OnStep-Konvertierung für Skywatcher EQ6R-PRO (V2.0)

OnStep Group Help with Settings Diskussion:

https://onstep.groups.io/g/main/topic/need_help_with_setting_up/77236404

Link zur Montierung mit Getriebedaten:

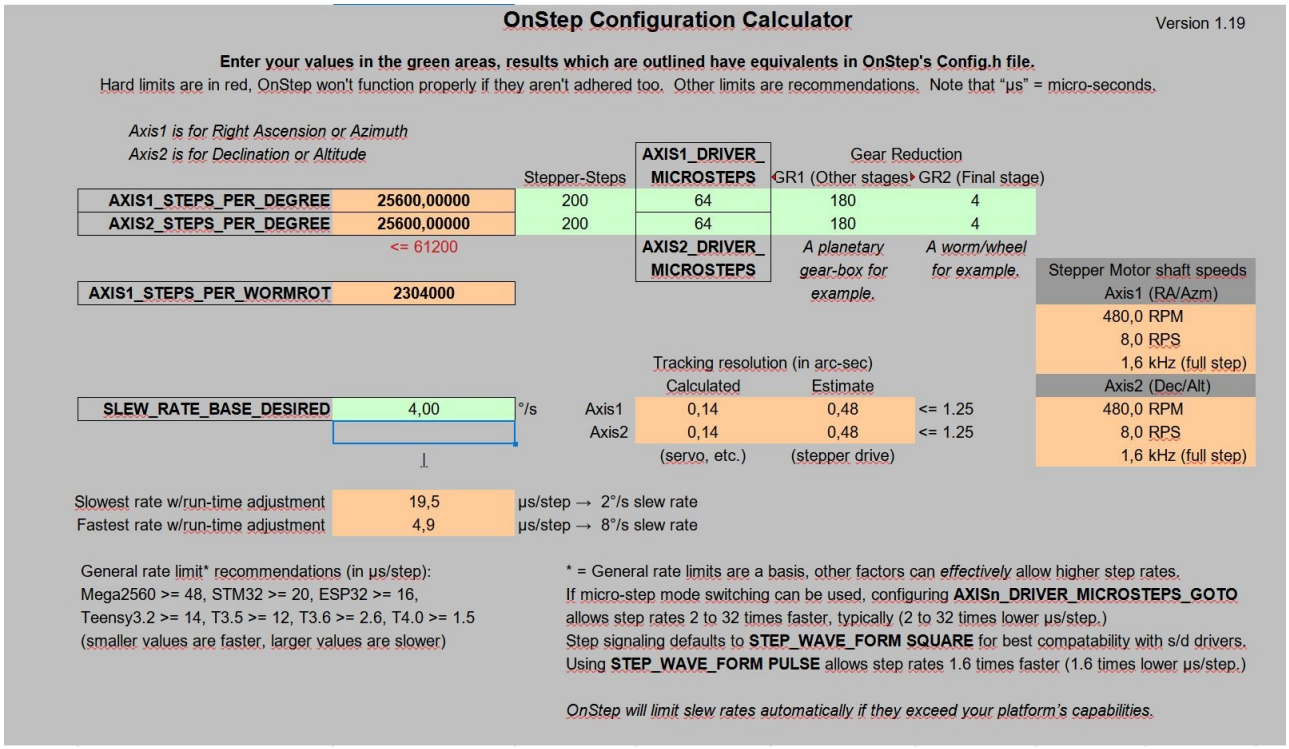
https://www.firstlightoptics.com/skywatcher-mounts/skywatcher-eq6-r-pro-synscan-go-to-equatorial-mount.html

- Hybrid Stepper mit 1,8° Schrittweite
- Worm drive 180 : 1
- Timing Belt / Riemenantrieb 48:12 (= 4)
- Original Mainboard 64 Microsteps / 1,8° Schrittweite
- Gear Ratio: 720
- Auflösung: 9216000 Schritte / Umdrehung
- Maximale Geschwindigkeit: 4,2°/Sekunde = ca. 0,14 Arcsec

Rechnung laut Experten für Untersetzung:
200 Schritte / Umdrehung bei 64MicroSteps und 48:12 Untersetzung = 25600 Schritte / Grad
(200 * 64 * 4 = 25600 steps / Grad)

Empfehlung für maximale Bewegungsrate: 4°/sec

Rechnung entspricht dem Calc-sheet:



OnStep Configuration Calculator Version 1.19

Enter your values in the green areas, results which are outlined have equivalents in OnStep's Config.h file.
Hard limits are in red, OnStep won't function properly if they aren't adhered too. Other limits are recommendations. Note that "µs" = micro-seconds.

Axis1 is for Right Ascension or Azimuth
Axis2 is for Declination or Altitude

		Stepper-Steps	AXIS1_DRIVER_MICROSTEPS	Gear Reduction GR1 (Other stages)	GR2 (Final stage)
AXIS1_STEPS_PER_DEGREE	25600,00000	200	64	180	4
AXIS2_STEPS_PER_DEGREE	25600,00000	200	64	180	4
	<= 61200		AXIS2_DRIVER_MICROSTEPS	*A planetary gear-box for example.*	*A worm/wheel for example.*
AXIS1_STEPS_PER_WORMROT	2304000				

Stepper Motor shaft speeds
Axis1 (RA/Azm)
480,0 RPM
8,0 RPS
1,6 kHz (full step)
Axis2 (Dec/Alt)
480,0 RPM
8,0 RPS
1,6 kHz (full step)

			Tracking resolution (in arc-sec) Calculated	Estimate	
SLEW_RATE_BASE_DESIRED	4,00	°/s	Axis1	0,14	0,48	<= 1.25
			Axis2	0,14	0,48	<= 1.25
				(servo, etc.)	(stepper drive)	

Slowest rate w/run-time adjustment	19,5	µs/step → 2°/s slew rate
Fastest rate w/run-time adjustment	4,9	µs/step → 8°/s slew rate

General rate limit* recommendations (in µs/step):
Mega2560 >= 48, STM32 >= 20, ESP32 >= 16,
Teensy3.2 >= 14, T3.5 >= 12, T3.6 >= 2.6, T4.0 >= 1.5
(smaller values are faster, larger values are slower)

* = General rate limits are a basis, other factors can *effectively* allow higher step rates.
If micro-step mode switching can be used, configuring **AXISn_DRIVER_MICROSTEPS_GOTO** allows step rates 2 to 32 times faster, typically (2 to 32 times lower µs/step.)
Step signaling defaults to **STEP_WAVE_FORM SQUARE** for best compatability with s/d drivers.
Using **STEP_WAVE_FORM PULSE** allows step rates 1.6 times faster (1.6 times lower µs/step.)

OnStep will limit slew rates automatically if they exceed your platform's capabilities.

Datenblatt für verschiedene Montierungen (aus Referenz EQMOD).

https://eq-mod.sourceforge.net/prerequisites.html

Mount Type		RA Gear Teeth	RA Gear Ratio	Microsteps per RA Revolution	Microsteps per Worm Revolution	Resolution (arcsecs)	MicroSteps
Skywatcher / Orion							
	EQ3-2 + Synscan Upgrade Kit	130	715:1	4576000	35200	0.283217	32
	NEQ3/HEQ3 Synscan	130	715:1	4576000	35200	0.283217	32
	SkyView Pro + Synscan Upgrade Kit	144	704:1	4505600	31288.89	0.287642	32
	SkyView Pro EQ	144	704:1	4505600	31288.89	0.287642	32
	EQ4 + Synscan Upgarde Kit (EQ5)	144	704:1	4505600	31288.89	0.287642	32
	EQ5 + Synscan Upgrade Kit	144	704:1	4505600	31288.89	0.287642	32
	EQ5 Synscan	144	705:1	4505600	31288.89	0.287642	32
	HEQ5 + Synscan Upgrade Kit	135	705:1	9024000	66844.44	0.143617	64
	HEQ5 Syntrek	135	705:1	9024000	66844.44	0.143617	64
	HEQ5 Synscan (Orion Sirius)	135	705:1	9024000	66844.44	0.143617	64
	EQ6 +Synscan Upgrade Kit						
	EQ6Pro Syntrek	180	705:1	9024000	50133.33	0.143617	64
	EQ6Pro Synscan (Orrion Atlas)	180	705:1	9024000	50133.33	0.143617	64
	NEQ6	180	705:1	9024000	50133.33	0.143617	64
	EQ6-R PRO	180	720:1	9216000	51200	0.140625	64
	AZ-EQ6GT (Orion Atla Pro AZ/EQ-G)	180	720:1	9216000	51200	0.140625	64
	AZ-EQ5GT (Orion Sirius Pro AZ/EQ-G) - see note below	135	405:1	5184000	38400	0.25	64
	EQ8 (Orion HDX110 EQ-G)	435	435:1	11136000	25600	0.116379	64
	EQM-35 Pro	180	360:1	4608000	25600	0.28125	64
	AzGTi - see note below	144		2073600	14400	0.0625	
Avalon Instruments							
	M-Uno Fast Reverse Single Fork Arm EQ	180	705:1	9024000	50133.33	0.143617	64
	Linear Fast Reverse EQ	180	705:1	9024000	50133.33	0.143617	64
Vixen							
	Vixen GPDX fitted with Synscan Upgrade Kit (EQ5)	144	704:1	4505600	31288.89	0.287642	32
	Vixen SP fitted with Synscan Upgrade kit (EQ5)	144	704:1	4505600	31288.89	0.287642	32

Aus Tabelle entnommen:
EQ6R-PRO
RA Gear Teeth: 180 = Worm drive
RA Gear Ration: 720:1
Microsteps per Revolution: 9216000
Microsteps per Worm revolution: 51200 (= 9216000 / 180) → YES!
Resolution in Arcsec: 0,140625
Microsteps: 64

Grüne Werte entsprechen dem EQ6R-PRO Datenblatt sowie dem Kalkulationsblatt.
Damit sind die kalkulierten Werte aus dem Excel-Sheet offensichtlich korrekt und als Parameter für eine OnStep-Steuerung für die EQ6R-PRO nutzbar.

- Infoseite für weitere Konvertierungen: https://onstep.groups.io/g/main/wiki/4414
- Übersicht OnStep: https://onstep.groups.io/g/main
- EQ6 Projekt auf Thingiverse: https://www.thingiverse.com/thing:4836661