

6K-600 peristaltic pump with 24 V stepper motor (Nema 23)

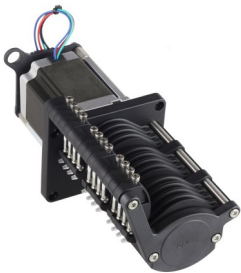


6K-600 12 Channel

Pump Only (without mounted driver)

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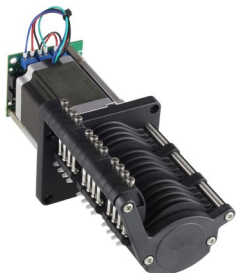
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A4 Driver



A4p Driver



iDs Driver

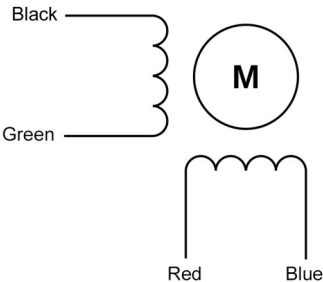
Optional Drivers

1.0 Flow and General Technical Data

Tube Size, ID (mm) ¹	Flow per Revolution (µl) ²	Flow at 100 rpm (ml/min) ²	Flow at 200 rpm (ml/min) ^{2,3}	
	4 / 8 roller	4 / 8 roller	4 / 8 roller	
Ø 0.5	18 / 14	1.8 / 1.4	3.7 / 2.9	
Ø 1.0	64 / 44	6.4 / 4.4	12.8 / 8.9	
Ø 2.0	232 / 143	23.2 / 14.3	46.5 / 28.6	
				¹ Wall thickness 1.0 mm
				² Flow values are per channel
				³ Speed above 200 rpm not recommended
Phasing	Rollers of channels 5, 6, 7 & 8 are 45° off-sett to all other channels (only relevant for 4 roller pumps)			
Accuracy	Typical 3% channel to channel variation			
Occlusion Tension	Occlusion tension is adjustable on each channel (see Assembly Information, page 5)			
Motor Type	2 phase, hybrid, bipolar, Nema 23. Additional information below.			
Power Consumption ⁴				
2.8 amp driver limiter setting	10 to 20 W			
4.0 amp driver limiter setting	24 to 30 W			
	⁴ default is 2.8 amp setting for A4, A4p and iDs supplied options			
Tube Materials	Innovaprene / Innovasil (Silicone) / Lagoprene / ED-Plex			
Driver Options				
A4	Analogue driver: 0 to 5 V DC or 0 to 100% PWM speed input, direction and enable inputs			
A4p	Analogue driver: 10 turn speed potentiometer, direction and enable inputs			
iDs	Digital driver: LCD display, speed, direction, acceleration, suck-back, and analogue mode			
Sensors Options				
Speed sensor	Micro reed switch, contacts close once per revolution (page 4)			
General Data				
Max pressure	1.0 bar			
Max suction height (dry)	9.0 m H ₂ O			
Motor life	>10000 hour			
Weight (without driver)	1560 g			
All data measured with 'run-in' Innovaprene tubing and H ₂ O				

2.0 Motor Details

Specification	
Type	2 phase, hybrid, bipolar
Size	Nema 23
Step Angle	1.8 ° (200 steps per revolution)
Voltage	24 V
Phase 1 / Phase 2	Black - Green / Red - Blue (see diagram on right)
Ambient temperature range	-20 to +50 °C
Max temperature rise	80 °C
Insulation resistance	100 MΩ
Insulation class	B
Rated current ¹	2.8 A
Resistance per phase	1.13 Ω ±10%
Inductance per phase	3.6 mH ±20%
Wire gauge	22 AWG
Lead length	300 mm
Recommended driver rating ²	2.8 A
¹ Rated current for stepper motors is traditionally defined as maximum holding current (zero RPM)	
² Drivers are supplied set at 2.8 A, however a setting between 2.0 and 4.0 can depending on running conditions	

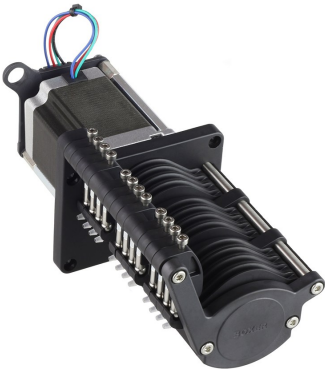


3.1 Stepper Driver : A4

The A4 stepper driver with analogue or PWM speed control input for accurate flow control of the 6K-600 is mounted on the rear of the motor via an adapter plate. The A4 driver has max 4.0 amp setting and is suitable for continuous operation.

Technical Data

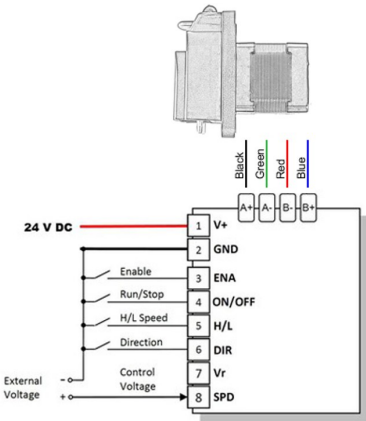
Driver Type	Full H-Bridge for 2 phase unipolar stepper motors
Mounting	Via a mounting plate on rear of motor
Voltage Range	10 to 30 V DC
Max Current	4.0 A
Current Limiter Factory Setting	2.8 A
Control Inputs	Enable, run / stop, high / low speed, direction, speed
Control Outputs	5 V DC reference output (for use with external potentiometer for speed control)
Current Limiter (on reverse side of driver)	To reduce motor temperature
Micro-Stepping	1/16 (fixed)
Automatic Acceleration (during start or speed adjust)	Ramp over 0.3 seconds
Max Working temperature	85 °C
Weight	100 g



The A4 driver is mounted on the reverse side of the adapter plate.

Electrical Connection Details

Outputs (to stepper motor):		
A- / A+	Black / Green	Phase A
B+ / B-	Red / Blue	Phase B
Note: reversing polarity of A or B will cause the motor to run in the opposite direction		
Inputs (to driver):		
V+	Supply Voltage	+ 24 V DC (range 10 to 30 V DC)
GND	Ground	GND
ENA ¹	Enable / Disable	Open = enabled / To GND = disabled (motor coils are not energised)
ON / OFF ¹	Run / Stop	Open = run / To GND = stopped (motor is locked with energised coils)
H/L ¹	High / Low Speed	Open = speed 0 to 800 rpm / To GND = speed 0 to 150 rpm
DIR ^{1,2}	Direction	Open = direction anticlockwise (CCW) / To GND = direction clockwise (CW)
Vr	+ 5 V DC output reference	For use with external potentiometer
SPD	Analogue Speed Input	0 to 5 V DC (resolution 255 steps / 8 bit) or PWM 0 to 100% (min. 10kHz)
Always start a peristaltic pump at slow to medium speed to avoid stalling		
¹ Inputs are internally pulled up		
² Direction is defined as looking at the pump from the front (clockwise means inlet left, outlet right)		



Current Limiter

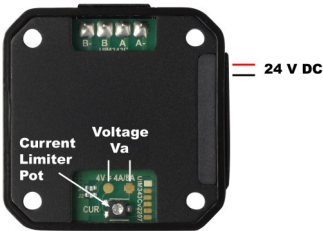
The current limiter on the underside of the driver is used to reduce motor temperatures. This is especially important when a peristaltic pump is run at slow speeds.

- Adjustment:
- connect driver to power supply.
 - measure voltage Va. Adjust with pot Va as necessary¹.
 - clockwise rotation decreases Va.
 - disconnect power supply
 - re-connect power supply (new Va value is mapped at switch on only)
 - test new setting

¹ Va can be varied between 0 and 4.0 V. It should be reduced until safely above the setting which will cause the motor to stall. Worse case will always be with a new tube with largest ID installed in the peristaltic pump. If Va is increased above 4.0 V, the current setting will not increase further.

Default setting: Limiter set at 2.8 A (Va = 2.8 V)

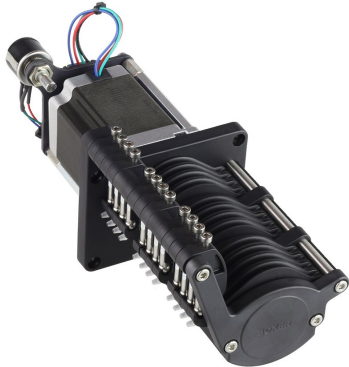
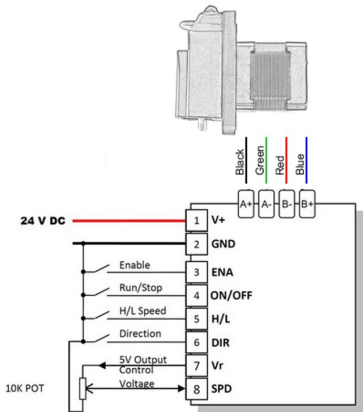
Note: the Jumpers J1 and J2 are not populated and have no function.



The underside of driver for adjusting the current limiter.

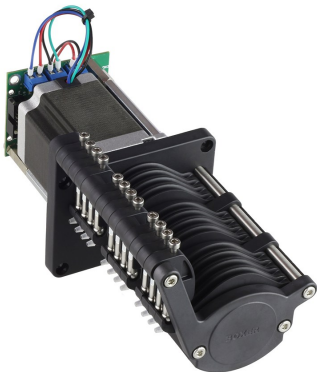
3.2 Stepper Driver : A4p

The A4p driver option is identical to the A4 driver, however a 10 turn potentiometer is included in the assembly (connected between +5V output voltage and GND with the wiper connected to the speed input).



3.3 Stepper Driver : ID

The iD driver is a digital driver with LCD display which allows setting of run speed, acceleration / deceleration, current limitation and direction via 4 push buttons and settings menu. Additionally the driver can run as a regular analogue driver with definable 0 to 5V input speed range. Via a 12 pin box connector, control of the driver can be remote.



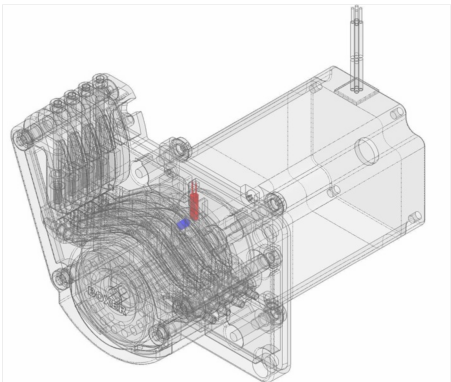
The full operating instructions are beyond the scope of this datasheet and are available from Boxer's website:

<https://www.boxerpumps.com/products-shop/accessories/stepper-drivers/>

(click on iDs Driver tab)

4.0 Optional Speed Sensor

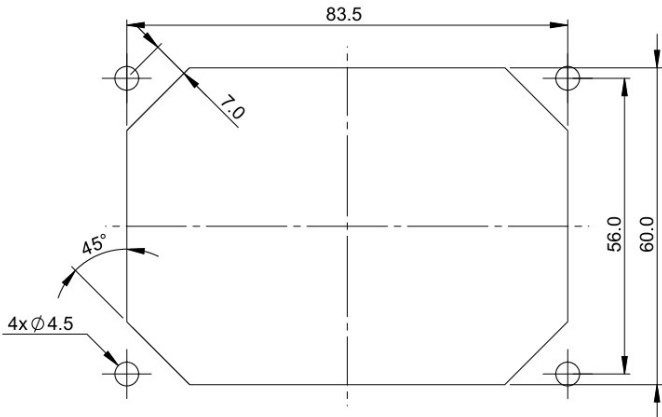
A micro reed sensor (shown in red) is mounted inside the pump body. A permanent magnet (shown in blue) is located on the rotor. The contacts of the micro reed sensor close when the magnet moves through the upper portion of the rotation., once per revolution. A speed sensor can also operate as a stall sensor.



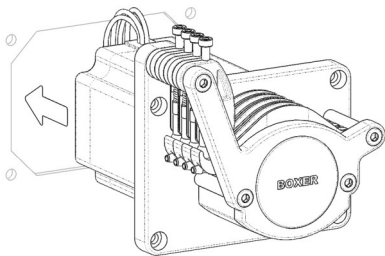
Specification	
Reed sensor type	Normally open, single pole, single throw
Contact closure	Once per revolution
Max. switching current	0.5 A
Max. switching voltage	170 V
Lead cross section area	0.06 mm²
Lead length	27 cm

5.1 Assembly Information

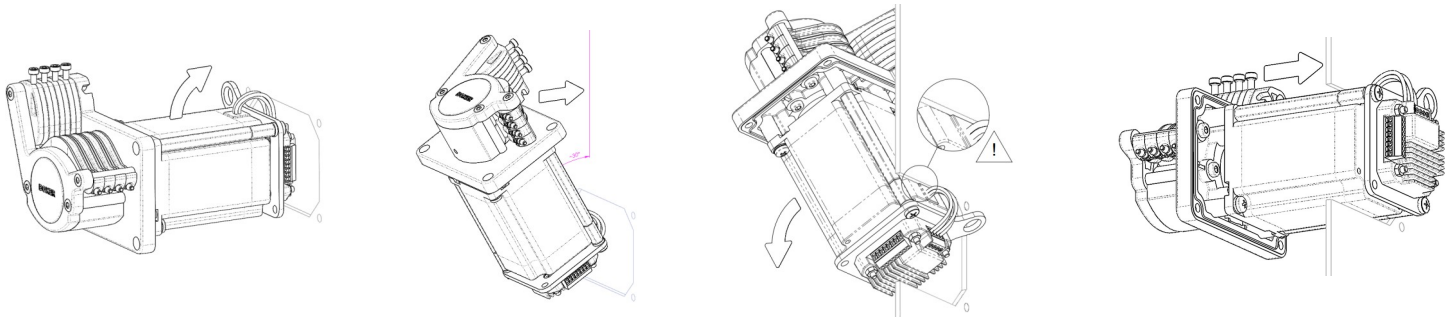
1 Prepare Panel Cut-Out.



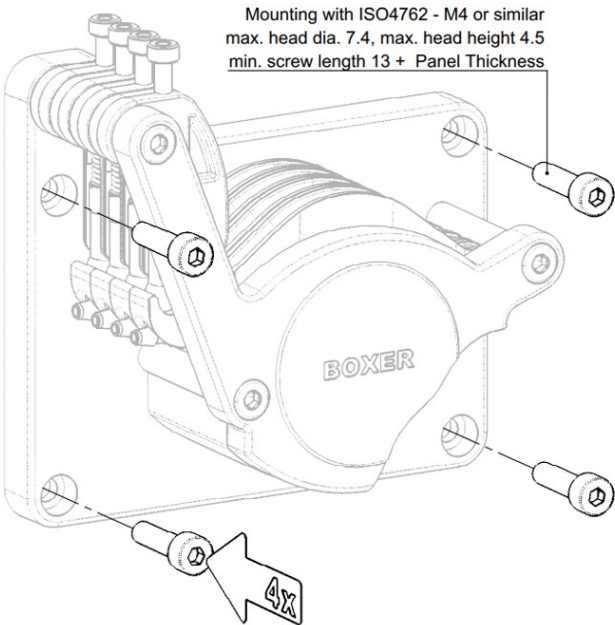
2 1 Without Driver: Ensure mounting gasket is in place, push motor through cut-out.



2 2 With Driver: Ensure mounting gasket is in place, tilt the motor, push motor / driver tilted through cut-out, return to horizontal position, push remaining motor through cut-out. For iDs Driver, disassembly of PCB from mounts is required.

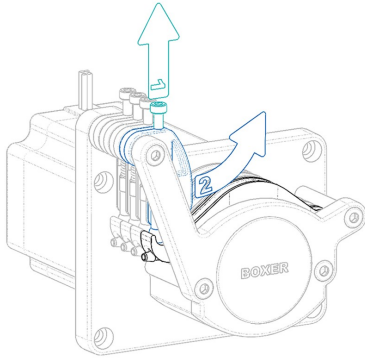


3 Secure with 4 x M4 bolts.

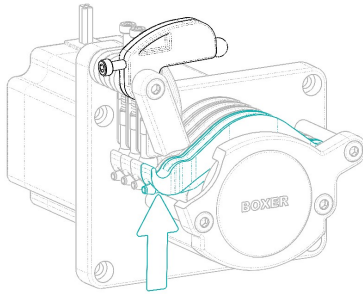


5.2 Tube Loading / Unloading

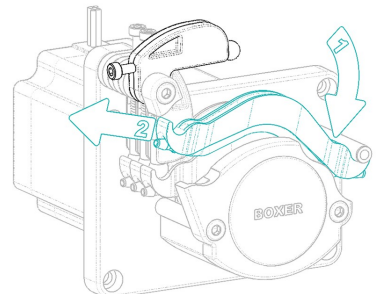
❶ Pull bolt head up and rotate the retainer.



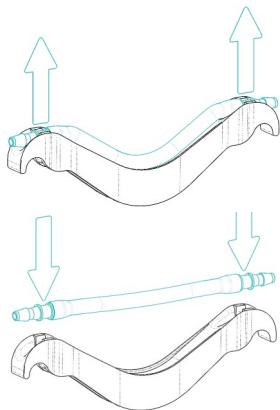
❷ Push tube saddle up on left side.



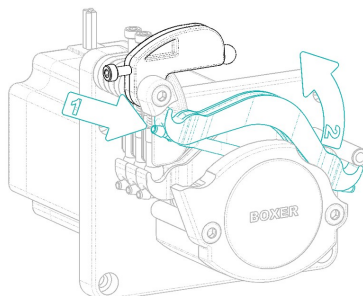
❸ Disengage saddle on right side and remove saddle.



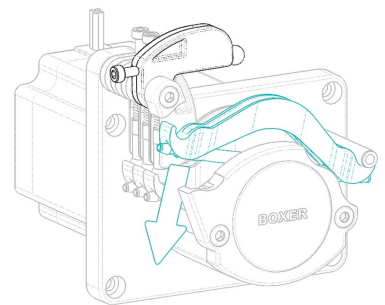
❹ Carefully remove / replace tube set.



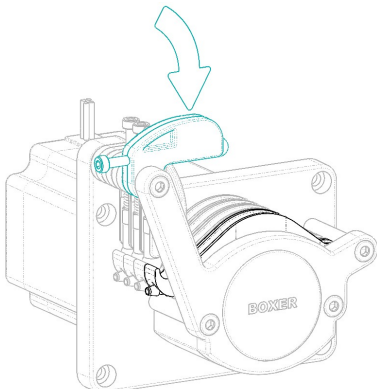
❺ Insert saddle and engage right side.



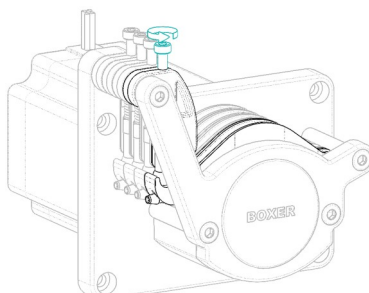
❻ Push tube saddle down on left side.



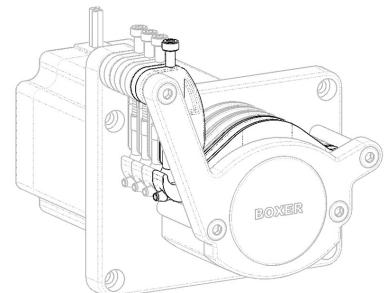
❼ Rotate retainer into position.



❾ Adjust occlusion tension*



❿ Ready for operation.



*Occlusion tension: pumps are supplied with lowest tension settings which is suitable for all listed tube sets. Adjustment is not normally required.

6.1 Order Information : Pumps

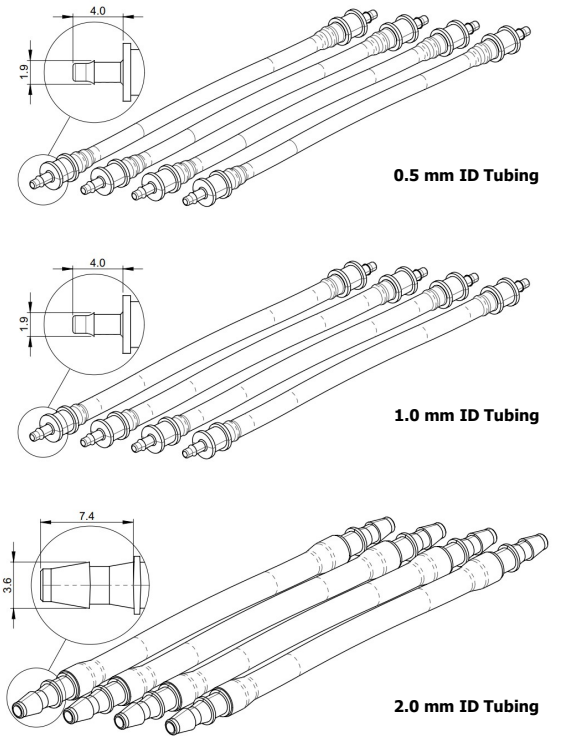
All pumps are supplied with saddles however tube sets should always be ordered separately.

Pump Configuration	4 Rollers	8 Rollers
6K-600 12 channel 24 V Stepper Nema 23	6634.100	6638.100
6K-600 12 channel 24 V Stepper Nema 23 / Speed Sensor	6634.110	6638.110
6K-600 12 channel 24 V Stepper Nema 23 / A4	6634.101	6638.101
6K-600 12 channel 24 V Stepper Nema 23 / A4 / Speed Sensor	6634.111	6638.111
6K-600 12 channel 24 V Stepper Nema 23 / A4p	6634.102	6638.102
6K-600 12 channel 24 V Stepper Nema 23 / A4p / Speed Sensor	6634.112	6638.112
6K-600 12 channel 24 V Stepper Nema 23 / iD	6634.103	6638.103
6K-600 12 channel 24 V Stepper Nema 23 / iD / Speed Sensor	6634.113	6638.113

6.2 Order Information: Tube Sets

Tube sets should be ordered separately.

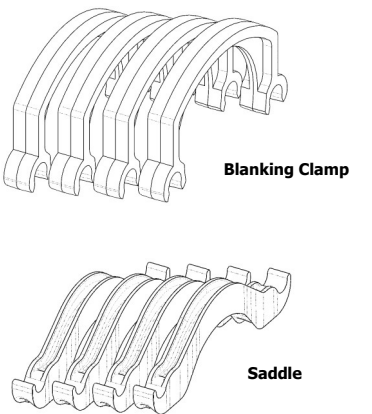
Tube ID	Tube Material	External Tube ID	Part Number	Qty per Part Number
(mm)		(mm)		
0.5	Innovaprene P60	0.5 to 1.0	6600.605	Set of 4
1.0	Innovaprene P60	0.5 to 1.0	6600.610	Set of 4
2.0	Innovaprene P60	2.0 to 2.5	6600.620	Set of 4
0.5	Innovasil G60	0.5 to 1.0	6600.305	Set of 4
1.0	Innovasil G60	0.5 to 1.0	6600.310	Set of 4
2.0	Innovasil G60	2.0 to 2.5	6600.320	Set of 4
1.0	Loagoprene	0.5 to 1.0	6600.410	Set of 4
2.0	Loagoprene	2.0 to 2.5	6600.420	Set of 4
1.0	ED-Plex	0.5 to 1.0	6600.510	Set of 4
2.0	ED-Plex	2.0 to 2.5	6600.520	Set of 4
Connector Material: PP (medical grade, clear)				
Technical information including chemical compatibility: → www.boxerpumps.com/accessories				



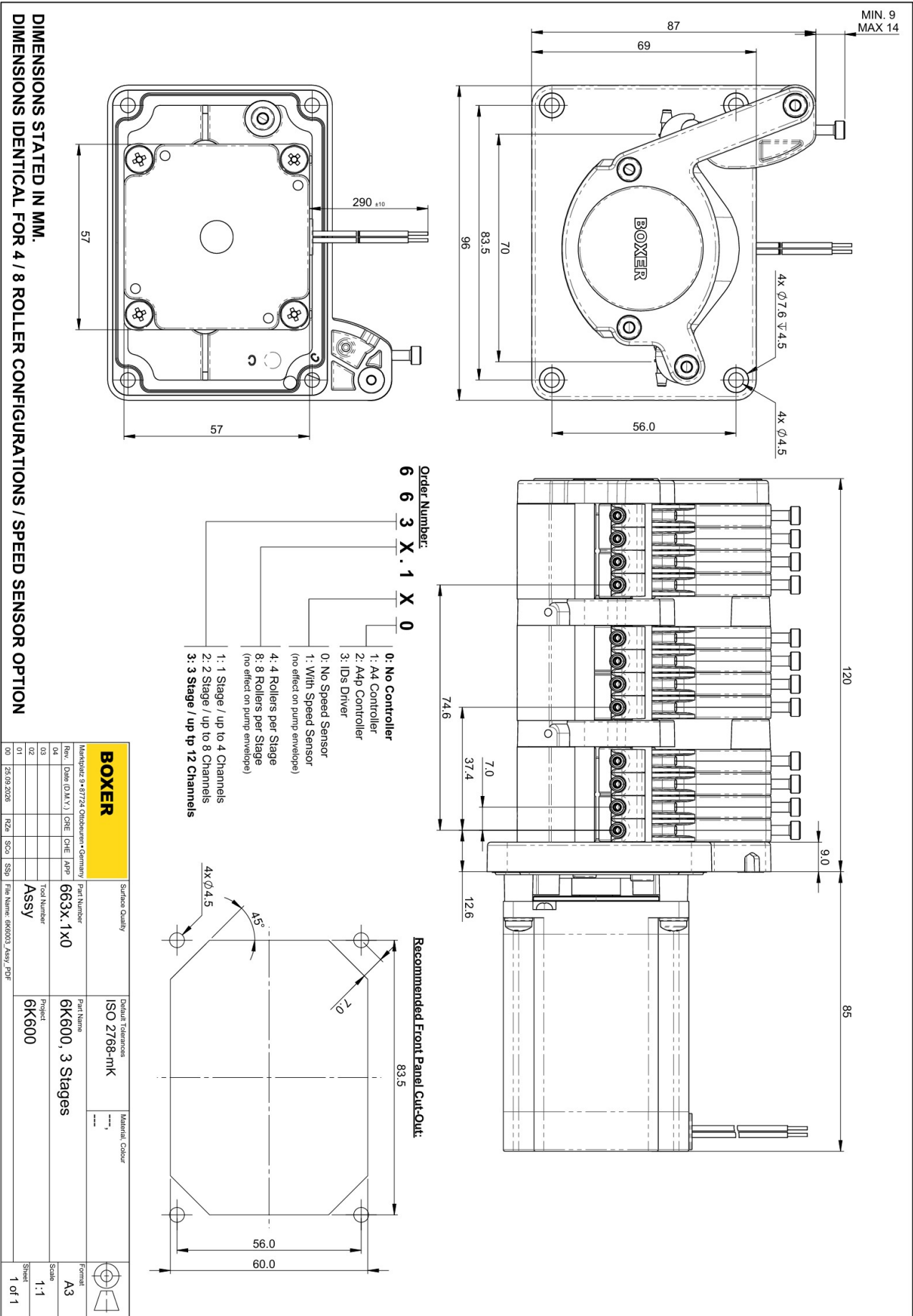
6.3 Order Information: Blanks and Spare Saddles

Blanks should be ordered to replace a tube set if the channels are not required. Additionally spare saddles can be ordered.

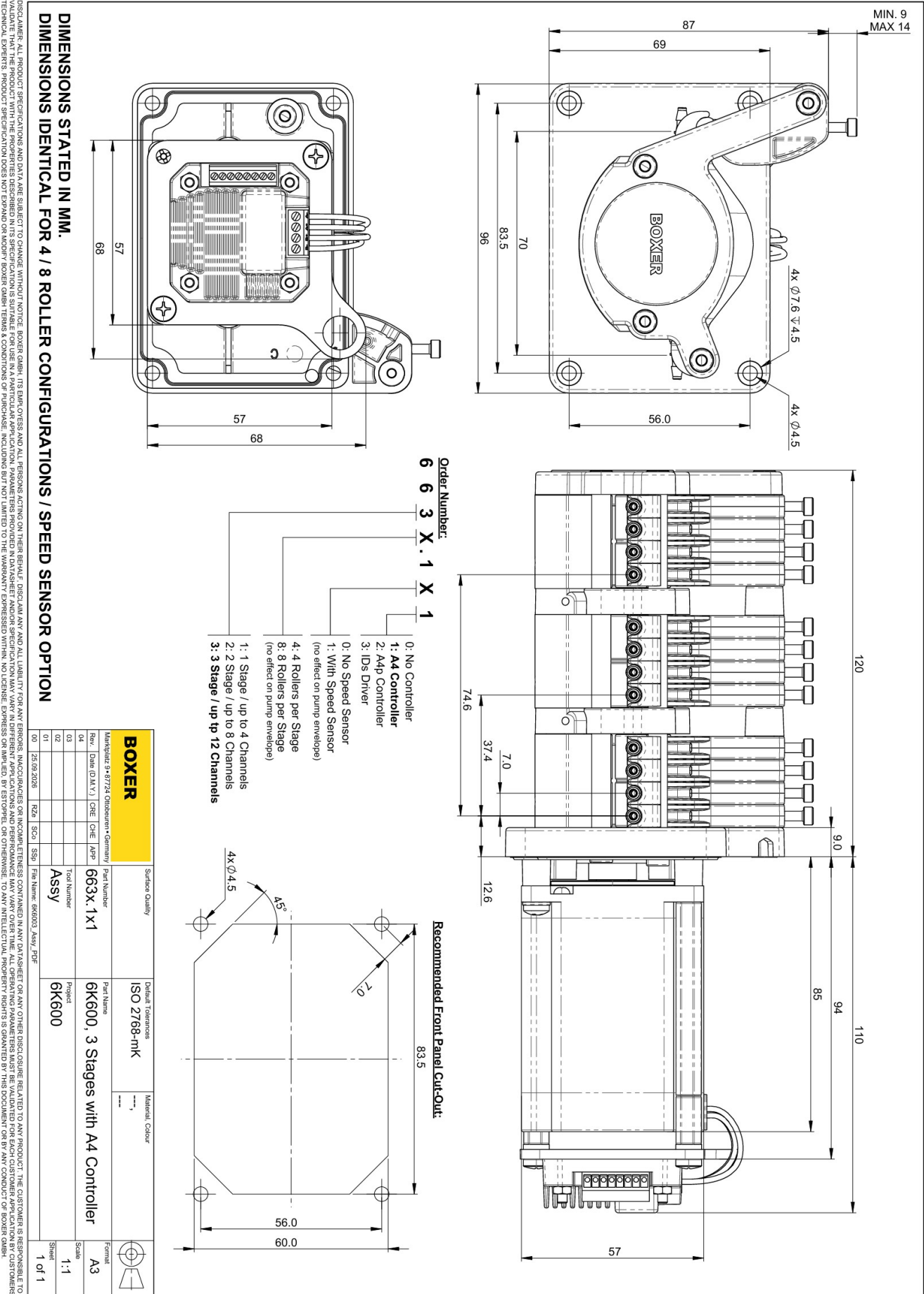
Item	Part Number	Qty per Part Number
Blanking Clamp	6600.100	Set of 4
Saddle for 4 roller pump	6600.104	Set of 4
Saddle for 8 roller pump	6600.108	Set of 4



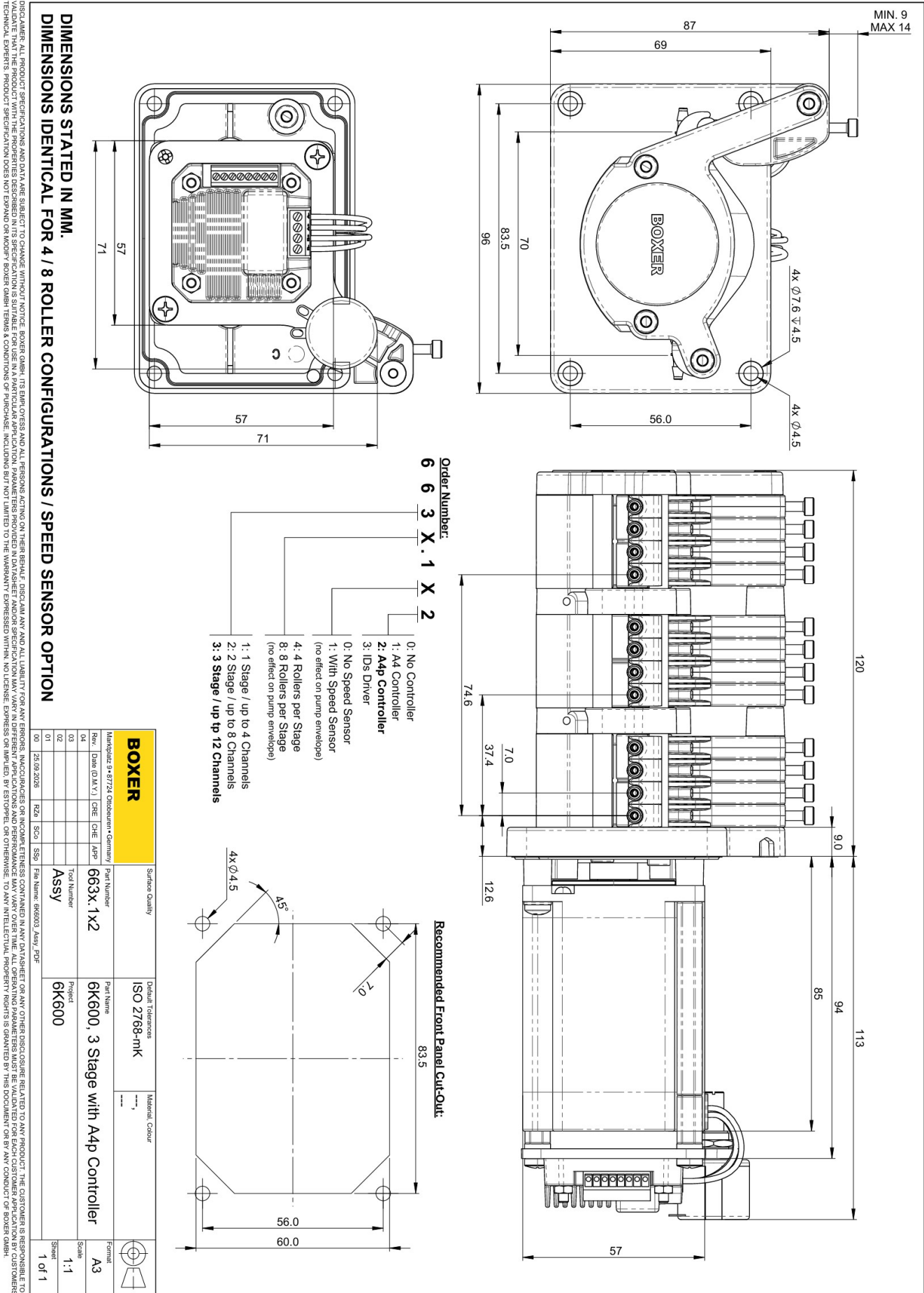
7.1 Enginerring Drawing : 6K-600 12 Channel (without stepper driver)



7.2 Enginnering Drawing : 6K-600 12 Channel (with A4 stepper driver)



7.3 Enginerring Drawing : 6K-600 12 Channel (with A4p stepper driver)



7.4 Enginerring Drawing : 6K-600 12 Channel (with iDs stepper driver)

