

# Mul File Specification - Axes

Specification for the Axes.mul file

## Contents


Specification






Sample



Comments

## Specification

The Axes file contains the details of the Axes

No	Name	Example	Format	Notes
1	Axis Name	X	string	The Axes are standardised with numbers and names. This ensures standardisation and compatibility across machine types See Axis Naming Standards
2	Axis Id	4	numeric	The axis Id is used by the PLC software to determine which physical drive is used. See Commissioning a Beckhoff Axis  ...This is different for each control system layout and usually follows the order of the drives on the TwinCAT network
3	Enabled	1	numeric	0- Axis Disabled 1 - Axis Enabled
4	Type	1	numeric	Axis Type. Changes how the system deals with homing sequences 0 - off 1 - servo 2 - stepper 3 - virtual
5	Scaling Factor	32727.430	float	Calibration factor in units per mm or degree
6	Reverse	1	numeric	Use to switch which direction is +ve Determined by <ul style="list-style-type: none"><li>• Manufacturer of the drive system</li><li>• Mounting location of motor</li><li>• Handing of the machine</li></ul> 0 - Standard Direction 1 - Reverse axis direction

7	Maximum Speed	2000	numeric	<p>Used as the fastest traverse speed when positioning in <math>\text{mms}^{-1}</math></p> <p> ...Note - if any other parameter speed is greater than this, it will throw an axis error</p> <p> ...The maximum speed is usually limited by the hardware. This should not be increased without authorisation.</p>												
8	Maximum Acceleration	3000	numeric	in $\text{mms}^{-2}$												
9	Maximum Deceleration	6000	numeric	in $\text{mms}^{-2}$												
10	Datum Offset	490.4	float	Distance from the physical axis homing point to datum zero point												
11	Move to position after datum	100.0	float	Following a home sequence, this determines where the axis move to A start position												
12	Home Input IO Reference	InC_GXHome	string	IO Reference code for the home input See Mul File Specification - ioDef												
13	Datum Sequence Type	0	numeric	<p>Used On Nextmove systems only, NOT Beckhoff</p> <table border="1"> <thead> <tr> <th>Bit</th> <th>Bit Value</th> <th>Purpose</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>Back-off target. Defines the target for the back-off phase: 0 = Back-off to home input 1 = Back-off to home input and next index pulse</td> </tr> <tr> <td>1</td> <td>2</td> <td>Initial seek direction. Determines the direction of the initial seek phase: 0 = Negative 1 = Positive</td> </tr> <tr> <td>2</td> <td>4</td> <td>Initial seek target. Defines the target for the initial seek phase: 0 = Home input 1 = Index pulse</td> </tr> </tbody> </table>	Bit	Bit Value	Purpose	0	1	Back-off target. Defines the target for the back-off phase: 0 = Back-off to home input 1 = Back-off to home input and next index pulse	1	2	Initial seek direction. Determines the direction of the initial seek phase: 0 = Negative 1 = Positive	2	4	Initial seek target. Defines the target for the initial seek phase: 0 = Home input 1 = Index pulse
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14	Home Speed	150	numeric	<p>Speed used to home the axis on initialisation in <math>\text{mms}^{-1}</math></p> <p> ...If a combination of high speed and low acceleration is used, along with a short run-off distance, the axis may bottom out when returning to zero</p>												
15	Maximum Following Error	20	numeric	<p>On a servo drive, this is the maximum tolerated distance between where the system want the axis to be and where it actually is. When this distance is exceeded, the system will throw a "Following Error"</p> <p> ...If this value is too big, the axis may never get to its intended position and no error will be generated. On Beckhoff systems, the system dynamics are so good that the following error is rarely &gt;2. On older systems, it can be greater</p>												
16	KF - Feedforward Gain	0.0	float	<p>Servo Axis Tuning parameters</p> <p> ...Changing these parameters can upset the stability of the system and damage the machine</p>												
17	KV - Damping Term	0.0	float													
18	Proportional Gain	30.0	float													

19	KI Integral Gain	0.000	float	
20	Minimum Position	-115	numeric	Physical limits of the machine Used by the software to ensure the machine does not exceed its limits
21	Maximum Position	7845		
22	Jerk	10000		Beckhoff system only - determines the smoothness of motion profile   ...Jerk is defined as the rate of change of acceleration  in mms <sup>-3</sup>
23	Database Logging	False	boolean	 ...Do not use
24	Axis Number	1		he Axes are standardised with numbers and names. This ensures standardisation and compatibility across machine types See Axis Naming Standards
25	Park Position	-9999	numeric	Position to move to when powering down the machine
26	Rereference position	403	numeric	If the axis is fitted with a re-reference input, this value is the axis postion. The re-reference input is a fast trigger input connected directly to the drive which allows on-the-fly positional changes This has been used on ZX5 SR axis where slippage on the SR mechanics is evident

## Sample

```
X,4,1,1,32727.430,1,2000,3000,6000,490.4,100.0,InC_GXHome,0,150,20,0.0,0.0,30.0,0.000,-115,7845,10000,False,1,-9999,403
Y,1,1,1,104857.600,0,250,2000,2000,8.4,0.0,InB_YHome,2,50,25,0.0,0.0,8.0,0.000,-120,120,10000,False,4,-9999,0
Z,2,1,1,104857.600,0,250,2000,2000,-38.4,0.0,InB_ZHome,2,50,25,0.0,0.0,12.0,0.000,-120,119,10000,False,5,-9999,0
R,7,1,1,126887.600,0,250,500,500,-0.4,0.0,InB_RHome,2,20,50,0.0,0.0,30.0,0.000,-3,361,10000,False,6,-9999,0
VY,3,1,1,104857.600,0,501,1000,1000,232.6,239.4,InB_VHome,0,50,5,0.0,0.0,8.0,0.000,-100,241,10000,False,11,-9999,0
SX,5,1,1,32727.430,0,2000,3000,6000,6931.8,7200.0,InE_SXHome,0,150,20,0.0,0.0,30.0,0.000,-38,7220,10000,False,10,-9999,0
SR,6,1,1,291851.000,1,250,400,400,55.4,90.0,InF_SRHome,3,20,5,0.0,5.0,10.0,0.000,45,136,5000,False,9,-9999,0
SY,8,1,2,819.600,1,20,50,50,-1.7,0.0,InF_SYHome,0,5,2,1.0,1.0,5.0,0.000,-20,19,10000,False,7,-9999,0
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