Wilcoxon Research

A full spectrum of custom cables

MEGGiTT
smart engineering for
extreme environments

A full spectrum of custom cables

Wilcoxon builds cables to your specifications and our exacting standards

- **Industrial process**
- **Predictive maintenance**
- **Condition based monitoring**
- **Military specifications**
- **Maritime**
- **Transportation**
- **Test and measurement**
- **Underwater**

Cables used with sensors are exposed to the chemicals, temperatures and hazards of the environment where the sensor is located. Therefore, it is important to consider the application and the environment when wiring sensors.

A Wilcoxon customer sales and service representative will help you select the cable, protection level and connector fittings to meet your individual needs. Custom cable orders are usually built in less than a week, some standard cables ship the same day.

Cable design

	Description	Application example
Multi-conductor shielded	Shielded, twisted pair wire.	Permanent sensor installations most often use multi-conductor shielded cable because it minimizes electrical noise, including RFI, ESD, and EMI.
Coaxial	Carries power and signal on an inner conductor. The shield acts as the signal common.	Coaxial cable is used with BNC connectors; together they reduce the connection time required for portable data collection.

Shielding

	Description	Application example
Foil	Shielding made of aluminized mylar with a drain wire for electrical connection; reduces RFI.	Foil shielding attenuates RF signals by reducing the noise imposed on cable by the surrounding equipment, as in a wind turbine.
Braided or spiral	Low frequency shielding is provided by a braid made from many strands of small gauge wire and wrapped around the conductor(s) of a cable.	Braided shielding is used to decrease power line signal interference like that often present around large electric motors.

Cable protection

	Description	Application example
Spiral armored jacket	Spiral wrap, interleaved band of metal surrounds a cable to protect it from heavy object impact.	The spiral armored jacket protects cable from damaging objects such as those found in a hot roll steel mill.
Stainless overbraid	Braided electrical shield of stainless steel wrapped along the outside of a cable provides protection against abrasion by foreign objects.	In the main intake pump at sewage treatment plant, a stainless overbraid protects cable from objects underwater and does not trap water.

Environmental resistance

	Description	Application example
Teflon®	Best temperature resistance, excellent chemical resistance.	Usually the cable jacket choice for the connection to the sensor, Teflon® cable jackets withstand up to 260˚C temperatures, making Teflon® ideal for hot environments.
PVC	Moderate chemical resistance.	PVC provides a low cost alternative for dry air installations.
Enviroprene	Good chemical resistance in non-abrasive environments.	Useful in most environments, a low-cost Enviroprene cable jacket protects against common exposures, such as UV rays in an outdoor cable tray installation
Tefzel®	Excellent chemical resistance, rated for use in radiation environments.	Radiation resistance makes Tefzel® appropriate for use around nuclear reactors.
Polyurethane	Low cost, waterproof material with good abrasion resistance.	Polyurethane is often used in underwater applications because it can be bonded to metals, creating a water-tight connection to the sensor.

Connectors

	Description	Application example
MIL-style	Rugged, simple and cost-effective connectors available in 2-pin, 3-pin, and 6-pin configurations.	MIL-style connectors are the most common connectors used with sensors. They are rugged and offer a wide variety of boots and sealing methods for use in different environments, including "splashproof" options.
Multi-conductor	MIL-style for 2 to 4 contacts. LEMO and DIN-style for more than four connections.	Multi-conductor connectors are often used on data collectors for the sensor connection.
Coaxial	Designed for ease of connectivity in instrumentation.	BNC and 10-32 Microdot connectors reduce the connection and disconnection time required in portable date collection.

MaxFlex™ cables for data collectors

Compatible with data collectors made by SKF, Emerson (CSI), and Rockwell (Entek IRD)

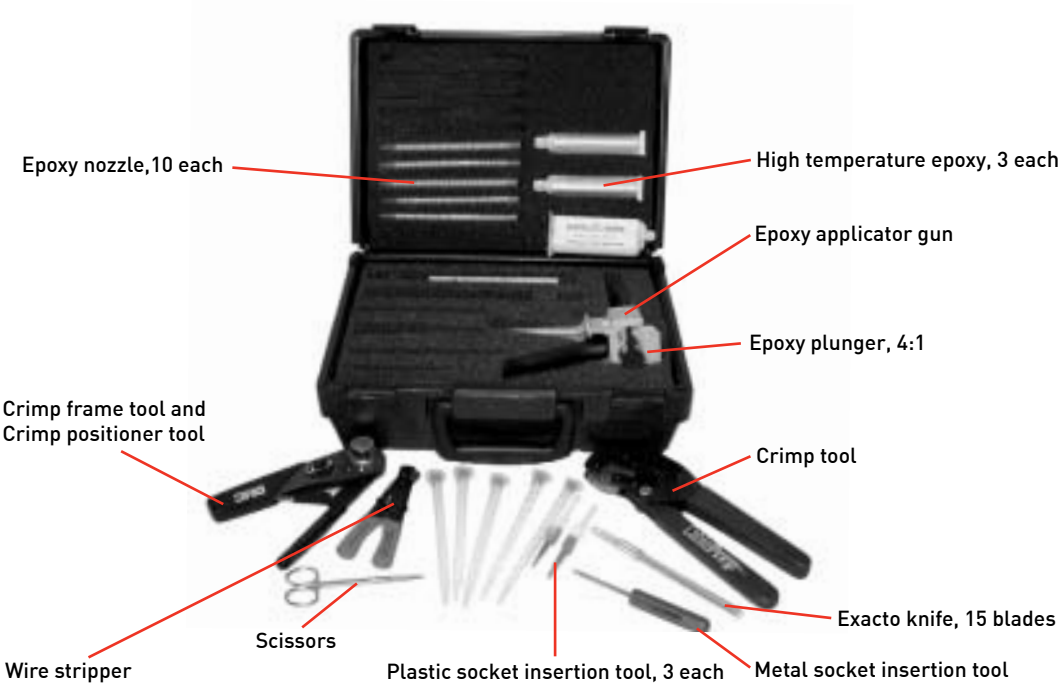
Wilcoxon's MaxFlex™ cables for data collectors are designed to exceed the harsh environmental requirements of industrial applications. MaxFlex™ cables have reinforced cable joints at the sensor connector end - the most common place that similar cables fail - to serve the needs of field data acquisition. They are rugged, reliable and resistant to abuse.

Why MaxFlex™ is the best

- Extended life
- Reinforced for strength and maximum flexibility
- Pull tested to over 100 pounds
- Excellent EMI/RFI shielding

Wilcoxon connector tool kits

In addition to custom built cable assemblies, Wilcoxon also provides HTC and HTS Tool Kits for field assembly of the 6Q - series of connectors. The High Temperature Crimp Kit is used to make a crimp connection to the socket, while the High Temperature Solder Kit is used when the socket will be soldered to the wire. A similar field installation kit, the SP Kit, is available for the 6SL - series of connectors.



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Cable and connector selection

Wilcoxon's extensive selection of cables and connectors offers a full spectrum of possibilities

Some of the most popular cables and connectors are pictured below. Want something you don't see here?
Call your customer sales and service representative at 1-800-WILCOXON or send an email to sensors@wilcoxon.com

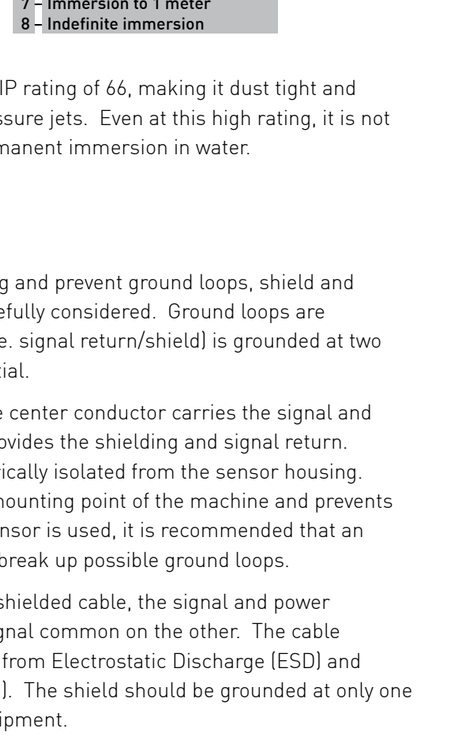
Connectors	Description	Recommended cables	IP
0	Blunt cut	All	00
1	Microdot 10-32	J1, J3, J4, J93	50
1A	Microdot 10-32, right angle	J1, J3	50
2	BNC, plug, male	J1, J3, J4, J5A, J6, J9T, J9T2, J9T2A, J9T3A, J9T4, J10, J44, J51,	50
2F	BNC, female	J61, J81, J93 J5A, J6, J9, J51, J61, J93	50
2T	BNC, twinaxial	J9	50
6	Amphenol, MIL-C-5015 style, 2 socket, metallic **Note: Electrical isolation between shield and transducer housing**	J3, J4, J5A, J6, J9, J9T, J9T2, J9T2A, J10, J51, J61, J81, J93	50
6GSL/6GSLI	MIL-C-5015 style, 3 socket, splash proof, premium GSL: Electrical contact between shield and transducer housing	J9T3, J9T3A	66
6GQ/6GQI	MIL-C-5015 style, 3 socket, splash proof, premium GSL: Electrical contact between shield and transducer housing GSLI: Electrical isolation between shield and transducer	J9T3, J9T3A	66
6Q/6QI	MIL-C-5015 style, 2 socket, high temperature (200°C / 392°F) Q: Electrical contact between shield and transducer housing QI: Electrical isolation between shield and transducer housing	J5A, J9A, J9T, J9T2A, J10, J51, J61	68
6QA/6QAI	MIL-C-5015 style, 2 socket, high temperature (200°C / 392°F) Q: Electrical contact between shield and transducer housing QI: Electrical isolation between shield and transducer housing	J9F	68
6SL/6SLI	MIL-C-5015 style, 2 socket, splash proof, premium SL: Electrical contact between shield and transducer housing SLI: Electrical isolation between shield and transducer housing	J5A, J9, J9T, J9T2, J9T2A, J9T2AS, J9T3, J9T3A, J9T4, J10, J51, J61	66
6W	MIL-C-5015 style, 2 socket, molded **Note: Electrical isolation between shield and transducer housing**	J5A, J9T2A, J10	64
6WR	MIL-C-5015 style, right angle, molded **Note: Electrical isolation between shield and transducer housing**	J9T2A, J10	64
9W	Bendix, 4 socket, threaded, weatherproof	J9T2S, J9T4, J9T4A	50
19SL/19SLI	MIL-C-5015 style, 6 socket SL: Electrical contact between shield and transducer housing SLI: Electrical isolation between shield and transducer housing	J9T4, J9T4A	66
20	LEMO, 7 pin	J9T, J9T2A, J10, J61	50

Common cables		Description	C° range	F° range	Diameter in.	pF/ft
	J1	Coaxial, low noise, orange PVC jacket	-55 to 80	-67 to 176	0.088	30
	J3	Coaxial, low noise, high temperature, red Teflon® jacket	-100 to 260	-148 to 500	0.085	30
	J5A	Coaxial, RG 58, black PVC jacket	-40 to 105	-40 to 221	0.190	30
	J9T	Coaxial, RG 59, black Teflon® jacket	-80 to 150	-112 to 302	0.190	20
	J9T2	Twisted pair, shielded, white Tefzel® jacket	-80 to 150	-112 to 302	0.190	27
	J9T2A	Twisted pair, shielded, yellow Teflon® jacket	-80 to 200	-112 to 392	0.190	27
	J9T2AS	Twisted pair, shielded, yellow Teflon® jacket with stainless steel braid	-80 to 200	-112 to 392	0.210	27
	J9T2S	Twisted pair, shielded, white Tefzel® jacket with stainless steel braid	-80 to 150	-112 to 302	0.210	27
	J9T3	Three conductor, shielded, white Tefzel® jacket	-80 to 150	-112 to 302	0.190	27
	J9T3A	Three conductor, shielded, yellow Teflon® jacket	-80 to 200	-112 to 392	0.190	27
	J9T4	Four conductor, shielded, red Teflon® jacket	-80 to 200	-112 to 392	0.190	30
	J9T4A	Four conductor, shielded, yellow Teflon® jacket	-80 to 200	-112 to 392	0.190	27
	J10	Twisted pair, shielded, gray Enviroprene jacket	-50 to 125	-58 to 257	0.190	30
	J88	Twisted pair, shielded, black Polyurethane jacket	-40 to 80	-40 to 176	0.175	60
	J88C	Twisted pair, shielded, black Polyurethane jacket, coiled with 6" straight ends	-40 to 80	-40 to 176	0.175	60
	J95	Five conductor, shielded, black Polyurethane jacket	-20 to 90	-4 to 194	0.240	22
	J96	Twisted pair, shielded, white Teflon® jacket	-80 to 150	-112 to 302	0.145	35
	J9F	Twisted pair, foil shielded with drain wire, red Teflon® jacket	-70 to 200	-94 to 392	0.125	51

Tech tips

Cable length

An accelerometer cable can be run one hundred feet without losing most signals. The exact length can be determined knowing the cable capacitance (30 picoFarads per foot is common) and the available voltage swing (typically at least 5V peak to peak). Given these values, the mazimum length is a function of supply current and highest frequency of interest. The chart to the right helps determine maximum cable lengths.



Note: Graph values assume cable capacitance of 30pF/ft and an available voltage swing of 5Vp-p. (I) represents current available to power the sensor.

IP ratings

Splashproof connectors for sensors are categorized according to an Ingress Protection or IP rating. IP ratings are industry standards that indicate how connectors withstand invasion in harsh environments. In order to qualify the level of sealing provided by a sensor connector, use the following chart:

Ingress protection ratings

First numeral Protection against solid bodies	Second numeral Protection against liquid
No protection – 0	0 – No protection
Objects greater than 50mm – 1	1 – Vertically dripping water
Objects greater than 12.5mm – 2	2 – Angled dripping water
Objects greater than 2.5mm – 3	3 – Sprayed water
Objects greater than 1.0mm – 4	4 – Splashed water
Dust-protected – 5	5 – Water jets
Dust-tight – 6	6 – Pressure jets
	7 – Immersion to 1 meter
	8 – Indefinite immersion

Wilcoxon's 6SL connector has an IP rating of 66, making it dust tight and protected against liquid from pressure jets. Even at this high rating, it is not appropriate for temporary or permanent immersion in water.

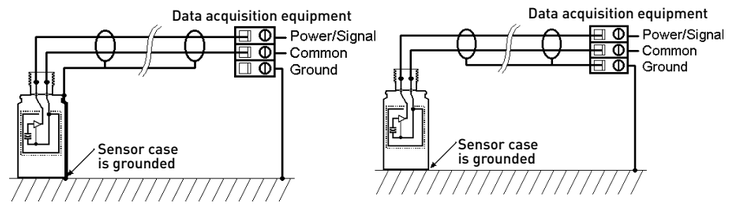
Avoiding ground loops

In order to provide proper shielding and prevent ground loops, shield and common grounding should be carefully considered. Ground loops are developed when a common line (i.e. signal return/shield) is grounded at two points of differing electrical potential.

For sensors with coaxial cable, the center conductor carries the signal and power, while the outer braiding provides the shielding and signal return. Normally the cable shield is electrically isolated from the sensor housing. This isolates the shield from the mounting point of the machine and prevents ground loops. If a non-isolated sensor is used, it is recommended that an isolated mounting pad be used to break up possible ground loops.

For sensors using two conductor/shielded cable, the signal and power are carried on one lead and the signal common on the other. The cable shield serves to protect the signal from Electrostatic Discharge (ESD) and Electromagnetic Interference (EMI). The shield should be grounded at only one point, normally to the readout equipment.

In all cases, it is very important that the cable shield terminations be properly grounded. Failure to do so in high ESD/EMI environments can result in damage to the sensor electronics.



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