

TMi SERIES TM-SMART SERIES

Multi-Turn Actuator



LTMD-Q Series
Multi-turn actuator 0.2 ~ 37kW (For nuclear power plant)



MW Series
Gear reducer-Worm, Bevel 51 ~ 30,600kgf.m



LEC Series
Self-descending actuator (1 ~ 20 Ton) 0.1 ~ 2.2kW

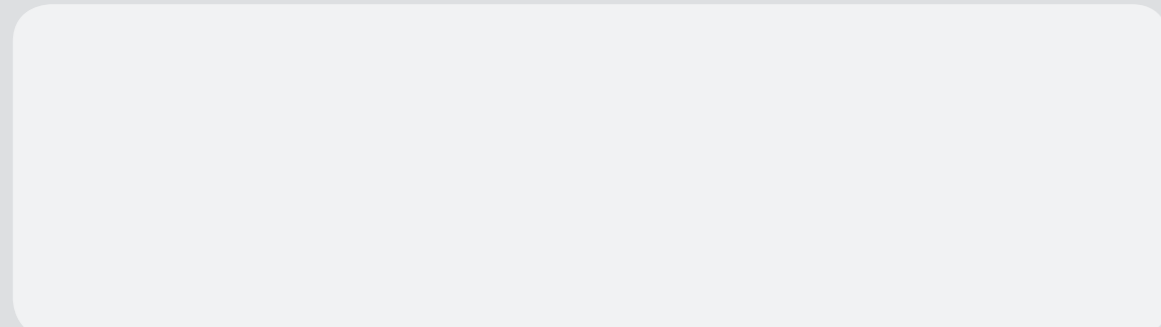


TQ Series
Quarter-turn actuator 15 ~ 180W



- Head Office & Factory : #344, Neungyeo-Ro, Neungseo-Myeon, Yeosu-Si, Gyeonggi-Do, Korea Tel : 031-880-2800 Fax : 031-881-5860
- Seoul Office : 18F, Un-Ik Bldg., #430, Eonju-ro, Gangnam-gu, Seoul, Korea Tel : 02-555-0883 Fax : 02-556-3026
- Daegu Office : 2F, 23-18 Industry Materials Circulation Center, 1629, Sangyeok 2-dong, Buk-gu, Daegu, Korea Tel : 053-604-1720 Fax : 053-604-1721

Website : www.enertork.com E-mail : enertork@enertork.com



The name Enertork is a registered trademark. Enertork recognizes all registered trademarks. Published and produced in South Korea by Enertork Limited.

The specification of actuator is subject to change without prior notice for on-going product improvement. Publication No. CAT-08-002 REV6, 2015.11



KEPCO Trusted Partner
Korea Power Plant Group Corporate Partner



TMi SERIES

TM-SMART SERIES

MULTI-TURN ACTUATOR

TM series are applicable to multi-turn valves such as globe, gate valves, and penstock. This series are also used for large-sized quarter-turn valves such as butterfly and ball valves, accompanied by worm gearboxes. TMi is an upgrade from the conventional TM actuators with added cutting-edge technologies such as fieldbus control and data logging to meet the demands of our customers. TM-Smart, derived from TMi, features non-intrusive position and torque settings. Setting and configuration is available by using IrDA remote control kit and push buttons, respectively.



- Double Sealed - IP68 & explosion proof
- Safe to use in all environments
- Multi-unit structure
- Side-mounted Handwheel, attached to an independent shaft

Upgrades of TMi Series

- Mechanical potentiometer slip device for easy setting
- Non-penetrating push buttons
- IP68 waterproof enclosure (under 8 metres for 72 hours)
- Prevention of chattering during activated torque switch condition
- Exd IIB T4 grade explosion proof on request
- Large 2-lined LCD display provided on request
- Fieldbus controls
 - Profibus-DP, FF, HART, Modbus and others (option)
- Fire retarding (option)
 - FR coating
 - Tested on UL1709:2005 standard
 - Certified by Lloyd's Register of Shipping

Upgrades of TM-Smart Series

- Features the same basic function and enclosure as TMi Series
- Non-intrusive Position & Torque setting
 - Easy setting and configuration using remote control kit and push buttons on operating panel
- Large 4-lined LCD display

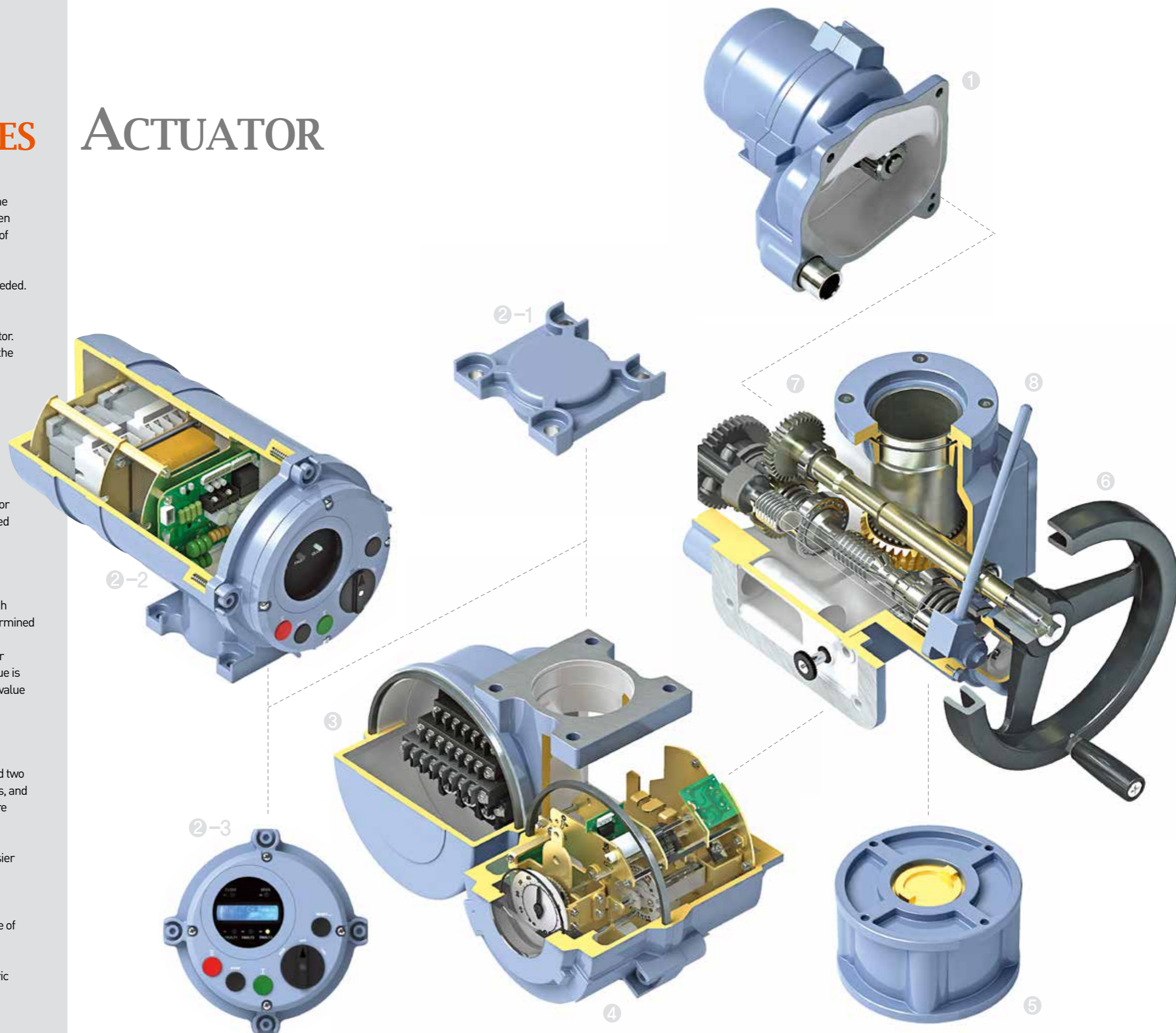


TMi SERIES

TM-SMART SERIES

ACTUATOR

- ❶ **HIGH TORQUE / LOW INERTIA MOTOR** immediately reaches the peak torque after starting up and stops with slight overrun when switch is off. The built in thermostat ensures accurate sensing of temperature to protect from damaging the motor.
- ❷-1 **BASE COVER** is used when the local control function is not needed.
- ❷-2 **INTEGRAL CONTROL UNIT**
 - Non-penetrating push buttons are integrated with the actuator.
 - Opto-isolator separates the inner circuit board to withstand the surge from remote signals.
 - Once the torque switch triggers, the actuator responds to no other command signals until the reset button is pressed.
 - LEDs for full open / full close / fault
- ❷-3 **LCD DISPLAY** is available on request.
- ❸ **TERMINAL UNIT** is separately structured to ensure the integrity of the components inside when the cover is removed for wiring at site. The unit is double-sealed with a series of v-shaped rings and O-rings.
- ❹ **SWITCH UNIT** consists assembly of the position limit switch, torque switch, and position indicator
 - **LIMIT SWITCH** is driven by a counter gear train to ensure high accuracy in setting environment and reliability at any predetermined positions. Quick and easy setting using a screwdriver.
 - **TORQUE SWITCH** automatically stops the motor when larger torque than the set value is applied to the stem bush. Set value is accurately measured and adjusted at the factory and the set value is also adjustable at the site by repositioning the dial.
 - **POSITION INDICATOR** takes wide angle to display the exact valve position in percentages.
- ❺ **THRUST UNIT** of ductile cast iron consists of thrust bearing and two types of drive bush, one is a threaded bush for multi-turn valves, and another is a bore with key bush for quarter-turn valves. Both are detachable for easy installation.
- ❻ **HANDWHEEL** is side-mounted on all of TMi series to allow easier manual operations.
- ❼ **HANDWHEEL SHAFT** engaged with the worm and wheel gear assembly bridged by an intermediate spur gear for the purpose of preventing the damages may be caused by manual operation.
- ❽ **CHANGE LEVER** operation easily switches over from the electric power operation to manual operation even when the motor is running.



TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Standard

Main power	50Hz, 3Ph, 200V, 220V, 230V, 380V, 400V, 415V, 440V, 460V, 480V 60Hz, 3Ph, 220V, 380V, 440V, 460V, 480V
Motor	Class F, without brake. Thermostat built-in and functionable within $\pm 10\%$ of the rated voltage Standard rating : 15 minutes
Integral Unit	Non-penetrating push buttons are integrated with the actuators The use of Opto-isolator allows the inner circuit board to be isolated from the external command signals and be protected from surge Once the torque signal is triggered, the actuator is protected by responding to no other command signal until the "RESET" button is pressed LED lights display the operation status (Open/Close/Fault and others)
Position Limit switch / Torque switch	Limit switch-Open 1, Close 1 Torque switch-Open 1, Close 1 * For TM-Smart, latch relays are used as switches
Indicator	LED type – Mechanical gear driven and valve position displayed in percentages LCD type – 0 ~ 100% digitally displayed
Terminal	Located in double-sealed compartment. All connections to the control printed circuit board use pins & sockets. To control : 37 pins with M4 screws, rating AC250V/5A For main power : 3 pins with M6 screws, rating AC660V/63A
Enclosure	IP-68 (under water, depth of 8m for 72 hours long), IEC 70529, 1989
Space heater	Thermistor type (PTC-5), embedded inside the switch unit Capacity : 5W, 100 to 240V, 0.3 to 1.8k Ω
Ambient temperature	Basic/LED type : -25 $^{\circ}$ C ~ 80 $^{\circ}$ C Smart/LCD type : -25 $^{\circ}$ C ~ 70 $^{\circ}$ C Option for low temperature : -40 $^{\circ}$ C ~ 60 $^{\circ}$ C
Manual / electric switch over	Automatic switch over to electric operation when motor starts up
Conduit entry	1 X PF/NPT 1 1/2" for main power and 2 X PF/NPT 1" for control use
Standard coating	Polyester Powder coating after anodizing (Munsell No. 2.5 PB5/2)
Protection Features	Prevent chattering by activating torque switch Delayed (5 seconds) detection of excess torque in valve jam cases ESD control (full open/ full close/ stay-put)

TM-SMART SERIES

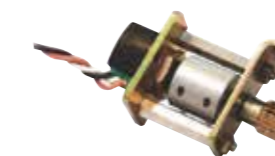
MULTI-TURN ACTUATOR

Smart Specification

LCD Screen Unit	<ul style="list-style-type: none"> ▶ Display the valve or damper's open position rate in "%" ▶ Indicate the actuator's status by characters <ul style="list-style-type: none"> - Display operating modes and status, open/close rate, torque value, etc.
Sensor Unit	<ul style="list-style-type: none"> ▶ Position Sensing <ul style="list-style-type: none"> - High-resolution absolute encoder based on magnetic hall sensor - Total available rotation range : 13bit - Previous position memory holds when the main power is cut off and without battery ▶ Torque Sensing <ul style="list-style-type: none"> - Maximise life cycle for parts by the use of optical contactless resolver - Torque setting range on actuator is 40% ~ 100%.
Data Logging & Diagnostics	<ul style="list-style-type: none"> ▶ Display trend curve graph of operating characteristics of the actuator ▶ Frequency log of position limit & torque limit reached ▶ Indicate the current status of operation mode ▶ Easy to set and configure ▶ Smart HMI (Human-Machine Interface) app with supplied wireless connection. (Request only)
Wireless Settings & Controls	<ul style="list-style-type: none"> ▶ No need to open up covers to set and modify position/torque and others. ▶ Use remote control kit and smart devices (PDA, Smartphone, and others) for setting, controlling and self-diagnosing of actuator.



Encoder



Torque Sensing



Remote Controller

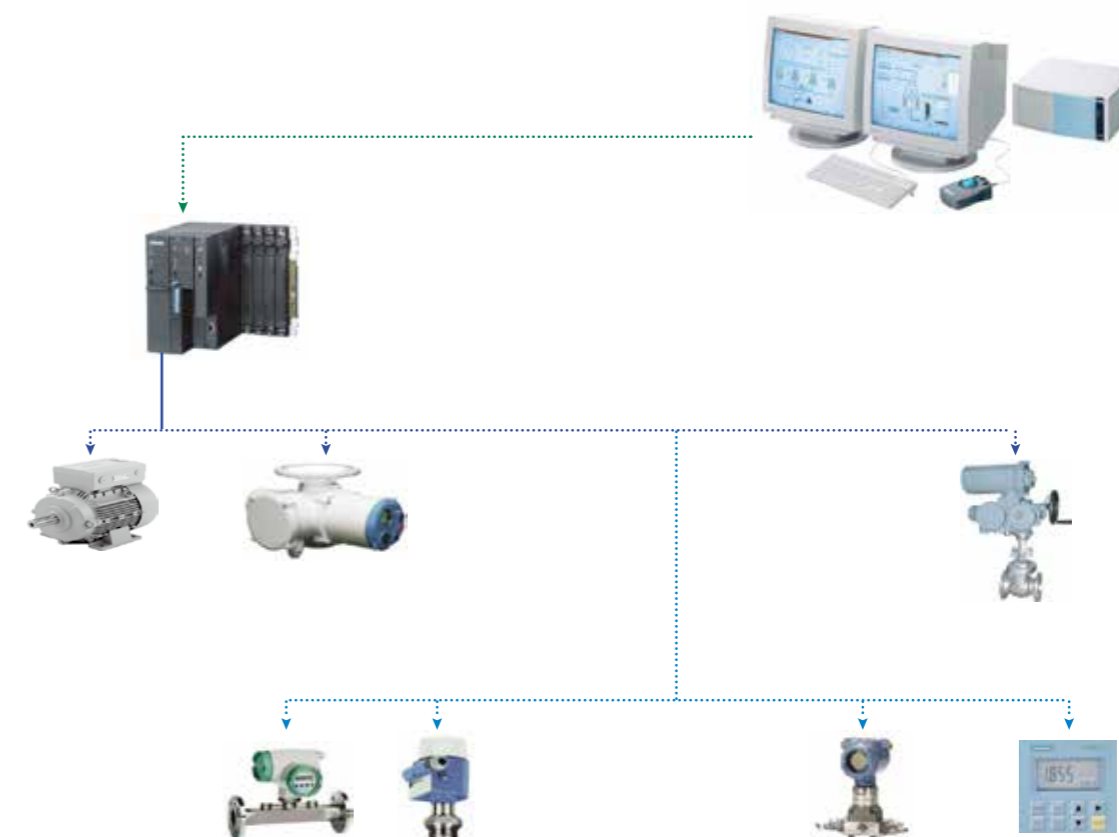
TMi SERIES, TM-SMART SERIES





MULTI-TURN ACTUATOR

Option

Main power	50/60Hz, 1PH, 220V		
Motor	For class other than class F, contact Enertork. (0.18kW, 0.37kW)		
Integral control unit	Type	LED	LCD
	Common	Non-penetrating push buttons (Open/Stop/Close/Reset), Local/Off/Remote Selector, Open/Fault/Close LEDs, Reversing Magnetic Contactor, Reverse phase detector, Automatic phase rotation correction, Monitor Relay	
	Self diagnosis	Accumulated Running times, Number of actions, The number of operation of position/torque switch triggered, and thermostat errors.	
	Fieldbus control	-	2-wire fieldbus communication (Profibus, Modbus, F/F, HART)
Potentiometer	Standard 1k Ω , Maximum internal input voltage: 25V, Linearity: 0.5%, Rated power consumption: 0.8W		
Transmitter	Input AC110/220V \pm 10%, output 4~20mA DC, Accuracy \pm 0.5%FS, Adjustable range : zero \pm 20%, span \pm 20%		
Modulation / Position Transmission	Input/output 4~20mA DC		
Terminal	59 Pins (56 Pins for control use, 3 Pins for main power)		
Ambient temperature	For other temperature range, contact Enertork.		
Explosion proof	Exd IIB T4		
Aux. Limit switch	Maximum of 16 contacts		
Optional coating	For the special coating, contact Enertork.		
Fire retarding	60minutes to UL1709 time-temperature curve		
Non-Intrusive Position & Torque setting *For Smart Series only	<ul style="list-style-type: none"> - Smart, easy to set and configure by using IrDA remote control kit - High-resolution absolute encoder on magnetic hall sensor - Torque sensing on optical contactless resolver - Data logging - Self-diagnostics 		

Fieldbus application



PROFIBUS		Profibus - DP V1 for redundancy. RS-485 serial Max 126 Slave devices
MODBUS		Modbus - RTU RS-485 serial Max 127 Slave devices
F/F		Foundation Fieldbus H1 (F/F H1) 31.25kb/s bus interface Max 240 Slave devices
HART		Highway Addressable Remote Transducer 4-20mA + FSK Max 15 Slave devices

TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Certifications



ISO9001 Certified by DNV



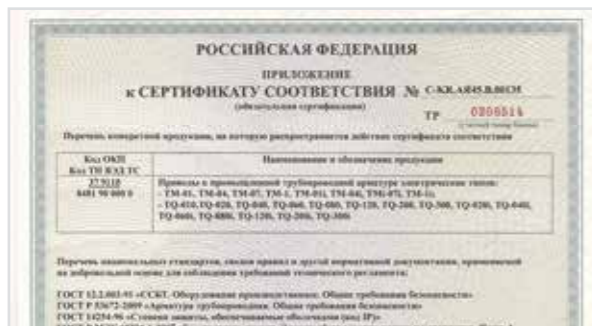
CE Certification



FM/ATEX Certification



FM Test Certificate



GOST-RTU for Russia



Profibus-DP Test certificate



Good Software - Korea



NEP Certification - Korea

Applications



Thermal Power Plant



Nuclear Power Plant



Oil refinery Plant



Steel Mill



Oil Storage Plant



Water Works

TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Speed-torque table

Model	rpm	60Hz	14.0	18.2	24.0	31.5	42.0	54.6	72.0	94.5	(★)	(★)
		50Hz	11.7	15.2	20.0	26.2	35.1	45.6	60.0	78.6	(120.0)	(157.2)
		Motor(kW)	Max. torque : Nm lb-ft									
TM-01i	0.2	133	103	78	59	64	49	37				
		99	76	58	44	47	36	27				
	0.4	147	147	147	112	120	92	70	53			
		109	109	109	83	89	68	52	6			
	0.75	147	147	147	147	147	117	89	(61)	(46)		
		109	109	109	109	109	87	66	(45)	(34)		
1.5											(119)	(91)
TM-04i	0.75	483	371	282	215	221	170	129	98			
		357	274	208	159	164	126	95	73			
	1.5	549	549	510	404	307	234					
		406	406	377	299	227	173					
	2.2	549	549	549	492	374	285	(172)	(131)			
		406	406	406	364	276	210	(127)	(97)			
3.7											(310)	(237)
TM-07i	2.2	844	844	816	622	641	492	374	285			
		623	623	603	459	473	364	276	210			
	3.7	844	844	844	785	596	454					
		623	623	623	580	440	335					
	5.5	844	844	844	844	844	659	(462)	(352)			
		623	623	623	623	623	487	(341)	(260)			
7.5											(615)	(469)
TM-1i	2.2	1399	1074	816	622	641	492	374	285			
		1033	793	603	459	473	364	276	210			
	3.7	1805	1712	1300	991	1022	785	596	454			
		1333	1265	961	732	755	580	440	335			
	5.5	1805	1805	1437	1138	865	659					
		1333	1333	1062	841	639	487					
7.5	1805	1805	1805	1602	1217	927	(615)	(469)				
	1333	1333	1333	1184	899	685	(454)	(346)				
11.0	1805	1805	1805	1805	1775	1353	(904)	(689)				
	1333	1333	1333	1333	1312	999	(668)	(509)				

※ Main power AC 460V 3PH 60Hz is standard. For other main power options, refer to Enertork. ※ (★) is 2pole motor specification.
 ※ (★) Speed is not recommended to apply for self-locking function. ※ For modulating, allow 50% of torque from the above table.

Mechanical data

Allowable torque		Allowable thrust		Allowable stem dia. mm		Flange dia. ISO No. Tap PCD/size Pilot dia. mm	Weight (kg)
Nm	lb-ft	ton	kN	key	threaded		
147	109	7.0	68.6	34	40	125	31
						F10	32
						102/4xM10	35
						70	41
549	406	13.0	127.4	50	58	175	52
						F14	58
						140/4xM16	62
						100	73
844	623	16.0	156.8	60	72	210	88
						F16	103
						165/4xM20	109
						130	122
1805	1333	27.0	264.6	80	95	300	132
						F25	151
						254/8xM16	157
						200	164
							172

TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Speed-torque table

Model	rpm	60Hz	14.0	18.2	24.0	31.5	42.0	54.6	72.0	94.5	(★)	(★)
		50Hz	11.7	15.2	20.0	26.2	35.1	45.6	60.0	78.6	(120.0)	(157.2)
Motor(kW)		Max. torque : Nm lb-ft										
TM-3i	5.5	3719	2856	2169	1653	1698	1304	990	754			
		2747	2110	1602	1221	1254	963	731	557			
	7.5	3924	3924	3053	2326	2390	1835	1394	1062			
		2899	2899	2255	1718	1765	1356	1030	784			
	11	3924	3924	3394		2678	2034	1550				
		2899	2899	2507		1978	1502	1145				
		3924	3924	3924		3611	2742	2089	1393	1061		
		2899	2899	2899		2667	2026	1543	1029	784		
	18.5	3924	3924	3924		3924	3382	2577	1721	1311		
		2899	2899	2899		2899	2498	1904	1271	969		
	TM-6i	11	7637	5866	4455	3394	3486	2678	2034	1550		
			5641	4333	3291	2507	2575	1978	1502	1145		
15		7848	7848	6007	4577	4701	3611	2742	2089			
		5797	5797	4437	3381	3473	2667	2026	1543			
18.5		7848	7409	5645		4454	3382	2577	1721	1311		
		5797	5473	4170		3290	2498	1904	1271	969		
22		7848	7848	6765		5337	4053	3088	2043	1556		
		5797	5797	4997		3942	2994	2281	1509	1150		
TM-12i	18.5	12701	9756	7409	5645	5798	4454	3382	2577			
		9382	7206	5473	4170	4283	3290	2498	1904			
	22	15220	11691	8878	6765	6948	5337	4053	3088			
		11243	8636	6558	4997	5133	3942	2944	2281			
	30	15696	15696	12028	9165	9414	7231	5491	4184	2738	2086	
		11594	11594	8885	6770	6954	5341	4056	3090	2023	1541	
	37	15696	14724	11218		8851	6722	5121	3350	2552		
		11594	10876	8286		6538	4965	3783	2474	1885		

Mechanical data

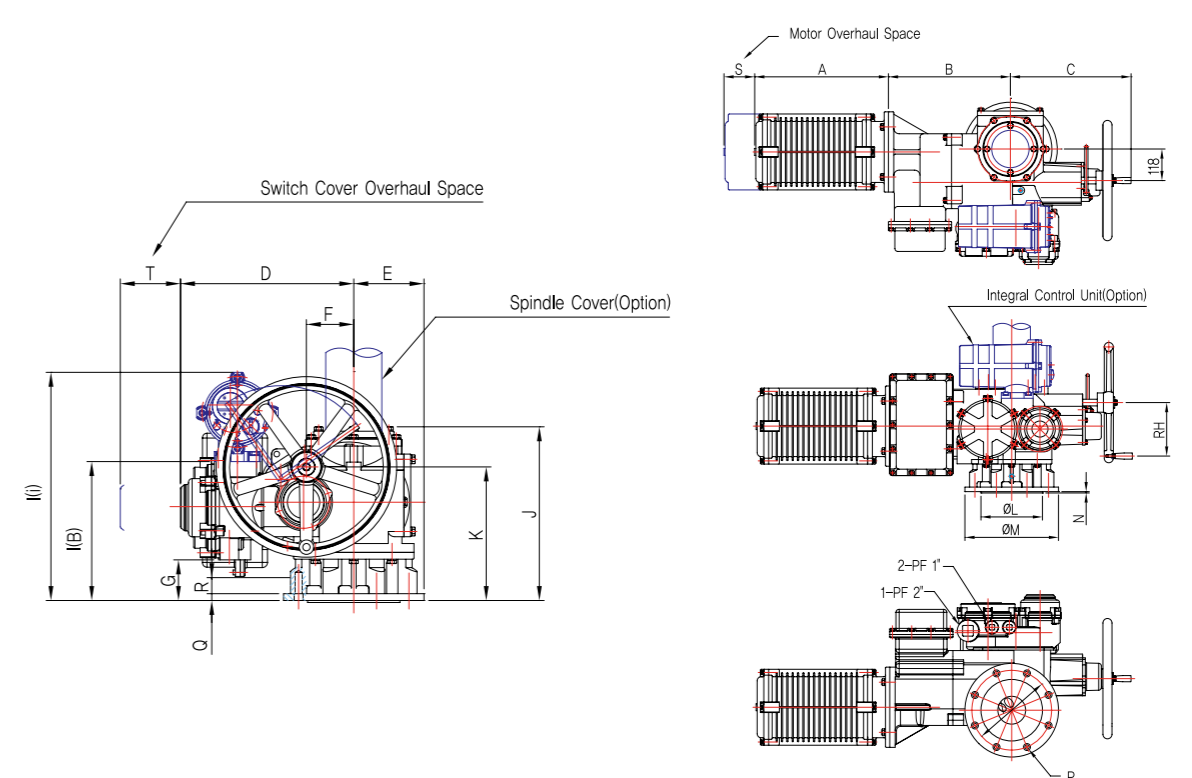
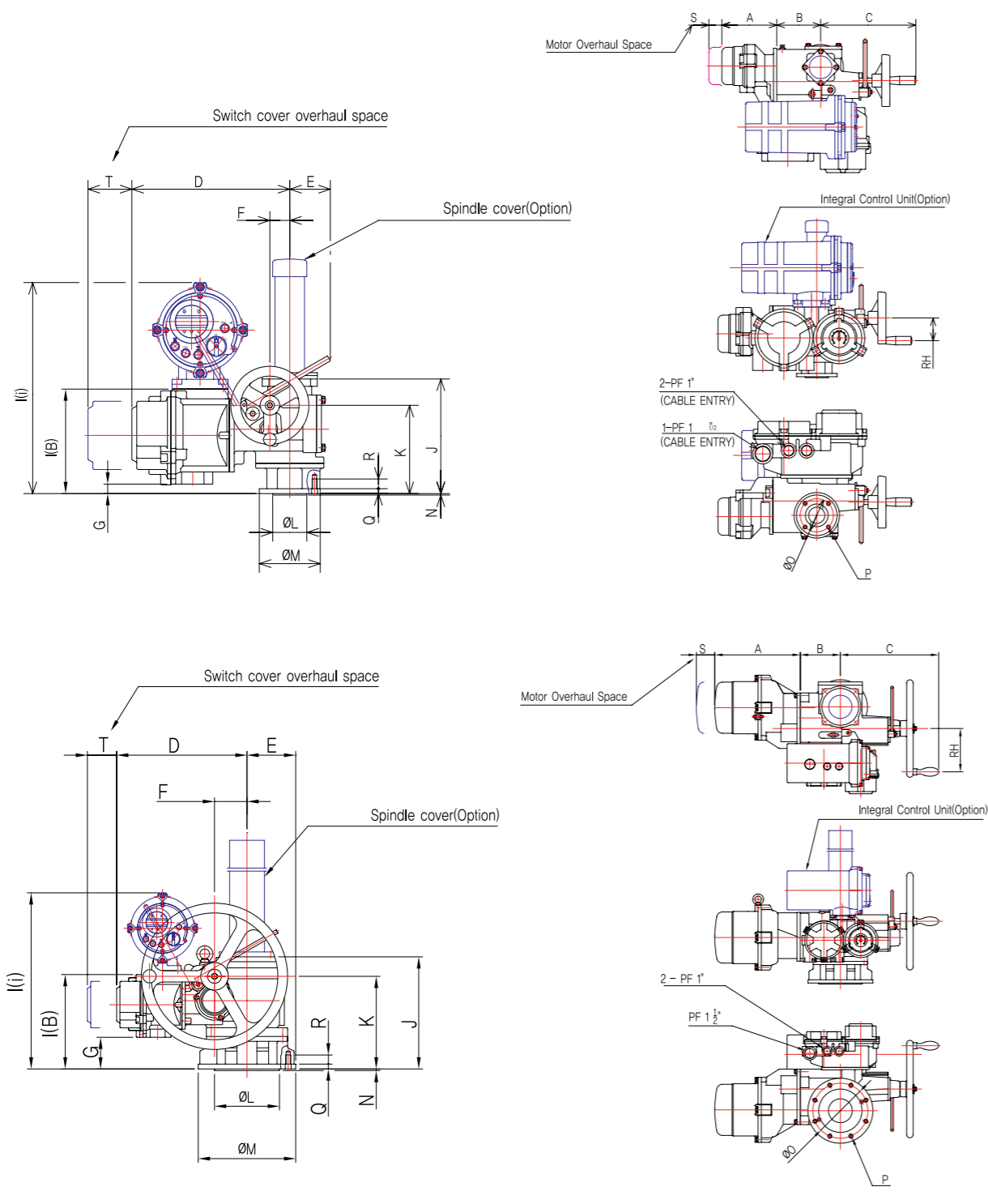
Allowable torque		Allowable thrust		Allowable stem dia. mm		Flange dia. ISO No. Tap PCD/size Pilot dia. mm	Weight (kg)
Nm	lb-ft	ton	kN	key	threaded		
3924	2899	40	392	100	115	350	290
						F30	305
						298/8xM20	320
						230	365
							365
7848	5797	68	665	140	160	415	500
						F35	510
						368/8xM30	550
						260	550
15696	11594	122	1195	155	180	475	950
						F40	950
						406/8xM36	990
						300	990

※ Main power AC 460V 3PH 60Hz is standard. For other main power options, refer to Enertork. ※ (★) is 2pole motor specification.
 ※ (★) Speed is not recommended to apply for self-locking function. ※ For modulating, allow 50% of torque from the above table.

TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Dimensional Data



Unit : mm

Model	A	B	C	D	E	F	G	H	I(i)	I(B)	J	K
TM-01	232	135	290	324	83	41	19	70	433	235	235	181
TM-04	295	140	341	352	88	58	45	110	459	260	282	219
TM-07	322	155	396	380	125	69	73	157	511	288	330	258
TM-1	400	185	453	401	150	100	98	200	542	313	345	285
TM-3	500	456	452	432	175	118	104	200	572	373	422	333
TM-6	521	540	593	519	219	178	182	250	725	450	573	335
TM-12	521	645	594	611	265	228	260	315	765	528	723	577

※I(B) and I(i) mean Basic and Integral type.

Model	L	M	N	O	P	Q	R	ISO NO.	S	T
TM-01	70	125	3		4-M10	10	20		40	90
TM-04	100	175	4		4-M16	10	28		75	90
TM-07	130	210	5		4-M20	15	30		85	90
TM-1	200	300	5		8-M16	15	28		85	90
TM-3	230	350	5		8-M20	17	40		115	100
TM-6	260	415	5		8-M30	20	40		115	100
TM-12	300	475	8		8-M36	24	46		115	100

TMi SERIES, TM-SMART SERIES

MULTI-TURN ACTUATOR

Customer Service

SIZING : The performance of motor operated valve (MOV), water gate, and damper depends on the proper sizing of actuator in terms of rotation speed and torque. Also, economic feasibility is another crucial element for sizing properly. We are ready to assist our customers with torque/thrust calculation, method of mounting, selection of options, and other enquiries at all times for achieving proper sizing.

SUPPLYING SPARES : Prompt response as an individual part and/or as modules, with immediate action.

MOV SUPPLY : Basically, we supply actuators to customers. However, if customer requests, Enertork may supply valves, dampers, and water gates along with our actuators under our quality guarantees.

RETROFIT/ATTACHMENT SUPPLY : In case of retrofitting or site installation of actuators, customers often need various attachments in relation with actuator such as mounting flanges, iron stands, levers, rods, metal fittings, and many others. We are ready to attend and help out from designing stages to supplying the product, until the customer satisfaction is reached.

Bill of materials

Parts	Material	KS/JIS NO.	ASTM NO.	
Case & Cover	TM-01,04,07,1	Alloy die casting(ALDC)	D6006/H5302	B85
	TM-3,6,12	Gear case : Cast iron(GC) Integral case : Alloy die casting(ALDC) etc. : Ductile cast iron(GCD)	D4301/G5501 D6006/H5302 D4302/G5502	A126 B85 A536
Thrust Unit	Ductile cast iron(GCD)	D4302/G5502	A536	
Worm	Chromium molybdenum(SCM)	D3711/G4105	A322	
Worm wheel	High strength Brass casting(HB5C)	D6007/H5102	B584	
Stem bush	Key	Carbon steel(SM45C)	D3752/G4051	1050
	Screw	TM-01, 04, 07, 1 : Copper alloy(C6782BE) TM-3, 6, 12 : High strength Brass casting(HB5C)	D5101/H3250 D6007/H5102	B16 B584
Grease	Lithium grease(EP 0)	M2130/K2220	ISO. KXBCA (MULIS)	

Quality control

All processes from designing through to the delivering of actuators, including preinspection of individual parts or modules, proceeds with strict accordance with the Quality Assurance Procedures certified by ISO9001. Before delivery, each actuator is tested and a Final test report is issued. Customised torque values, sleeve rotational speed, motor current, voltage, performance of position limit and torque limit switches, and manual/automatic switch-over are checked at the specially developed test console and test report is recorded.



Automatic warehouse

FINAL TEST REPORT		Enertork Ltd.	
ACTUATOR FOR DAMPER & VALVE CONTROL		DATE : 2013-07-01 PAGE : 1 / 1	
Customer	GRA-ENG SYSTEM INDIA LTD	Tested by	C. H. LEE
Order No.	-	Checked by	K. U. AHN
Application	-	Approved by	Y. G. AHN
Serial No.	TQ 130782-0025		
Model	TQ-08SM		
Type	Integral Case / Integral Separate / Standard / M.O.V		
Operation			
Opening or Closing Time	Specified (On Load) 21 sec, Actual (On Load) 21.0 sec	Output	40 Poles, 4 Rev, 10 Installation Class
Rotations Per minute	Specified (On Load) 0.71 rpm, Actual (On Load) 0.71 rpm		
No Load Test	3.8, 400 V, 50 Hz, Current 0.3 A	Phase	3, 400 V, 50 Hz, 1380 rpm, Thermal Protector
Voltage Control Power	AC 110 V		
Insulation & Dielectric Test			
Insulation Test	by 500 V Megger 1000 Ω, by 500 V Megger 1000 Ω		
Dielectric Test	AC 1500 V, 5 min, Good by AC 1500 V, 1 min, Good by		
Load Characteristic			
V Load (V)	Current (A) for Reference	Torque (kgf-cm)	Current (A) for Reference
0	-	-	-
5	-	-	-
10	-	-	-
15	-	-	-
20	-	-	-
25	-	-	-
30	-	-	-
35	-	-	-
40	-	-	-
45	-	-	-
50	-	-	-
55	-	-	-
60	-	-	-
65	-	-	-
70	-	-	-
75	-	-	-
80	-	-	-
85	-	-	-
90	-	-	-
95	-	-	-
100	-	-	-
Painting			
Open	Set up 20.0, 0.3	Material	EPOXY
Close	Set up 20.0, 0.3	Color	RAL 9008 - 100mk
Result of Test			
Functions	Good	Operation	Good
Dimensions	Good	Appearance	Good
Enclosure	Good	IP 68	
Backer			
Roller Gear Ratio	-	Remarks	
Gear Efficiency	-		



Machining



Design



Assembly



Final test



Quality Control