Precision AutoResearch

CVT Belt Slip Sensor

For many years, racers using CVT systems have divided engine RPMs by jackshaft RPMs and have believed that ratio represented actual clutch ratio. It does not, simply because it does not account for the effect of belt slippage on clutch ratio. But belt slippage could not be measured although everyone agreed there must be a great deal of slippage necessary to produce the observed belt temperatures. Until now.

The new, Black Diamond CVT Belt Slip Sensor is an innovative breakthrough enabling the accurate measurement of CVT clutch belt slippage, even while on the race course.

A CVT clutch is a wonderful device when it functions exactly as intended. Unfortunately, it is almost impossible to ensure that the calculated clutch ratios are the true clutch ratios actually delivered by the sheaves.

Using on-board data collection, It is common practice to measure crankshaft speed and jackshaft rotational speed. Dividing the engine rpm by the shaft rpm should give the clutch ratio. Unfortunately it does not. The critical problem is the matter of belt slippage which thwarts all attempts to measure true clutch ratio.

Until now. By using a special optical belt speed sensor along with engine rpm and jackshaft speed, it is now possible to accurately measure and record the apparent clutch ratio, the true clutch ratio and the clutch slippage at every rpm and speed point on the track or trail.

Mounting the Belt Slip Sensor

The Belt Slip Sensor is easily and quickly mounted with a simple bracket aimed at any point on the belt outer surface. The distance from the belt is adjustable and the electrical connection is via a simple snap together connector.

Operation

In order to function, the sensor must be powered by a minimum of 10.0vdc. The sensor operates as a on/off switch. The on state is indicated by green and yellow LEDs on the sensor. The yellow led indicates that marginal on (bright) state has been attained. Maximum response rate is 1000Hz or 60,000 pulses per minute.

Target preparation
The first step is to ensure the belt presents a suitable visual target. The clutch belt should have all stickers and markings removed or painted a dark color. A light colored stripe is then applied to the belt using any flexible paint.

Best performance is obtained with a fully black object, marked with reflective (silver or bright white) paint stripes in the area of sensor excitement. Painted stripes should be long enough to permit excited state for at least 1.25ms. For most belt applications, a two to four inch wide white stripe is sufficient. You may supply more than one stripe, provided they are equidistant along the belt length. Use black paint for the remainder of the belt, to mask additional markings which may trigger the sensor.

Installation/Calibration
Mount the installation bracket so that it is aimed at the striped marking on the belt. Installation is made by inserting the sensor in a 19mm hole in a suitable bracket and securing with locking shaft nuts. Install the sensor perpendicular to the target (+/-5deg). Ideal distance is 5-40cm; maximum reliable detection limit is 45-50cm.

Once installed, the sensor should be calibrated using the calibration screw adjacent to the indicator LED's. Operation of this function is as follows:

1) With light (white) target in view of sensor, adjust calibration screw until both Green and Yellow LEDs turn on. ***Yellow or Yellow/Green LED should remain solid (ON) through all white target regions***.
2) With target (black) in view of sensor, both LEDs should be OFF. If not, then readjust calibration screw until LEDs are off. ***Yellow LED should be OFF through all black regions***.
3) Repeat steps 1/2 as necessary. If Yellow LED (no Green) is excited in either target zone, then insufficient delineation has been established between white and black targets. Bring sensor closer to target or increase contrast between white and black target colors. Consider the effect of belt reposition, due to clutch sheave movement.

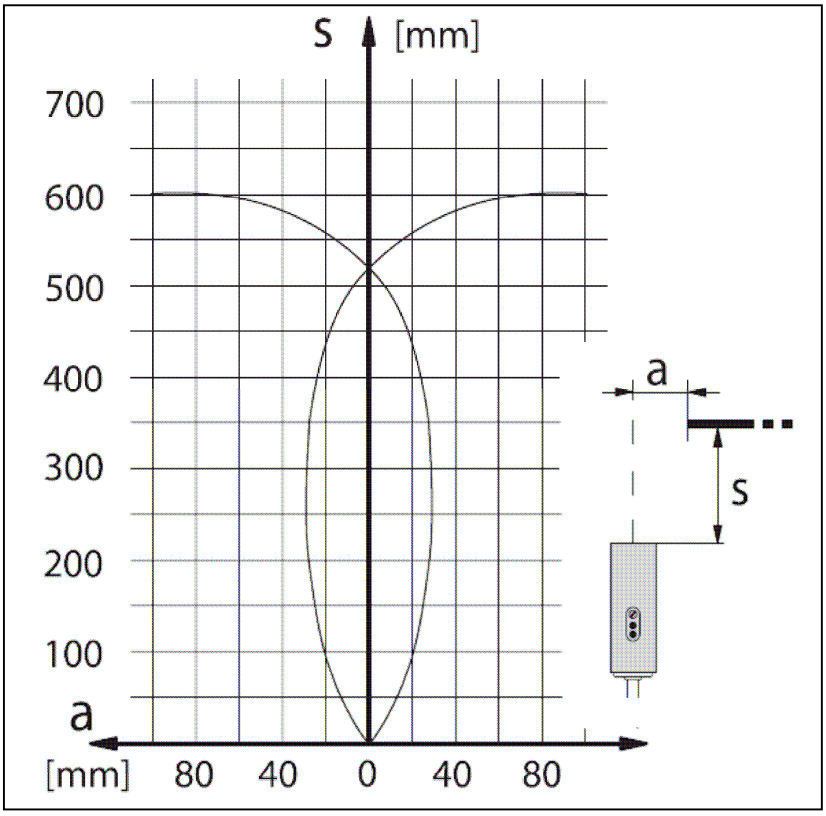
Repeat steps 1/2 as necessary. If Yellow LED (no Green) is excited in either target zone, then insufficient delineation has been established.

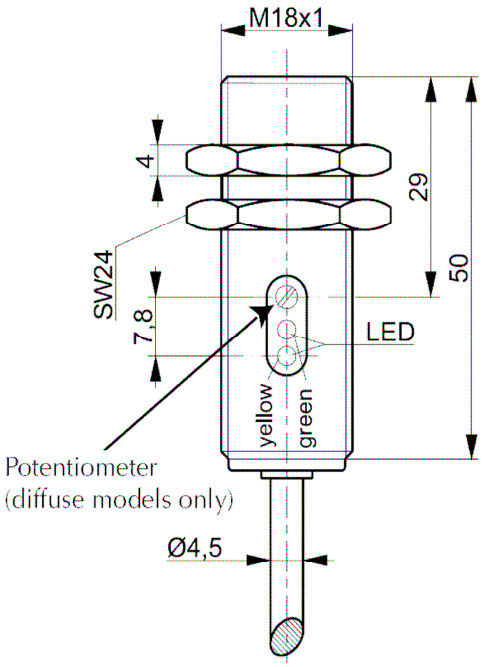
Maintenance
While the sensor itself requires no maintenance or service, it is a good idea to inspect it on a regular basis to ensure that the lens is free of snow, dirt and debris. In exceptional severe duty conditions, a threaded tube may be installed to protect the lens from unwanted elements.

Specifications

Housing style	M18 x 1.0 threaded full length
Housing material	Nickel plated brass
Power supply	10-30vdc @ 15mA
IR beam	Infra-red led (~880nm)

Sensing range	500mm (20”) adjustable with calibration screw
Output	<100mA during excitation state
Response	1000Hz
Indicators	Green ON (excite state, gain ≥2) Yellow ON (excite state, gain≥1) Green & Yellow OFF (dark state)
Operating temp	-13° to 131°F





Technical support
As always, product technical support is readily available from qualified racing engineers. If you have any questions, do not hesitate to call.

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(630) 766-4402