Sensors for Robots

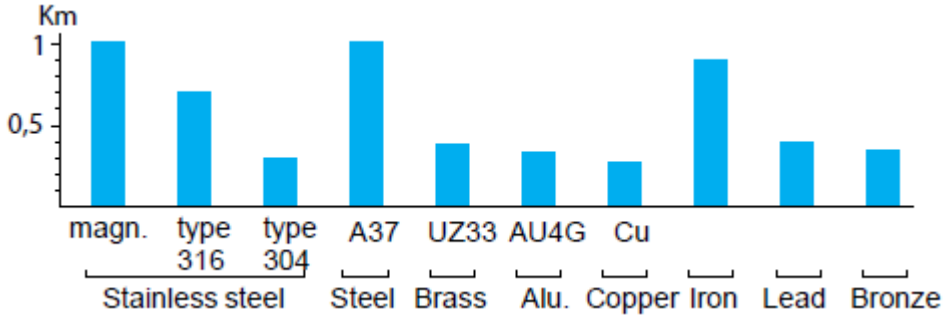
Inductive Sensor

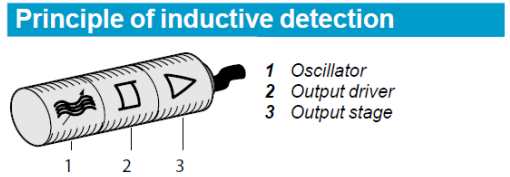
Different types of inductive sensors

Sensors magnetic fields
Sensor reach 0 – 10 mm

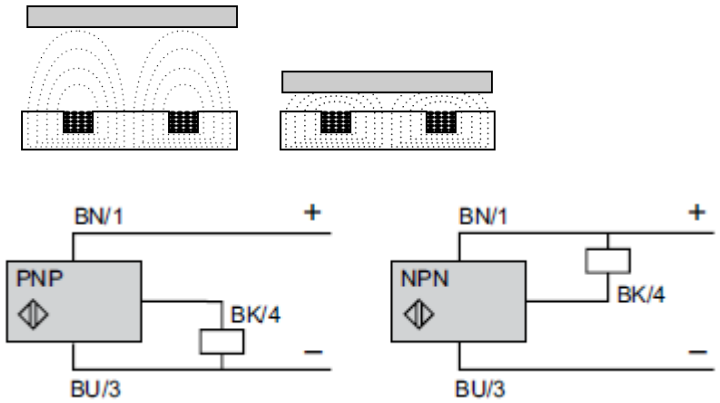
Without shielding

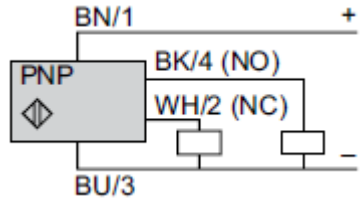
With shielding





Composition of an inductive proximity sensor

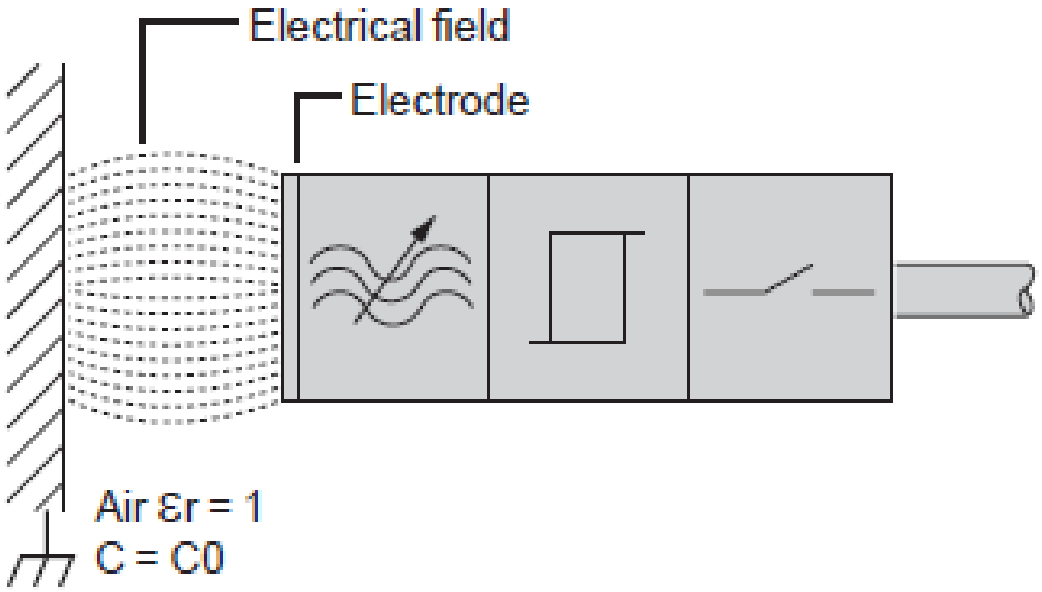


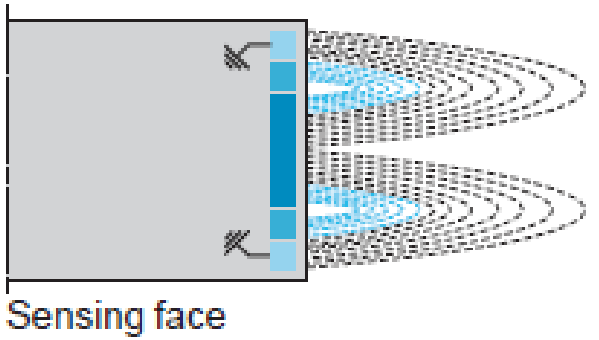


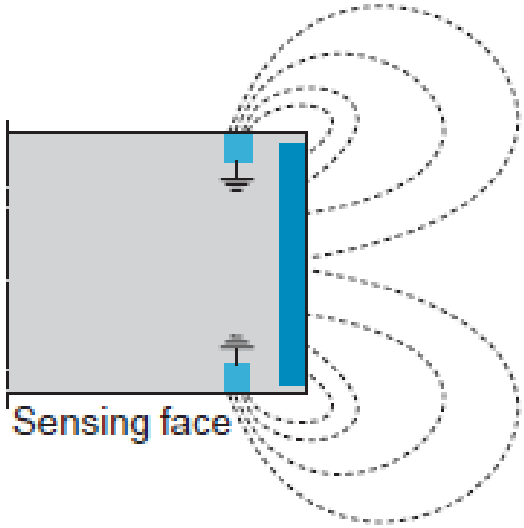
Capacitive Sensors

Can measure anything but air. Sensor reach 0 – 2mm

Adjustement of sensor reach







Ultrasound sensor

Sensor reach 0 – 3 meters. The sensor doesn't work on object very close by.
A typical sound frequency is 200 KHz.

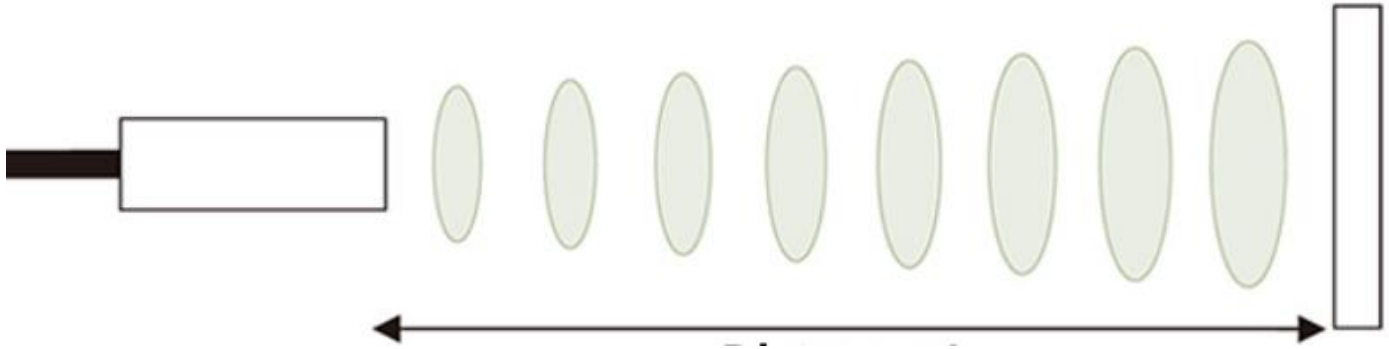
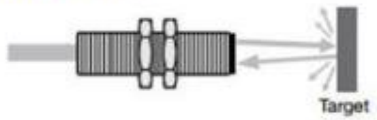
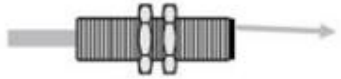
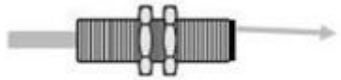
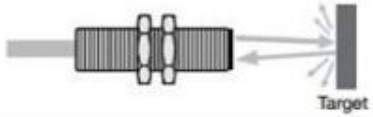
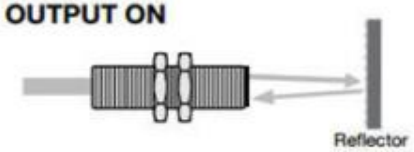
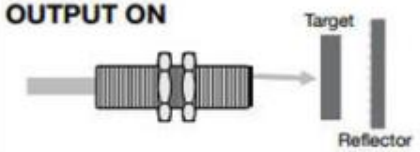
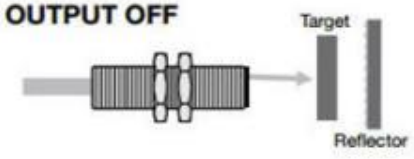
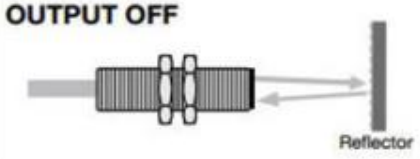
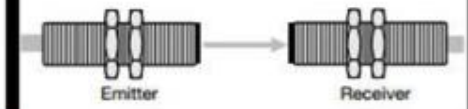
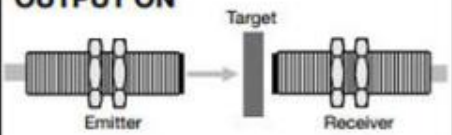
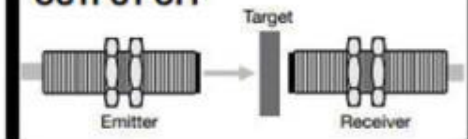
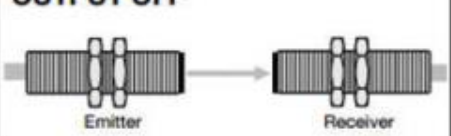
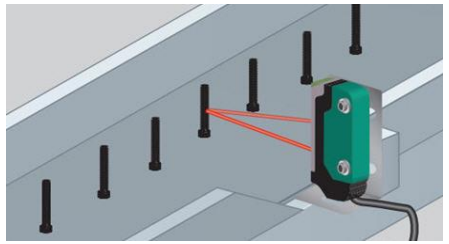
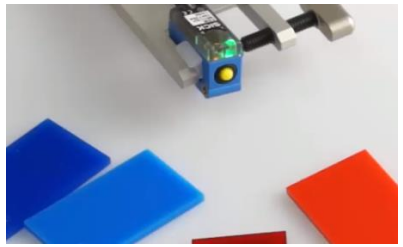


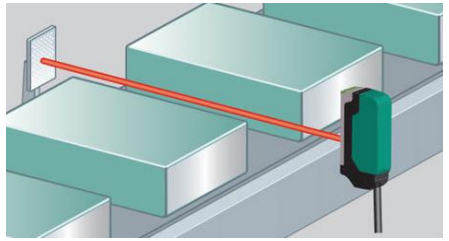
Photo cells

Types of photo cells

MODE	LIGHT ON	DARK ON
DIFFUSE	OUTPUT ON 	OUTPUT ON 
	OUTPUT OFF 	OUTPUT OFF 
RETRO-REFLECTIVE	OUTPUT ON 	OUTPUT ON 
	OUTPUT OFF 	OUTPUT OFF 
THRU-BEAM	OUTPUT ON 	OUTPUT ON 
	OUTPUT OFF 	OUTPUT OFF 







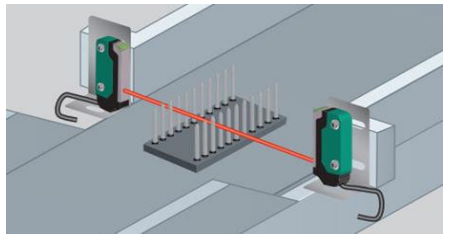


Photo cells

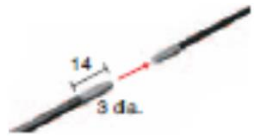
Types of photo cells with fiber optics

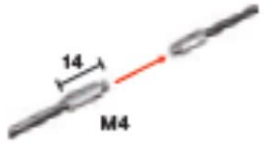
same types as with ordinary photo cells

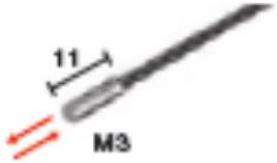
Only for short distances

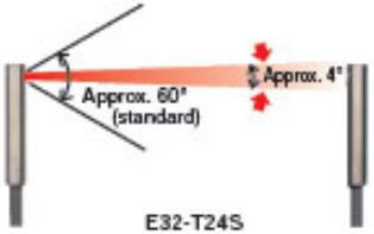
The shortening tool is used ONCE ONLY

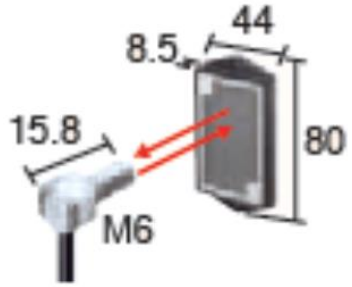
The reciever usually has to be calibrated









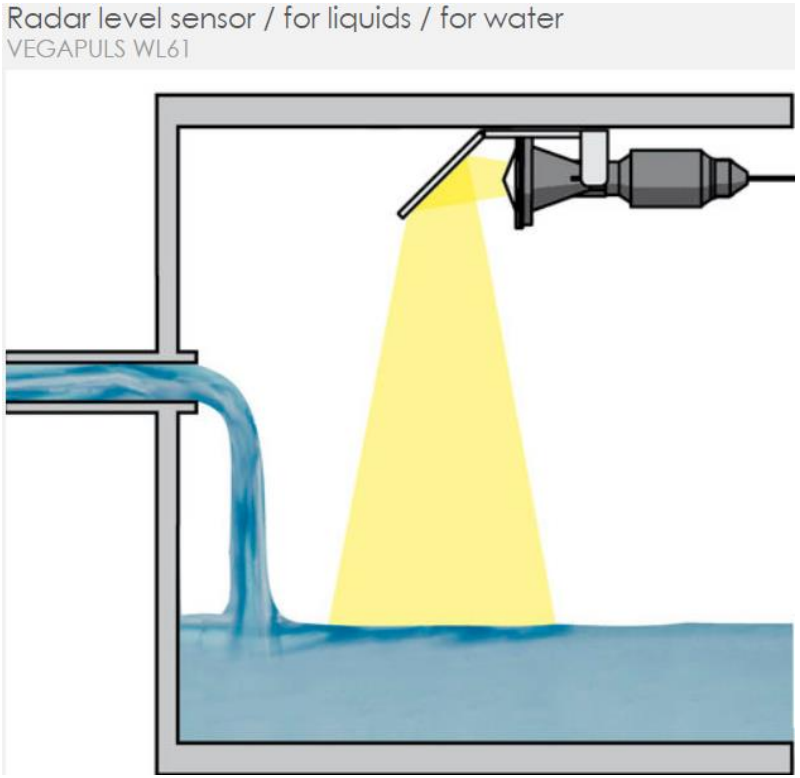


Analogue Sensors

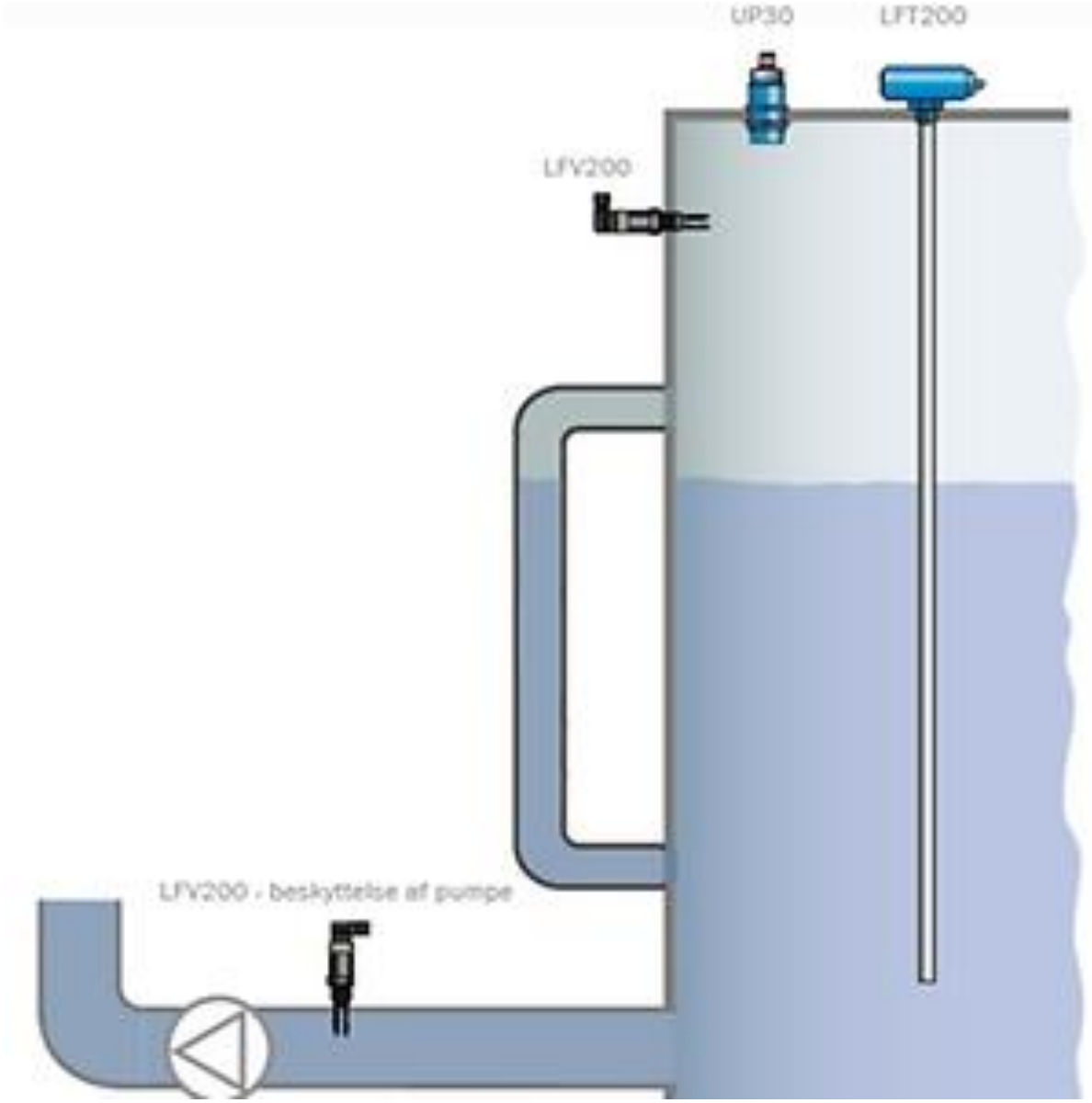
Level Sensor

Pressure transmitter, membrane

Radar



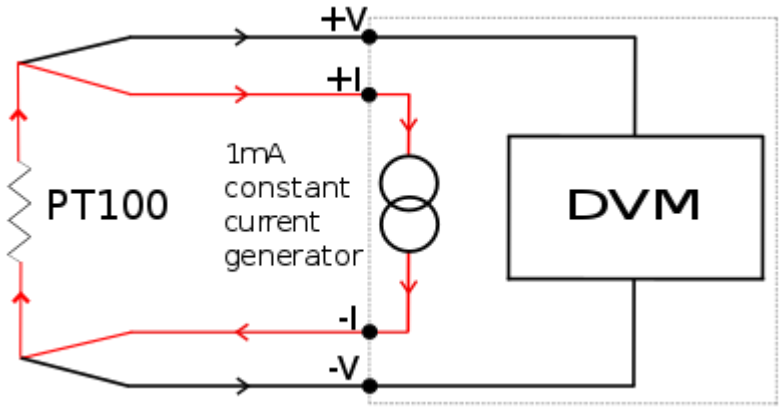
Ultrasound



Temperature

PT100/1000 sensor

Platinum resistance thermometers (PRT)



https://en.wikipedia.org/wiki/Resistance_thermometer

Temperature in °C	Resistance in Ω								
	ITS-90 Pt100[11]	Pt100 Typ: 404	Pt1000 Typ: 501	PTC Typ: 201	NTC Typ: 101	NTC Typ: 102	NTC Typ: 103	NTC Typ: 104	NTC Typ: 105
−50	79.901192	80.31	803.1	1032					
−45	81.925089	82.29	822.9	1084					
−40	83.945642	84.27	842.7	1135			50475		
−35	85.962913	86.25	862.5	1191			36405		
−30	87.976963	88.22	882.2	1246			26550		
−25	89.987844	90.19	901.9	1306		26083	19560		
−20	91.995602	92.16	921.6	1366		19414	14560		
−15	94.000276	94.12	941.2	1430		14596	10943		
−10	96.001893	96.09	960.9	1493		11066	8299		
−5	98.000470	98.04	980.4	1561	31389	8466			
0	99.996012	100.00	1000.0	1628	23868	6536			
5	101.988430	101.95	1019.5	1700	18299	5078			
10	103.977803	103.90	1039.0	1771	14130	3986			
15	105.964137	105.85	1058.5	1847	10998				
20	107.947437	107.79	1077.9	1922	8618				
25	109.927708	109.73	1097.3	2000	6800			15000	
30	111.904954	111.67	1116.7	2080	5401			11933	
35	113.879179	113.61	1136.1	2162	4317			9522	
40	115.850387	115.54	1155.4	2244	3471			7657	
45	117.818581	117.47	1174.7	2330				6194	
50	119.783766	119.40	1194.0	2415				5039	
55	121.745943	121.32	1213.2	2505				4299	27475
60	123.705116	123.24	1232.4	2595				3756	22590

Temperature

Thermo-elements

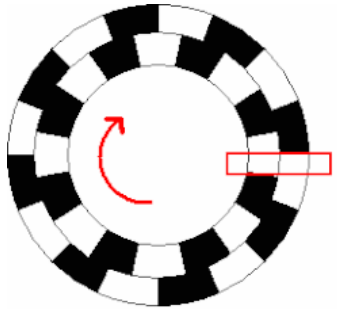
Termoelementfølere leveres i følgende standard typer.

Type J	**Fe-CuNi** **Velegnet måleområde:** +95°..+750° C **Nøjagtighed**: +/-2,5° C eller +/-0,75%
Type L	**Fe-CuNi** **Velegnet måleområde:** +100°..+600° C Udgået DIN 43 710 standard der ligger tæt på type J.
Type K	**NiCr-Ni** **Velegnet område:** 0°..+1200° C **Nøjagtighed:** +/-2,5° C eller 0,75%
Type E	**NiCr-CuNi** **Velegnet måleområde:** 0°..+800° C **Nøjagtighed**: +/-2,5° C eller +/-0,75%
Type S	**PtRh(10%)-Pt** **Velegnet måleområde:** +980°..+1450° C **Nøjagtighed**: +/-1,5° C eller +/-0,25%
Type R	**PtRh(13%)-Pt** **Velegnet måleområde:** +870°..+1450° C **Nøjagtighed**: +/-1,5° C eller +/-0,25%
Type B	**PtRh(30%)-PtRh(6%)** **Velegnet måleområde:** +600°..+1820° C **Nøjagtighed**: +/-1,5° C eller +/-0,25%
Type N	**NiCrSil-NiSil** **Velegnet måleområde:** +650°..+1250° C **Nøjagtighed**: +/-2,5° C eller +/-0,75%
Type T	**Cu-CuNi** **Velegnet måleområde:** -200°..350° C **Nøjagtighed**: +/-1,0° C eller +/-0,75%

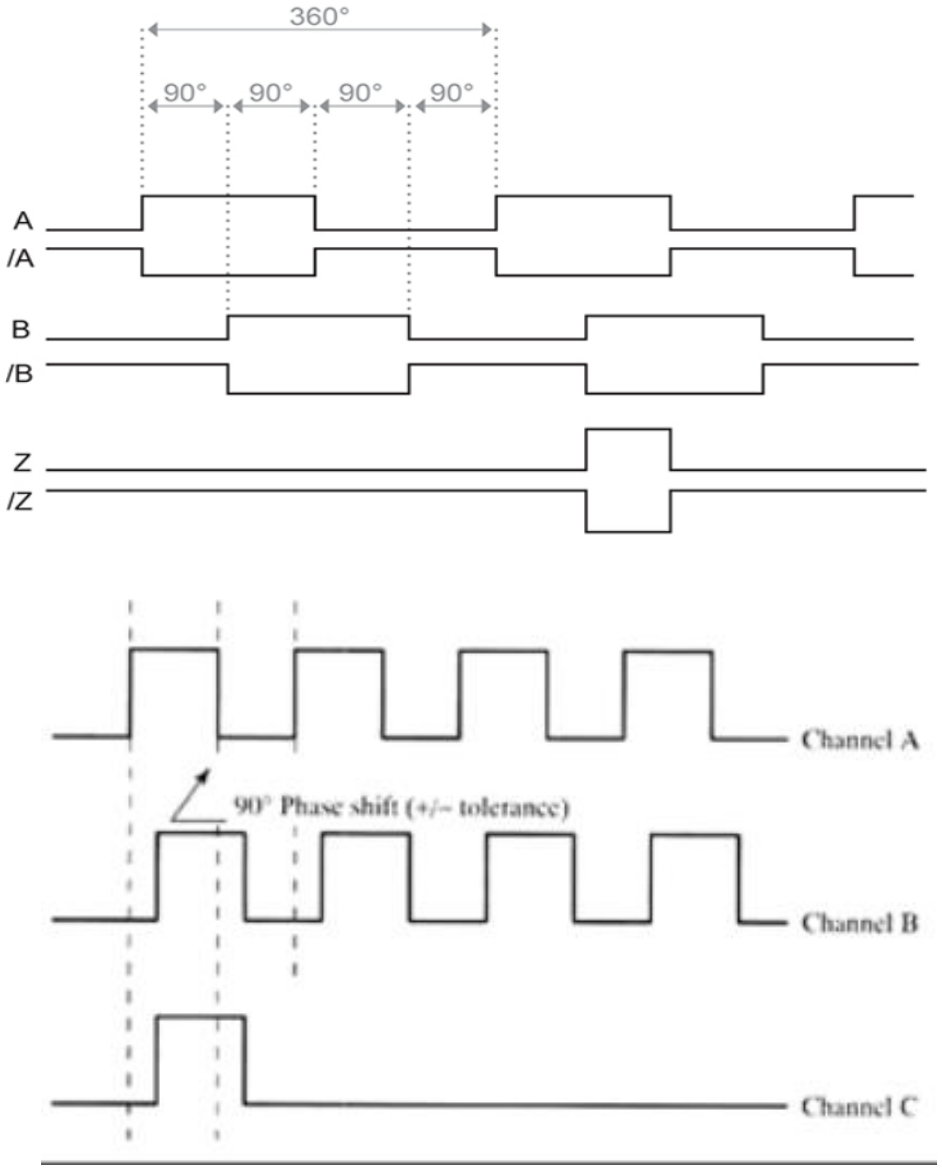
Pulse counter

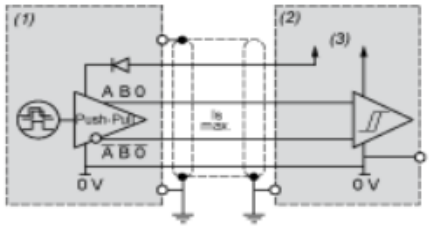
Encoders

A-B counter



A	B
1	1





(1) Encoder
(2) Processing
(3) Supply 11 V/30 V

Wiring Diagram

Cable Connections

Wire colour	BN	RD	VT	BU	YE	OG	GN	BK
Signal Supply	A^-	+V	0	0^-	B	B^-	A	0V

BN = Brown

RD = Red

VT = Violet

BU = Blue

YE = Yellow

OG = Orange

GN = Green

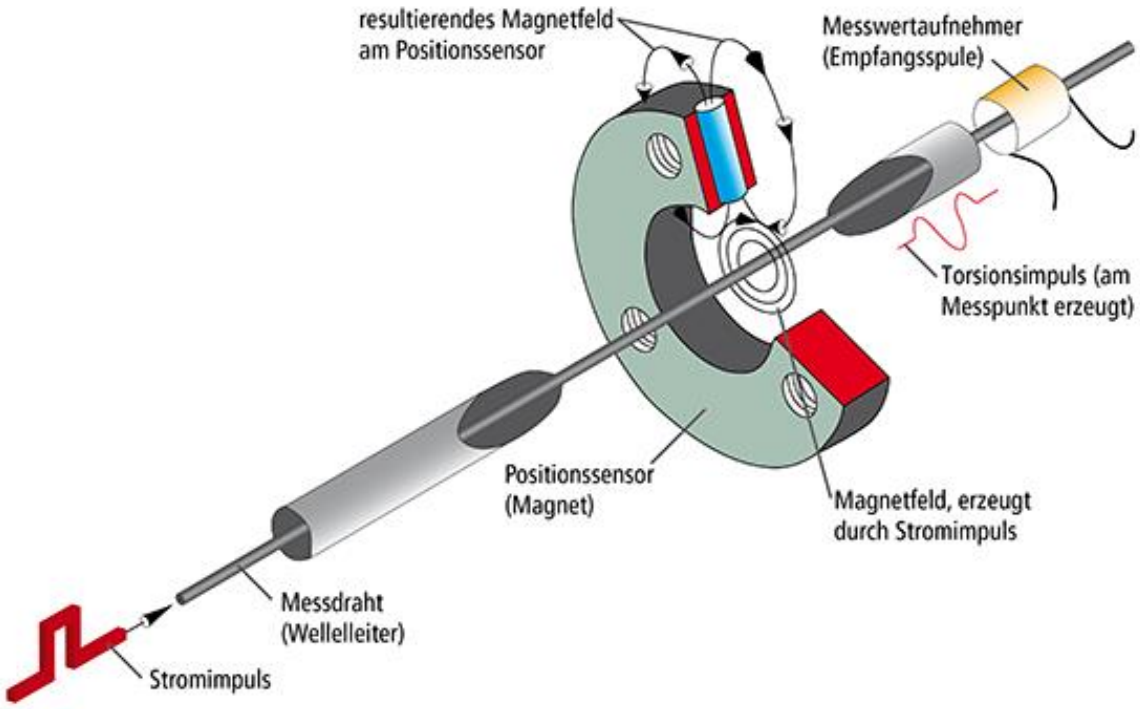
BK = Black

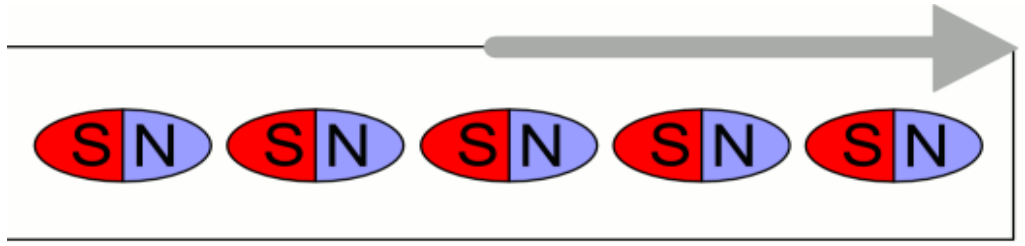
Linear encoder

Linear encoder with an analogue output signal

The magnetostriction principle is a body's change in volume by magnetising.

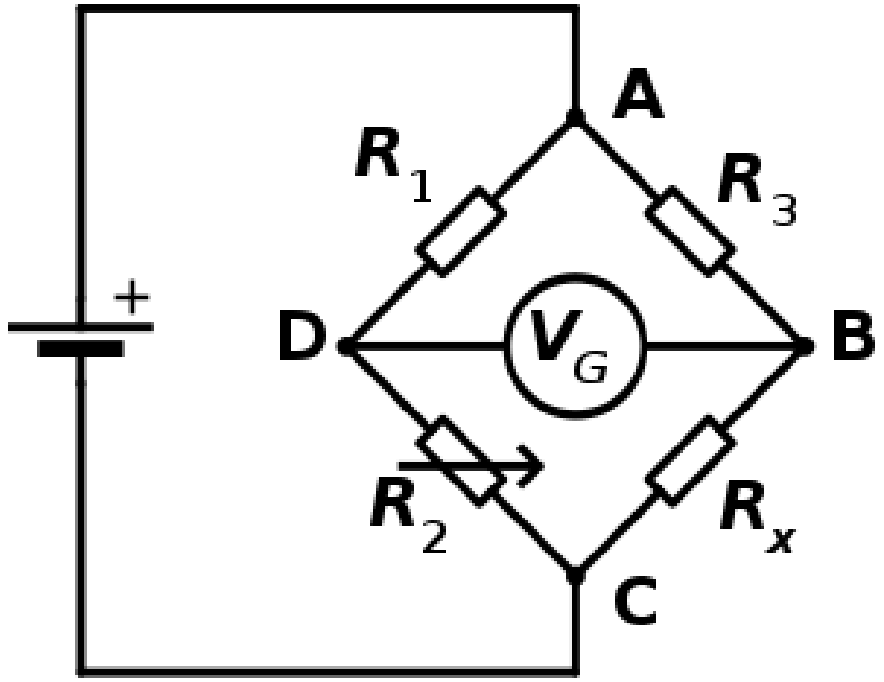
Sick MAX48





Load cells

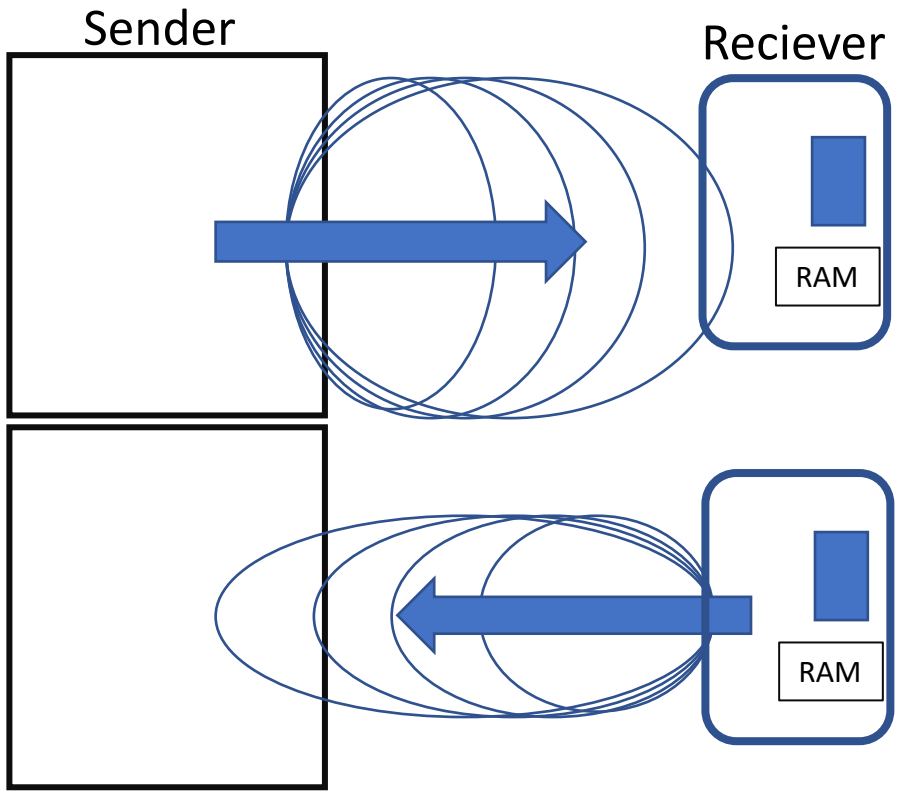
A load cell normally consists of four Strain Gauges, in a Wheatstone bridge configuration.



RFID sensor

RFID stands for **R**adio **F**requency **ID**entification. It is able to send the signal up to 100 meters.

It typically sendts a text string consisting of letters and/or numbers.



The energy from the radio signal is able to power a little condensator.

When the energy has reached a certain level, it is able to send its data to the unit.