MODELS XTR2504-2510
SERVOTUBE HIGH RIGIDITY UNIT

FEATURES

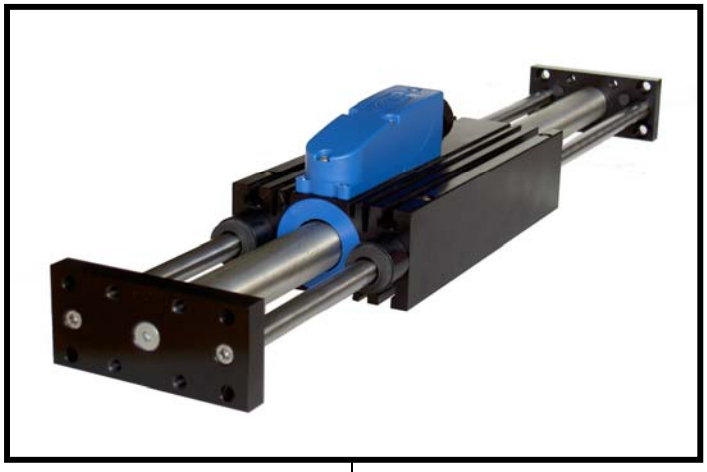
- **Outrigger-bearings for high side-loading applications**
- **Up to 20% more force than standard ServoTube STA25**
- **61~119 N (14~27 lb) continuous force**
- **344~860 N (77~193 lb) peak force**
- **28~310 mm stroke**
- **12 µm (0.47 mil) resolution**
- **Speeds up to 5.6 m/s**
- **Acceleration up to 369 m/s^2**
- **Built-in position feedback -- no encoder required**
- **Standard 1V pk-pk sin/cos position output**
- **IP67 rating**
- **Plug-and-play with a range of matched servo amplifiers and indexers**

APPLICATIONS

- **Packaging**
- **Material Handling**
- **Automated Assembly**

THE OEM ADVANTAGE

- **Ready-to-use actuator requires no bearing support**
- **Flexible position control**
- **High speed and acceleration**
- **Clean, quiet operation**
- **No maintenance or adjustment**



The ServoTube high rigidity actuator with integrated outrigger-bearings is an ideal solution for applications with high side-loading. A ball-bushing option with steel bearing rails provides maximum side-loading support. Polymer bushings use aluminum rails for reduced weight and are ideal for vertical loads.

Iron-sleeve design produces up to 20% more force than standard ServoTube actuator. Four models deliver a continuous force range of 61~119 N (14~27 lb) with peak forces up to 860 N (193 lb). Twelve stroke lengths are available from 28~310mm.

The patented magnetic design of ServoTube generates 12 micron (0.47 mil) repeatability and 250 micron (10 mil) accuracy from a non-contact, integral position sensor. No external encoder is required. Position output is industry standard 1V pk-pk sin/cos signals.

ServoTube is an ideal OEM solution for easy integration into pick-and-place gantries and general purpose material handling machines. The load is mounted directly to the industry standard mounting plate.

ServoTube has superior thermal efficiency, radiating heat uniformly. High duty cycles are possible without the need for forced-air or water cooling.

ServoTube is complemented by a range of matched, self-tuning servo-amplifiers and indexers complete with plug-and-play cabling. Amplifiers interface easily to PLCs and feature CANopen and DeviceNet connectivity.

ELECTRICAL SPECIFICATIONS

FORCER TYPE	2504		2506		2508		2510		units
	S (1)	**P** (1)	**S** (1)	**P** (1)	**S** (1)	**P** (1)	**S** (1)	**P** (1)	
Peak force @ 25°C ambient for 1 sec	344	172	516	258	688	344	860	430	N
Peak current @ 25°C ambient for 1 sec	20		20		20		20		A_{pk}
With 25x25x2.5cm heatsink plate									
Continuous stall force @ 25°C ambient (2)	60.7		81.8		101.2		119.4		N
Continuous stall current @ 25°C ambient	2.49	4.98	2.24	4.48	2.08	4.16	1.96	3.92	A_{rms}
	3.53	7.06	3.17	6.34	2.94	5.88	2.78	5.56	A_{pk}
Without heatsink plate									
Continuous stall force @ 25°C ambient (2)	52.2		72.3		90.4		108.0		N
Continuous stall current @ 25°C ambient	2.15	4.30	1.98	3.96	1.86	3.72	1.78	3.56	A_{rms}
	3.03	6.06	2.80	5.60	2.63	5.26	2.51	5.02	A_{pk}
Force constant (sine commutation)	24.3	12.1	36.5	18.2	48.6	24.3	60.8	30.4	N/A_{rms}
	17.2	8.6	25.8	12.9	34.4	17.2	43.0	21.5	N/A_{pk}
Back EMF constant (phase to phase)	19.9	9.9	29.8	14.9	39.7	19.8	49.7	24.8	$V_{pk}/m/s$
Fundamental forcer constant	7.53		9.22		10.65		11.90		$N/\sqrt{W}$
Eddy current loss	2.35		2.35		2.35		2.35		N/m/s
Sleeve cogging force	2.2		3.2		3.3		3.0		+/-N
Resistance @ 25°C (phase to phase)	5.40	1.35	8.11	2.03	10.81	2.70	13.51	3.38	Ohm
Resistance @ 100°C (phase to phase)	6.96	1.74	10.45	2.61	13.93	3.48	17.41	4.35	Ohm
Inductance @ 1kHz (phase to phase)	4.32	1.08	6.48	1.62	8.64	2.16	10.80	2.70	mH
Electrical time constant	0.80		0.80		0.80		0.80		ms
Continuous working voltage	380		380		380		380		V d.c.
Pole pitch (one electrical cycle)	51.2		51.2		51.2		51.2		mm
Peak acceleration (3, 5)	225	113	288	144	334	167	369	185	m/s^2
Maximum speed (4, 5)	5.6	4.1	5.3	5.0	4.8	5.5	4.3	5.8	m/s
Peak acceleration (3, 6)	276	138	354	177	413	206	458	229	m/s^2
Maximum speed (4, 6)	6.1	4.6	5.7	5.5	5.1	6.2	4.5	6.3	m/s

Notes: -

(1) S=series forcer phases, P=parallel forcer phases
(2) Reduce continuous stall force to 89% at 40°C ambient
(3) Based on a moving thrust rod with 28mm stroke and no payload
(4) Based on triangular move over maximum stroke and no payload
(5) -B bush bearing option
(6) -P polymer bearing option

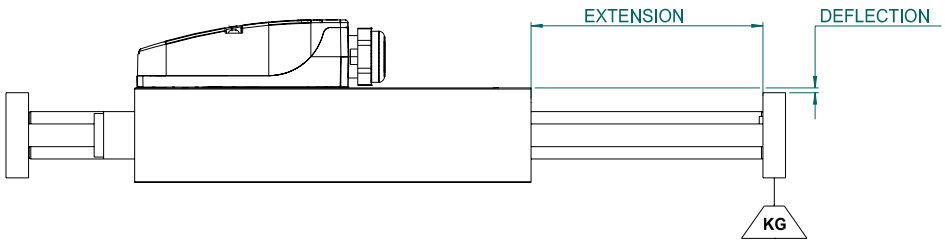
THERMAL SPECIFICATIONS

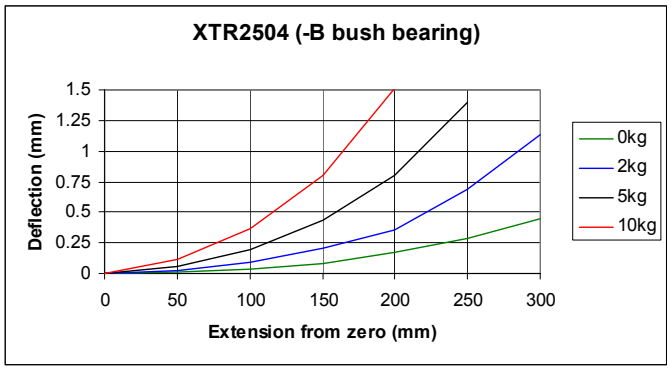
FORCER TYPE	2504	2506	2508	2510	units
Maximum phase temperature	100	100	100	100	°C
Thermal resistance $Rth_{phase\text{-}housing}$	0.39	0.28	0.23	0.19	°C/W
With 25x25x2.5cm heatsink plate					
Power dissipation @ 25°C ambient	65.0	78.8	90.4	100.6	Watt
Thermal resistance $Rth_{housing\text{-}ambient}$	0.76	0.67	0.60	0.56	°C/W
Without heatsink plate					
Power dissipation @ 25°C ambient	48.1	61.5	72.1	82.4	Watt
Thermal resistance $Rth_{housing\text{-}ambient}$	1.17	0.94	0.81	0.72	°C/W
Thermal time constant	1639	1773	1940	2080	s

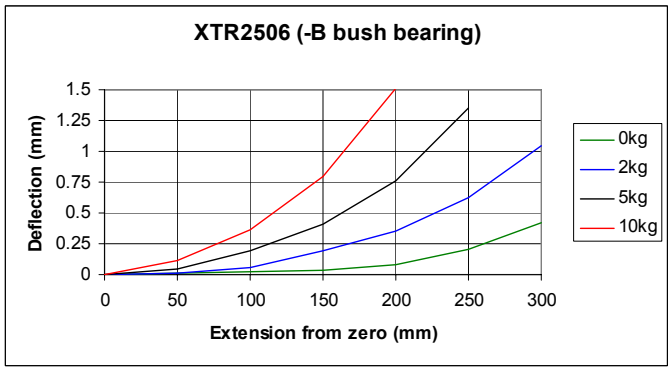
MECHANICAL SPECIFICATIONS

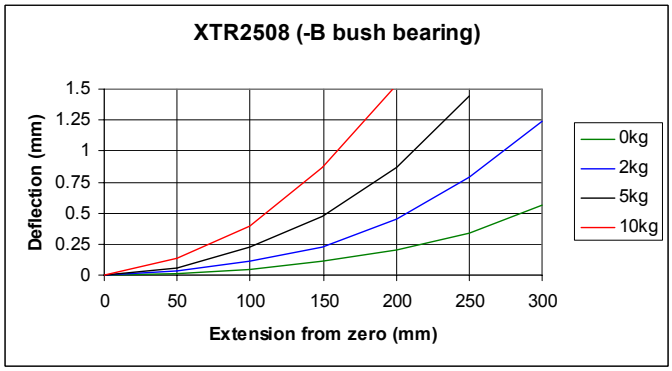
FORCER TYPE	2504	2506	2508	2510	units
Maximum stroke	310	310	310	310	mm
Forcer mass	1.65	2.25	2.85	3.45	kg
Moving mass (-B bush bearing option)	0.25+(overall length (m) x 5.24)				kg
Moving mass (-P polymer bearing option)	0.25+(overall length (m) x 4.10)				kg

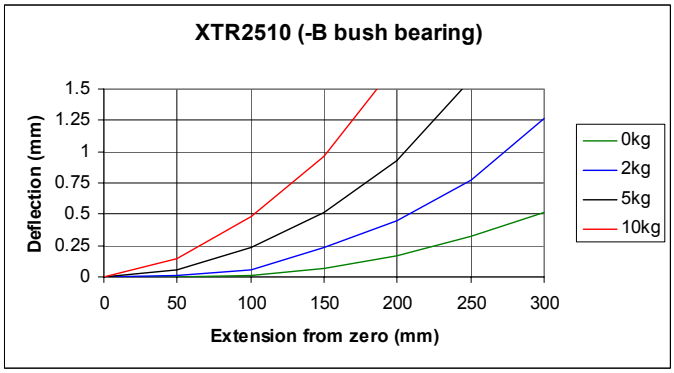
MECHANICAL RIGIDITY

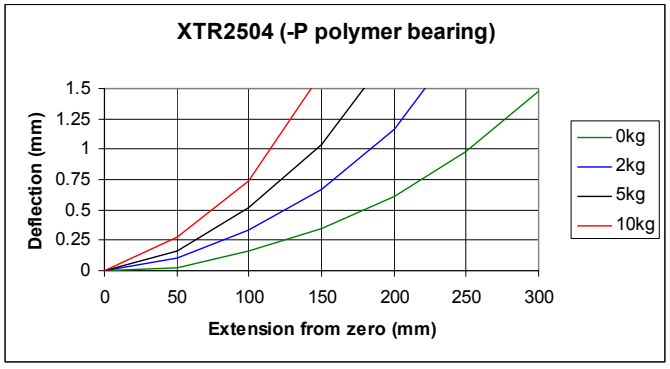


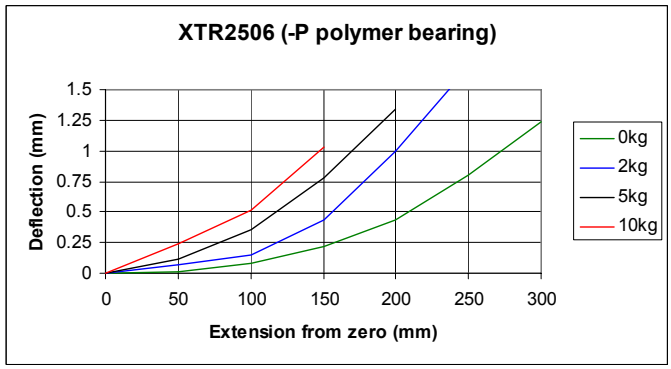


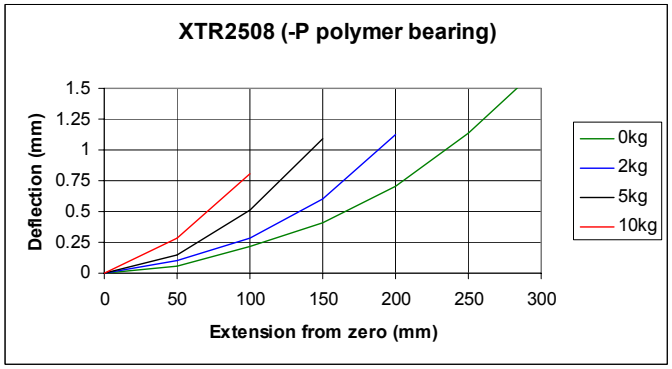


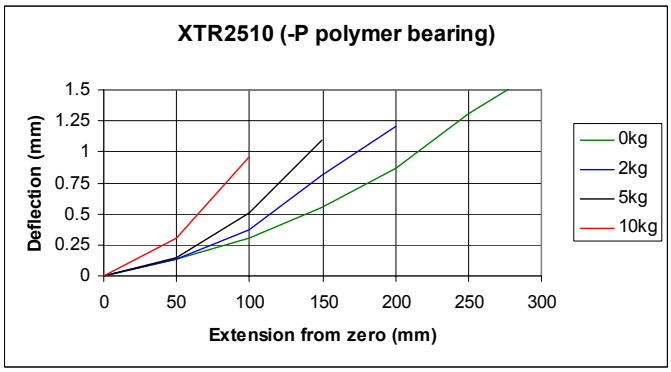




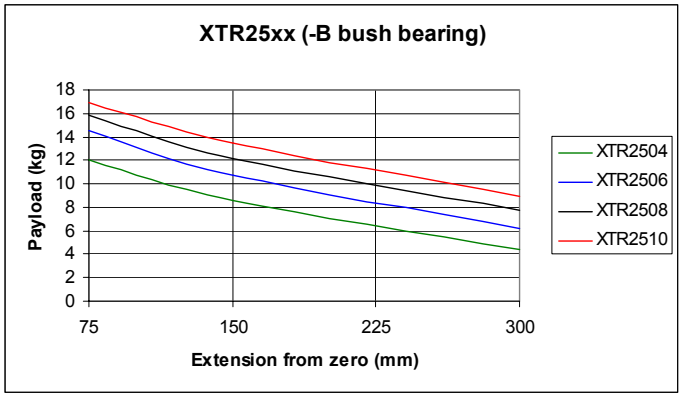


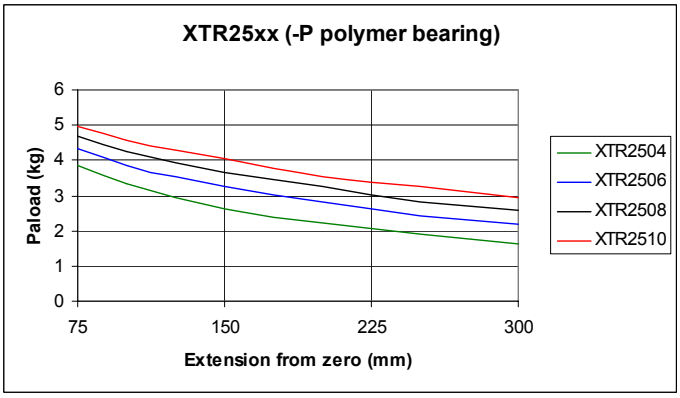




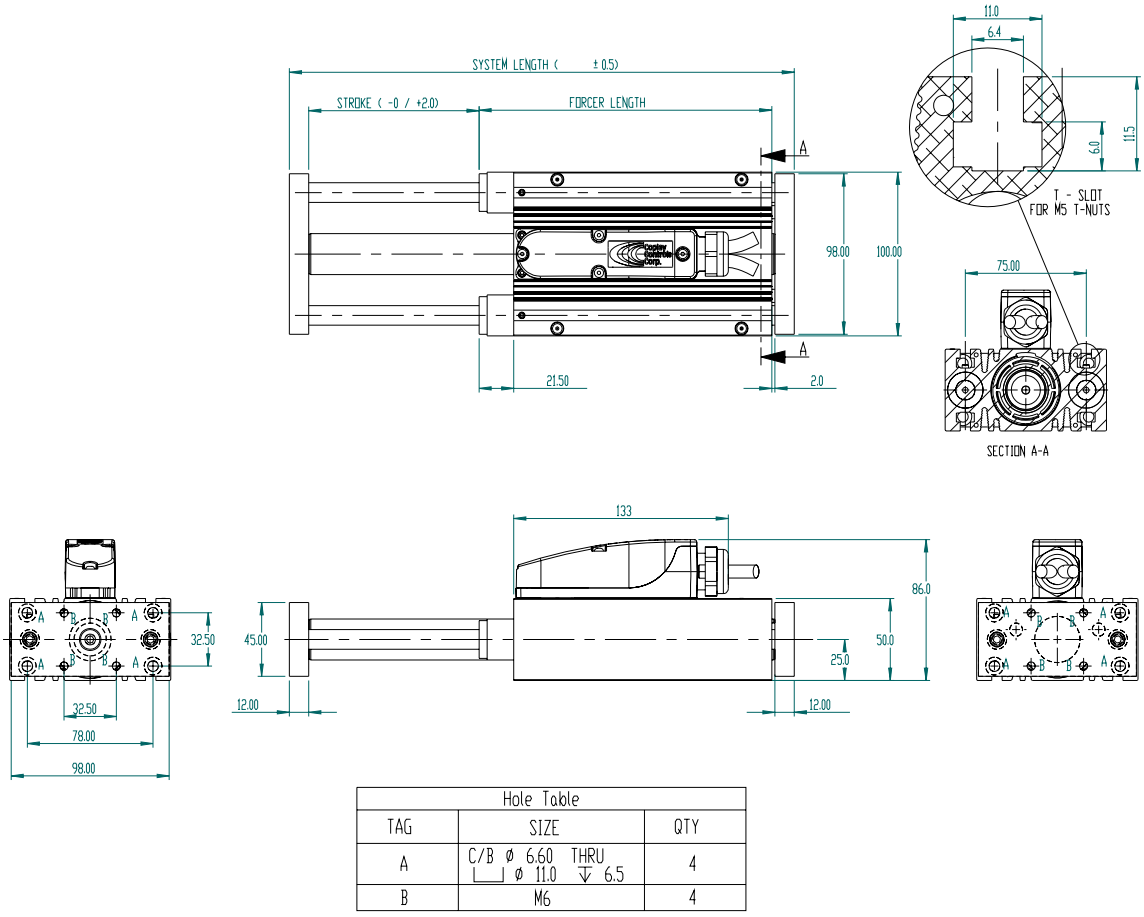


PAYLOAD VERSUS EXTENSION FOR 10,000KM LIFE





OUTLINE DRAWINGS



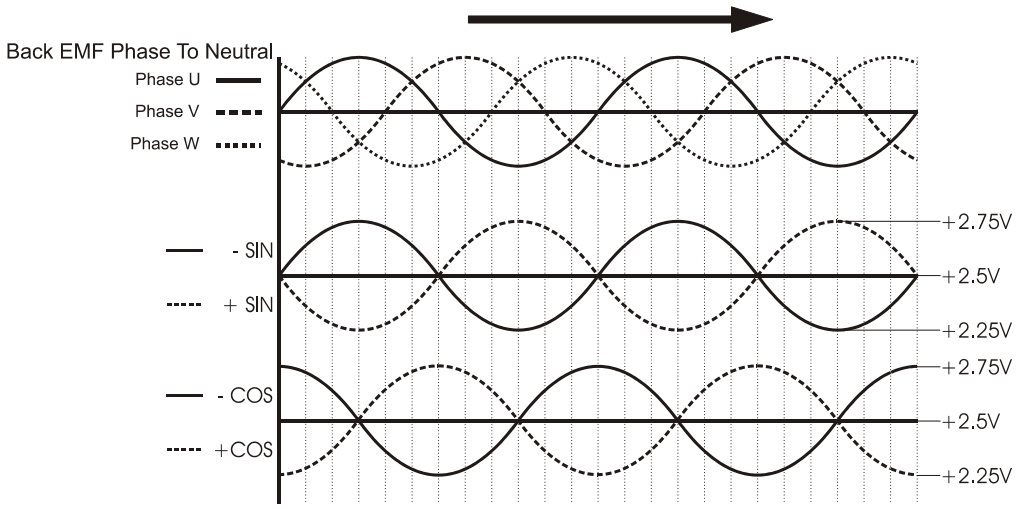
Hole Table		
TAG	SIZE	QTY
A	C/B ø 6.60 THRU ⌴ ø 11.0 ↧ 6.5	4
B	M6	4

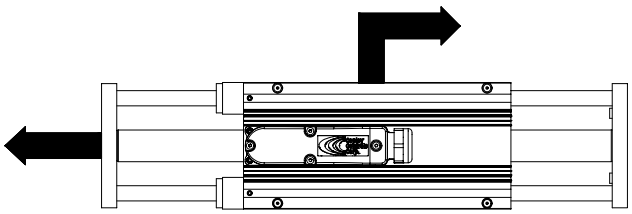
Stroke min (mm)	System length (mm)			
	XTR2504	**XTR2506**	**XTR2508**	**XTR2510**
28	236	287	339	390
54	262	313	364	415
79	287	339	390	441
105	313	364	415	467
131	339	390	441	492
156	364	415	467	518
182	390	441	492	544
207	415	467	518	569
233	441	492	544	595
259	467	518	569	621
284	492	544	595	646
310	518	569	621	672

Forcer	Forcer length (mm)
XTR2504	181.5
XTR2506	232.5
XTR2508	283.5
XTR2510	334.5

POSITION SENSOR

The position sensor outputs analogue, differential sine and cosine signals for providing position feedback. Shown below are the relationships between forcer phase back EMF and position sensor outputs for one direction of motion (as shown by arrows). It should be noted that +SIN or -SIN is always in phase with forcer phase U. For the motion shown, -SIN is in phase with forcer phase U. For motion in the opposing direction +SIN is in phase with forcer phase U.





Specification	value	units
Output signal period	51.2	mm
Signal amplitude (between +/- signals)	1	Vpk-pk
Output current	±10	mA
Supply voltage	5 ± 0.25	Vd.c.
Supply current (output current =0)	15 ± 5	mA
Resolution (1)	12	µm
Position Repeatability (2)	±12	µm
Absolute Accuracy (3)	±250	µm/m

Notes: -

(1) Dependent on amplifier.

(2) Dependent on amplifier. Under constant operating conditions. Self-heating of the thrust rod by the forcer will cause expansion in the thrust rod during the initial warm up period. In high duty applications (corresponding to an internal forcer temperature of 80°C) a 1 metre thrust rod will expand typically by 250µm.

(3) Maximum error over 1metre under constant operating conditions.

FORCER OVER TEMPERATURE SENSOR

It is strongly recommended that the forcer over-temperature sensor is connected to the drive amplifier or servo controller **at all times** in order to reduce the risk of damage to the forcer due to excessive temperatures.

Protection is provided by three, positive temperature coefficient (PTC) thermistors embedded in the forcer phases. As the forcer phase temperature approaches 100°C, the PTC thermistors exhibit a sharp increase in electrical resistance. This change in resistance can be detected by circuitry within the drive amplifier or servo controller and used to reduce or disable the output of the drive amplifier in order to protect the forcer.

Specification	value	units
Resistance in the temperature range -20°C to +70°C	60 to 750	Ohms
Resistance at 85°C	≤1650	Ohms
Resistance at 95°C	≥3990	Ohms
Resistance at 105°C	≥12000	Ohms
Maximum continuous voltage	30	Vd.c.

CABLE

The XTR has two separate cables providing connections for forcer power and position sensor. There are two options available with option R being supplied as standard.

Option S cables are flexible but are not intended for continuous flex or energy chain applications.

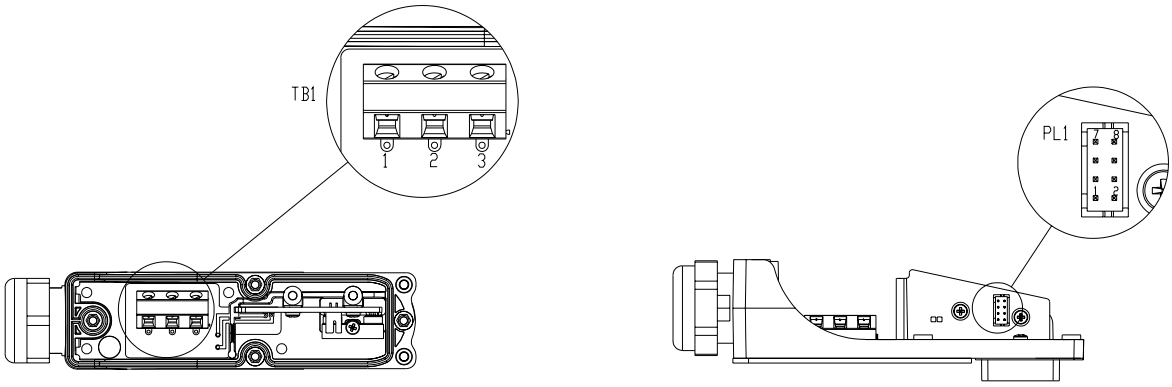
Option S specification	Power	Sensor
Overall diameter (nominal)	8.2mm	7.8mm
Outer jacket material	PVC	PVC
Number of conductors	4	4 x twisted pair
Size of conductors	1.5mm^2 (16 AWG)	0.14mm^2 (26 AWG)
Screened / Unscreened	Screened	Screened
Operating voltage	600Vrms	300Vrms
Minimum bending radius-fixed routing	41mm	40mm
Operating temperature-fixed routing	-40 °C to + 90 °C	-40 °C to +70 °C
UL style	2586 105 °C 600V	21083 90 °C 300V

Option R cables are suitable for continuous flex or energy chain applications.

Option R specification	Power	Sensor
Overall diameter (nominal)	7.6mm	7.8mm
Outer jacket material	PUR	PVC
Number of conductors	4	4 x twisted pair
Size of conductors	1.5mm^2 (16 AWG)	0.14mm^2 (26 AWG)
Screened / Unscreened	Screened	Screened
Operating voltage	300Vrms	300Vrms
Minimum bending radius-flexible routing	38mm	58mm
Operating temperature- flexible routing	-40 °C to + 80 °C	+5 °C to +70 °C
UL style	20233 80 °C 300V	21083 90 °C 300V

CONNECTIONS

Connections within the forcer termination box are as follows: -



TB1	Function	Conductor designation
1	Forcer phase U	Black 1
2	Forcer phase V	Black 2
3	Forcer phase W	Black 3
Chassis	Protective earth + both cable screens	Green/Yellow

PL1 Sensor PCB	Function	Conductor designation
1	+SIN	Blue
2	-SIN	Black paired with Blue
3	+COS	White
4	-COS	Black paired with White
5	+5Vd.c.	Red
6	0V	Black paired with Red
7	+TH (Thermistor)	Green
8	-TH (Thermistor)	Black paired with Green

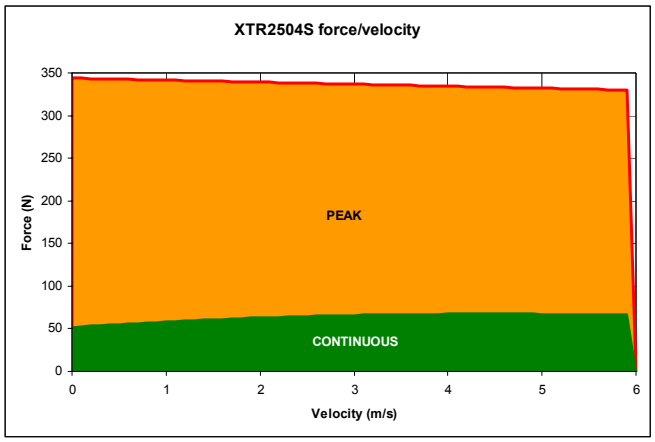
ENVIRONMENT

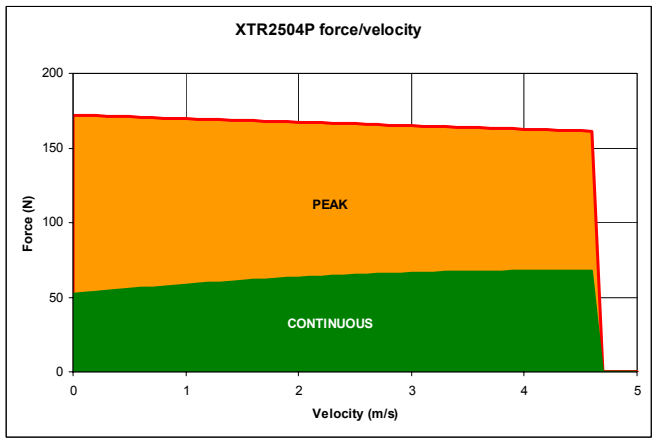
The XTR is intended for use in an environment within the following conditions: -

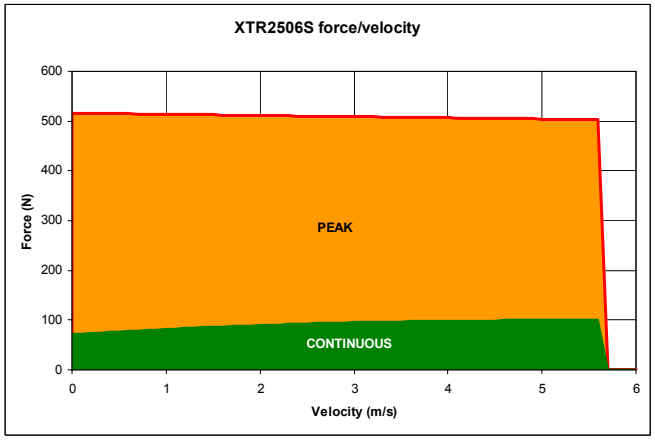
Operating temperature	0 to +40 °C
Storage temperature	-25 to +70 °C
Ingress protection	IP67
Altitude (above mean sea level)	1000m
Overvoltage category	II
Pollution degree	2
EMC	light industrial

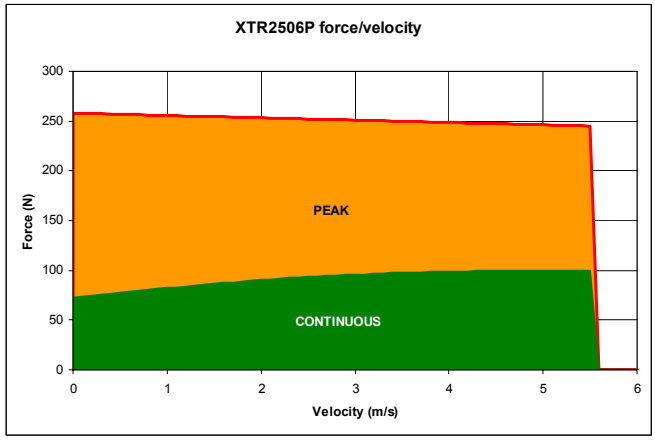
FORCE/VELOCITY PROFILES (WITH AN OPERATING VOLTAGE OF 325VD.C. AND NO PAYLOAD)

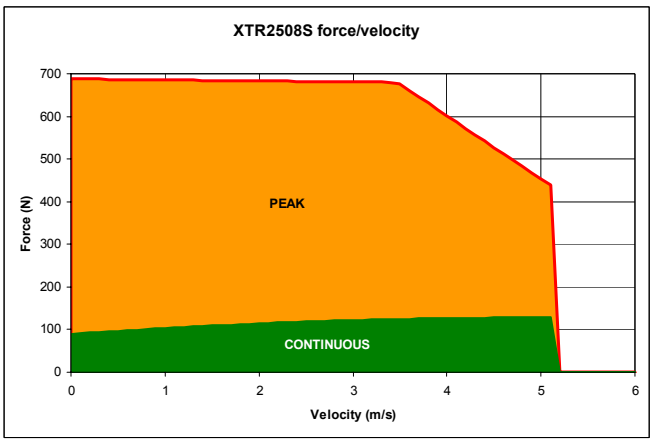
S=series forcer phases P=parallel forcer phases

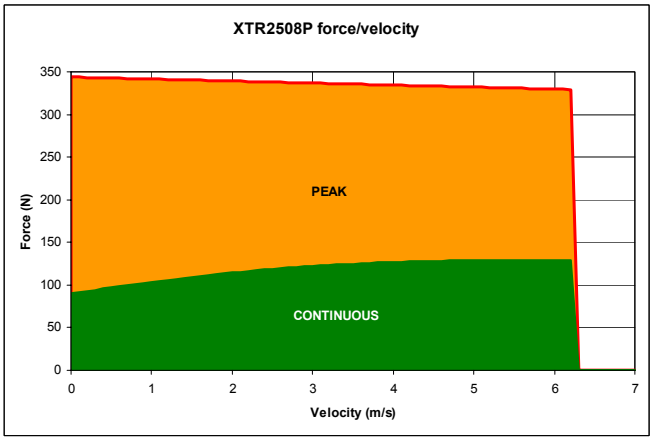


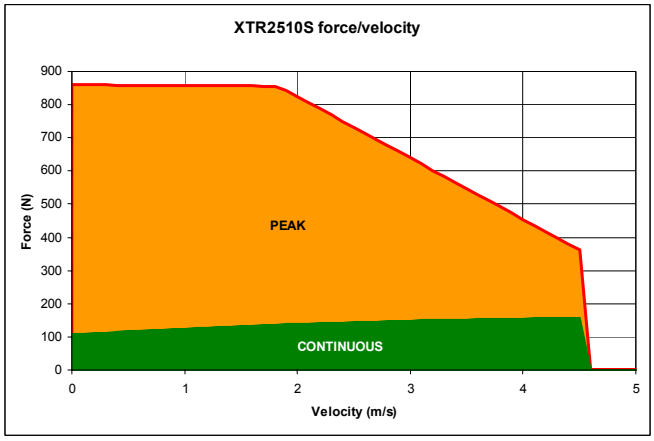


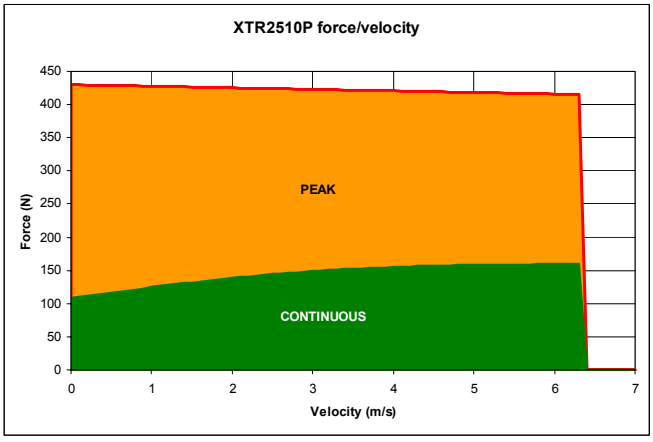












ORDER CODES

XTR25□□ □-□□□ □-□-□ □□ □-□□

Brake
BR

Cable Termination
X-Xenus
F-Flying leads
P-Parker

Cable Length
03-3m
05-5m

Cable Type
S-Non-Robotic
R-Robotic

Environment
S-Standard
F-Food grade

Forcer
04, 06, 08, 10

Winding
S-Series
P-Parallel

Stroke
028, 054, 079, 105, 131, 156
182, 207, 233, 259, 284, 310
Stroke in mm

Bearing
B-Bush
P-Polymer