

Working principle of draw wire sensors



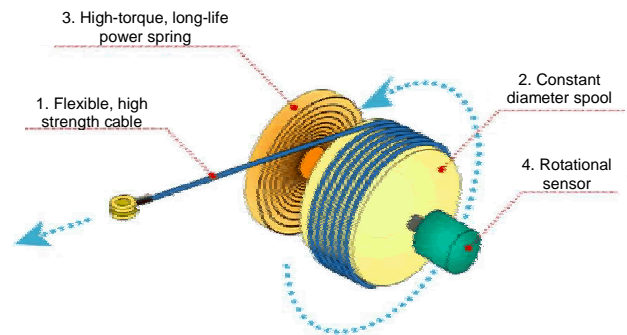
A draw wire sensor, sometimes also known as a Cable-Extension Transducer (CET), a string pot, a string encoder or yo-yo sensor, is a device used to detect and measure linear position and velocity using a flexible cable and spring-loaded spool.

Simply mount the transducer's body to a fixed surface and attach the stainless steel cable to the movable object. As the object moves, the transducer produces an electrical (analogue or digital) signal proportional to the cable's linear extension or velocity. This signal can then be sent to a display, data acquisition system or controller.

Draw-wire sensors are composed of four main parts:

1. measuring cable
2. spool
3. spring
4. rotational sensor (potentiometer or encoder).

Inside the transducer's housing, a stainless steel cable is wound on a precisely machined constant diameter cylindrical spool that turns as the measuring cable reels and unreels.



Applications

Draw-wire sensors can be installed in minutes, fitted into precarious or tight areas and they do not require perfectly parallel alignment. They also offer great flexibility, a small-size to measurement ratio and they cost less than rod or wand-type measurement devices.

They can be used in a wide variety of applications including industrial factory automation, high-tech medical devices, structural and automotive testing, die-casting or injection moulding, hydraulic cylinder control or just about anything else you can think of.



Model variety

A variety of sensors and options is available in measuring strokes from 5 cm to more than 40 m, various cable materials, enclosures, connections etc. Some models are available with cable velocity limiting options (see on the right) and increased protection class.

All industry-standard output signal types are available. These include potentiometer (voltage divider), 0-10 VDC, 4-20 mA, encoder and RS232/422 communications.

Custom-design and OEM versions can be supplied.









Draw-wire sensors MSZ

Draw wire sensors - Compact models (up to 2500 mm range)

Type	MSZ-A	MSZ-2	MSZ-P1	MSZ-T1	MSZ-65	MSZ-T100
						
Data						
Full stroke ranges [mm]	125	750	1250	1250	1250	2500
Accuracy [±% FS]	0.15%	0.25 ... 0.02%	1.00 ... 0.25%	0.28 ... 0.02%	0.02%	0.28 ... 0.04%
Repeatability [±% FS]	0.02%	0.02%	0.05%	0.05 ... 0.02%	0.02%	0.05 ... 0.02%
Enclosure						
Enclosure material	anod. alu	anod. alu (cover: PC)	plastic (Polycarbonate)	anod. alu / ABS	anod. alu	anod. alu / coated
Protection class	IP65	IP50	IP50	IP65 ... 67 dep. on model	IP65	IP50
Measuring cable						
Nylon-coated stainless steel	●	●	●	●	●	●
Stainless steel	-	-	-	-	-	-
Thermoplastic	-	-	-	-	-	-
Signal output						
Voltage divider (Potentiometer)	●	●	●	●	-	●
Position / DC-velocity output	-	-	-	-	-	●
0 ... 10 VDC	-	-	-	●	-	●
4 ... 20 mA	-	-	-	●	-	●
Incremental encoder	-	●	-	●	●	●
RS 232	-	-	-	●	-	-
Devicenet	-	-	-	●	-	-
Absolute encoder	-	-	-	-	(●)	-
Connections						
Solder terminals	-	-	●	-	-	-
Leads	●	-	-	-	-	-
Cable	-	●	-	●	(●)	●
Connector	-	●	-	●	●	●
More features						
Special features	-	-	-	cable spring-loaded guide	-	-
Typical applications	limited space applications	high-accelerations (e.g. in-flight testing, autom. aerospace or crash tests)	cable misalignment tolerant	moderate accel. applications (e.g. structural testing, autom. mechanism tests, hydraulic cyl. monitoring)	Lifts, stages, mobile vehicles	Lab environment moderate accel. applications

Draw wire sensors - Industry models (up to 42500 mm range)

Type	MSZ-T5	MSZ-T8	MSZ-81	MSZ-122	MSZ-T9	MSZ-T9X
						
Data						
Full stroke ranges [mm]	6250	1500	6250	4300	13750	42500
Accuracy [±% FS]	0.28 ... 0.02%	0.28 ... 0.02%	0.02%	0.02%	0.12 ... 0.02%	0.12 ... 0.02%
Repeatability [±% FS]	0.05 ... 0.02%	0.05 ... 0.02%	0.02%	0.02%	0.05 ... 0.02%	0.05 ... 0.02%
Enclosure						
Enclosure material	anod. alu	anod. alu or stainless steel	anod. alu	coated alu (or stainless steel)	coated alu or stainless steel	coated alu or stainless steel
Protection class	IP65 ... 67 dep. on model	IP65 ... 68 dep. on model	IP65	IP65	IP65 ... 68 dep. on model	IP65 ... 67 dep. on model
Measuring cable						
Nylon-coated stainless steel	●	●	●	●	●	● (Stainless steel for larger stroke ranges)
Stainless steel	●	●	-	●	●	-
Thermoplastic	●	●	-	●	●	-
Signal output						
Voltage divider (Potentiometer)	●	●	-	-	●	●
Position / DC-velocity output	●	-	-	-	●	●
0 ... 10 VDC	●	●	-	-	●	●
4 ... 20 mA	●	●	-	-	●	●
Incremental encoder	●	●	●	●	●	●
RS 232	●	●	-	-	●	●
CAN Bus	●	●	-	-	●	●
Devicenet	●	●	-	-	●	●
Absolute encoder	-	-	(●)	(●)	-	-
Connections						
Cable	●	●	(●)	(●)	●	●
Connector	●	●	●	●	●	●
Features						
Special features	-	1) various connections 2) Hazardous area version	-	-	1) increased cable tension opt. 2) Hazardous area version	Hazardous area version
Typical applications	Harsh applications with high accel. and high cycle life	Rugged model for harsh production applications	Lifts, stages, mobile vehicles	Lifts, stages, mobile vehicles	ideal for hydraulic and telescope applications	Extremely long stroke and velocity feedback applications