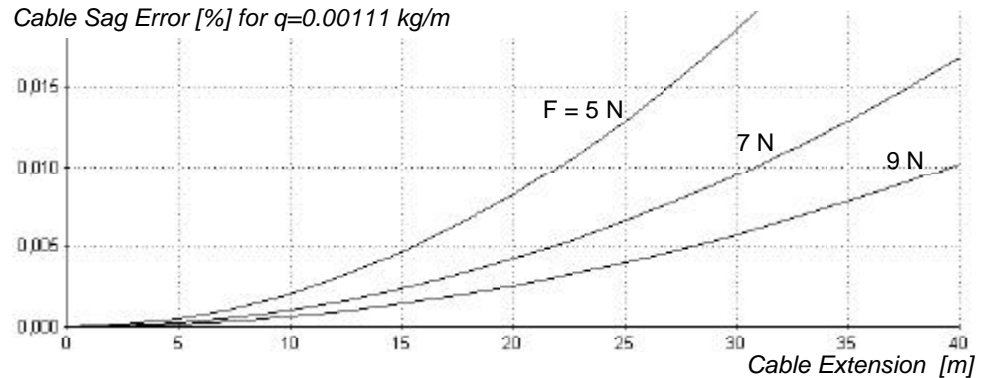


Cable Sag

When the sensor cable is used horizontally a small amount of cable sag is experienced. This sag does not produce any significant error and can be ignored in comparison with other sources of measurement error. It is dependant on cable extension, pull-out force and and gravitational effects and can be quantified by the formula for catenary curves shown below.

Cable Sag Error [%] for $q=0.00111 \text{ kg/m}$



$$l = 2 \cdot \lambda \cdot \sinh\left(\frac{a}{2\lambda}\right), \quad \text{with } \lambda = \frac{H}{q}$$

$$f \approx \frac{a}{4} \cdot \sqrt{6 \cdot \left(\frac{l}{a} - 1\right)}$$

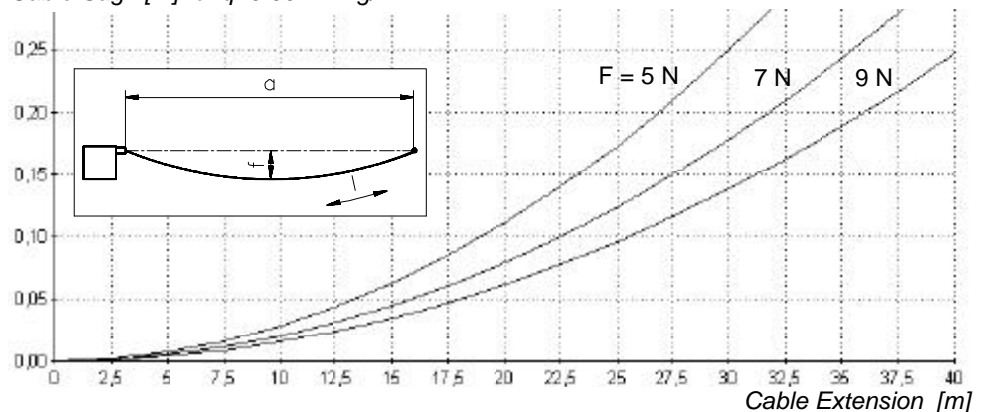
F = Pull-out Force [N]
 H = F/g with $g = 9.81 \text{ m/s}^2$
 a = Cable Extension [m]
 l = Cable Length [m]
 q = Weight per Unit Length [kg/m]
 f = Cable Sag [m]

(Source: Hütte Ed: A29; Ch's: E25 (21); E25 (23) with $h=0$)

In some very long applications the total amount of cable sag produced will require the user to ensure free cable movement at all times.

With the above formula the actual cable sag in a specific application can be calculated (see diagram below). The cable forces depend on sensor type and are specified in the data sheet for each model.

Cable Sag f [m] for $q=0.00111 \text{ kg/m}$



WS Position Sensors are engineered to minimize measurement error caused by cable sag. Only the very longest cable extensions will produce significant sag errors. In this case provision must be made to allow free cable movement or alternatively cable support wheels or guides must be provided.

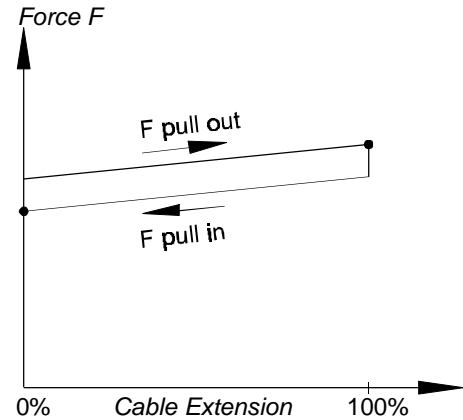
The above information is provided as a user guide only and is not part of our specific technical product data.

Maximum Pull-Out Force

This is the maximum value of the force required to pull the cable out of the sensor unit and is reached when the cable is almost at its maximum travel.

Minimum Pull-Out Force

This is the minimum value of the force required to pull the cable back into the sensor unit and is reached when the cable is almost at its minimum travel.



Maximum Acceleration

This is the maximum permissible value (in m/s^2) that the moving component to which the measuring cable is attached may accelerate in either direction. It is valid in both acceleration and deceleration conditions and must not be exceeded as the cable may jump off the cable drum causing possible sensor failure.

Resolution

The resolution of a WS Position Sensor depends on the device used as the sensing element. The potentiometers used by ASM have an essentially infinite resolution, limited only by "noise".

WS Position Sensors with incremental or absolute encoders as the sensing element are available with up to 25 pulses (counts) per mm. Higher pulse counts are only necessary for very special applications e.g. certain control systems that depend on high pulse rates.. In situations where high pulse rates are required encoders with sine wave output signals can be useful. Additional pulses can also be generated by external interpolating circuits giving pulse counts up to 100 per mm.

Resolution must not be confused with accuracy.

Although incremental WS Sensors are limited in their resolution they provide better long term linearity and repeatability when compared with analog sensors.

Application Information

At ASM our aim is to ensure we provide the best sensor for your application first time, every time. To help us achieve this goal we have developed a User Application Information Form which you will find on the following two pages. Please complete as many sections as possible and return to ASM. Our product engineers thoroughly understand the capabilities of our WS Position Sensors and their applications and can offer you the right advice on choosing the best sensor for your positioning job.

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