Active sensors

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DC/DC LVDT sensors

XLT0950 compact long life range

- Measurement range: 10mm to 60mm
- Slim 9.54mm Ø housing/3.0mm Ø shaft
- Choice of mounting
- Contactless technology
- Integral or separate signal conditioning
- Superior temperature performance
- Duplex model

The XLT0956 and XLT0957 series is compact, long life, high temperature linear position sensor with integral electronics. Housed in a slim 9.54mm Ø stainless steel body, they have fully encapsulated, sealed internal electronics and electrical connections. The sensors are manufactured to quality standards required for high performance, high cyclic control and measurement systems. With a measurement range from 10mm to 60mm, the sensor operates from a 5Vdc regulated supply with a low noise analogue output of 0.5V to 4.5Vdc. The XLT's precision wound inductive coils enable an improved temperature performance (low thermal drift, typically <±0.005%FS/°C), compared to other similar inductive products. Also available is the XLTDP0957, a duplex sensor, which has the same fully encapsulated, sealed internal electronics and electrical connections. The XLT0955 model is designed for high temperature applications and has separate signal conditioning.

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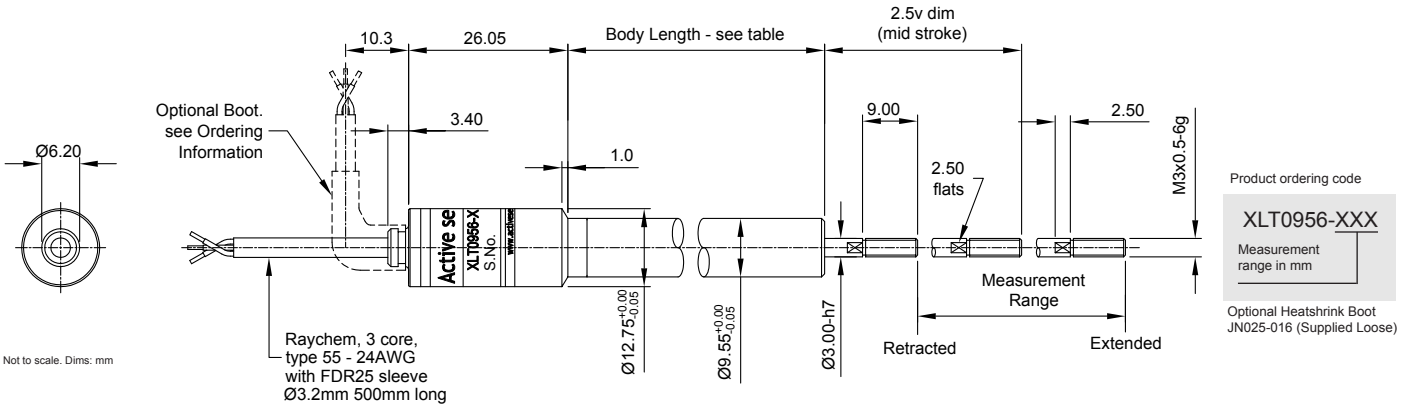
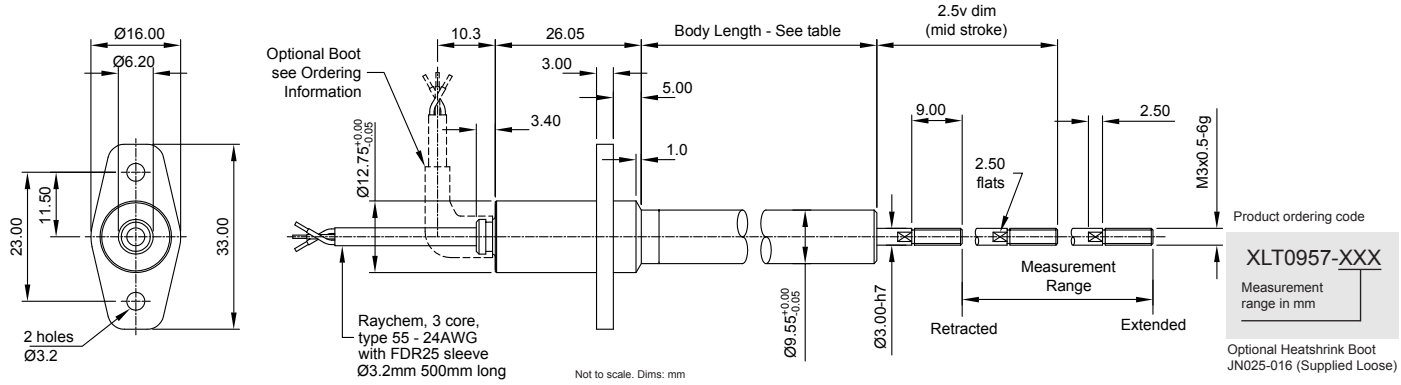
Model dimensions and mounting

XLT0956 - body clamp mount



XLT0957 - flange mount



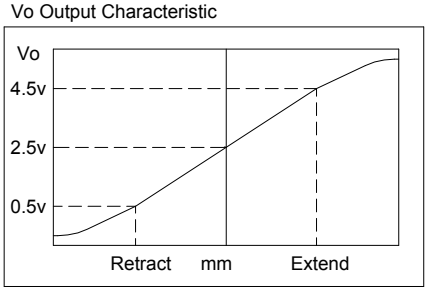
Electrical & mechanical information for XLT0956 and XLT0957 range

Measurement range		10	15	20	25	30	40	50	60	mm
Body length		42	42	52	52	62	72	77	87	mm
Non-linearity (note 2)		<±0.5%								FS
Operating temperature		-40 to +125								°C
Thermal drift (note 3)		<±0.010%								FS/°C
Input voltage (+Vs)		+5.0 ±5%								Vdc
Line regulation (note 4)		Ratio-metric with +Vs								
Supply current		<10								mA
Operating speed		<10								m/S
Sealing		IP67								
Weight	XLT0950	22.0	23.0	28.0	29.0	33.0	38.0	41.0	46.0	Grams
	XLT0957	24.5	25.5	30.5	31.5	35.5	40.5	43.5	48.5	Grams
Material		Case - Stainless Steel 416 Shaft - Stainless Steel 316 Core - Nickel iron alloy								

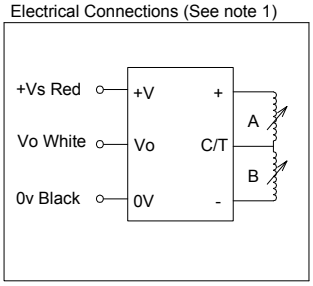
Analogue output

Output voltage (Vo)	0.5 to 4.5							Vdc
Sensitivity (±2%) (note 2)	400	266.7	200	160	133.3	100	80	66.7	mV/mm
2.5V dim (±1.0mm) (note 5)	20.5	23	25.5	28	30.5	35.5	40.5	45.0	mm
Frequency response (-3db)	500 (Nom)								Hz
Output noise and ripple	<0.1%								FS pk-pk

Vo Output Characteristic



Electrical Connections (See note 1)



Note:
1. Incorrect wiring will cause internal damage to the sensor.
2. Non-linearity error and sensitivity is calculated from least squares best fit method.
3. Average thermal drift over operating temperature range.
4. When +Vs = +4.75 to 5.25 Vdc.
5. Tested when +Vs is set at 5V ±1mV.

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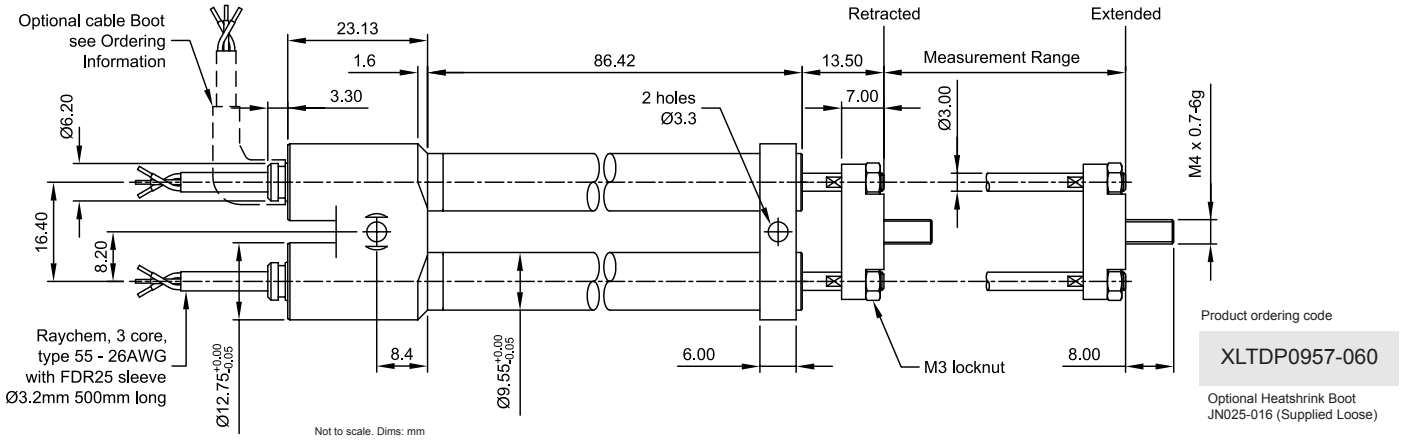
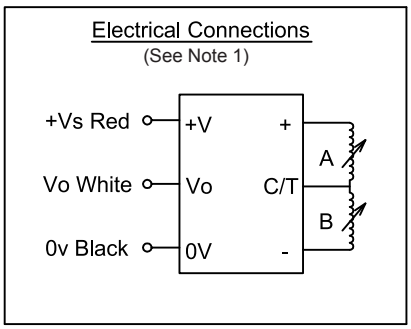
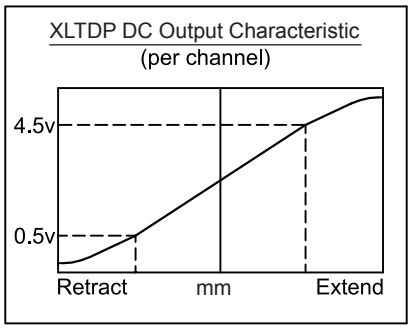
XLTDP0957 - duplex model



Electrical & mechanical information for XLTDP0957 range

Measurement range	60	mm
Input voltage (+Vs)	5 ±5%	Volts DC
Supply current	<10	mA dc
Output voltage (Vo)	0.5 to 4.5	Volts DC
Non-linearity	<±0.5	%
Phasing (channel to channel)	<1.0	%
Thermal drift	<±0.01%	FS/°C
Output load	>150	ohms
Output noise and ripple	0.1%	FS (pk-pk)
Frequency response (-3dB)	500 (Nom)	Hz
Mechanical range	Measurement range +1	mm
Shaft velocity	<1000	mm/sec
Operating temp. range	-40° to +125°	°C
Sealing	IP66	
Shaft operating force	<100 (typical)	grams
Material	Case - Stainless steel 416 Shaft - Stainless Steel 316	





Note:
1. Incorrect wiring will cause internal damage to the sensor.

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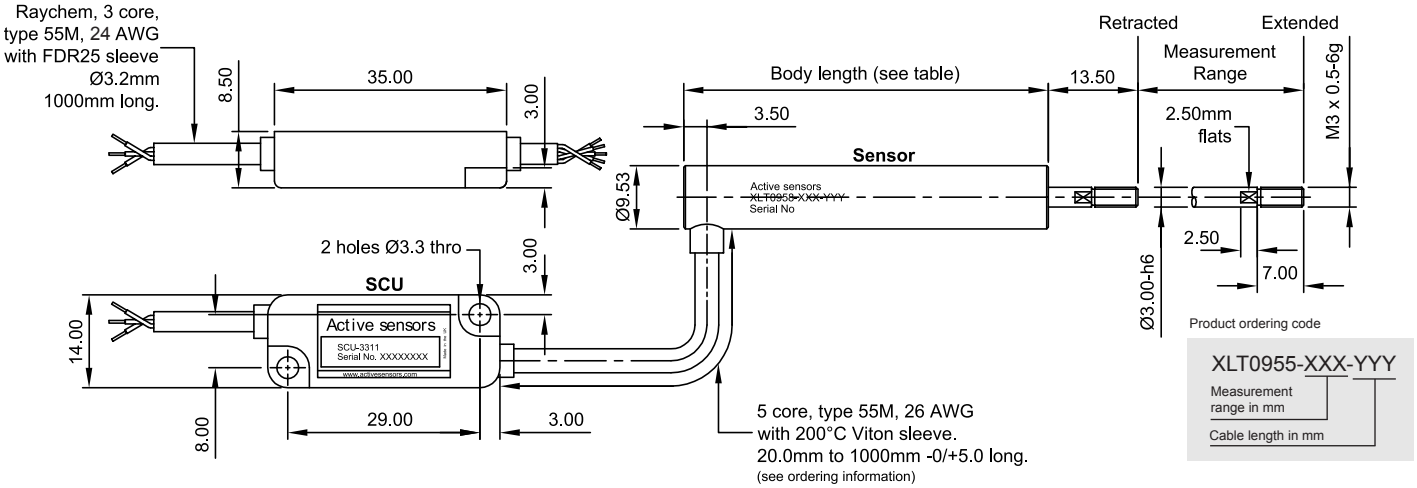
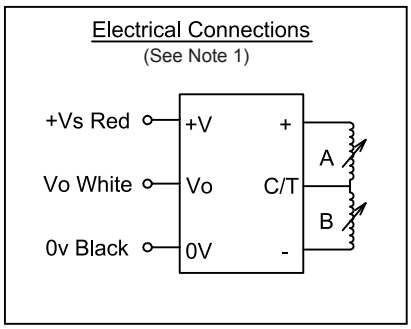
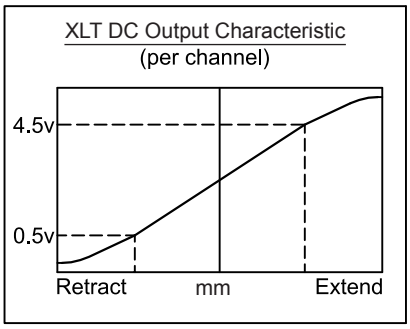
XLT0955 - high temperature model (separate signal conditioning)



Electrical & mechanical information for XLT0955 range

Measurement range	10	15	20	25	30	40	50	60	mm
Body length	45.0	45.0	55.0	55.0	65.0	75.0	80.0	90.0	mm
Input voltage (+Vs)	5 ±5%								Volts DC
Supply current	<10								mA dc
Output voltage (Vo) (Note 2)	0.5 to 4.5								Volts DC
Sensitivity (Note 3) ±1%	200								mV/mm
Non-linearity	<±0.50								%
Thermal drift	<±0.01%								FS/°C
Output load	>150								ohms
Output noise and ripple	0.1%								FS (pk-pk)
Frequency response (-3dB)	500 (Nom)								Hz
Mechanical range	Measurement range +1								mm
Shaft velocity	<1000								mm/sec
Operating temp. range	Sensor -40° to +180°				SCU -40° to +125°				°C
Sealing	IP66								
Shaft operating force	<100 (typical)								grams
Case material	Sensor - Stainless Steel 416				SCU - Aluminium				





Note:
1. Incorrect wiring will cause internal damage to the sensor.
2. Output (Vo) ratiometric with Input (+Vs).
3. Non-linearity error and sensitivity is calculated from least squares best fit method.
4. Output (Vo) will be 2.5V ±0.1V at mid range.

Other XLT DC/DC LVDT sensors available

XLT1300

- Measurement range: 25mm to 200mm
- Robust 12.7mm Ø housing/4.0mm Ø shaft
- Choice of mounting
- Integral or separate signal conditioning

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DC/DC LVDT sensors

XLT1320 compact long life range

- Measurement range: 25mm (1”) to 200mm (8”)
- Robust 12.7mm Ø housing/4.0mm Ø shaft
- Choice of mounting
- Contactless technology
- Integral or separate signal conditioning
- Superior temperature performance

The XLT1321 and XLT1325 is a compact, long life, high temperature linear position sensor with integral electronics. It is housed in a slim 12.70mm Ø stainless steel body and has fully encapsulated, sealed internal electronics and electrical connections. The sensor is manufactured to quality standards required for high performance, high cyclic control and measurement systems. With a measurement range from 25mm to 200mm, the sensor operates from 6 to 30Vdc unregulated supply with a low noise analogue output of 0.5V to 4.5Vdc. The XLT’s precision wound inductive coils enable an improved temperature performance (low thermal drift, typically <±0.005%FS/°C), compared to other similar inductive products. Also available in the XLT1328 sensor which is designed for high temperature applications and has separate

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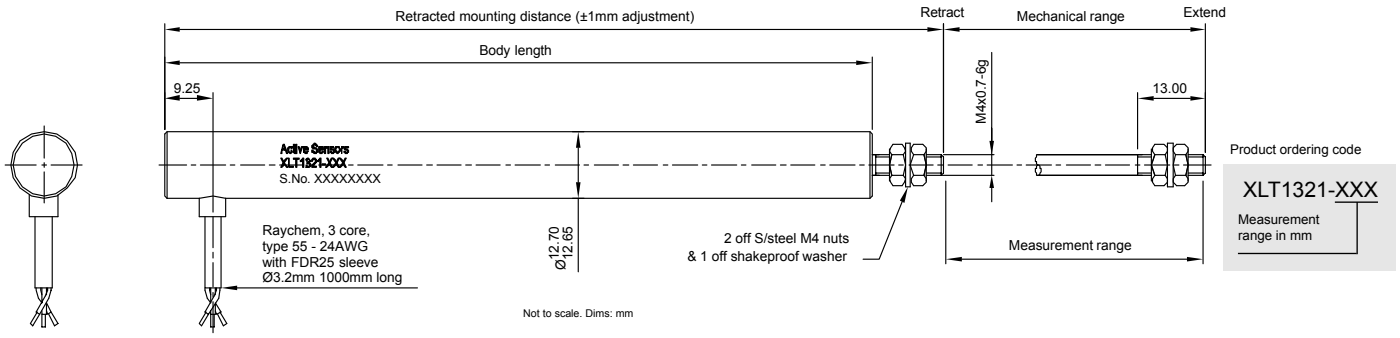
Model dimensions and mounting

XLT1321 - body clamp mount

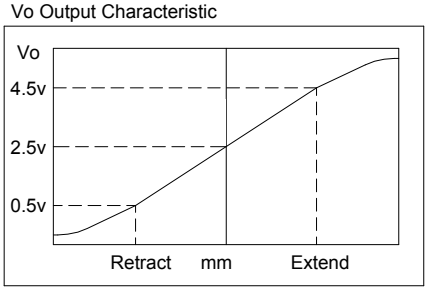


Electrical & mechanical information for XLT1321 range

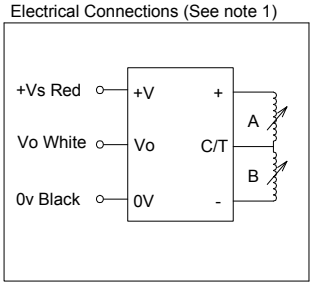
Measurement range	25	50	75	100	150	200	mm
Retracted mounting distance	124	149	174	199	249	299	mm
Body length	110	135	160	185	235	285	mm
Input voltage (+Vs)	+6 to +30						Volts DC
Supply current	<10						mA dc
Output voltage (Vo)	0.50 to 4.50						Volts DC
Non-linearity	<±0.30						%
Thermal drift	<±0.01%						FS/°C
Output load	>150						ohms
Output noise and ripple	0.1%						FS (pk-pk)
Frequency response (-3dB)	250 (Nom)						Hz
Mechanical range	Measurement range +1						mm
Shaft velocity	<1000						mm/sec
Operating temp. range	-40° to +125°						°C
Sealing	IP66						
Shaft operating force	<100 (typical)						grams
Weight (approx.)	71	83	105	108	141	166	grams
Material	Case - Stainless Steel 410 Shaft - Stainless Steel 303						

Note 1: Incorrect wiring may cause internal damage to the sensor.

Vo Output Characteristic



Electrical Connections (See note 1)



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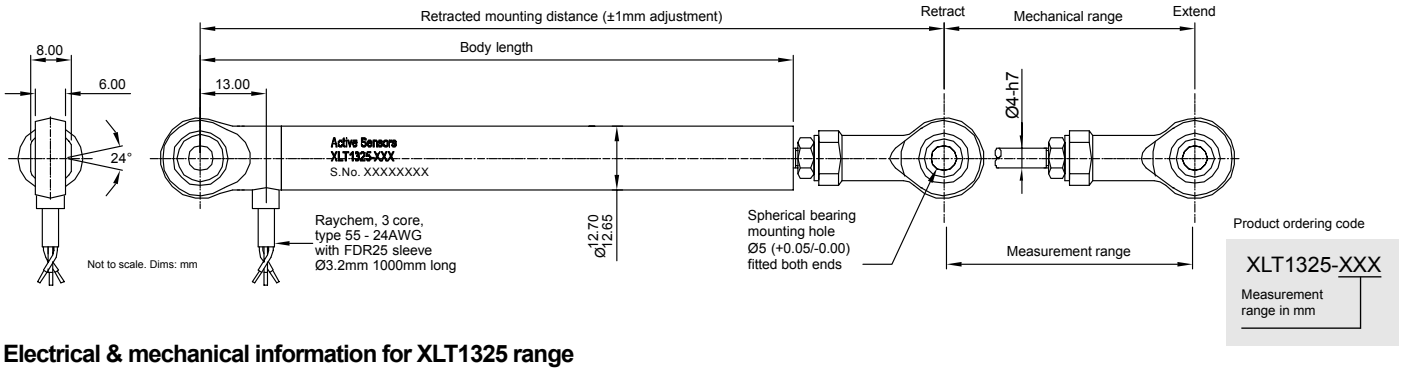
XLT1325 - rod end mount

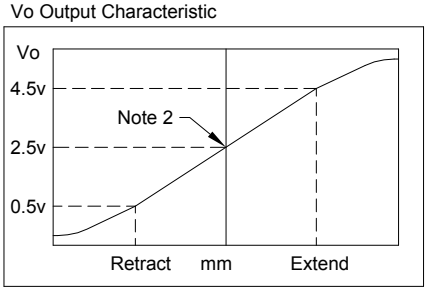


Electrical & mechanical information for XLT1325 range

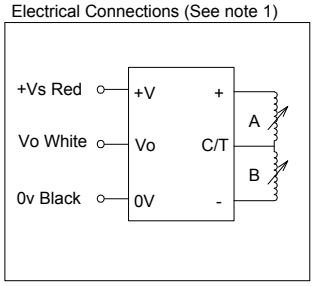
Measurement range	25	50	75	100	150	200	mm
Retracted mounting distance	173	198	223	248	298	348	mm
Body length	143	168	193	218	268	318	mm
Input voltage (+Vs)	+6 to +30						Volts DC
Line regulation (ΔVo)	<0.025%FS (+Vs = +6 to +30Vdc)						
Supply current	<10						mA dc
Output voltage (Vo)	0.50 to 4.50						Volts DC
Sensitivity (Note 3) ±1%	160	80	53.3	40	26.7	20	mV/mm
Non-linearity (Note 3)	<±0.30						%
Thermal drift	<±0.010%						FS/°C
Output load	>150						ohms
Output noise and ripple	0.05%						FS (pk-pk)
Frequency response (-3dB)	500 (Nom)						Hz
Mechanical range	Measurement range +1						mm
Shaft velocity	<1000						mm/sec
Operating temp. range	-40° to +125°						°C
Sealing	IP66						
Shaft operating force	<100 (typical)						grams
Material	Case - Stainless Steel 410 Shaft - Stainless Steel 303						

Note 1: Incorrect wiring may cause internal damage to the sensor.
Note 2: Sensor calibrated to 2.5v±0.01v at Retracted mounted distance + (Measurement range/2)
Note 3: Non-linearity error and sensitivity is calculated from least squares best fit method.

Vo Output Characteristic



Electrical Connections (See note 1)



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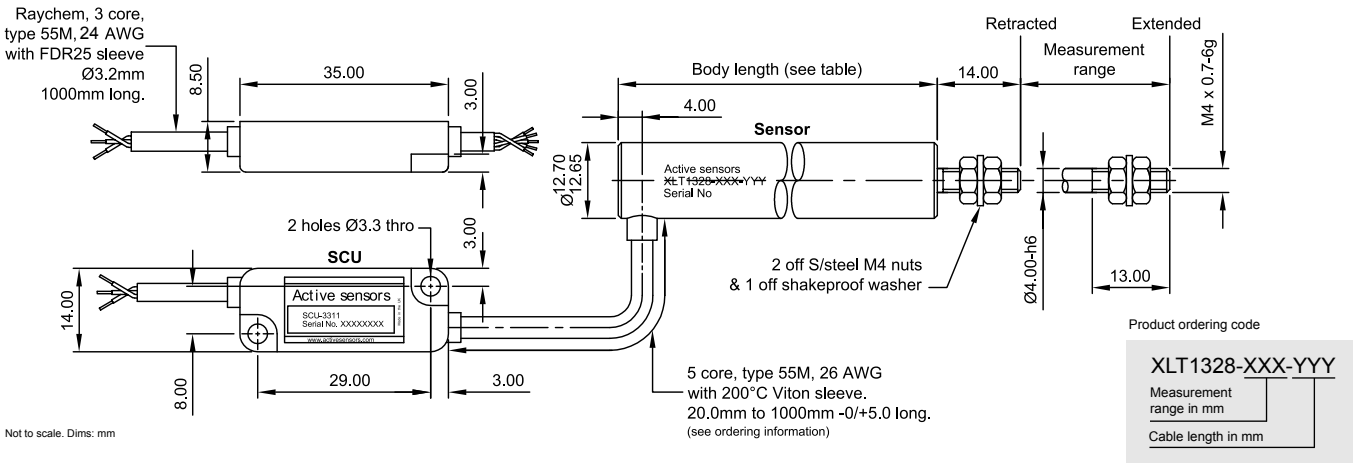
XLT1328 - high temperature model (separate signal conditioning)

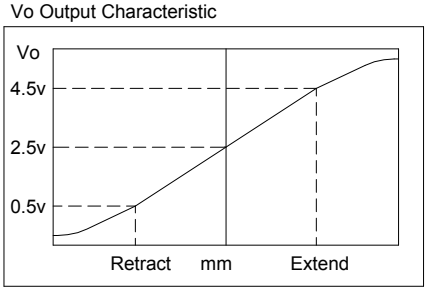


Electrical & mechanical information for XLT1328 range

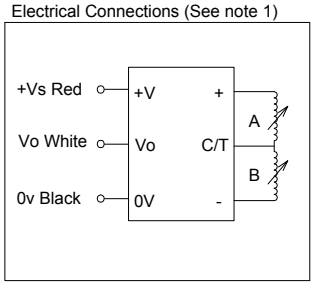
Measurement range	25	50	75	100	150	200	mm
Body length	80.0	105.0	130.0	155.0	205.0	255.0	mm
Input voltage (+Vs)	5 ±5%						Volts DC
Supply current	<10						mA dc
Output voltage (Vo) (Note 2)	0.50 to 4.50						Volts DC
Non-linearity	<±0.50						%
Thermal drift	<±0.010%						FS/°C
Output load	>150						ohms
Output noise and ripple	0.1%						FS (pk-pk)
Frequency response (-3dB)	500 (Nom)						Hz
Operating temp. range	Sensor - -40° to +180°			SCU - -40° to +125°			°C
Sealing	IP66						
Material	Sensor - Stainless Steel 410			SCU - Aluminium			

Note 1: Incorrect wiring may cause internal damage to the sensor.
Note 2: Output (Vo) ratiometric with input (+Vs)

Vo Output Characteristic



Electrical Connections (See note 1)



Other XLT DC/DC LVDT sensors available

XLT0950

- Measurement range: 10mm to 60mm
- Slim 9.54mm Ø housing/3.0mm Ø shaft
- Choice of mounting
- Integral or separate signal conditioning

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DC/DC LVDT sensors

XLT1321 and XLT1325 DC/DC linear position sensor technical information

(See datasheets for mechanical specification)

- Measurement range: 25mm (1”) to 200mm (8”)
- Contactless technology
- Operation up to +125°C
- 6V to 30Vdc input
- 0.5V to 4.5Vdc output

Internal circuit features

The sensors input circuitry contains its own linear regulator system that incorporates several features which make it ideal for use in automotive battery-powered systems. In addition to the normal features associated with sensors that contain voltage regulation, such as current limiting and thermal limiting, the sensor is protected against reverse input voltage. The input of the sensor will withstand reverse voltages of 50V. Current flow into the device will be limited to less than 6mA (typically less than 100µA) and no negative voltage will appear at the output, as the sensor protects both itself and the load and therefore provides protection against reverse connected batteries.

The XLT 1321/25 linear inductive sensor series have internal thermal limiting designed to protect the sensor during overload conditions. For continuous normal conditions the maximum temperature rating of 125°C must not be exceeded. It is important to give careful consideration to the thermal resistance from sensor case to ambient during high temperature operation and any additional heat sources mounted nearby must also be considered.

The output circuit contains a high output drive CMOS operational amplifier with a high tolerance to resistive (RL) and capacitive (CL) loads and is therefore suitable for line driver applications as it possess a 25mA dc output drive capability The output amplifier is stable with capacitive loads up to 780pF. When driving higher capacitive loads, a low value isolation resistor (39O) connected in series with the output improves the transient response and the phase margin. The lead length between the sensor and the dc power source and the signal output (Vo) and the data aquisition system should be kept below 10m.

Wire functions

RED (+Vs): A dc voltage is applied to this wire to power the internal signal conditioning electronics of the sensor. The supply can be a regulated or unregulated voltage supply, providing the level does not exceed that stated in the operating voltage range of the sensor. Permanent damage may result if the supply voltage exceeds the absolute maximum levels. The voltage supply must be capable of supplying 10mA of current, to power the internal electronics plus the maximum output current (Iout) supplied to the load.

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BLACK (0V): This wire is connected to the supply return, 0v or ground of the sensor's external power supply system. The black wire is isolated from the sensors conducting case.

WHITE (Vo): This wire provides a low noise output voltage signal (0.5V to 4.5V) from the sensors output amplifier and is referenced to the sensors black terminal wire. The resistive (RL) and/or capacitive (CL) loads connected to this terminal and the corresponding output current (Iout), must not exceed the limit specified.

Absolute maximum ratings

Permanent damage may occur if the XLT1321/25 sensor is exposed to any conditions outside its absolute maximum rating.

Supply voltage	(+Vs) +50V	
Operating temperature range	-40°C to +125°C	(Note 1)
Storage temperature range	-40°C to +125°C	
Maximum power dissipation	1W	
Output current (Iout)	<30mA	(Note 2)

Operating specification

TA= +25°C, +Vs= +12Vdc, RL= 10KΩ, CL= 0pF unless otherwise stated.
♦ see operating characteristics

Parameter	Symbols	Conditions	Min	Typ	Max	Units
Input voltage	+Vs		4.75		30	Vdc
Input current	Is	♦ +Vs = +4.75 to +30Vdc		7	10	mA
Output voltage	Vo		0.5		4.50	Vdc
Sensitivity tolerance (±)		Note 3, 4			1.0	%
Output current	Iout	♦ see derating graph			25	mA
Output resistance		Up to 10Khz			0.10	ohms
Line regulation	△Vol/△+Vs	♦△+Vs = +6v to +30Vdc			0.01	%FS
Output noise/ripple		♦ RL=10K, CL=0pF			0.10	%FS p-p
Power on settlement		♦ within 0.25%FS of final output			200	mS
Under voltage cutout		♦ RL=100K		4.0		Vdc

Performance specification

Parameter	Symbols	Conditions	Min	Typ	Max	Units
Measurement range			25		200	mm
Non-linearity (±)		Note 4		0.2	0.3	%FS
Resolution				INFINITE		
Operating temperature	t°C	♦ Note 1	-40		+125	°C
Thermal drift (±)		♦ Note 5		0.005	0.010	%FS/°C
Frequency response	Bw	♦ Note 6		500		Hz

Load specification

Parameter	Symbols	Conditions	Min	Typ	Max	Units
Load resistance	RL		180			ohms
Load capacitance	CL				780	pF
Lead length					10	m

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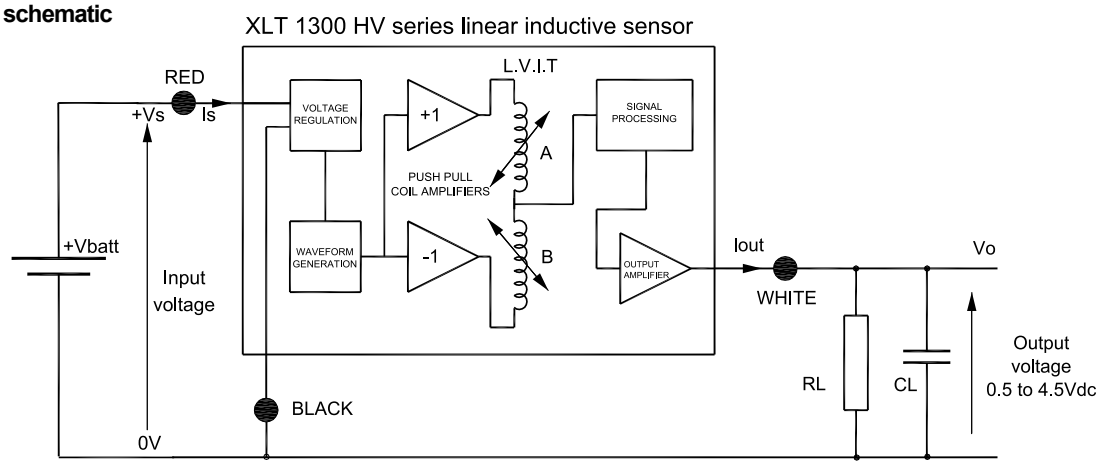
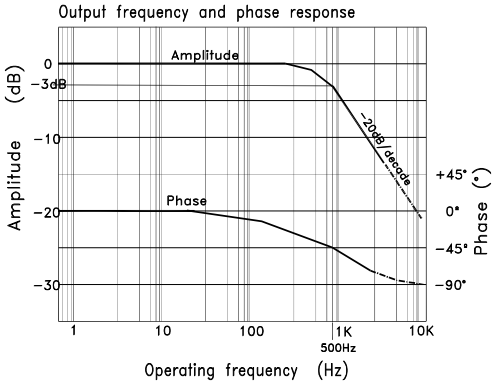
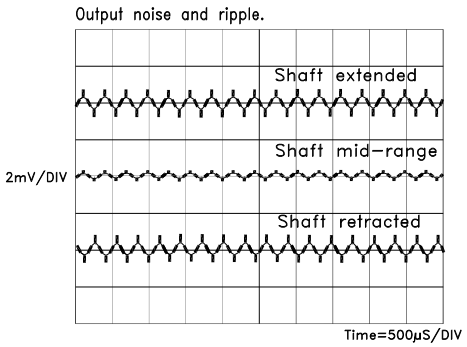
Connection schematic

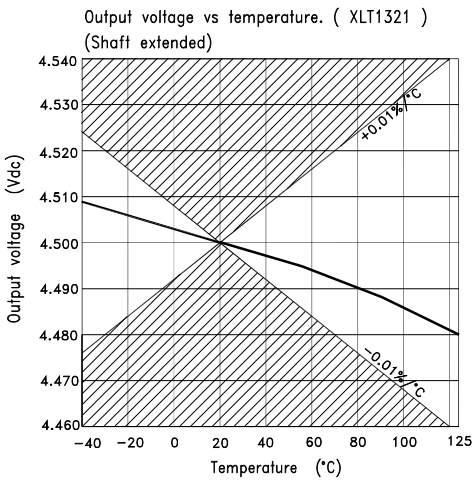


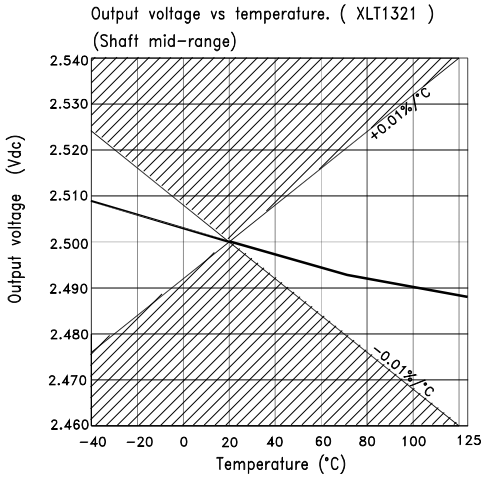
Operating characteristics

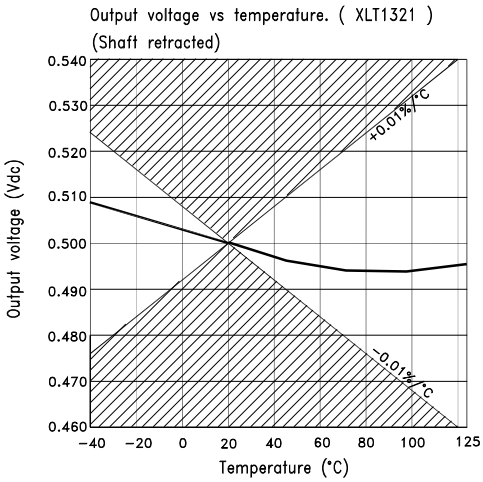
TA= +25°C, +Vs=+12.0Vdc, RL= 10KΩ, CL= 0pF unless otherwise stated.

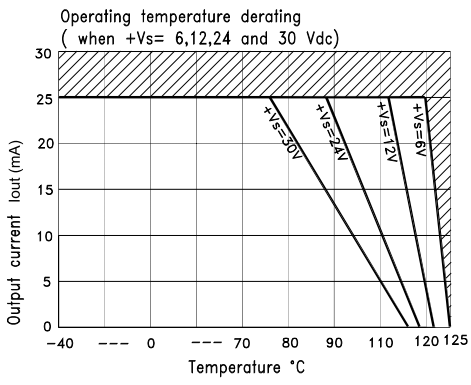












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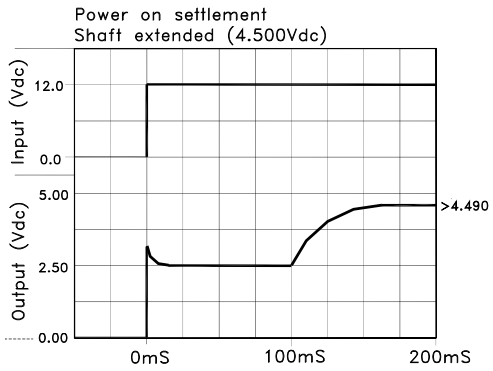

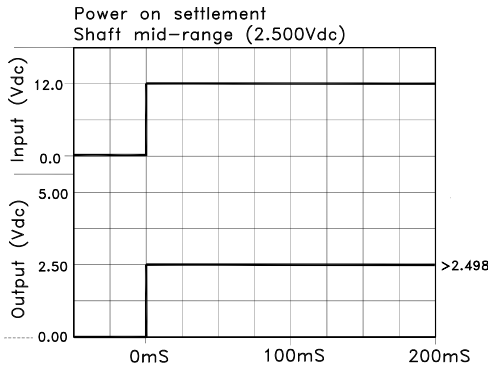

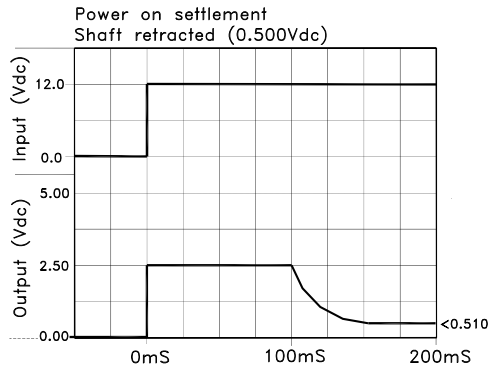

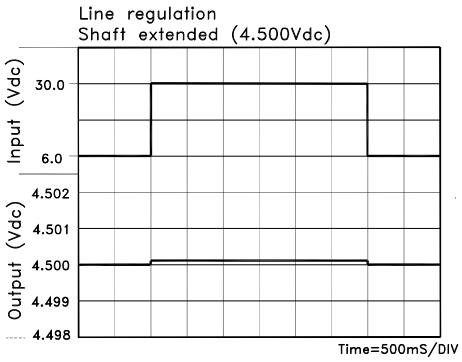

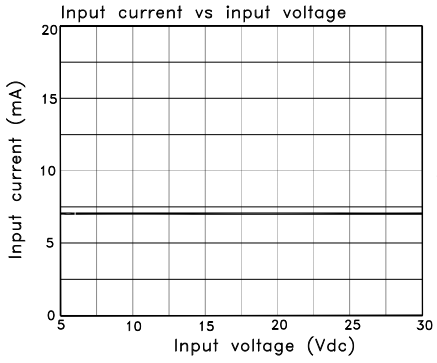

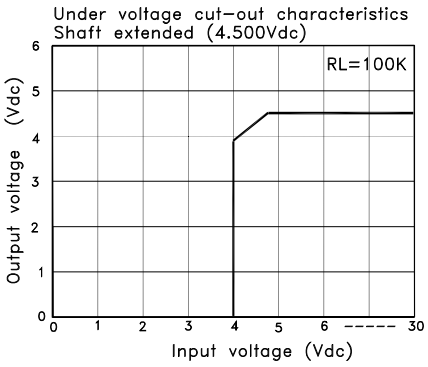

Notes

Note 1: when +Vs=+6Vdc and RL>100KΩ, otherwise see operating temperature derating characteristics.

Note 2: The output current (Iout = Vo/RL) can reach 30mA as long as the maximum power dissipation of the sensor is not exceeded.

Note 3: Ideal sensitivity (mV/mm) is calculated from the ideal span voltage of 4000mV (4.5-0.5Vdc), divided by the sensor measurement range in mm.

Note 4: Non-linearity error and sensitivity is calculated from the least squares best fit method.

Note 5: Average thermal drift over –40 to +125°C temperature range.

Note 6: -3dB Bandwidth with a 1st order (-20dB/decade) roll-off.

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