

MA2

series



Product Segments

- **Industrial Motion**

TiMOTION's MA2 series electric linear actuator was specifically designed for applications that face harsh working environments, requiring a heavy-duty construction and durability. Additionally, the MA2 has an optional T-Smart version. Embedded with a driver board, the MA2 allows for easy integration with a variety of control interfaces, eliminating the need for an external control box.

For more information about T-Smart actuators, please click [here](#).

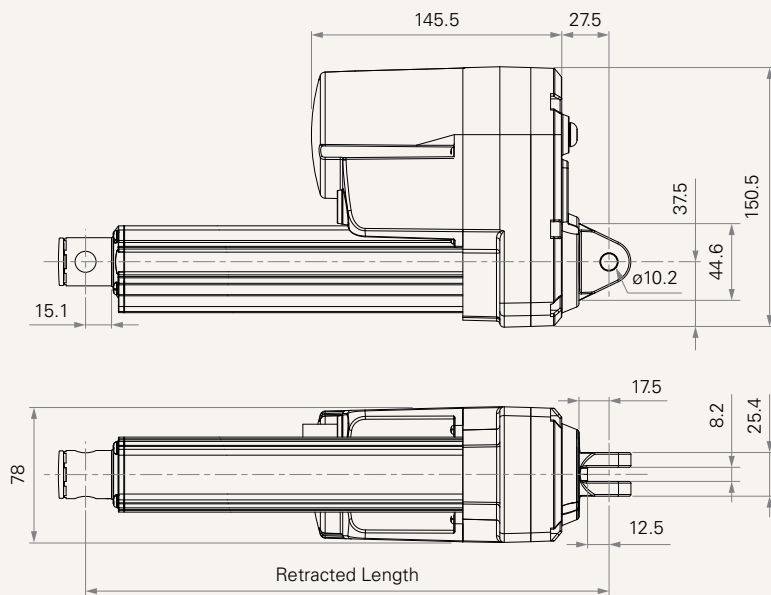
General Features

Max. load	8,000N (push); 4,000N (pull)
Max. speed at max. load	5.5mm/s
Max. speed at no load	52.5mm/s
Retracted length	≥ Stroke + 132mm
IP rating	IP69K (static)
Certificate	UL73, EMC
Stroke	25~1000mm
Output Signals	External signal of actuator, mechanical Pot., NPN Hall sensor (5-36V input) * 2
Voltage	12/24/36/48V DC
Operational temperature range	-40°C~+85°C
Operational temperature range at full performance	+5°C~+45°C
Manual drive	
Protocol support:	Advanced, SAE J1939, Modbus RTU

Drawing

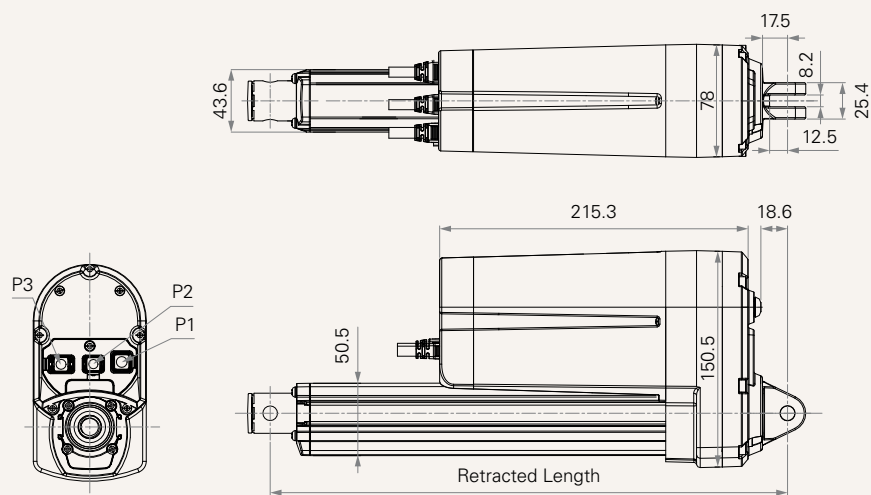
Standard Dimensions

1 = Single Cable
(mm)



T-Smart Dimensions

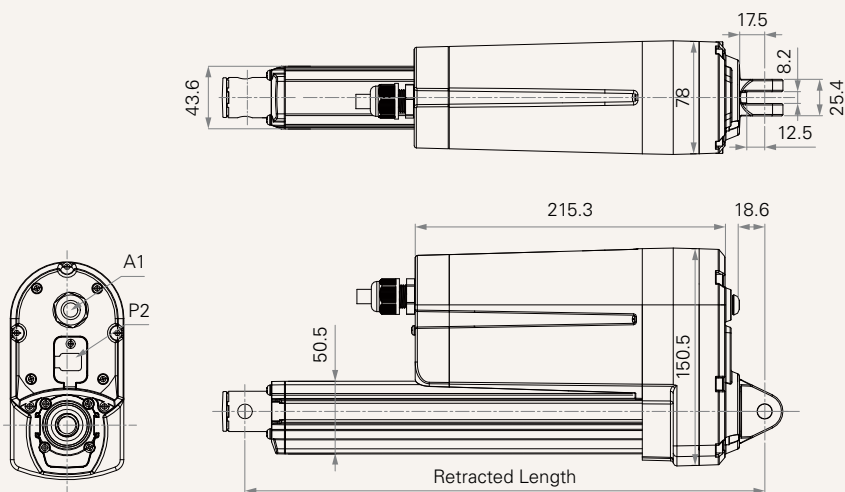
3 = 3 Sockets with Extension Cable
(mm)



Drawing

T-Smart Dimensions

T = 1+1 Type; A1 Direct Cable Out
(mm)



Load and Speed (12V DC)

CODE	Load (N)		Self Locking Force (N) Motor Brake	Duty Cycle	Typical Current (A)		Typical Speed (mm/s)		T-Smart Default OCP Value
	Push	Pull			No Load	With Load	No Load	With Load	
F	1000	1000	1300	25%	5.20	13.50	52.50	41.95	20.50
G	2000	2000	2600	25%	4.30	12.60	25.50	20.40	18.50
H	4000	4000	5200	25%	4.20	12.95	13.20	10.90	19.00
J	6000	4000	8000	25%	3.80	10.95	6.60	5.50	16.00
K	8000	4000	8000	10%	3.80	12.95	6.60	5.10	19.50

Load and Speed (24V DC)

CODE	Load (N)		Self Locking Force (N) Motor Brake	Duty Cycle	Typical Current (A)		Typical Speed (mm/s)		T-Smart Default OCP Value
	Push	Pull			No Load	With Load	No Load	With Load	
F	1000	1000	1300	25%	2.70	6.80	52.50	44.20	10.50
G	2000	2000	2600	25%	2.40	6.65	25.50	21.75	10.00
H	4000	4000	5200	25%	2.30	6.85	13.20	11.00	10.00
J	6000	4000	8000	25%	2.00	5.75	6.60	5.80	8.50
K	8000	4000	8000	10%	2.00	6.85	6.60	5.50	10.50

Load and Speed (36V DC)

CODE	Load (N)		Self Locking Force (N)	Duty Cycle	Typical Current (A)		Typical Speed (mm/s)	
	Push	Pull			Motor Brake	No Load	With Load	No Load
F	1000	1000	1300	25%	1.80	4.60	52.50	44.20
G	2000	2000	2600	25%	1.60	4.45	25.50	21.75
H	4000	4000	5200	25%	1.50	4.65	13.20	11.00
J	6000	4000	8000	25%	1.40	3.85	6.60	5.80
K	8000	4000	8000	10%	1.40	4.65	6.60	5.50

Load and Speed (48V DC)

CODE	Load (N)		Self Locking Force (N)	Duty Cycle	Typical Current (A)		Typical Speed (mm/s)	
	Push	Pull			Motor Brake	No Load	With Load	No Load
F	1000	1000	1300	25%	1.40	3.40	52.50	44.20
G	2000	2000	2600	25%	1.20	3.35	25.50	21.75
H	4000	4000	5200	25%	1.20	3.45	13.20	11.00
J	6000	4000	8000	25%	1.00	2.85	6.60	5.80
K	8000	4000	8000	10%	1.00	3.45	6.60	5.50

Note

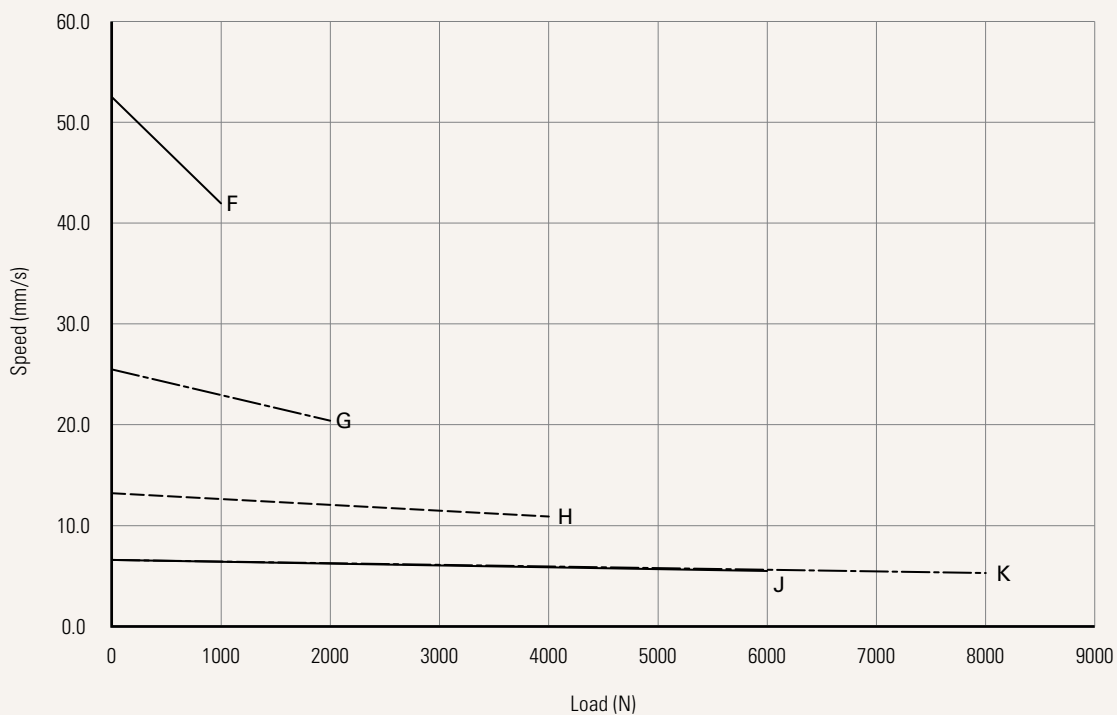
- 1 #B, C, D, E are only available in Type #N_Normal.
- 2 Please refer to the approved drawing for the final authentic value.
- 3 Voltage range: 12V±20%, 24V±10%, 36V±10%, 48V±10%.
- 4 The current & speed in table are tested when the actuator is extending under push load.
- 5 Without load, noise level ≤ 78dBA (by TiMOTION test standard, ambient noise level ≤ 36dBA)
- 6 Standard stroke: Min. 25mm, Max. please refer to the table below.
- 7 Tolerance: fully extended length & retracted length ± 3mm.

CODE	Load (N)	Max Stroke (mm)
F	≤ 1000	1000
G	≤ 2000	800
H, J	≤ 6000	600
K	≤ 8000	320

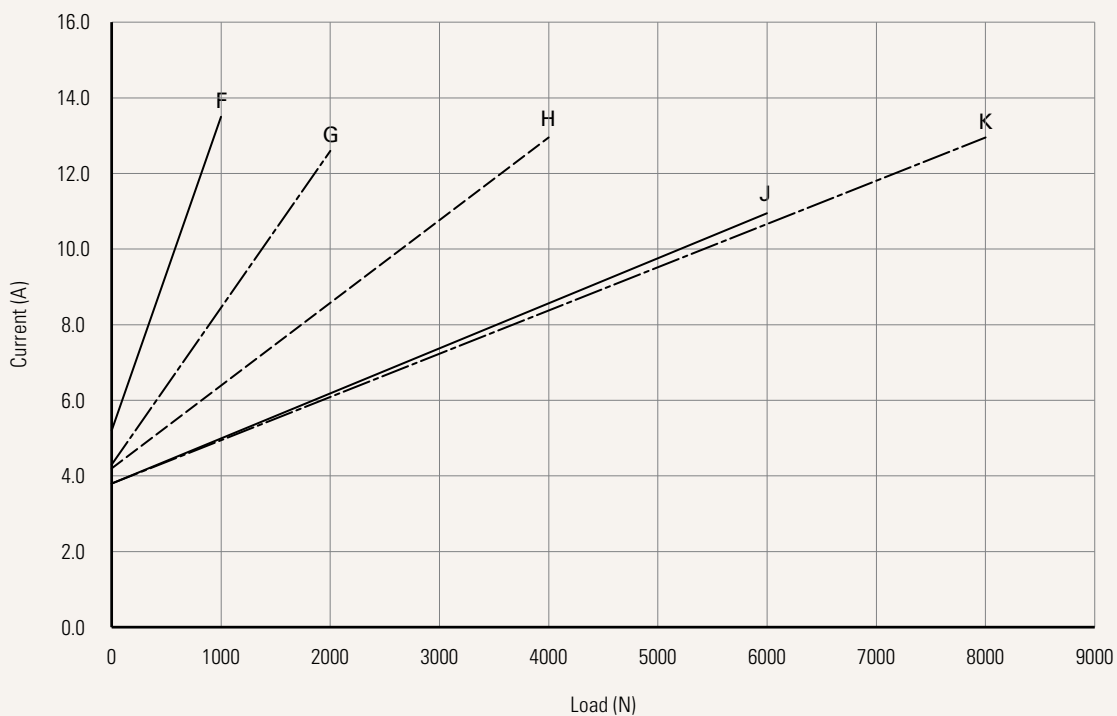
* Max. stroke with mechanical Pot: 570mm.

Performance Data (12V DC Motor)

Speed vs. Load

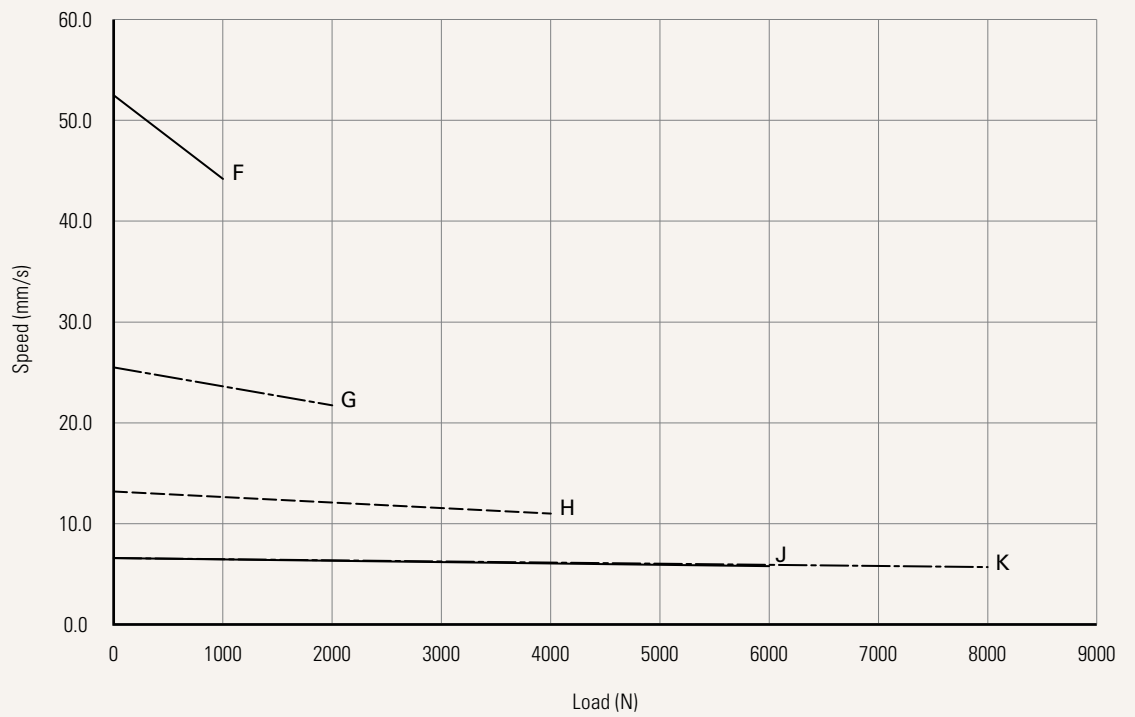


Current vs. Load

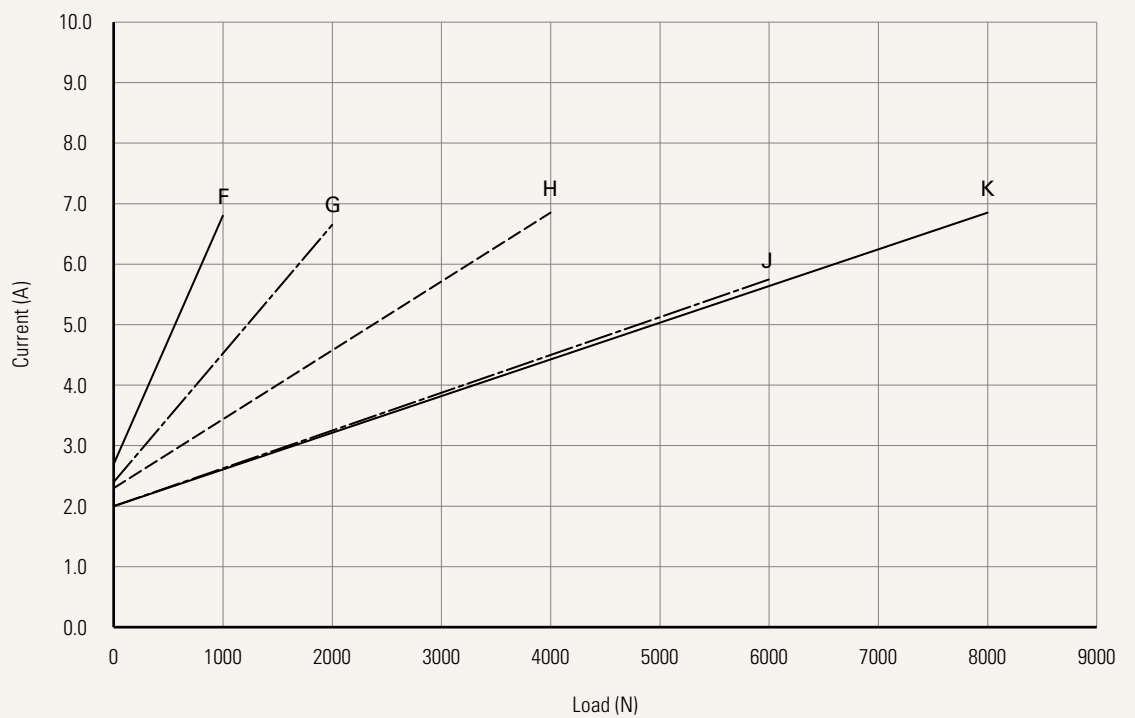


Performance Data (24V DC Motor)

Speed vs. Load

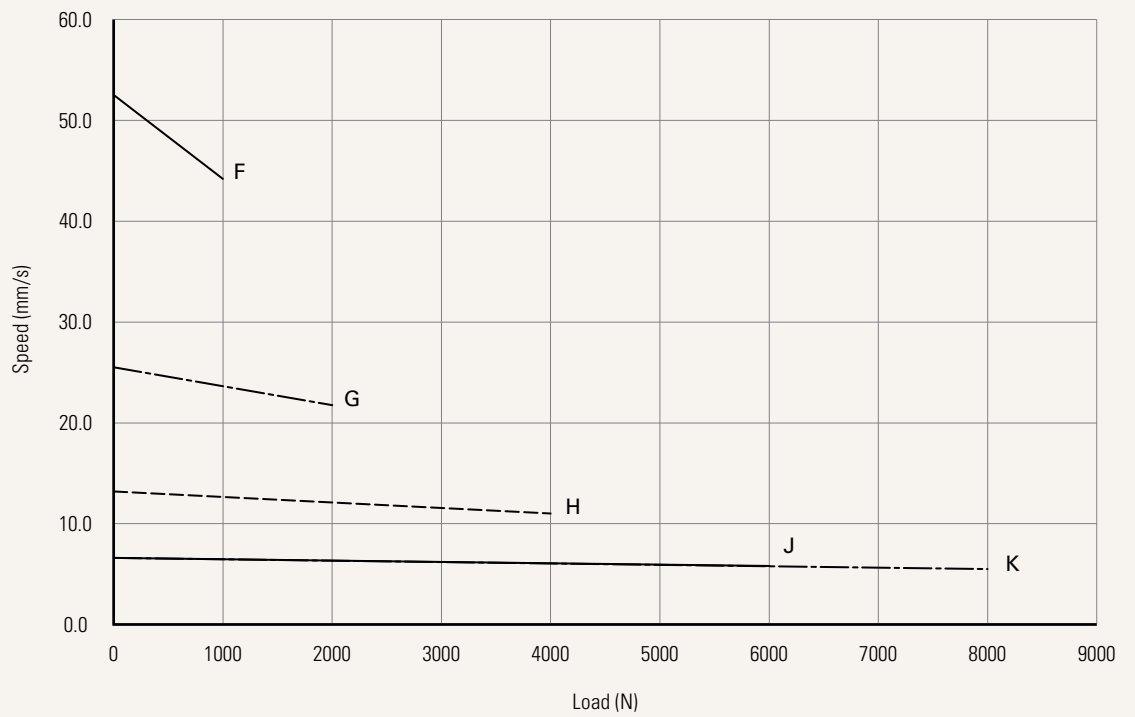


Current vs. Load

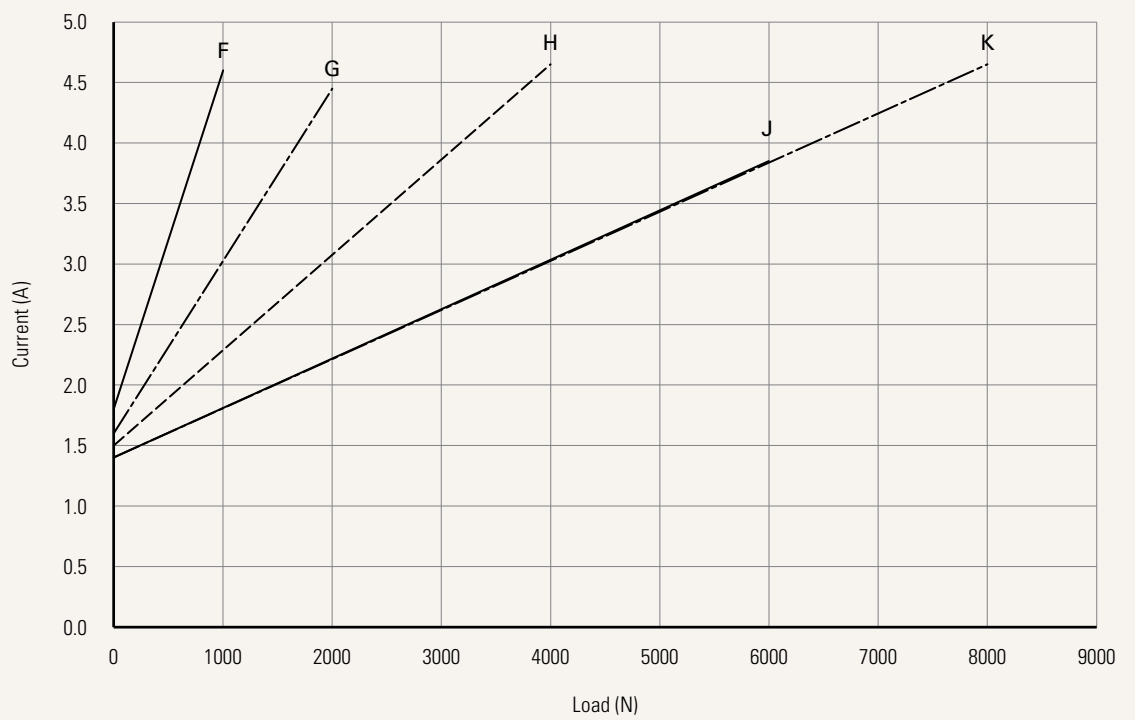


Performance Data (36V DC Motor)

Speed vs. Load

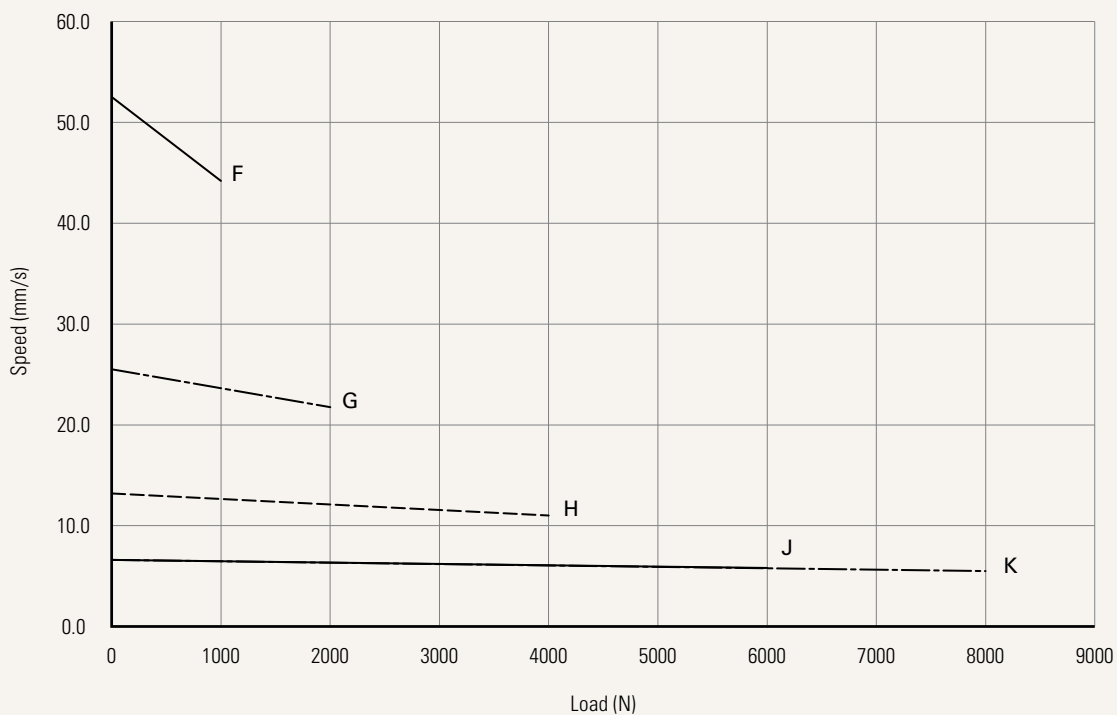


Current vs. Load

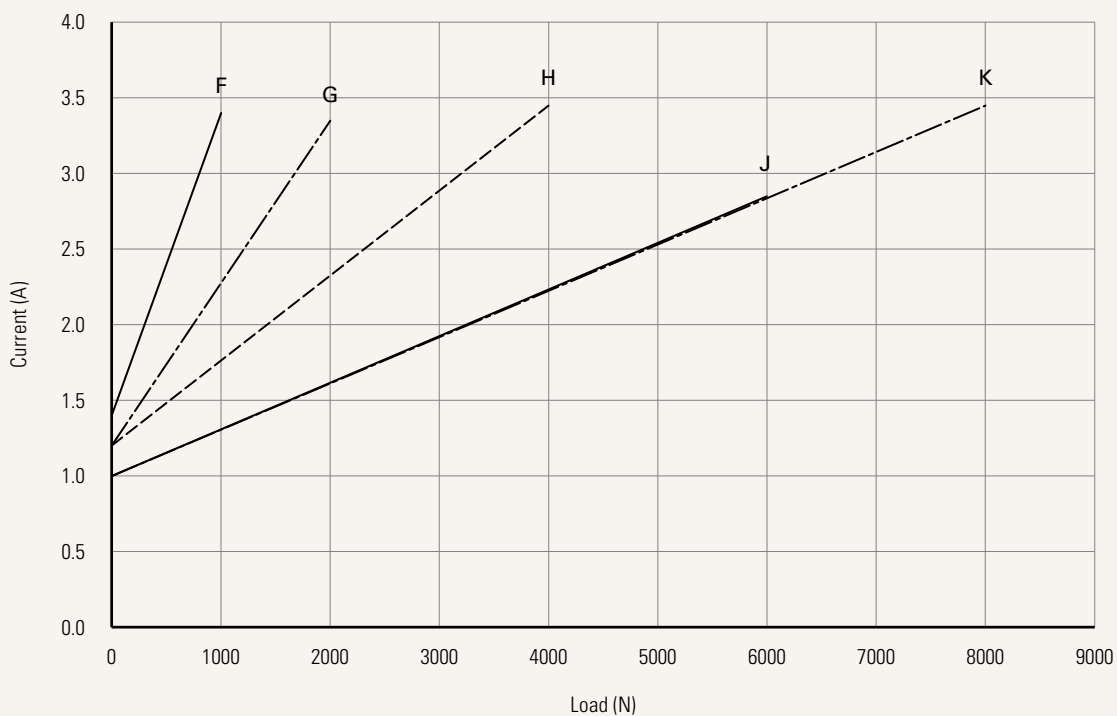


Performance Data (48V DC Motor)

Speed vs. Load



Current vs. Load



Type See page 2-3	N = Normal	T = T-Smart		
Voltage	1 = 12V DC	2 = 24V DC	3 = 36V DC	4 = 48V DC
Load and Speed	See page 3-4			
Stroke (mm)	See page 4			
Retracted Length (mm)	See page 13			
Rear Attachment (mm) See page 14	1 = Aluminum, U clevis, slot 8.2, depth 12.5, hole 10.2 2 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 10.2 3 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.8	4 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.2 S = Stainless steel SUS304 (lost-wax casting), slot 8.2, depth 15, hole 10.2		
Front Attachment (mm) See page 14-15	1 = Steel, inner tube with punching hole and seal plug, hole 10.2 2 = Steel, inner tube with punching hole and seal plug, hole 12.2 3 = Steel, inner tube with punching hole and seal plug, hole 12.8 4 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 10.2	5 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.2 6 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.8 7 = Stainless Steel 316L, slotless, hole 10.2 8 = Stainless Steel 316L, slotless, hole 12.2 9 = Stainless Steel 316L, slotless, hole 12.8 K = Rod end bearing, hole 12.8		
Direction of Rear Attachment (Counterclockwise) See page 15	1 = 0°	3 = 90°	B = Rear 0°; Front 90°	C = Rear 90°; Front 0°
Function of Limit Switches See page 14-16	1 = Two limit switches cut off the actuator at EOS 2 = Two limit switches cut off the actuator at EOS + third one in between sends signal 3 = Two limit switches send signal at EOS 4 = Two limit switches send signal at end of stroke + third one in-between sends signal	6 = Two limit switches cut off the actuator and send signal at EOS T = Two limit switches send signal at end of stroke to embedded PCBA (T-Smart dedicated option)		
External Signal of Actuator	0 = Without 3 = Reed switch * 1, tinned leads (NO, signal to customer control system) 4 = Reed switch * 2, tinned leads (NO, signal to customer control system) C = Reed switch * 2, Molex 6p (T-Smart dedicated option, normal open)			
Output Signal See page 16-18	0 = Without 1 = Mechanical pot. N = NPN Hall sensor (5-36V input) * 2		T = Hall sensor * 2, signals to embedded PCBA (T-Smart dedicated option)	
IP Rating	1 = Without 2 = IP54	3 = IP66 6 = IP66M	8 = IP69K	



Cable Exit See page 2-3	1 = Single cable 3 = 3 sockets with extension cable (P1, P2, P3) (T-Smart dedicated option) T = Direct cable out, 1+1 type: Military connector (A1) + Molex 6P connector (P2) (T-Smart dedicated option)
A1 / P1 Connector (mm) See page 15	01 = Tinned leads, unsheathed wire 50, stripped wire 10
A1 / P1 Cable Length (mm)	XXXX = Input 4 digital number directly, range 100-5000, multiples of 100 (e.g. 500, enter 0500)
P2 Connector (mm)	00 = Without OP = Rubber seal plug (T-Smart dedicated option)
P2 Cable Length (mm)	0000 = Without
P3 Connector (mm)	00 = Without 01 = Tinned leads, unsheathed wire 50, stripped wire 10 (T-Smart dedicated option)
P3 Cable Length (mm)	0000 = Without XXXX = Input 4 digital number directly, range 100-5000, multiples of 100 (e.g. 500, enter 0500) (T-Smart dedicated option)
Alternative	N = Normal T = Advanced J = SAE J1939 (J1939 default, transmission rate 250Kbps, proposal #PF22018) K = SAE J1939 (transmission rate 500Kbps, proposal #DS23021) M = Modbus RTU (proposal #PF22082)
Packaging (mm²)	0 = Sample packaging C = Standard package, US fumigated pallet (1219*1016) 1 = Standard package, EU fumigated pallet (1200*800) 2 = Standard package, EU fumigated pallet (1500*800) E = Standard package, US plywood pallet (1219*1016) 5 = Standard package, EU plywood pallet (1200*800) 6 = Standard package, EU plywood pallet (1500*800)

Stroke Limit	0 = Standard: Two micro switches cut off the actuator at end of stroke U = Virtual upper limit + physical lower limit L = Physical upper limit + virtual lower limit	1 = Reed upper limit + physical lower limit 2 = Physical upper limit + reed lower limit 3 = Reed upper limit + reed lower limit
Virtual Upper Limit (mm)	XXXX = 4 digits for stroke position. Default: max. stroke length (e.g. for 300, please enter 0300)	
Virtual Lower Limit (mm)	XXXX = 4 digits for stroke position. Default: 0000 (e.g. for 300, please enter 0300)	
Extending Speed (%)	XX = PWM duty cycle, range from 01~100. Default: 00, meaning 100 duty cycle (e.g. for PWM 50, enter 50)	
Retracting Speed (%)	XX = PWM duty cycle, range from 01~100. Default: 00, meaning 100 duty cycle (e.g. for PWM 50, enter 50)	
Soft Stop Distance From Upper Limit (mm)	XX = Range from 00~30. Default: 00, meaning no deceleration (e.g. for 5, enter 05)	
Soft Stop Distance From Lower Limit (mm)	XX = Range from 00~30. Default: 00, meaning no deceleration (e.g. for 5, enter 05)	
Duration of Soft Stop Before Upper Limit (s)	XX = Unit 0.1, soft stop time, range from 0.1~3.0. Default: 05, meaning soft stop duration is 0.5 (e.g. for 2.5, enter 25)	
Duration of Soft Stop Before Lower Limit (s)	XX = Unit 0.1, soft stop time, range from 0.1~3.0. Default: 05, meaning soft stop duration is 0.5 (e.g. for 2.5, enter 25)	
Soft Start - Extending (s)	XX = Unit 0.1, soft start time, range from 0.1~3.0. Default: 05, meaning soft stop duration is 0.5 (e.g. for 2.5, enter 25)	
Soft Start - Retracting (s)	XX = Unit 0.1, soft start time, range from 0.1~3.0. Default: 05, meaning soft stop duration is 0.5 (e.g. for 2.5, enter 25)	
Over-Current Protection Value - Extending (A)	XXX = Unit 0.1, range from 000~actuator OCP value. (e.g. for 3.4, enter 034)	
Over-Current Holding Time - Extending (Not Settable) (A)	000 = Unit 0.1, value 000	
Over-Current Protection Value - Retracting (A)	XXX = Unit 0.1, range from 000~actuator OCP value (e.g. for 3.4, enter 034)	
Over-Current Holding Time - Retracting (Not Settable) (s)	000 = Unit 0.1, value 000	



Output Signal - EOS Signal	1 = With, at both ends			
Output Signal - Position Feedback / Bus Communication	0 = Without	C = Termination resistor on		
	H = With, Hall * 2	D = Termination resistor off		
	2 = With, Hall-Pot. & PWM			
Hall-Pot. Default Value - At Fully Extended Position (V)	XXX = Unit 0.1, range from 000~100. Default value 100, meaning 10.0 (e.g. for 9.4, enter 094)			
Hall-Pot. Default Value - At Fully Retracted Position (A)	XXX = Unit 0.1, range from 000~100. Default value 000, meaning 0.0 (e.g. for 9.4, enter 094)			
PWM Value - At Fully Extended Position (%)	XX = Range from 10~90. Default value 90, meaning 90 (e.g. 55, enter 55)			
Actuator PWM Value - At Fully Retracted Position (%)	XX = Range from 10~90 (e.g. 55, enter 55, default value 10, meaning 10)			
Alternative_#T_Advanced Synchronization	0 = Without (1 actuator)	3 = 3 actuators	5 = 5 actuators	7 = 7 actuators
	2 = 2 actuators	4 = 4 actuators	6 = 6 actuators	8 = 8 actuators
Actuator ID	1 = J1939 / Modbus / Primary (Synchronization master actuator)			
	0 = Secondary (Synchronization slave actuator)			

Retracted Length (mm)

1. Calculate $A+B+C = Y$
2. Retracted length needs to \geq Stroke + Y

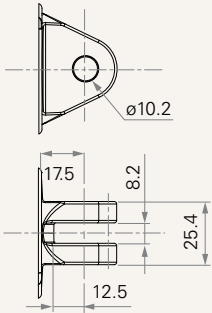
A.		
Front Attachment	Rear Attachment	
	1	2, 3, 4, S
1, 2, 3	+132	+135
4, 5, 6	+161	+164
7, 8, 9	+150	+153
K	+178	+181

C.	
Output Signal	
0, N, P	-
1	+20

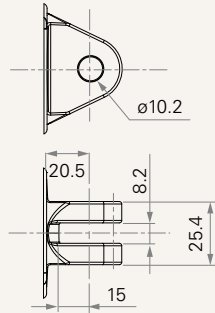
B.	
Stroke (mm)	Load & Speed Type (N)
	F, G, H, J, K
25~150	-
151~200	-
201~250	+10
251~300	+20
301~350	+30
351~400	+40
401~450	+50
451~500	+60
501~550	+70
551~600	+80
601~650	+90
651~700	+100
701~750	+110
751~800	+120
801~850	+130
851~900	+140
901~950	+150
951~1000	+160

Rear Attachment (mm)

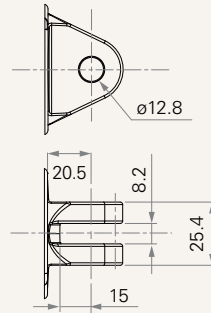
1 = Aluminum, U clevis, slot 8.2, depth 12.5, hole 10.2



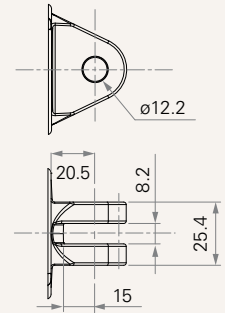
2 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 10.2



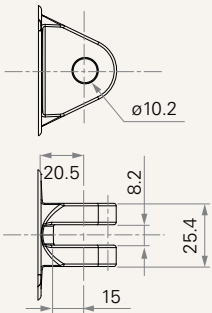
3 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.8



4 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.2

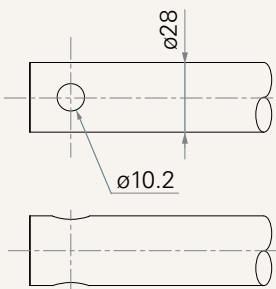


S = Stainless steel SUS304 (lost-wax casting), slot 8.2, depth 15, hole 10.2

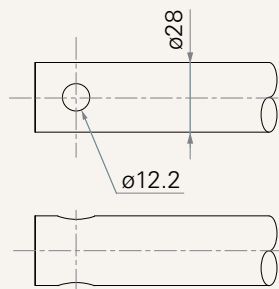


Front Attachment (mm)

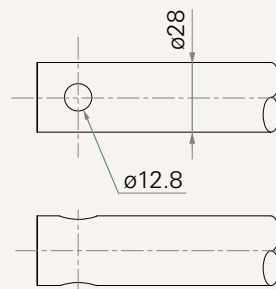
1 = Steel, inner tube with punching hole and seal plug, hole 10.2



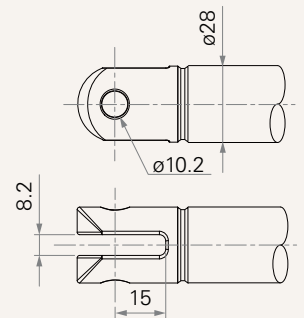
2 = Steel, inner tube with punching hole and seal plug, hole 12.2



3 = Steel, inner tube with punching hole and seal plug, hole 12.8

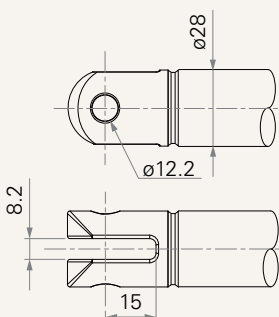


4 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 10.2

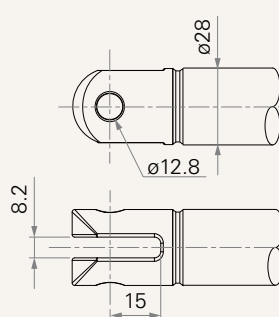


* Inner tube with punching hole and seal plug

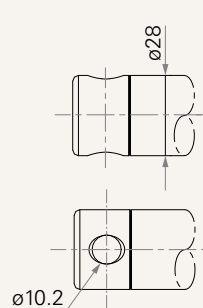
5 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.2



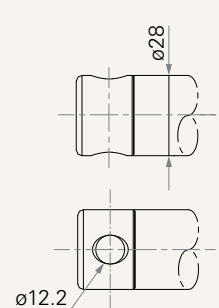
6 = Aluminum, U clevis, slot 8.2, depth 15.0, hole 12.8



7 = Stainless Steel 316L, slotless, hole 10.2



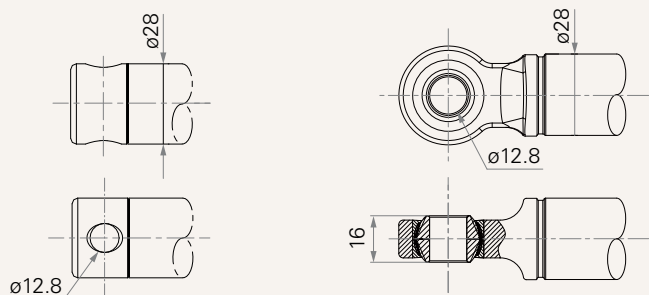
8 = Stainless Steel 316L, slotless, hole 12.2



Front Attachment (mm)

9 = Stainless Steel 316L, slotless, hole 12.8

K = Rod end bearing, hole 12.8



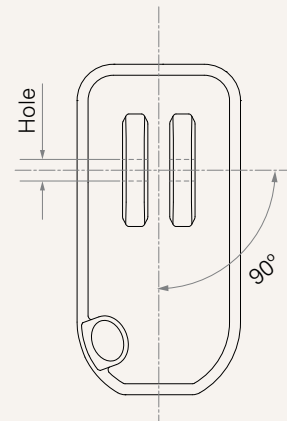
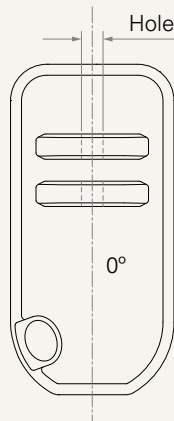
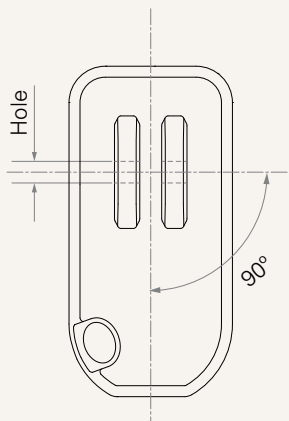
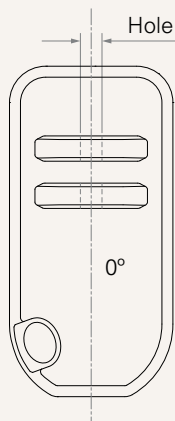
Direction of Rear Attachment (Counterclockwise)

1 = 0°

3 = 90°

B = Rear 0°; Front 90°

C = Rear 90°; Front 0°



* The front attachment is perpendicular to the rear attachment and cannot be rotated. If rotation of the front attachment is required, please consult our engineer.

Connector (mm)

01 = Tinned leads, unsheathed wire
50, stripped wire 10



Wire Definition

#N_Normal

Port	Function of Limit Switches	Wire Color	Wire Gauge (AWG)	Output Signal		
				0. Without	1. Mechanical Pot.	N. Hall Sensor * 2
A1	1 Two limit switches cut off the actuator at end of stroke	● RD	14	EXT+	EXT+	EXT+
		● BK	14	RET+	RET+	RET+
		● RD	20	-	POT-out	+5V
		○ WH	20	-	+5V (POT)	S1
		● BK	20	-	GND	GND
		● BU	20	-	-	S2
		● BN	20	-	-	-
		● GY	20	-	-	-
		● OG	20	-	-	-
		● VT	20	-	-	-
A1	2 Two limit switches cut off the actuator at EOS + third one in-between sends signal	● RD	14	EXT+	EXT+	EXT+
		● BK	14	RET+	RET+	RET+
		● RD	20	-	-	Hall-Vin (+5V)
		○ WH	20	3rd LS pin1	3rd LS pin1	S1
		● BK	20	3rd LS pin2	POT-GND	GND
		● BU	20	-	3rd LS pin2	S2
		● BN	20	-	POT-Vin (+5V)	3rd LS pin1
		● GY	20	-	-	-
		● OG	20	-	POT-Vout	3rd LS pin2
		● VT	20	-	-	-
A1	3 Two limit switches send signal at end of stroke	● RD	14	EXT+	EXT+	EXT+
		● BK	14	RET+	RET+	RET+
		● RD	20	EOS-COM	EOS-COM	+5V
		○ WH	20	EOS-extended	EOS-extended	S1
		● BK	20	-	POT-GND	GND
		● BU	20	EOS-retracted	EOS-retracted	S2
		● BN	20	-	POT-Vin (+5V)	EOS-extended
		● GY	20	-	-	-
		● OG	20	-	POT-Vout	EOS-retracted
		● VT	20	-	-	EOS-COM
A1	4 Two limit switches send signal at end of stroke + third one in-between sends signal	● RD	14	EXT+	EXT+	EXT+
		● BK	14	RET+	RET+	RET+
		● RD	20	EOS-COM	EOS-COM	Hall-Vin (+5V)
		○ WH	20	EOS-extended	EOS-extended	S1
		● BK	20	3rd LS pin1	3rd LS pin1	Hall-GND
		● BU	20	EOS-retracted	EOS-retracted	S2
		● BN	20	-	POT-Vin (+5V)	EOS-extended
		● GY	20	-	-	3rd LS pin1
		● OG	20	-	POT-Vout	EOS-retracted
		● VT	20	-	POT-GND	EOS-COM
A1	6 Two limit switches cut off the actuator and send signal at EOS	● RD	14	EXT+	EXT+	-
		● BK	14	RET+	RET+	-
		● RD	20	-	-	-
		○ WH	20	EOS-extended	EOS-extended	-
		● BK	20	EOS-retracted	POT-GND	-
		● BU	20	-	EOS-retracted	-
		● BN	20	-	POT-Vin (+5V)	-
		● GY	20	-	-	-
		● OG	20	-	POT-Vout	-
		● VT	20	-	-	-

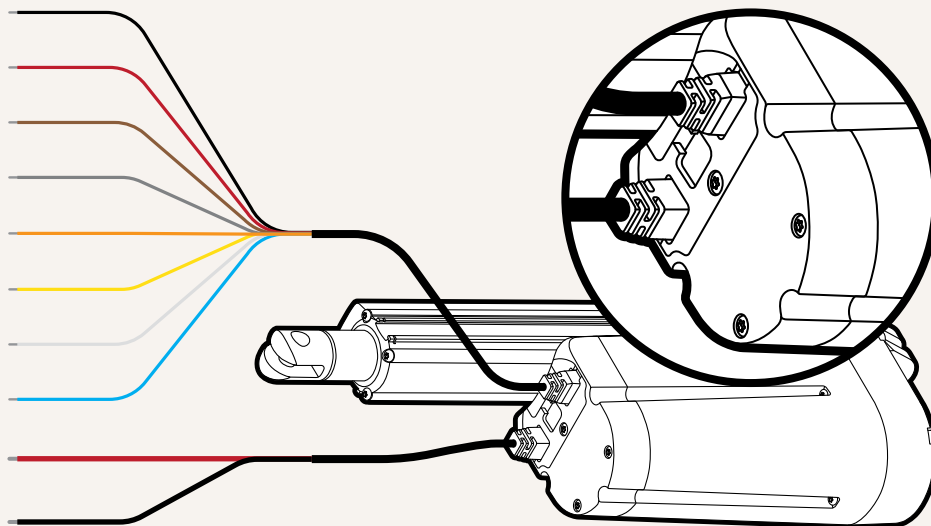
Wire Definition

#T_T-Smart

3 Sockets with Extension Cable (P1, P2, P3) (T-Smart Dedicated Option)

Port	Wire Color	AWG	Signal
P1	● RD	14	+Vcc
	● BK	14	Power ground
P2	● RD	20	For programming or wireless accessories.
	○ WH	20	
	● BU	20	
	● BK	20	
	● BN	20	
	● GY	20	
P3	● BN	20	Ctrl - Extend
	● GY	20	Ctrl - Retract
	● OG	20	EOS-extended
	● YE	20	EOS-retracted
	○ WH	20	Hall-Pot. / Hall A / Commu. A
	● BU	20	PWM / Hall B / Commu. B
	● RD	20	Vaux. (Power supply to controller)
	● BK	20	Signal ground

* Control motor movement: when Vaux wire is short circuit with Ctrl-Extend / Ctrl-retract wire.



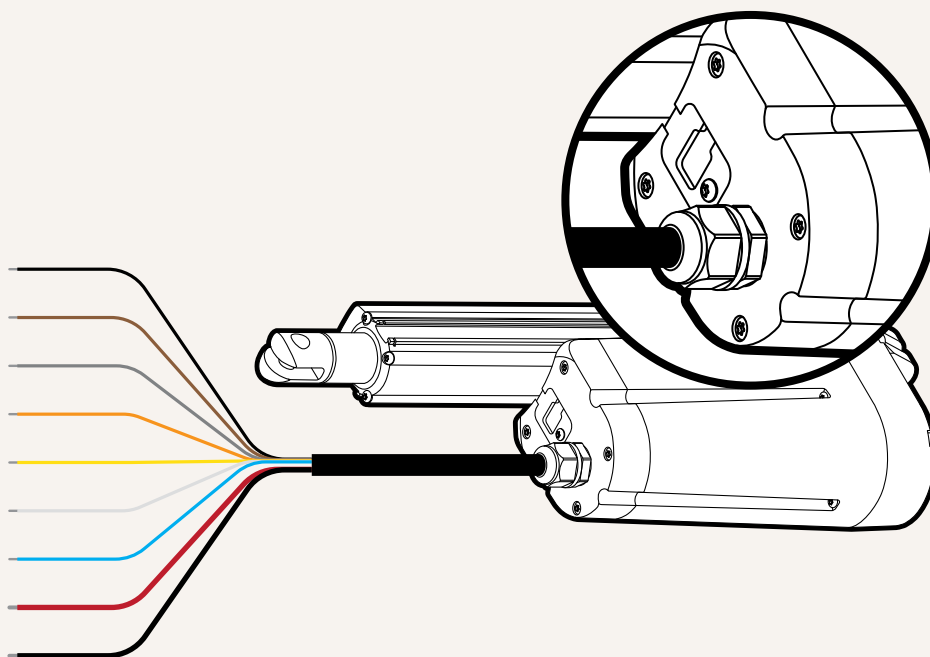
Wire Definition

#T_T-Smart

Direct Cable Out, 1+1 Type: Military Connector (A1) + Molex 6P Connector (P2) (T-Smart Dedicated Option)

Port	Wire Color	AWG	Signal
A1	● RD	14	+Vcc
	● BK	14	Power ground
	● BN	20	Ctrl - Extend
	● GY	20	Ctrl - Retract
	● OG	20	EOS-extended
	● YE	20	EOS-retracted
	○ WH	20	Hall-Pot. / Hall A / Commu. A
	● BU	20	PWM / Hall B / Commu. B
	● BK	20	Signal ground
	P2	● RD	20
○ WH		20	
● BU		20	For programming or wireless accessories.
● BK		20	
● BN		20	
● GY		20	

* Control motor movement: when Vcc wire is short circuit with Ctrl-Extend / Ctrl-retract wire.



Terms of Use

The user is responsible for determining the suitability of TiMOTION products for a specific application. TiMOTION products are subject to change without prior notice.