Magnetic Clutches Explanation

At overload status the hysteresis clutches and brakes slip through. The losses (due to the slip rotation speed and torque) are transformed into heat. If the dissipation power exceeds the quantity of heat which can be conducted to the environment, the clutch (brake) will superheat. With the formula on the right side it is possible to check if the chosen max. power loss of the clutch (brake) ist sufficient for the desired operation.

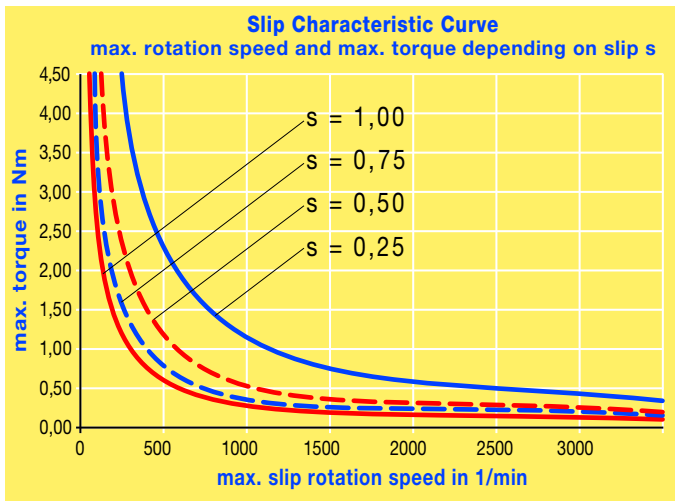
$$P_V = \frac{T \times n_s}{9{,}55} \times s$$

P_V: max. power loss (W)
T: applied torque (Nm)
n_s: slip rotation speed (min^{-1})
s: slip (-)

Example 1: A hysteresis brake of type HSV 2 (P_{vmax} = 23 W) is applied as spool brake (s = 1). The applied torque shall be 1,5 Nm. Which rotation speed is allowed permanently, without superheating the brake?

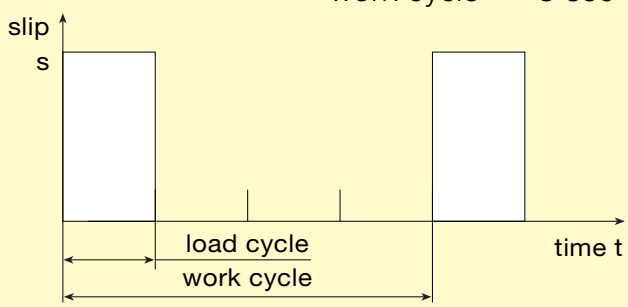
$$P_V = \frac{T \times n_s}{9{,}55} \times s \Rightarrow n_s = \frac{9{,}55 \times P_V}{T \times s} \Rightarrow n_s = \frac{9{,}55 \times 23W}{1{,}5\ Nm \times 1} = 146\ min^{-1}$$

The brake can slip permanently with a rotation speed of 146 min^{-1}. Starting out from this result the average paper speed (dependent on the diameter of the roll of paper) can now be calculated.



Example 2:
A hysteresis clutch of type HSV4a is applied in a bottle capping machine. One work cycle lasts 8 seconds. 6 seconds of this the clutch is engaged, 2 seconds the inner and the outer part are rotating relatively to each other. This 2 seconds are the actual load cycle of the clutch – the clutch is slipping.

$$\text{slip } s = \frac{\text{load cycle}}{\text{work cycle}} = \frac{2\ sec}{8\ sec}$$



With an applied torque of T_N = 4 Nm and a slipping rate of 25% (s = 0 ,25) the permanently allowed rotation speed is n = 287 min^{-1} (see formula and diagram)!