Start-up sequence swiveling

1. Documentation

Industrial Standard	**ISO 841-2001**, DIN 66217
Standard documentation:	**Programming Guide, Standard Cycles, Swiveling**
	Programming Guide, ShopMill
Advanced documentation:	Description of Functions, 3/2 Axes Inclined Machining
	Kinematic Transformation
Current notes:	SIEMENSE.txt (PCU50 F:\CST.DIR\HLP.DIR)

2. Set machine data

See Programming Guide, Standard Cycles, Swiveling

3. Starting up HMI

Which files need to be changed?

HMI basic version >= 6.2 load current cycle version to the basic version

Activate "**Swivel**" softkey in the **Start-up** area:

To activate Swivel SK, the ";" semicolon must be removed from the following lines in the

Startup.com file in the Standard Cycles directory (F:\dh\cts.dir).

```
//S(Start)
;HS14=($82084,ac7)
;PRESS(HS14)
;LM("SCHWENK1a","SCHWENK1.com")
;END_PRESS
...
```

The "**Swivel**" softkey is displayed in the Program area under /**Milling/>>/Swivel cycle**

Note: **MD 10088 $MM_NUM_TOOLCARRIER > 0**

4. Identification of the machine kinematics (Swiveling/Kinematics start-up screen form)

- How many swiveling kinematics does the machine have ?

    Combinations of 2 (or 1) rotary axis and the 3 linear axes are always formed.

- What kinematics are involved?

    Inclinable head

    swivel table

    kinematics mixed of inclinable head and rotary table

- Is the direction of the linear machines axes XYZ correct ? Right-hand rule

- Which rotary axis rotates around which machine axis?

- What is the 1st or 2nd rotary axis of a swivel data record?

- What is the initial state of the kinematics?

  Rotary axis positions in initial state, tool direction in the initial state

  (G17, G18, G19 plane)

- Is the rotary direction of the rotary axes on the machine correct ?

- How do the rotary axis vectors of kinematics (V1,V2) lie around the XYZ machine axes ?

  Enter the data in the swivel data screen form,

  > +1 for inclinable heads

  > −1 for swivel tables.

  Other values in rotary axis vectors (V1,V2) are 0.

- What is the position and the direction of the offset vectors (I1..I4) of the kinematics ?

  Measuring and entry of the offset vectors (I1..I4) is made by the machine producer.

  > **Inclinable head**

  > **I3** distance from the toolholder to the pivot point of the 1st rotary axis

  > **I2** distance from the pivot point of the 1st rotary axis to the pivot point of the 2nd rotary axis

  > **I1** close the vector chain I1=-(I2+I3)

  > **Swivel table**

  > I2 distance from the toolholder to the pivot point of the 1st rotary axis

  > I3 distance from the pivot point of the 1st rotary axis to the pivot point of the 2nd rotary axis

  > I4 close the vector chain I4=-(I2+I3)

  > **Inclinable head / swivel table (mixed kinematics)**

  > I2 distance from the toolholder to the pivot point of the 1st rotary axis

  > I1 close the vector chain I1=-I2

  > I3 distance from the toolholder to the pivot point of the 2nd rotary axis

  > I4 close the vector chain I4=-I3

5. Display options in the Swivel start-up screen form

- What types of swiveling mode are to be displayed in the Program area of the SWIVEL screen form?

  > For axis (always displayed), projection angle, solid angle.

- Which direction or no direction is to be displayed in the Program area of the SWIVEL screen form?

  > Do the machine kinematics have 2 or 1 solutions for a swivel plane?

  > If 1 solution: Displayed direction is no

  > If 2 solutions: To which rotary axis does the direction (minus or plus) relate ?

  >   Toggled the number of rotary axis (1 or 2)

6. Swivel / rotary axes start-up screen form

- What is the name of the rotary axis 1 and rotary axis 2 ?

  The channel name of the rotary axis must be entered for NC rotary axes (automatic).

  A user name can be specified for manual / semi-automatic rotary axes.

- Is rotary axis mode automatic, manual or semi-automatic?

- Enter the traversing range of the rotary axes

  Minimum value at the left, maximum value at the right.

  For automatic rotary axes, the traversing range corresponds to the software end positions of

  the rotary axis. 0 and 360 degrees must be entered for modulo axes.

- Is the rotary axis position <> 0 in initial state of the kinematics?

  If yes: Enter the rotary axis position in the initial setting "Kinematics offset" field.

- Do the machine kinematics have a Hirth tooth system?

  If yes: Enter the angle offset and the angle increment of the Hirth tooth system.

- Should a swivel data record change be performed?

  Relevant only for ShopMill / ShopTurn

7. Check the machine kinematics using the NC program (CYCLE800)

Example:

T1 D1 ; tool call

G55   ;call zero point offset

CYCLE800 .... ; Input parameters of rotation are variable

G1 X0 Y0 Z0 F1000 ;check the tool tip

M0

M2