4
		0.35 - 0.50	1.20 - 1.70	Silicone	40	Blue	184139-1
		0.35 - 0.50	1.20 - 1.70	Silicone	50	Blue	1-368889-1
		0.50 - 1.00	1.40 - 2.10	Silicone	40	Brown	1-178210-3
0.50 - 1.50	1.50 - 2.40	Silicone	40	Green	347874-1		
		0.50 - 1.25	2.00 - 2.60	Silicone	40	Brown	1-172888-3

\*) Nitrile Butadiene Rubber  
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## Single Wire Seals

Product (Example)	Cavity Diameter (mm)	Wire Cross Section (mm <sup>2</sup> )	Wire Diameter (mm) min. - max.	Material	Hardness Shore „A“	Color	Part Number
 2822355-1	4.40	0.50 - 1.25	2.00 - 3.00	Silicone	50	Purple	1-900325-9
		0.50 - 1.25	2.00 - 2.60	NBR *)	38	Black	2822354-1
		0.50 - 1.25	2.00 - 2.60	NBR *)	38	Black	2822354-2
		0.50 - 1.25	1.80 - 2.60	NBR *)	40	Black	2822355-1
 368120-2	4.40	0.50 - 1.40	1.80 - 2.60	Silicone	50	Gray	368120-2
		0.50 - 1.50	1.50 - 2.40	Silicone	40	Red	348989-1
		0.50 - 1.50	1.70 - 2.40	Silicone	50	Red	1-368280-1
 184140-1	4.40	0.75 - 1.00	1.60 - 2.10	Silicone	40	Orange	184140-1
		1.50 - 2.00	2.20 - 2.70	Silicone	40	Purple	184141-1
		2.00	2.40 - 2.70	Silicone	40	Yellow	347875-1
		0.35 - 1.0	1.20 - 2.10	Silicone	50	Orange	284863-1
 284863-1	5.00	2.50	2.70 - 3.00	Silicone	50	Gray	282536-1
		0.30 - 1.00	1.20 - 2.10	Silicone	45	Blue	368932-1
 368932-1	5.10	2.50 - 4.00	2.20 - 3.00	Silicone	50	Blue	1743988-1
		0.35 - 1.00	1.20 - 2.10	Silicone	50	Blue	963294-1
 828905-1	5.20	0.35 - 1.00	1.20 - 2.10	Silicone	50	Light Blue	828904-1
		0.50 - 1.50	2.00 - 2.70	Silicone	50	Brown	963293-1
		0.50 - 2.50	2.20 - 3.00	Silicone	50	White	828905-1
		0.50 - 1.50	2.00 - 2.70	Silicone	50	Brown	963293-2
		1.50 - 2.50	2.70 - 3.00	Silicone	50	Yellow	963292-1
		1.50 - 2.50	2.30 - 3.00	NBR *)	50	Gray	826764-1
		0.35 - 1.00	1.20 - 2.10	Silicone	50	Dark Blue	828920-2
 828920-1	5.40	0.35 - 1.00	1.20 - 2.10	Silicone	50	Gray	828920-1
		0.75 - 1.00	1.70 - 2.10	Silicone	50	Blue	1393458-1
		1.00 - 2.50	2.10 - 3.00	Silicone	50	Yellow	828921-1
		1.50 - 2.50	2.20 - 3.00	Silicone	50	Red/Brown	1393457-4
		0.35 - 1.00	1.20 - 2.10	Silicone	50	Dark Blue	828920-2

\*) Nitrile Butadiene Rubber




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## Single Wire Seals

Product (Example)	Cavity Diameter (mm)	Wire Cross Section (mm <sup>2</sup> )	Wire Diameter (mm) min. - max.	Material	Hardness Shore „A“	Color	Part Number
 281934-4	5.50	0.35 - 0.50	1.20 - 1.60	Silicone	50	Green	281934-4
		0.50 - 1.00	3.40 - 6.20	Silicone	50	Red	368947-2
		0.50 - 1.00	3.40 - 6.20	Silicone	50	Yellow	368947-1
		0.75 - 1.50	1.70 - 2.40	Silicone	50	Yellow	281934-2
 368947-1	5.50	1.20 - 1.60	1.70 - 2.40	Silicone	50	White	281934-5
		1.50 - 2.00	1.20 - 1.60	Silicone	50	Brown	1745057-2
		2.00 - 2.50	2.50 - 3.30	Silicone	50	Red	281934-3
 967610-1	6.40	0.35 - 1.00	1.40 - 2.10	Silicone	50	Gray	967610-1
		1.50 - 2.50	2.20 - 3.00	Silicone	50	Yellow	967609-1
		1.50 - 2.50	2.20 - 3.00	Silicone	50	Yellow	2236402-1
		2.50 - 4.00	3.00 - 3.70	Silicone	50	Green	828985-1
 368933-1	6.78	1.50 - 2.50	2.20 - 3.00	Silicone	45	White	368933-1
 963245-1	7.20	0.35 - 1.00	1.40 - 2.10	Silicone	50	Light Blue	963243-1
		1.50 - 2.50	2.20 - 3.00	Silicone	50	White	963244-1
		2.50 - 4.00	3.40 - 3.70	Silicone	50	Yellow	963245-1
		4.00 - 6.00	3.60 - 4.30	Silicone	50	Green	967011-1
		7.00	4.30 - 5.20	Silicone	50	Red	968043-1
		0.30 - 1.25	2.00 - 2.70	NBR *)	40	Gray	85024-1
 85011-1	7.50	2.00 - 3.00	2.90 - 3.80	NBR *)	40	Black	85011-1
		6.00 - 8.00	3.30 - 3.80	Silicone	45	Gray	368940-1
 2188967-3	7.80	5.00	4.60 - 5.00	Silicone	45	Gray	2188967-3
 347713-1	8.05	0.50 - 1.50	1.60 - 2.40	Silicone	40	Orange	347707-1
		2.00 - 3.00	2.60 - 3.40	Silicone	40	Yellow	347713-1












\*) Nitrile Butadiene Rubber  
(continued on page 6)

## Single Wire Seals

Product (Example)	Cavity Diameter (mm)	Wire Cross Section (mm <sup>2</sup> )	Wire Diameter (mm) min. - max.	Material	Hardness Shore „A“	Color	Part Number
 2822353-1	8.20	0.85 - 1.25	1.80 - 2.10	NBR *)	50	Gray	368811-1
		1.25 - 3.00	2.50 - 4.10	NBR *)	38	Black	2822353-1
		4.00 - 6.00	3.85 - 4.75	Silicone	50	Gray	282362-1
		3.00 - 5.00	3.60 - 4.60	NBR *)	45	Black	368910-1
 1394512-1	8.48	0.50 - 1.50	2.00 - 2.70	Silicone	50	White	1394511-1
		0.50 - 1.00	1.40 - 2.00	Silicone	50	Yellow	2177018-1
		4.00	3.40 - 3.70	Silicone	50	Blue	1394512-1
		4.00 - 6.00	4.00 - 4.50	Silicone	50	Green	1719043-1
 967608-1	8.50	1.50 - 2.50	2.20 - 3.00	Silicone	50	Yellow	967607-1
		1.50 - 2.50	2.70 - 3.00	Silicone	50	Red Brown	1823111-1
		2.50 - 4.00	2.65 - 3.90	Silicone	50	Yellow	1544941-1
		4.00	3.40 - 3.70	Silicone	50	Green	967608-1
		5.00 - 6.00	3.80 - 4.50	Silicone	50	Red	1544941-2
		16.0	3.50 - 5.50	Silicone	50	Blue	1719972-1
 1544316-1	10.5	2.50 - 50.0	2.65 - 4.00	Silicone	50	Brown	1544970-1
		3.00 - 6.00	3.20 - 4.10	Silicone	50	Green	1544316-1
		3.00 - 6.00	3.10 - 4.20	Silicone	50	Green	1544664-1
		6.00 - 7.00	4.10 - 5.00	Silicone	50	Blue	1544970-2
		7.00 - 10.00	4.90 - 5.90	Silicone	50	Orange	1544316-2
		7.00 - 10.0	4.60 - 5.70	Silicone	50	Orange	1544664-2
		10.0	5.10 - 6.00	Silicone	50	Yellow	1544970-3
 1355437-2	15.0	5.00 - 6.00	4.70 - 5.30	Silicone	50	Light Blue	1355307-1
		5.00 - 6.00	4.60 - 5.20	Silicone	50	Violet	1355437-1
		10.0	5.80 - 6.60	Silicone	50	Light Blue	1355437-2
		10.0 - 16.0	7.10 - 8.10	Silicone	50	Red	1355437-3

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## Cavity Plugs

Product (Example)	Cavity Diameter (mm)	Material	Hardness Shore	Color	Part Number
 967056-1	3.45	Silicone	60	Blue	967056-1
 963531-1	3.60	Silicone	60	Red brown	1473234-1
		Silicone	50	White	963531-1
		Silicone	50	Natural	1394132-1
		Silicone	50	White	1393457-3
 963143-1	4.00	Silicone	60	White	963143-1
 963143-1	4.40	Silicone	50	Gray	348461-1
		NBR *)	50	Black	2822357-1
 828906-2	5.00	Silicone	50	Brown	828906-2
 828922-1	5.40	Silicone	50	Natural	828922-1
		Silicone	50	Green	828922-2
 282081-2	5.50	Silicone	50	Yellow	282081-2
		Silicone	50	Red	282081-1
 828986-1	6.40	Silicone	50	Black	100132-1
		Silicone	50	Natural	967653-1
		Silicone	50	Brown	828986-1
 967652-1	8.50	Silicone	50	Natural	967652-1
 2822358-1	9.80	Silicone	50	Gray	348462-1
		NBR *)	50	Black	2822358-1
 1544316-3	10.5	Silicone	45	White	1544664-3
		Silicone	45	White	1544316-3
		Silicone	45	White	1544970-4

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