Wilcoxon
SENSING TECHNOLOGIES

A full spectrum of custom cables

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Wilcoxon Sensing Technologies builds cables to our exacting standards for a variety of applications:

- >> Industrial process
- >> Predictive maintenance
- >> Condition monitoring
- >> Military specifications
- >> Maritime
- >> Transportation
- >> Test and measurement
- >> Underwater
- >> Paper machines
- >> Machine tools
- >> High temperature or radiation
- >> Hazardous areas

Cables used with sensors are exposed to the chemicals, temperatures and hazards of the environment where the sensor is mounted. It is important to consider the application and the environment when selecting a cable to be used with a sensor.

A Wilcoxon sales and service representative can help you select the cable, protection level and connector fittings that meet your specific needs. Custom cable orders are usually built in less than a week, and some standard cables ship the next day. All cables are built with the care and precision you have come to expect from Wilcoxon.

MaxFlex® cables

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

MaxFlex® cables for data collectors are designed to excel in the harsh environments of route based data collection. MaxFlex® cables have reinforced cable joints at the sensor connector end – the most common place that similar cables fail to survive severe handling during data collection. The rugged cable is reliable, durable, and resistant to wear and tear.

Why Maxflex is the best

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

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 and charge output accelerometers. Low-noise mineral insulation cable minimizes triboelectric effects.

Shielding

	Description	Application example
Foil	Shielding made of aluminized mylar with a drain wire for electrical connection	The foil blocks high levels of RF signal which are often found in wind turbine nacelles or high speed turbines.
Braided or spiral	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 considered more effective at minimizing power line frequencies found around electric motors. Tightly wound braided shield also protects against RF interference.

Cable protection

	Description	Application example
Spiral armored jacket	Spiral wrap, interleaved band of metal surrounding a cable	Spiral armored jacket protects the cable from heavy objects like those found in a hot roll steel mill, and provides chemical resistance since the cable is completely isolated from the atmosphere.
Stainless overbraid	Braided electrical shield of stainless steel wrapped along the outside of a cable	A stainless steel overbraid protects the cable from shart objects and can also act as an additional signal shield. For underwater applications the stainless braid protects the outer insulation from foreign objects and does not trap water.

Environmental resistance

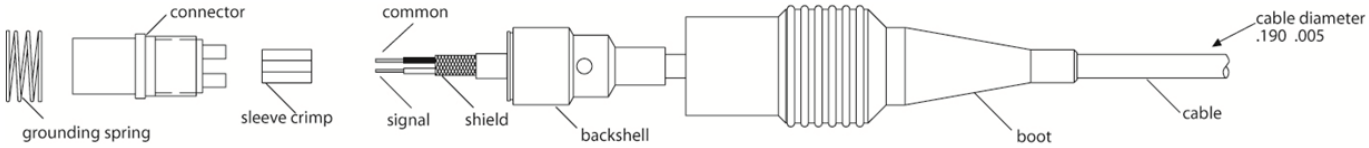
	Description	Application example
Teflon®	Best temperature resistance, excellent chemical resistance	The cable jacket of choice for most applications, Teflon® can withstand temperatures up to 260° C, ideal for hot environments. Teflon® is resistant to most chemicals and physically strong, providing long cable life.
Enviroprene	Better chemical resistance in non-abrasive environments	A low-cost alternative to Teflon®, Enviroprene is useful for most environments and protects against common exposures, such as UV rays found in outdoor cable tray installations.
PVC	Good chemical resistance	PVC is a low-cost solution for dry air installations but does not provide the same range of chemical resistances as Teflon.
Tefzel®	Better chemical resistance, rated for use in areas with radiation	Radiation resistance makes Tefzel® appropriate for use in nuclear environments.
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 watertight seal to the sensor.

Connectors

	Description	Application example
MIL-style	Rugged, simple and cost-effective connectors available in a variety of pin configurations	MIL-style is the most common connector used with industrial sensors. They are rugged and offer a wide variety of boots and sealing methods for use in different environments, including “splashproof” options.
Multi-conductor	LEMO, Bendix, Turck, M12 and other multi-conductor connections	Multi-conductor connectors are used on data collectors, multi-axis sensors and triaxial units. M12 connectors are commonly used in process applications.
Coaxial	2 pin connectors for use with coaxial cables	BNC and 10-32 Microdot connectors reduce the connection time associated with portable data connection.

Durable connectors - built to last

The Wilcoxon 6Q boot used with a high quality Teflon® coated cable, such as J9T2A, has set the standard as a ruggedized, submersible connector cable assembly. Rated at IP68 and tested up to 650 p.s.i., 6Q connectors are usable in temperatures up to 200° C and underwater submersible to 230 feet. The design of the 6Q allows it to be used in settings where the cable shield must be connected to the sensor body, or for industrial applications where the shield must be isolated from the sensor (made possible by removing the grounding spring). The pairing the of the new 6QN neoprene boot and J9T2 Tefzel® cable is an ideal configuration for nuclear environments.



Wilcoxon connector tool kits

Wilcoxon provides High Temperature Crimp (HTC) and High Temperature Solder (HTS) toolkits for field assembly of the 6Q series of connectors. The HTC kit is used to make a crimp connection to a socket, while the HTS kit is for applications where the socket will be soldered to the wire. Each kit comes with all the tools necessary to prepare connectors and cables in the field, including high temperature epoxy to backfill the connector, creating a sealed, potted backshell.

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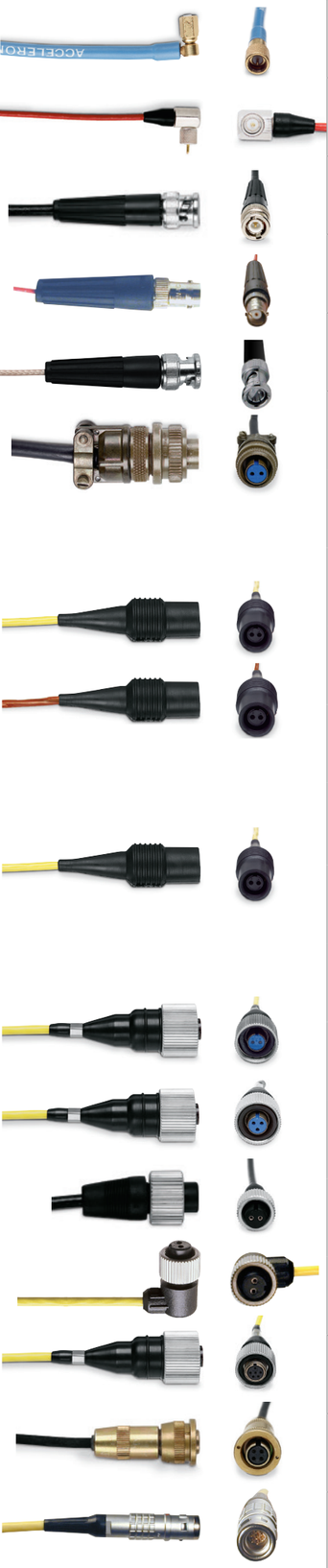
Cable and connector selection



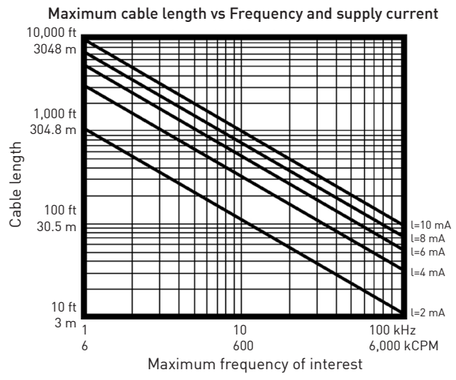
Connector		Description	Compatible cables	IP
1		Microdot 10-32	J1, J3, J4, J93	50
1A		Microdot 10-32, right angle	J1, J3	50
2		BNC, plug, male	J1, J3, J4, J5A, J6, J9T, J9T2, J9T2A, J9T3A, J9T4, J10, J44, J51	50
2F		BNC, female	J6, J9, J51, J61, J81, J93	50
2T		BNC, twin-axial	J9	50
MIL-C-5015 style	6	Amphenol, 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
	6D2	2 pin, suitable for use in Class I, Div 2 (Zone 2) areas, factory assembled		
	6Q/6QI	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, J9T, J9T2A, J10, J51, J61, J91	68
	6QA/6QAI	2 socket, high temperature (200° C/392° F) QA: Electrical contact between shield and transducer housing QI: Electrical isolation between shield and transducer housing	J9F	67
	6QN/6QNI	2 socket, radiation resistant, Neoprene boot/Tefzel® insert QN Electrical contact between shield and transducer housing QNI: Electrical isolation between shield and transducer housing		68
	6GQ/6GQI	3 socket, premium GQ: Electrical contact between shield and transducer housing GQI: Electrical isolation between shield and transducer housing	J9T3, J9T3A	68
	6GD2	3 pin, suitable for use in Class I, Div 2 (Zone 2) areas, factory assembled		67
	6SL/6SLI	2 socket 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
	6GSL/6GSLI	3 socket GSL: Electrical contact between shield and transducer housing GSLI: Electrical isolation between shield and transducer housing	J9T3, J9T3A	66
	6W	2 socket, molded connector Note: electrical isolation between shield and transducer housing	J5A, J9T2A, J10	67
	6WR	2 socket, right angle, molded connector Note: electrical isolation between shield and transducer housing	J9T2A, J10	67
	19SL/19SLI	6 socket SL: Electrical contact between shield and transducer housing SLI: Electrical isolation between shield and transducer housing	J9T4, J9T4A	66
9W		Bendix, 4 socket, threaded, weatherproof	J9T2S, J9T4, J9T4A	50
20		LEMO, 7 pin	J9T, J9T2A, J10, J61	50
M12		Molded M12 5 socket connector Note: for 4 conductor applications please contact us	J10	68

	Cable	Description	Max temp		Diameter		pF/ft
			F	C	inch	cm	
Coaxial	J1	Low noise, orange PVC jacket	176°	80°	0.088	0.224	30
	J3	Low noise, high temp, red Teflon® jacket	500°	260°	0.085	0.216	30
	J5A	RG58, black PVC jacket	221°	105°	0.190	0.483	30
	J9T	RG59, black Teflon® jacket	302°	150°	0.190	0.483	20
	J93	RG316/U, high temp, clear Teflon® jacket	392°	200°	0.098	0.249	29
Twisted pair, shielded	J88	Black Polyurethane jacket	176°	80°	0.175	0.445	60
	J88C	Black Polyurethane jacket, coiled with 6' straight ends	176°	80°	0.175	0.445	60
	J9	Grey PVC jacket	176°	80°	0.231	0.587	32
	J9A	Brown PVC jacket	221°	105°	0.190	0.483	28
	J9T2	White Tefzel® jacket, radiation resistant	302°	150°	0.190	0.483	27
	J9T2A	Yellow Teflon® jacket	392°	200°	0.190	0.483	27
	J9T2AS	Yellow Teflon® jacket with stainless steel braid	392°	200°	0.210	0.533	27
	J9T2B	Blue Teflon® jacket	392°	200°	0.210	0.533	27
	J9T2S	White Tefzel® jacket with stainless steel braid	302°	150°	0.210	0.533	27
	J96	White Teflon® jacket	302°	150°	0.145	0.368	35
	J10	Gray Enviroprene jacket	257°	125°	0.190	0.483	30
	J9F	Foil shield with drain wire, red Teflon® jacket	392°	200°	0.125	0.318	51
Shielded, multi-conductor	J9T3	3 conductor, white Tefzel® jacket	302°	150°	0.190	0.483	27
	J9T3A	3 conductor, yellow Teflon® jacket	392°	200°	0.190	0.483	27
	J9T4	4 conductor, red Teflon® jacket	392°	200°	0.190	0.483	30
	J9T4A	4 conductor, yellow Teflon® jacket	392°	200°	0.190	0.483	27
	J95	5 conductor, black Polyurethane jacket	194°	90°	0.240	0.610	22

Tech tips

Cable length

An accelerometer cable can be run 100 feet without losing signal content. The exact length before signal degradation begins can be determined using cable capacitance (30 pico-Farads per foot is common) and available voltage swing (typically at least 5 V peak-to-peak). Using these values, the maximum length is a function of supply current and the highest frequency of interest. The chart to the right helps determine maximum cable lengths.



Note: Graph values assume cable capacities of 30 pF/ft and an available swing of 5 V p-p. The current available is represented by I.

IP ratings

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

Protection against solids		Protection against liquid	
No protection	0	0	No protection
Objects >50 mm	1	1	Vertically dripping water
Objects >12.5 mm	2	2	Angled dripping water
Objects >2.5 mm	3	3	Sprayed water
Objects >1.0 mm	4	4	Splashed water
Dust-protected	5	5	Water jets
Dust-tight	6	6	Pressure jets
		7	Immersion to 1 meter
		8	Indefinite immersion

Example: Wilcoxon 6SL connectors are rated at IP66, meaning they are dust-tight and protected against liquid from pressure jets. Even though it is rated highly, the connector is not appropriate for temporary or permanent immersion in water.

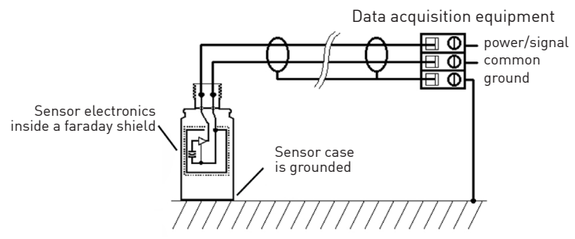
Avoiding ground loops

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 braid 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 at 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 possible ground loops.

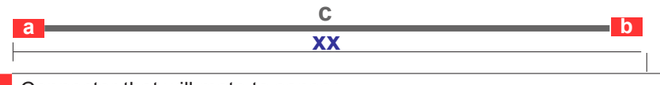
For sensors using 2 conductor/shielded cable, the signal and power are carried on one lead and the signal common on the other. The cable shield serves to protect the signal from Electrostatic Discharge (ESD) and Electromagnetic Interference (EMI). The shield should be grounded at only one point, normally at 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 sensor electronics. Choosing a single point for your ground also greatly increases the ability of the shield to protect against RF interference.



How to order

Ra-b-c-xx-d is the numbering system for custom cable assemblies.



a	Connector that will mate to sensor
b	Cable termination connector
c	Compatible cable type
xx	Desired cable length (ft/m), including connectors (standard lengths: 3, 5, 10 ft)
d	Optional: armor (A), stainless steel braid (S), safety connector (SC)

Note: R signfies cable assembly
Example: R6Q-0-J9T2A-16 (16 ft yellow Teflon® cable, 2 pin IP68 connector to blunt cut)

To place an order, contact us via email at info@wilcoxon.com or by phone at +1 (301) 330 8811.

To view our selection of cables and connectors, visit www.wilcoxon.com.