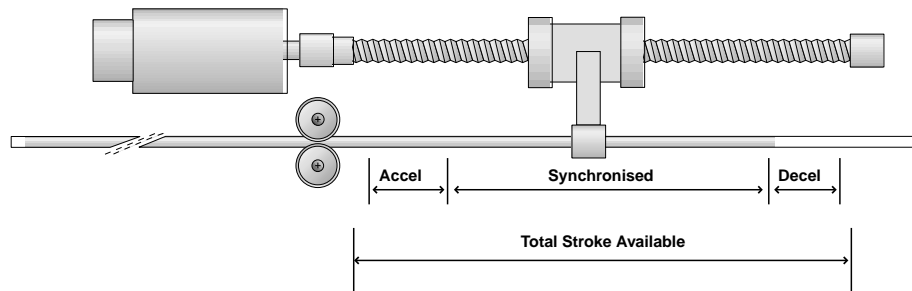


Flying Shear - Tube Cutter

Basic Requirements

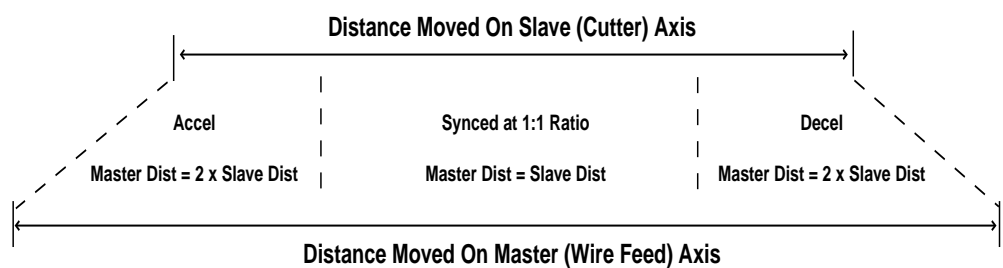
Rolled tubing is fed via a pinch-roll through a cutter mechanism attached to a ball-screw. The cutter must synchronise to the tubing and fire an output to activate the cutter at a known point. An encoder is fitted to the feed rollers and for this simple case we can assume that slippage through the rolls is negligible.



- The total movement available on the ballscrew is 500mm, therefore the cutter must accelerate up to line speed, synchronise for the cut and decelerate again within this distance
- The cutter needs to be fired at a regular position in order to cut accurately.
- For this example we want to cut tubing into 5m lengths. Units are in metres.

1. Synchronising the Cutter to line speed with MOVELINK

We have a maximum of 500mm movement on the cutter axis. We will use the 100mm at either end of the travel for acceleration and deceleration, leaving 300mm synced to line speed.



As we can see in the diagram above, our link distance for the acceleration and deceleration phases need to be twice the distance moved by the cutter, and whilst in sync the distances will be the same.

accel: cutter moves 100mm linked to 200mm on the master
 sync: cutter moves 300mm linked to 300mm on the master
 decel: cutter moves 100mm linked to 200mm on the master

The resultant **MOVELINK** parameters can be determined by adding the component parts together. So, if our parameters are in metres the command would be:

MOVELINK(0.5,0.7,0.2,0.2,link_ax).

2. Using REP_DIST to control the cycle

We have to synchronise the cut such that we are cutting the correct length as required. If we set the REP_DIST (repeat distance) parameter for the reference axis to the required cut length then the encoder count will roll-over at this point.

```
REP_DIST = 5      \ Ensure encoder count rolls over at 5m
REP_OPTION=1     \ Count from 0-->5, 0-->5 repeating
```

We can use the additional 'start-mode' parameter on the MOVELINK command to start the motion at a specified point, say 4m. i.e.

```
MOVELINK(0.5,0.7,0.2,0.2,0,2,4)
```

the extra 2 parameters are:

```
Startmode = 2 - start at a known absolute position ...
Position   = 4 - ... which is 4m
```

The knife needs to move back to its start position. This could also be a move link as shown below, though it is not necessary to worry about the sync as the blade will not be in contact with the tubr during this time and therefore we could simple use an absolute move back to 0.

```
MOVELINK(-0.5,1,0.25,0.25,0) \ Move back over 1m ref.
or
MOVEABS(0)
```

3. Firing the cutter at a known absolute position

We could simply wait until the knife reaches a certain position by testing the measured position from the encoder (MPOS), this would be a simple piece of code such as this:

```
WAIT UNTIL MPOS >= 0.25
OP(op_cut,ON)
WAIT UNTIL MPOS >=0.35
OP(op_cut,OFF)
```

Whilst this code is satisfactory in many cases, we have a far more elegant solution available in the form of the TrioBASIC **PSWITCH** command,

PSWITCH

The Motion Coordinator features up to 16 software position switches, which enable a specified output to be automatically switched within a specified position range. Once a PSWITCH is enabled it will be continually scanned by the processor and whenever the measured position of the axis is in range the output will be set.

In this application we have to be careful how we use the PSWITCH. If we set it to work on the knife axis, then we would need to continually enable / disable the switch as otherwise the cutter would fire on both the forward and return stroke of the axis (see ex1). A better solution in this case might be to setup the PSWITCH on the master axis, as this is travelling in a single direction only (see ex 2.)

With REP_OPTION set to 1, the encoder counts from 0 to REP_DIST-1 then resets to 0 again

```

○ constants:
  ax_feed=0
  ax_cut=1
○ setup:
  BASE(ax_feed)
  REP_DIST = 5
  REP_OPTION = ON
  BASE(ax_cut)
○ main_lp:
  PSWITCH(1,ON,ax_cut,op_cut,ON,0.25,0.35)
  MOVELINK(0.5,0.7,0.2,0.2,ax_feed,2,4)
  WAIT IDLE
  PSWITCH(1,OFF)
  MOVELINK(-0.5,1,0.25,0.25,0)
○ goto main_lp

```

Example 1. PSWITCH on CUTTER axis

```

○ constants:
  ax_feed=0
  ax_cut=1
○ setup:
  BASE(ax_feed)
  REP_DIST = 5
  REP_OPTION = ON
  PSWITCH(1,ON,ax_feed,op_cut,ON,4.3,4.4)
  BASE(ax_cut)
○ main_lp:
  MOVELINK(0.5,0.7,0.2,0.2,ax_feed,2,4)
  MOVELINK(-0.5,1,0.25,0.25,0)
○ goto main_lp

```

Example 2. PSWITCH on MASTER axis