calculating thrust force and drive power

To select the appropriate lift type for your application, you need to know the total thrust force that will be applied to the lift system. Moreover, this force has to be known to calculate the drive output power required.

thrust force

The **total force,** *Ft,* which is to be applied to the lift (all strands) is the sum of the load's weight force, the friction force, acceleration or deceleration forces and external forces.

$$Ft = Fw + Ff + Fa + Fe \text{ [N]}$$

The **weight force,** *Fw,* is calculated by multiplying the load's mass (in kg) by the gravity constant:

$$Fw = M \times 9.81 \text{ [N]}$$

Note that the weight force must include the **weight of the platform and/or supporting structures.** For strokes greater than 3 m, the weight of the lift strands has to be included as well.

The **friction force,** *Ff,* chiefly depends on the surface properties of the guiding elements. It is obtained by multiplying the relevant share of the weight force by the friction factor for the guiding.

Acceleration and/or deceleration forces, *Fa,* have to be considered according to the individual application.
External forces, *Fe,* may occur through shock loads, for example, when the lift hits a mechanical stop.

The force applied to **each single lift column** is obtained by dividing the total force by the number of columns.

drive power

To calculate the motor power required, the drive moment and revolutions per minute (rpm) must be known.

The **drive moment** *M* is calculated on the basis of the total thrust force:

$$M = \frac{Ft \times 10^{-3} \times p}{0.8} \text{ [Nm]}$$

– where *Ft* is the total of all forces in effect (see above), *p* is the pitch of the lift in mm and *0.8* is a constant that takes account of system efficiency.

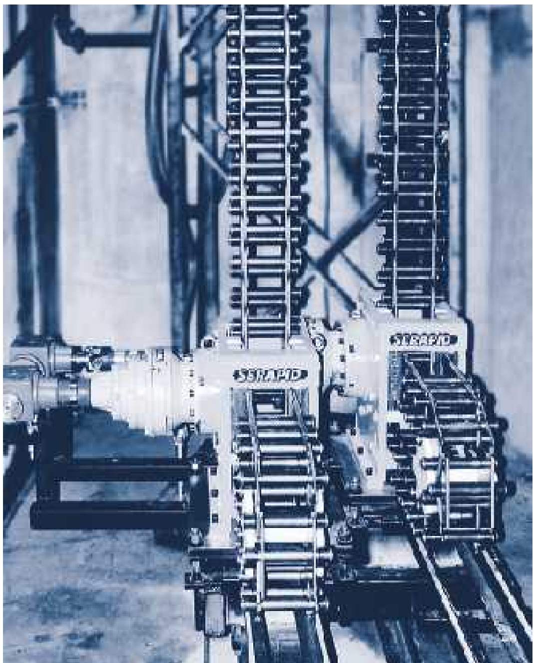
The number of **drive revolutions,** *R,* is calculated on the basis of required speed:

$$R = \frac{\vec{S}}{6 \times 10^{-3} \times p} \text{ [rpm]}$$

– where $\vec{S}$ is the motion speed in m/min, *6* is the number of pinion teeth and *p* is the pitch of the lift in mm.

The required **output power** *P* can be obtained with the formula:

$$P = \frac{M \times R}{9550} \text{ [kW]}$$



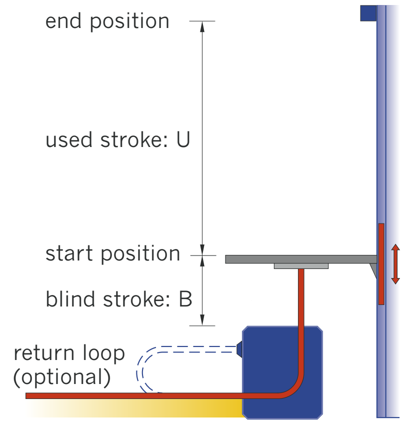
calculating the length of the lift strands

The length of a lift strand is basically the length of the stroke plus the few additional links that remain inside the drive housing and, if required, the links used for looping the return and attaching its rear end to the housing.

If there is a distance between the drive housing and the load's start position, the length of that blind stroke, *B*, has to be added to the actually used stroke, *U*. The total length of the strand is usually specified by the number of links. This number, *L*, is obtained by:

$$L = \frac{B + U}{p} + Lc + Lr \text{ [links]}$$

– where *p* is the pitch of the links. *Lc* is the number of links that remain in the drive housing; it is 5 for the ChainLift and 4 for the LinkLift. *Lr* is the number of links used for the optional return loop and end attachment; it is 9 for the ChainLift and 8 for the LinkLift. – If necessary, the result has to be rounded to the next higher integer.



standard-duty and heavy-duty lift systems

Following the requirements of current applications, SERAPID offers two lines of lifting systems. On the one hand there is a wide range of tasks where lifts perform no more than 10 lifting/lowering cycles in one hour, while for the rest of the time they are used only to hold a load or are not used at all.
For these applications we offer our **standard-duty lift systems.**

On the other hand, there are tasks that require 20 or even more active operating cycles per hour – especially in industrial production. To ensure increased lifetime and reliability for such applications, we have devised our line of **heavy-duty lift systems.** Among other special features, these include reinforced components and permanent lubrication systems.