

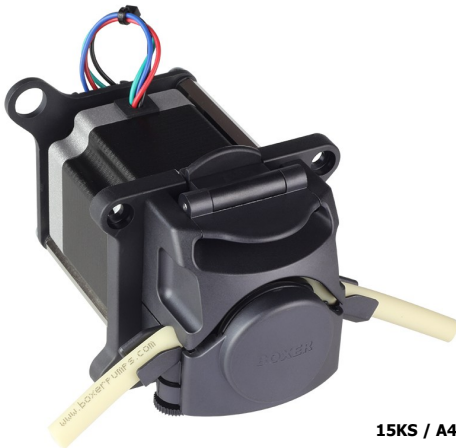
15KS peristaltic pump with 24 V stepper motor (Nema 23)

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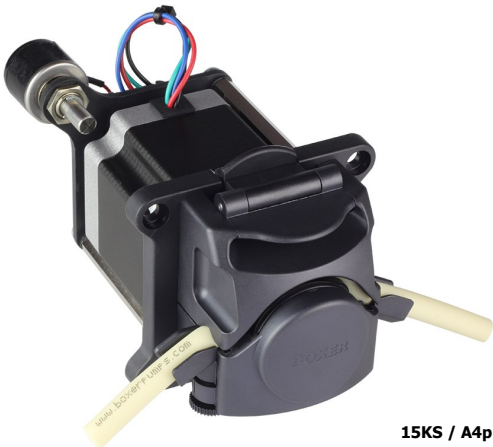
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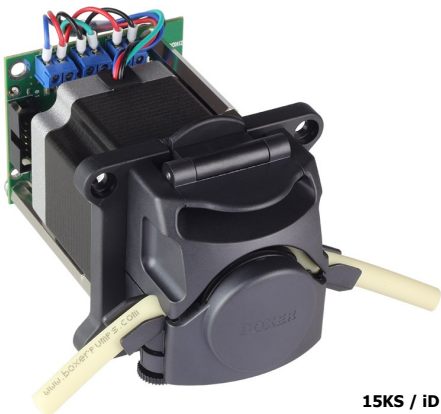
15KS



15KS / A4



15KS / A4p



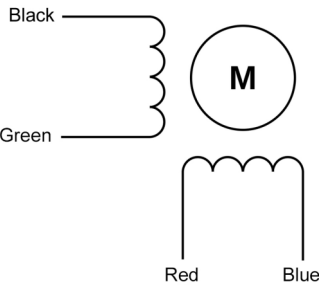
15KS / iD

1.0 Flow and General Technical Data

Tube Size, ID (mm) ¹	Flow per Revolution (µl)	Flow at 100 rpm (ml/min)	Flow at 500 rpm (ml/min) ²	Flow at 800 rpm (ml/min) ³
	3 / 4 / 6 roller	3 / 4 / 6 roller	3 / 4 / 6 roller	3 / 4 / 6 Roller
Ø 1.6	210 / 190 / 170	21 / 19 / 17	105 / 95 / 85	168 / 152 / 136
Ø 2.4	435 / 390 / 320	43 / 39 / 32	215 / 195 / 160	348 / 312 / 256
Ø 3.2	730 / 660 / 495	73 / 66 / 49	365 / 330 / 245	584 / 528 / 396
Ø 4.8	1340 / 1250 / 830	134 / 125 / 83	670 / 625 / 415	1072 / 1000 / 664
¹ Wall thickness 1.6 mm				
² 500 rpm is max recommended continuous speed				
³ above 500 rpm is recommended for intermittent operation only (to avoid tube damage)				
Motor Type	2 phase, hybrid, bipolar, Nema 23			
	Additional information below.			
Power Consumption	Approx. 18.0 to 20.5 W			
Tube Materials	Innovaprene / Innovasil (Silicone) / Pharm-a-line / Lagoprene / ED-Plex			
Driver Options				
A4	Analogue driver: 0 to 5 V DC speed input, direction and enable inputs			
A4p	Analogue driver: speed regulation via mounted potentiometer, direction and enable inputs			
iD	Digital driver with LCD display			
General Data				
Max pressure	2.0 bar			
Max suction height (dry)	9.0 m H ₂ O			
Motor life	>10000 hour			
Weight (without driver)	850 g			
All data measured with 'run-in' Innovaprene continuous tubing and H ₂ O				

2.0 Motor Details

Specification	
Type	2 phase, hybrid, bipolar
Size	Nema 23 / 58 mm
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	0.86 A
Resistance per phase	4.9 Ω ±10%
Inductance per phase	11.4 mH ±20%
Wire gauge	26 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 A current limiter should be set at approx. 2.8 A to avoid excessive motor temperatures	



3.1 Stepper Driver : A4

The A4 stepper driver with analogue speed control input for accurate flow control of the 15KS 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

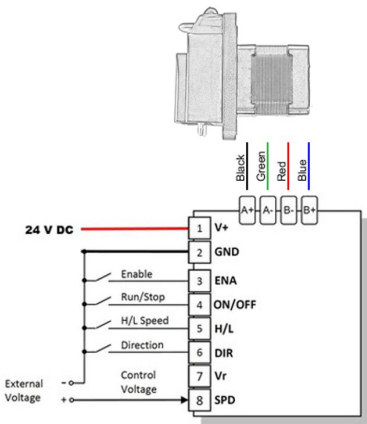
Driver Type	Full H-Bridge for 2 phase unipolar stepper motors
Mounting	Via a mounting plate on rear of motor
Voltage Range	10 to 30 V DC
Max Current	4.0 A
Current Limiter Factory Setting	2.8 A
Control Inputs	Enable, run / stop, high / low speed, direction, speed
Control Outputs	5 V DC reference output (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 analogue only (resolution 255 steps / 8 bit) ³
Always start a peristaltic pump at slow to medium speed (less than 300 rpm) 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)		
³ PWM or any digital signal on SPD input will damage the driver		



Current Limiter

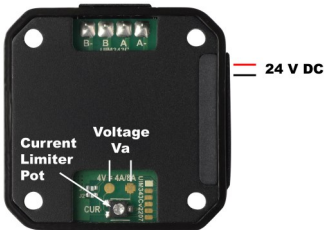
The current limiter on the underside of the driver is used to reduce motor temperatures. This is especially important when a peristaltic pump is run at slow speeds.

- 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.

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

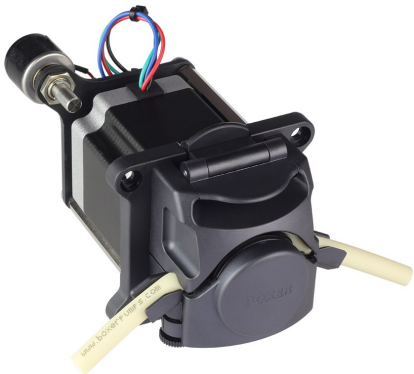
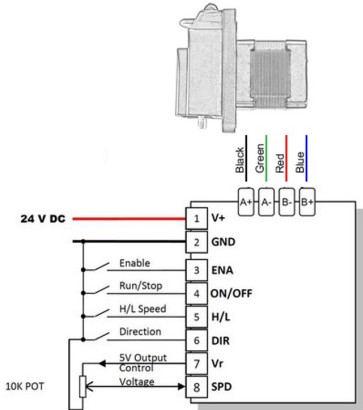
Note: the Jumpers J1 and J2 are not populated and have no function.



The underside of driver for adjusting the current limiter.

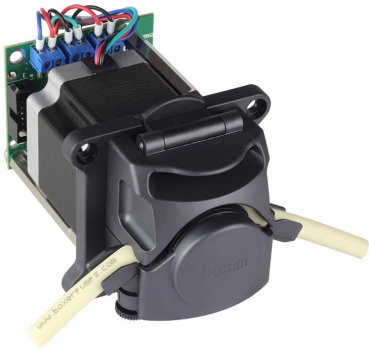
3.2 Stepper Driver : A4p

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.



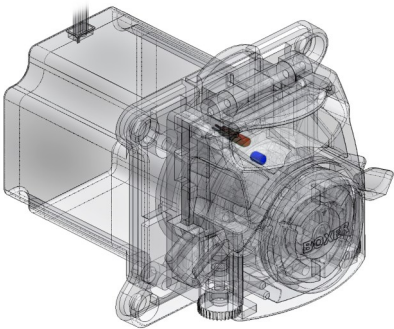
The full operating instructions are beyond the scope of this datasheet and are available from Boxer's website:

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

(click on iD Driver tab)

4.0 Optional Speed Sensor

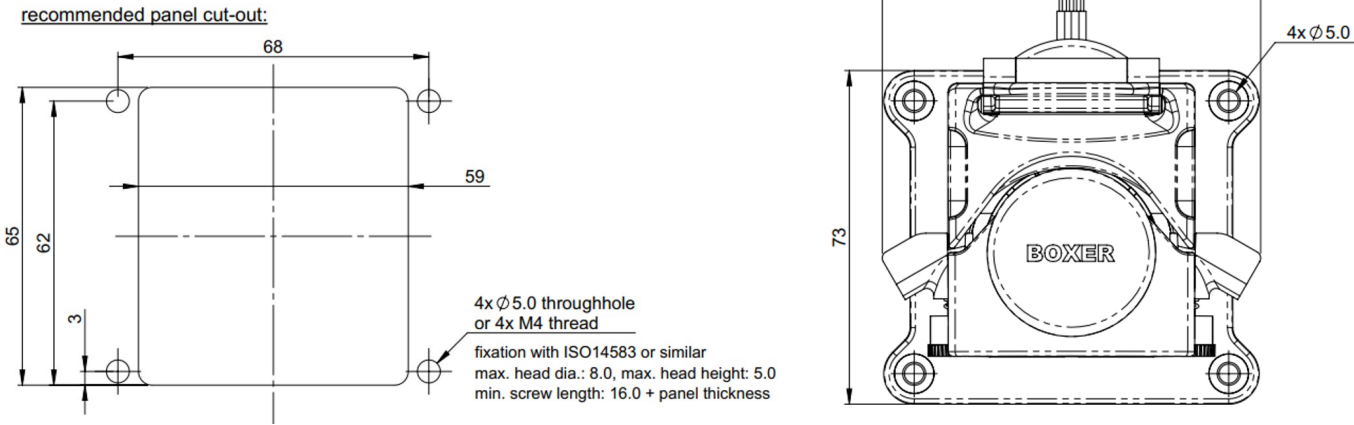
A micro reed sensor (shown in red) is mounted inside the pump body. A permanent magnet (shown in blue) is located on the rotor. The contacts of the micro reed sensor close when the magnet moves through the upper portion of the rotation., once per revolution. A speed sensor can also operate as a stall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



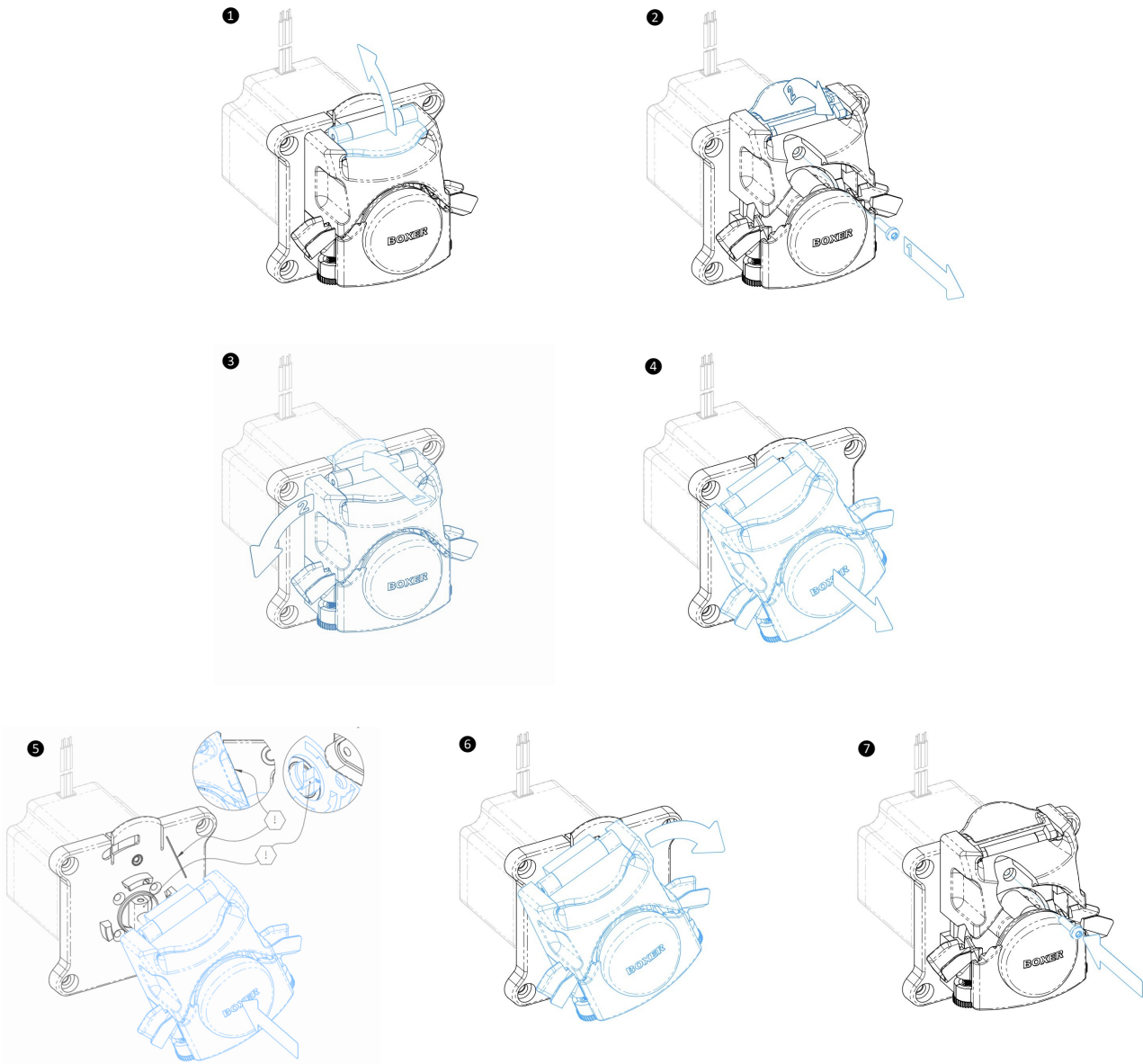
Specification	
Reed sensor type	Normally open, single pole, single throw
Contact closure	Once per revolution
Max. switching current	0.5 A
Max. switching voltage	170 V
Lead cross section area	0.06 mm²
Lead length	27 cm

5.0 Assembly Information

The 15KS peristaltic pump with Stepper Motor is assembled to a panel cut-out using 4 x M5 bolts. The counter-sunk mounting holes are accessed without removal of the head assembly. A mounting gasket to eliminate noise and vibration is provided and should be placed between the motor and panel.



The 15KS head can be removed (1 to 4) and replaced (5 to 7) as part of routine maintenance:



6.1 Order Information : Pumps

Pump and tubing should always be ordered separately.

Pump Configuration	3 Rollers	4 Rollers	6 Rollers
15KS 24 V Stepper Nema 23	15901.100	15902.100	15903.100
15KS 24 V Stepper Nema 23 / Speed Sensor	15901.110	15902.110	15903.110
15KS 24 V Stepper Nema 23 / A4	15901.101	15902.101	15903.101
15KS 24 V Stepper Nema 23 / A4 / Speed Sensor	15901.111	15902.111	15903.111
15KS 24 V Stepper Nema 23 / A4p	15951.101	15952.101	15953.101
15KS 24 V Stepper Nema 23 / A4p / Speed Sensor	15951.111	15952.111	15953.111
15KS 24 V Stepper Nema 23 / iD	15901.105	15902.105	15903.105
15KS 24 V Stepper Nema 23 / iD / Speed Sensor	15901.115	15902.115	15903.115

6.2 Order Information: Tube Lengths, Tubing Multiples of 1m or Coils

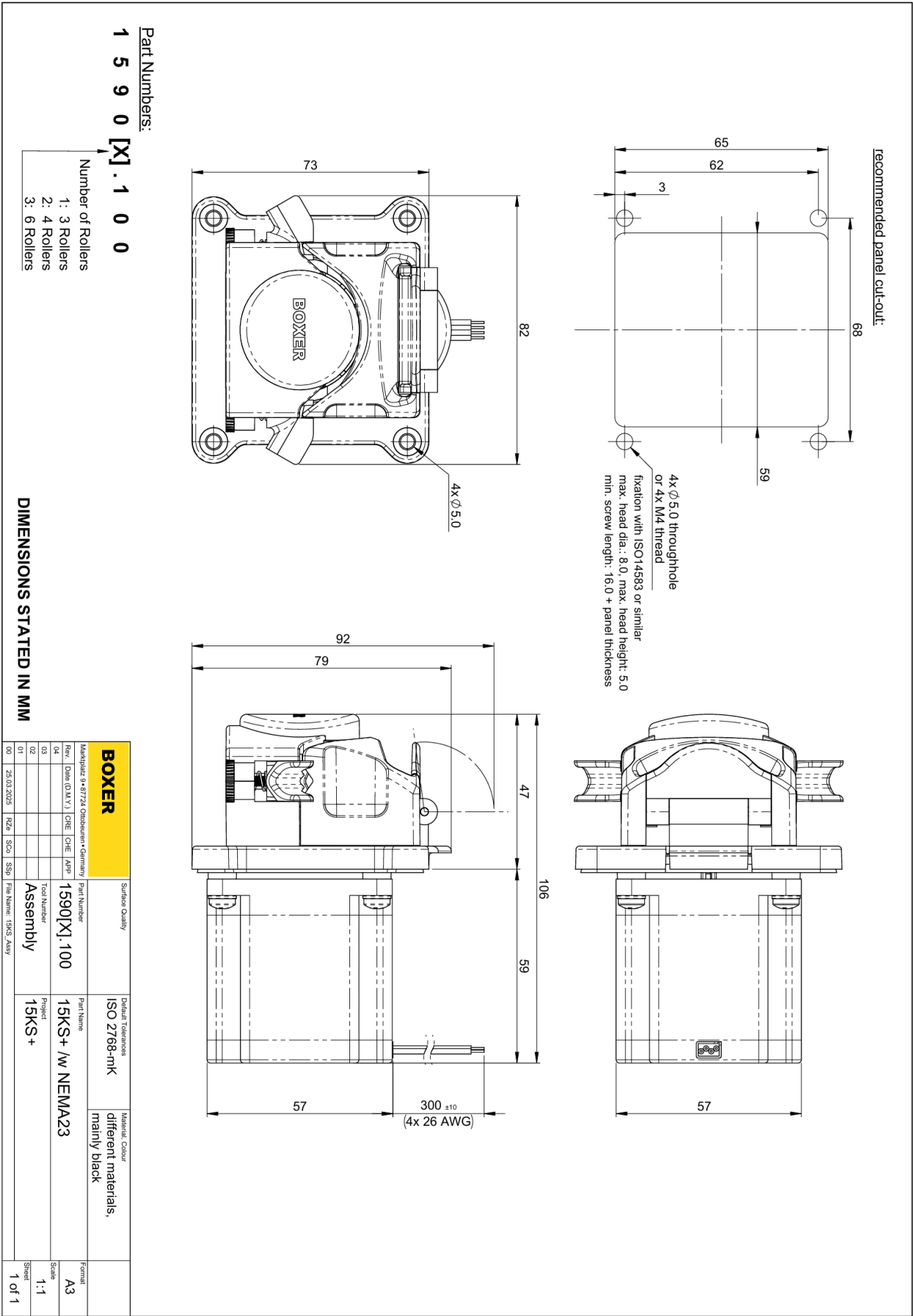
Tube Material	ID (mm)	Tube Lengths (150 mm)	Part Number	
			1 m (or multiples of)	15 m Coil
Innovaprene P60	1.6	15000.216	81616.601	81616.615
Innovaprene P60	2.4	15000.217	82416.601	82416.615
Innovaprene P60	3.2	15000.218	83216.601	83216.616
Innovaprene P60	4.8	15000.219	84816.601	84816.615
Innovasil (Silicone) G60	1.6	15000.230	81616.301	81616.315
Innovasil (Silicone) G60	2.4	15000.231	82416.301	82416.315
Innovasil (Silicone) G60	3.2	15000.232	83216.301	83216.315
Innovasil (Silicone) G60	4.8	15000.233	84816.301	84816.315

Technical information including chemical compatibility: → www.boxerpumps.com/accessories

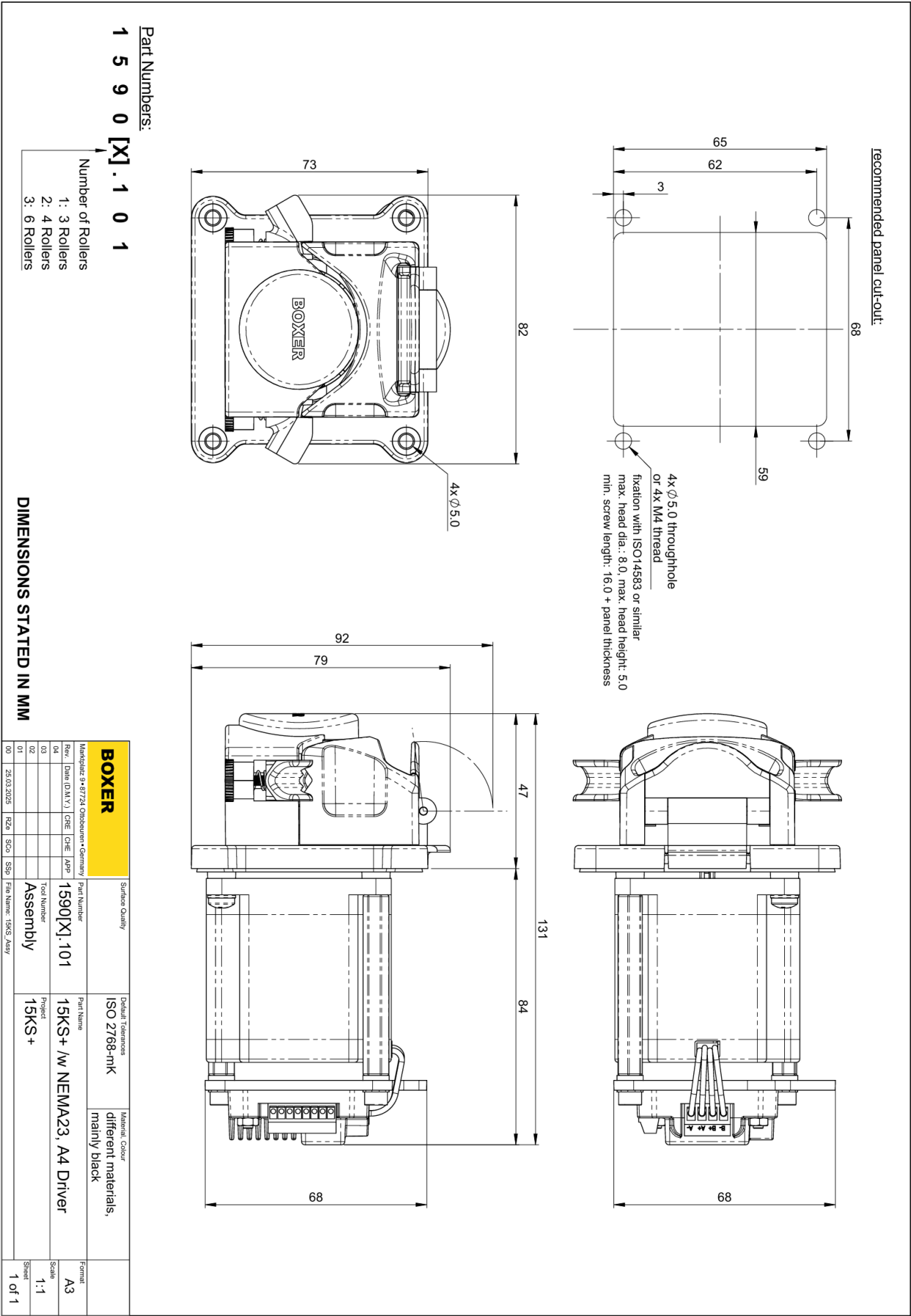
Pharmaline, Lagoprene and ED-Plex tubing is also available:→ www.boxerpumps.com/accessories/15ks-15qq



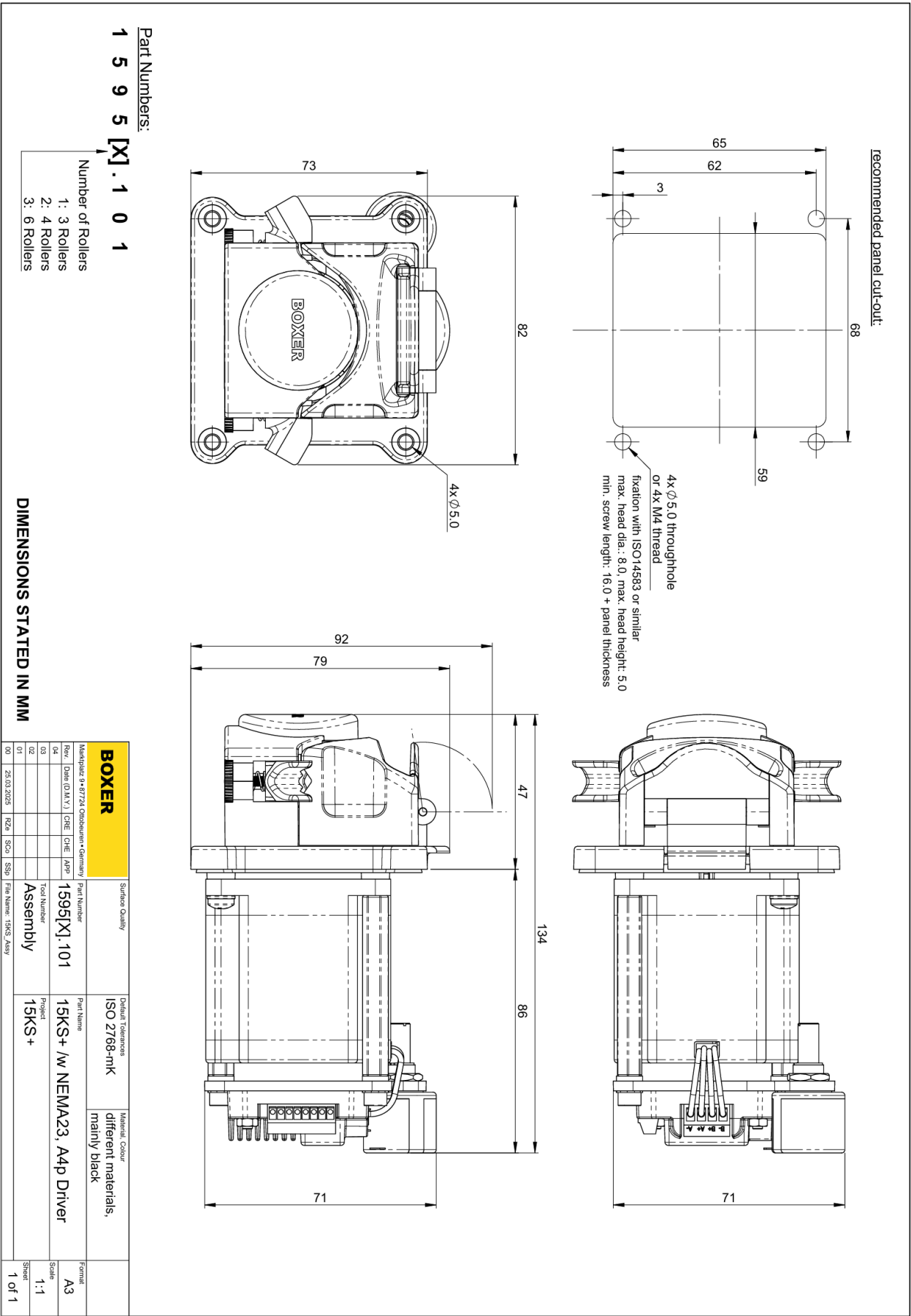
7.1 Enginerring Drawing : 15KS



7.2 Enginerring Drawing : 15KS / A4



7.3 Enginerring Drawing : 15KS / A4p



7.4 Enginnering Drawing : 15KS / iD

