

Motion Control at KIT Accelerators

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Foreword

- Not an expert on motion control
- Not involved in deciding the motion control solutions
- Did not initially implement most of the examples
- In general we use either **streamdevice** or **motor** record
- Accelerator related motion control (no beamlines)

Previous Default Controller

- For stepper motors
- Maxnet in combination with Middel cards
 - `omsMAXnetConfig("MCONTROL0", 5, "MAXNET0", 20, 200, "AX;LTH;LMF;ABL;PSO;AY;LTH;LMF;ABL;PSO;AZ;LTH;LMF;ABL;PSO;AT;LTH;LMH;ABL;PSO;")`
- Used both via ethernet and serial communication
- No absolute encoder possible
- Severe **reliability issues**, required restarts if running for a longer time
→ losing position information

Thorlabs & Newport

- Newport linear delay line
 - Newport's own controller
 - For optical delay to synchronize electrons and THz pulse
 - Motor record
- Thorlabs DDS300 linear stage
 - Thorlabs' own controller
 - Moving the focus position of a lens for the UV laser injection (FLUTE)
 - Extended motor record (PR online)
- Thorlabs flip mirror holder
 - Thorlabs' own controller (small cube)
 - Display of small cube controllers become unreadable after some years
 - Flip mirror or lens in or out – in our case we use it as a remote shutter

smarAct: Piezo Motors

- Linear-stage: SmarAct SLC-1720-LC
- Tip-Tilt mirror: SmarAct STT-25.4

- Original integration with streamdevice

- MCS1 & MCS2 controller in use

- Switched to motor record

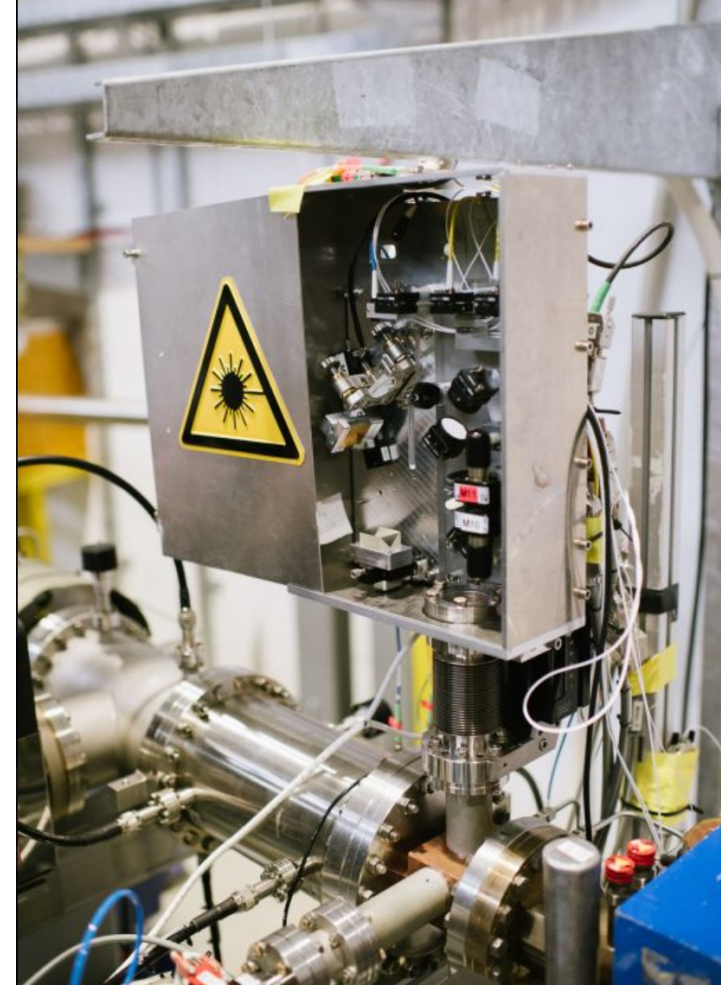
- Was working, but reports of not working properly lately

EO Monitor Setup

- Rotation Stage: PI Micos DT-34 SM
 - Optical reference switch not supported
- Linear Stage: PI Micos VT-21-2SM
 - Some issues with limit switches
- Linear Stage: Oriental Motors PKP268D28A2
 - Additional absolute readback

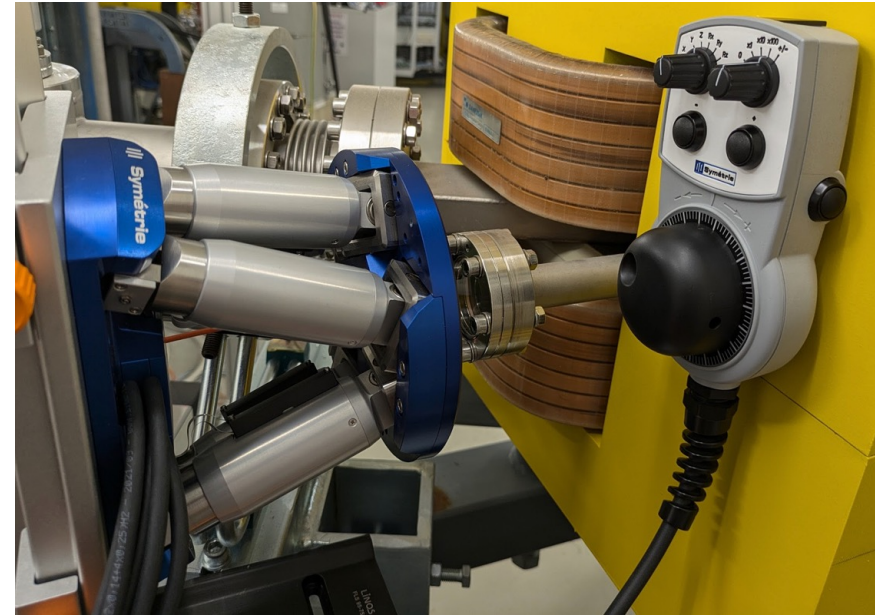
- Less issues with Maxnet cards, as not always on

- Linear-stage: SmarAct SLC-1720-LC
- Tip-Tilt mirror: SmarAct STT-25.4



Symetrie Hexapod

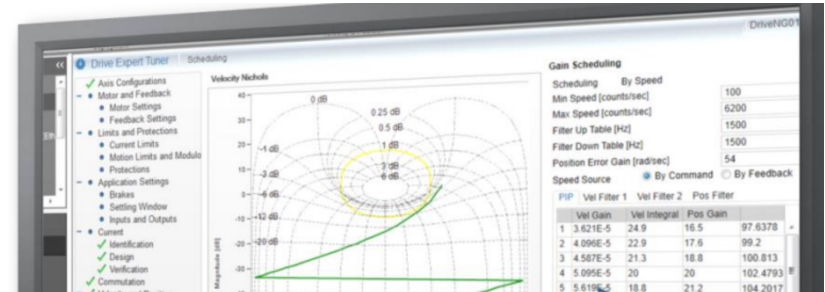
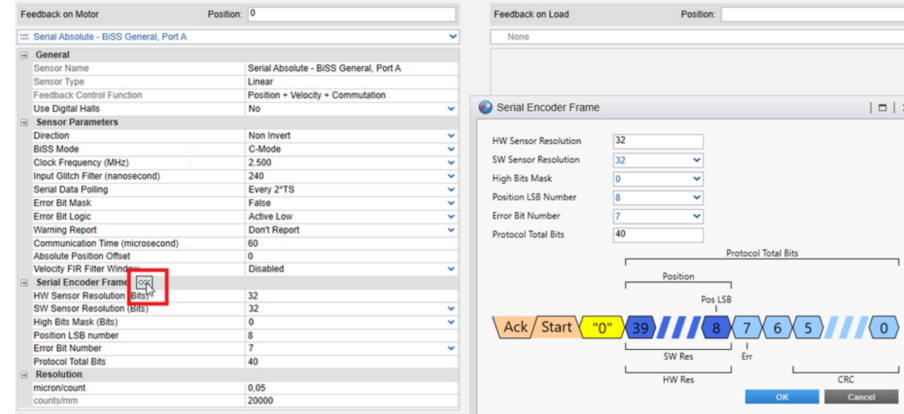
- “Recent” addition to EPICS motor
- Integration was surprisingly effortless
- User mostly happy
 - Occasional crash



■ <https://github.com/epics-motor/motorSymetrie>

New Default Motor Controller

- ElmoMC Gold DC Bell
- Up to 1.2 kW continuous power
- Ethernet: UDP
- EtherCat
- Absolute encoder
- Feature rich configuration software
- Created basic EPICS motor support

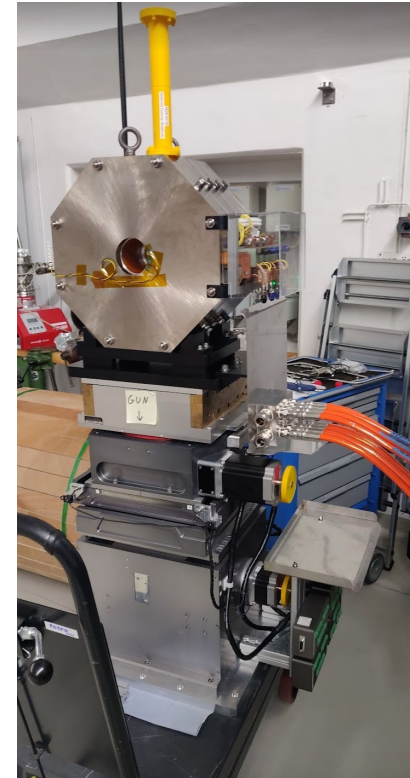
Serial Encoder Frame

HW Sensor Resolution: 32
 SW Sensor Resolution: 32
 High Bits Mask: 0
 Position LSB Number: 8
 Error Bit Number: 7
 Protocol Total Bits: 40

Bit Diagram: Ack | Start | "0" | 39 (Position) | 8 (SW Res) | 7 (Err) | 6 (HW Res) | 5 (CRC) | 0

5-Axis Table to Align Solenoid Magnet

- Originally with Maxnet
- Table issues
 - several "engineering" problems
 - Encoders not working correctly
 - Documentation regarding gear ratios wrong
- Controller
 - First usage
 - Highly complex software
 - EPICS support not yet tested
 - Random crashes of network interface
- Design issues
 - Movement limited by beam pipe
 - Hard limit switches worthless
 - Complex boundary conditions with 5 axis movements



Bunch Compressor

- PP electronic SMC 9300 controller
- Originally only single axis movement
- Various interlock strategies considered
- Now added records for synchronized movement
- Missing interlock input
- → Tests next week

