



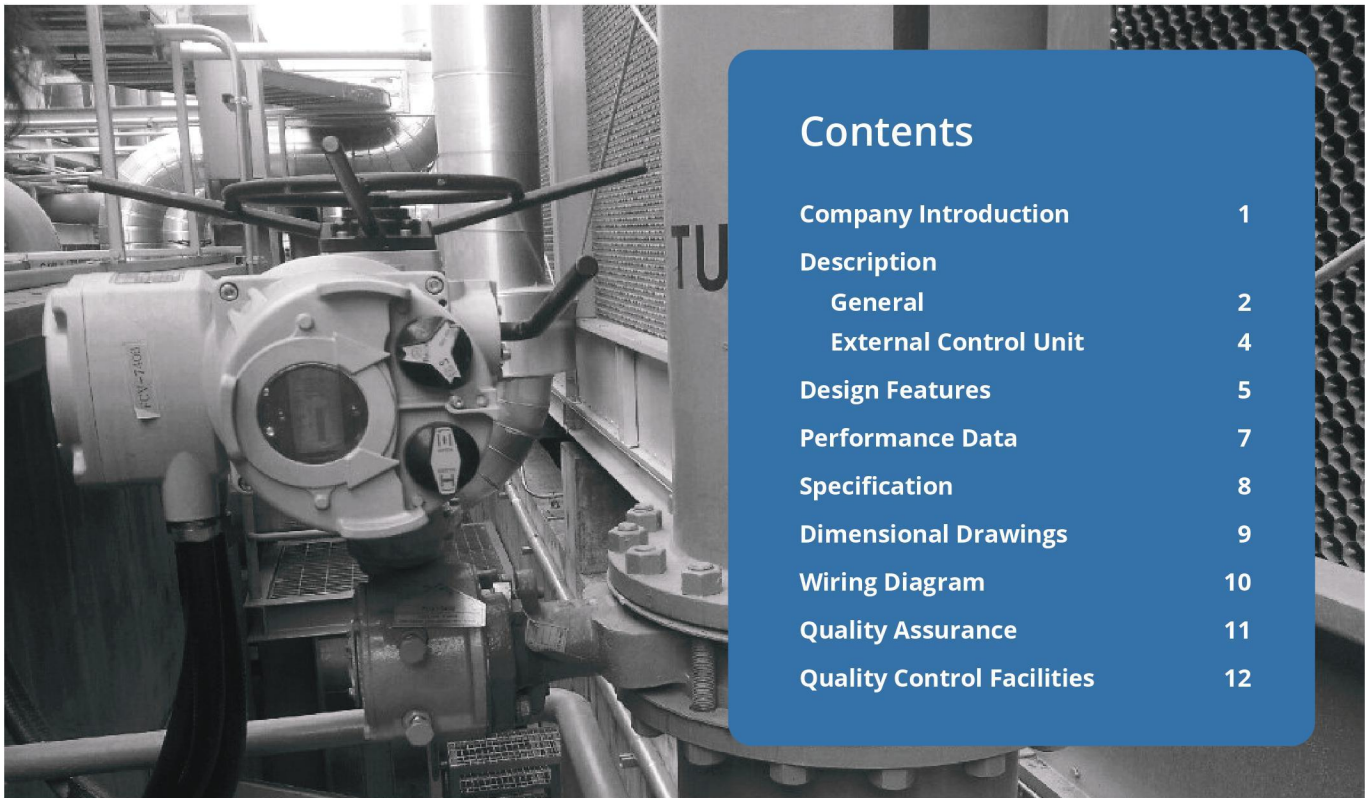
# ELECTRIC MULTI-TURN ACTUATOR HM-SERIES



IECEX CE 0344 Ex I C<sup>s</sup> EAC PROFIBUS

Valve automation leader HKC

HCAG-HM-17 Rev.0



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## Company Introduction

Since 1991, HKC has made every effort to deliver the highest quality products and services for our customers. Moreover, we have worked very hard to lead and advance the rapidly changing industry through continuous innovation management, technical development, human resource management, and etc.

Based on technical theory and diverse experience, HKC's unique know-how is the basic power of development and scientific production of all products, and HKC is growing into a first class corporation that leads valve automation industry with cutting-edge technologies.

HKC puts emphasis on corporate social responsibility. We constantly seek for opportunities with partners and customers for mutual progress, share and development. In addition all of our services are processed through customer-focused management that prioritizes customer satisfaction utmost.

HKC will continually strive to be a global leading corporation that leads the 21st century valve automation industry by creating a great contribution towards the future with the highest quality products, endless development of new technology and continuous customer services.

## Contact Information

### Headquarter / Factory

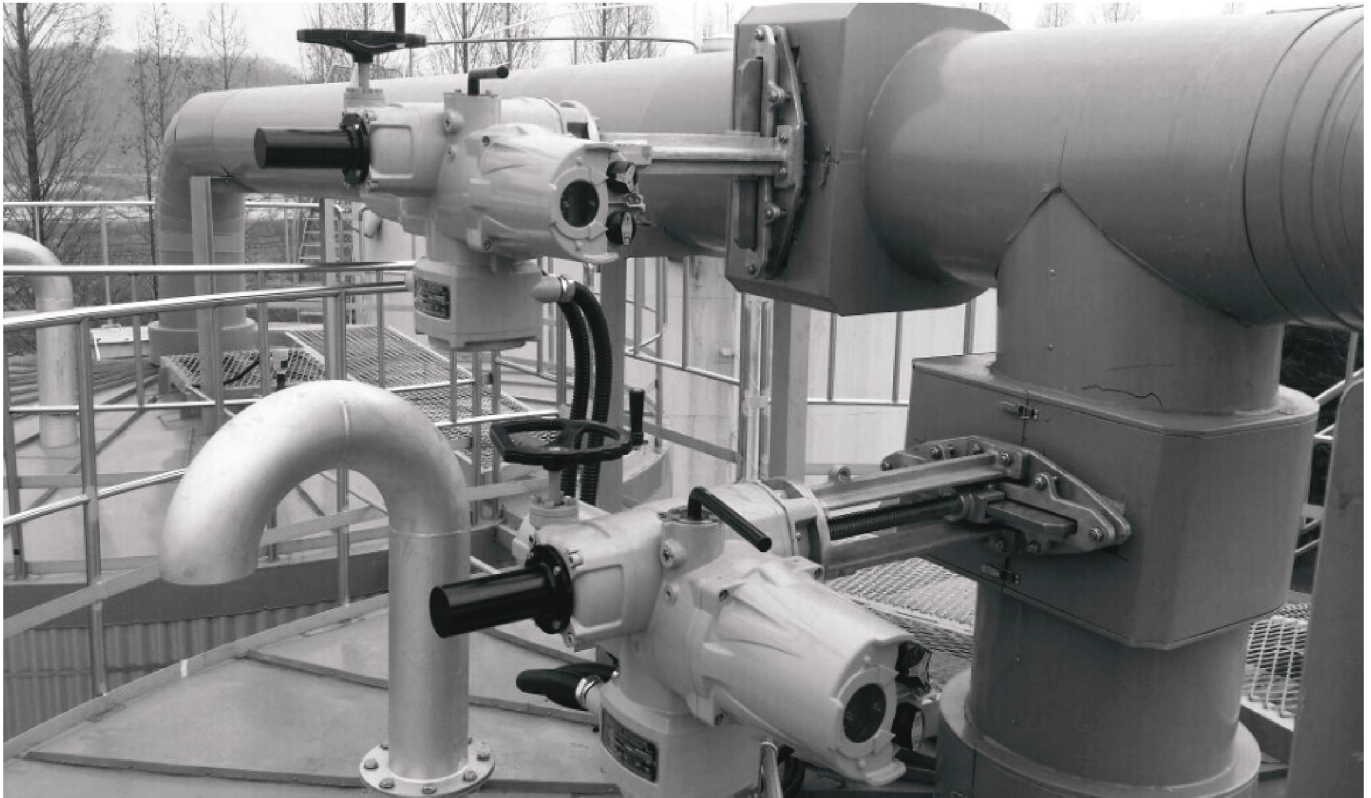
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## Description

HM-series electric multi-turn actuator is specially designed for all multi-turn valve applications (linear motion valves), such as globe valve, gate valve, diaphragm valve, and etc. Moreover, by attaching a worm gearbox, it can also be used for large sized quarter turn valve applications, such as butterfly valve and ball valve.

Since its launch, HM-series electric actuator has been continuously enhanced and improved on its quality as well as its features through continuous development by our R&D department. This brochure describes and explains key features, specifications, performance, technical data, wiring diagrams and dimensional drawings of the continuously improving HM-series actuator.

### HM-series actuator provides high reliability and performance.

The housings of all HM-series actuator are high grade aluminum alloys which are robust and light weight (except HM-100 to HM-300). To provide high corrosion resistance, they are hard anodized on the inside & outside and epoxy-polyurethane coating is further applied on the outside. With rugged design construction, there are two types of enclosure: watertight enclosure (IP68) and flame proof enclosure (Ex d IIB T4).

### Wide range of torque outputs to suit your needs.

HM-series actuator provides wide range of torque outputs to meet specific customer torque requirements. Direct torque outputs range from 35 Nm to 3,000 Nm. When combined with a worm gearbox, the maximum torque output can be adjusted up to 500,000 Nm.

### User friendly controls and indications.

For setting HM-series actuator, there is no need to remove the cover (non-intrusive setting). All settings can be done via either local control switches or infrared wireless communication. The simple user interface supports English and Korean languages.



## Description

### Smart and intelligent control system.

- Wide range of voltages available
- Current status display (open / close / stop)
- LED signal lamp unit  
(Red: open, Green: close, Yellow: fault)
- Local control: two rotary selector switches.
  - Function selector switch (local / stop / remote)
  - Operation selector switch (open / close)
- Remote control: user friendly interface on the window screen clearly explains the function of the buttons at each stage of the setting.
- Real time valve position / torque measurement
- Fault display with a message
- Temperature display
- System backup rechargeable battery level display
- Built-in auto phase discriminator
- Anti-condensation space heater (option)
- Password setting for security
- Thermostatic protection. The thermostat resistor inside the motor senses the temperature and stops the actuator in case of the motor overheat.
- Reversal protection. An auto time delay is added to the circuit when the actuator is commanded to suddenly reverse its direction to prevent the valve from receiving the shock load.
- Solid state design model for more accurate positioning
- Interrupter timer for valve protection from hydraulic shock (water hammer). Adjustable pulsed operation can be applied to any portion of the opening / closing valve stroke to reduce the speed and prevent hydraulic shock.
- Partial stroke. To ensure reliable valve operation, the actuator opens / closes the valve to the pre-set stroke and determines whether the valve is jammed or not.
- User configured interlock function. Prevents one actuator from changing its state due to the state of another actuator.
- External Control Unit (option) to provide a remote control / operation of the HM-series actuator that is installed in unreachable / inaccessible locations (see page 4 for more details).
- Fieldbus (Profibus, CANopen, Modbus)





## External Control Unit

The External Control Unit (ECU) allows users to remotely operate the HM-series actuator from a distance up to 1,200 m. The ECU is a replica of the HM-series actuator panel that uses the same display and the same control user interface. The ECU supply power can be supplied by the attached actuator, eliminating the need for an intrusive external power supply. The ECU is recommended if the actuator is installed in the following conditions:

- the actuator is installed in an inaccessible location.
- heavy vibration at the valve as this may effect the control electronics.
- high ambient temperature at the valve as this may effect the control electronics.

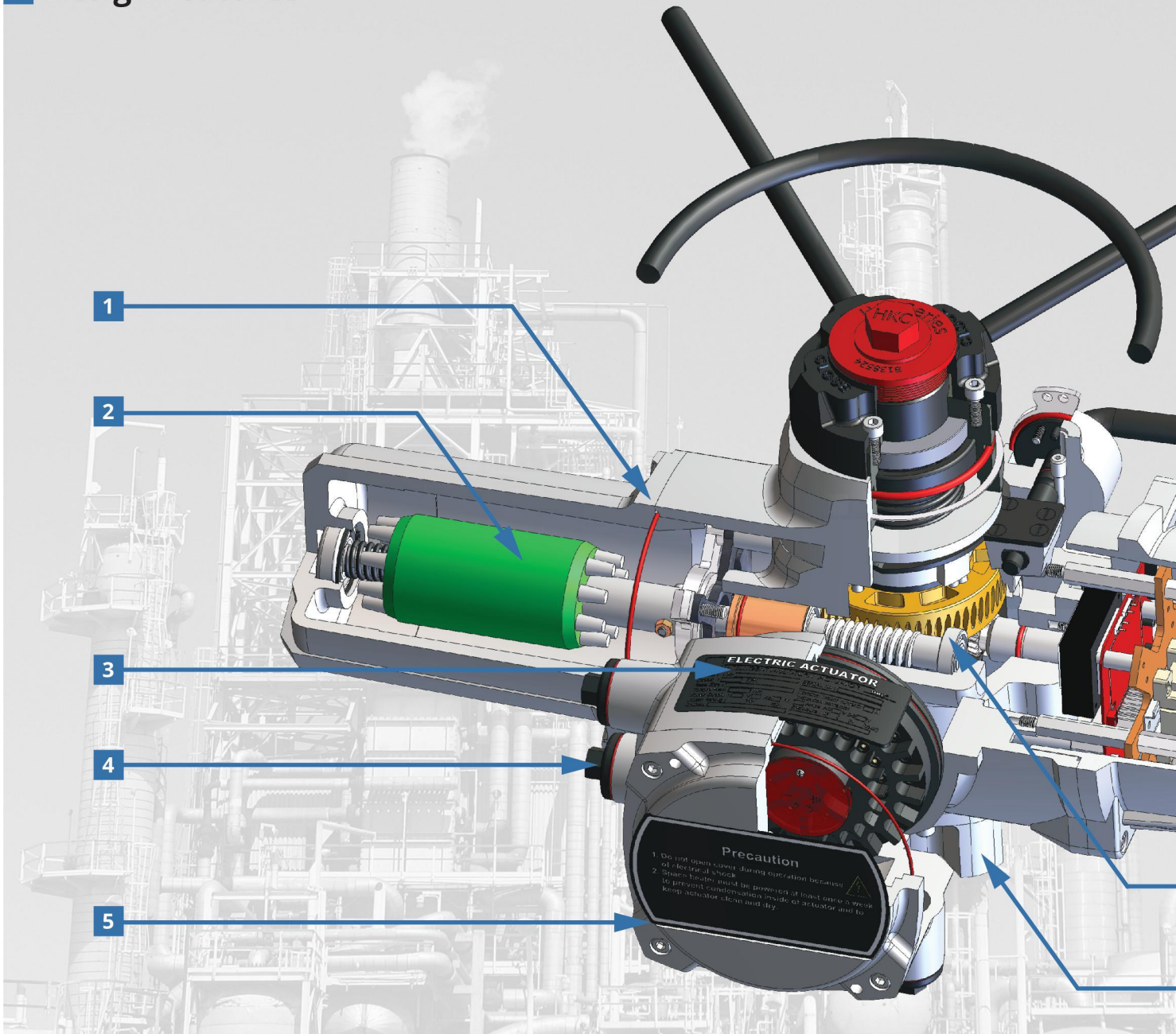
### Features

- The same user interface of the HM-series actuator
- Installation using standard data cable (RS-485 or RS-422) up to 1,200 m from the actuator
- 24 V dc supply power from the actuator or from an external power supply
- Enclosure: IP67 / IP68 (10m, 72 hours)
- Can be mounted on a wall or pole mount bracket

### Specification

<b>Enclosure</b>	Weatherproof enclosure IP67, Watertight enclosure IP68 (10 m / 72 hours)
<b>Power supply</b>	24 V dc (from actuator or external)
<b>Material</b>	Aluminium die-casting (cover) and high grade aluminium alloy (body)
<b>External coating</b>	Anodizing treatment and polyester powder coating
<b>Ambient temperature</b>	-20 to +70 °C
<b>Ambient humidity</b>	90% Max. RH (non-condensing)
<b>Cable entries</b>	3 x PF3/4", 2 x PF1" or 3 x M20, 2 x M25
<b>Mounting</b>	Pole or wall mount bracket
<b>Local control</b>	Two rotary selector switches: function selector (local / stop / remote) operation selector (open / close)
<b>Remote control</b>	Operation control via a remote control

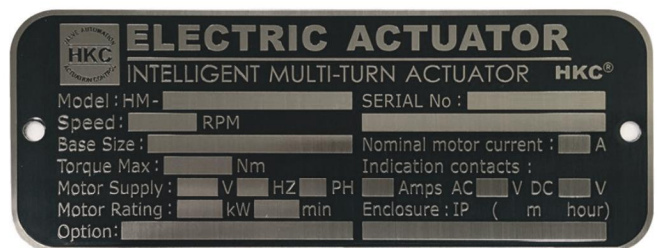
## Design Features



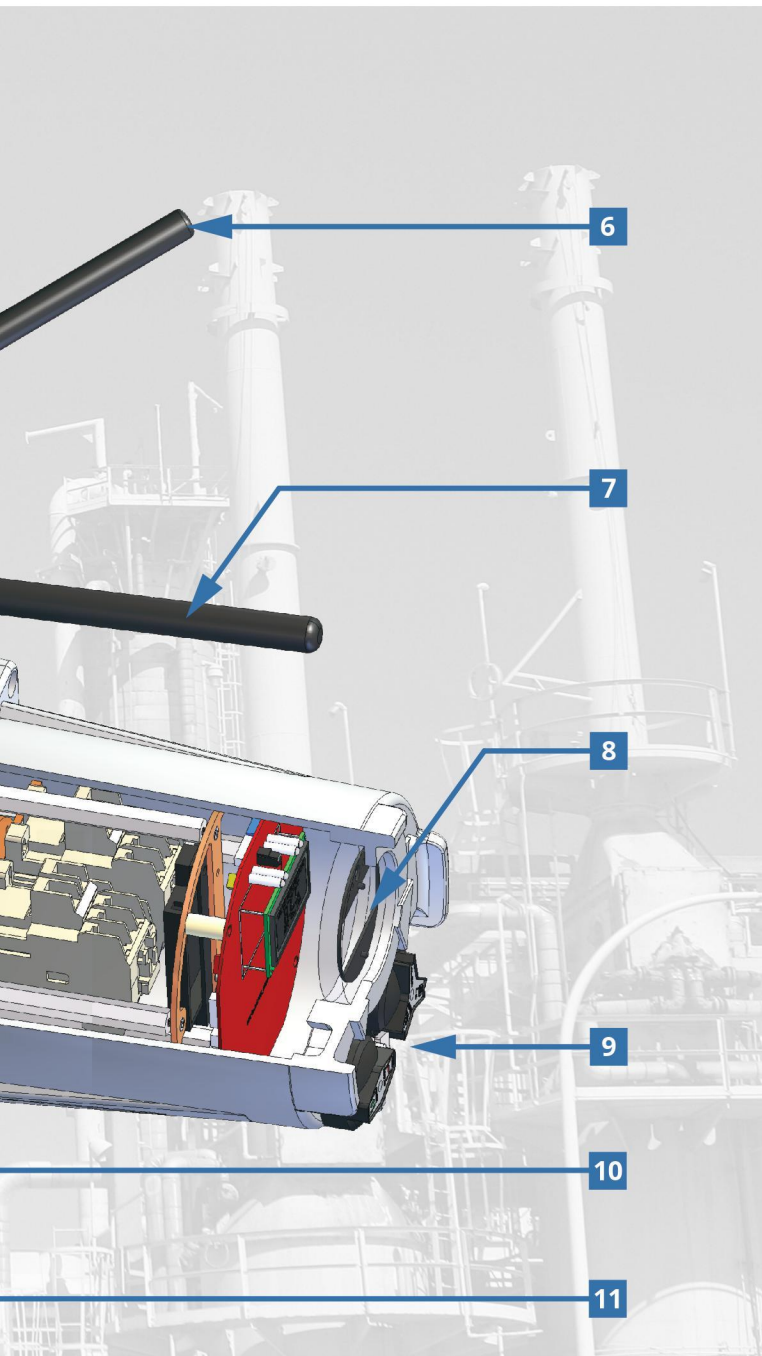
**1 Body & cover:** High grade aluminium alloys with high corrosion resistance due to anodizing on the inside and outside. Epoxy-polyurethane coating is further applied to enhance corrosion resistance. At our factory site, all bodies and covers are precisely machined between the maximum and minimum permissible limits. The standard dimension of HM-series actuator is shown on page 9.

**2 Motor:** Available in 1 phase and 3 phase. All motors are custom built suited for valve automation (high torque, low current, and low inertia). Thermostatic protection is ensured by the thermostat resistor inside the motor, which stops the motor in the event of its overheat.

**3 Name plate:** All necessary information regarding the actuator can be found in the name plate as shown below. Every actuator that is manufactured by HKC is assigned with a serial number and recorded in our system for future reference.







**4 Cable entries:** 5 cable entries with various types.

- Standard: 4 x PF1", 1 x PF1½"
- Flame proof: 4 x NPT1", 1 x NPT1½" or 4 x M33, 1 x M45

**5 Terminal compartment:** The double-sealed terminal compartment provides the actuator a complete protection from the environment when the cover is removed for the wiring purposes, leaving the internal parts and wires intact.

**6 Handwheel:** Handwheel drive can be activated when the **7 manual override lever** is locked into the manual operation (pushed down). Handwheel drive is independent of the motor drive thus it provides safe operation; that is, the manual override lever can be pushed down and locked regardless of the motor status - whether motor is running or not. Note that motor drive has preference over handwheel drive, which means the lever automatically returns when the motor starts running. Both handwheel and lever have been designed so that they can be easily separated from the body for easy maintenance and for convenient installation in narrow or small sites.

For an effective and efficient manual operation, direct drive or geared handwheel has been selected and sized according to the actuator size (see the specification page for more details - page 8). Optional declutchable manual worm gear override (MGO), which has higher gear ratio, is also available on request.

**8 Display:** High resolution LCD screen displays various information including current status, valve position, torque measurement, temperature, alarm and etc., along with duplicated LED signal lamp unit (red: open, green: close, yellow: fault) and is protected by a 10 mm polycarbonate window.

**9 Local control selector switches:** Both Function Selector (open / close) and lockable Operation Selector (local / stop / remote) switches are magnetic switches that do not penetrate the control cover. This ensures isolation of the internal circuits and enhances the actuator protection from the environment.

**10 Worm gear system:** The HM-series mechanical worm gear system provides a necessary self-locking effect which prevents displacement of valve position when an external force acts upon the closing element.

**11 Mounting base:** All thrust (ISO 5210) and non-thrust type (ISO 5211 or MSS SP102) bases can be separated for easy installation. Meanwhile the actuator is still protected by the remaining bottom cover. If the actuator should be removed for maintenance purposes, the valve position can be maintained by leaving the base on the valve where the bottom cover still protects the actuator during maintenance.

## Performance Data

### 3 Phase ac Performance Data

RPM		Torque (Nm)									
50 Hz	60 Hz	HM-004	HM-008	HM-011	HM-020	HM-040	HM-060	HM-100	HM-150	HM-200	HM-300
18	21	35	80	110	200	400	600	1000	1500	2000	-
*24	*29	35	80	110	200	400	600	1000	1500	2000	3000
36	*43	35	80	110	200	300	540	850	1300	1700	-
*48	*57	35	68	110	200	250	470	680	1000	1360	-
*72	*86	35	48	-	176	250	470	680	1000	1360	-
*96	*115	35	40	-	142	230	370	540	750	1000	-
144	173	-	-	-	105	150	260	400	650	860	-
192	230	-	-	-	-	-	-	-	540	730	-
Motor rating (kW)		0.75	0.75	0.75	1.2	1.2	1.9	2.6	3.7	5.5	5.5

\* Standard rpm. (43 rpm is available from HM-004 to HM-020)

#### Notes:

- For actuator output speed 144 / 173 / 192 / 230 rpm, it is recommended to connect a gearbox as high speed operation may cause a problem.

### 1 Phase ac Performance Data

RPM		Torque (Nm)		
50 Hz	60 Hz	HM-008	HM-020	HM-040
18	21	65	165	450
*24	*29	60	130	400
36	43	45	130	350
*48	*57	40	125	320
*72	*86	35	100	230
*96	*115	25	80	190
144	173	-	60	135
Motor rating (kW)		0.75	1.2	1.2

\* Standard rpm

#### Notes:

- For actuator output speed 144 / 173 rpm, it is recommended to connect a gearbox as high speed operation may cause a problem.
- HM-040 actuator requires 220 V ac or more.

### Solid State Design Performance Data

RPM		3-Phase Torque (Nm)					1-Phase Torque (Nm)	
50 Hz	60 Hz	HM-004 S3	HM-008 S3	HM-011 S3	HM-020 S3	HM-040 S3	HM-008 S1	HM-020 S1
18	21	35	80	110	200	400	65	165
*24	*29	35	80	110	200	-	60	130
36	43	35	80	-	-	-	45	130
*48	*57	35	68	-	-	-	40	125
*72	*86	35	48	-	-	-	30	100
*96	*115	-	-	-	-	-	25	80
Motor rating (kW)		0.75	0.75	0.75	1.2	1.2	0.75	1.2

\* Standard rpm

#### Notes:

- All 3 phase solid state design actuators require 380 V ac or more.
- HM-008 S1 actuator requires 110 – 240 V ac.
- HM-020 S1 actuator requires 220 – 240 V ac.



## Specification

### Standard Specification

<b>Enclosure</b>	Weatherproof enclosure IP67		
<b>Materials</b>	<ul style="list-style-type: none"> <li>■ HM-004 to HM-060: High grade aluminium alloy &amp; anti-corrosion coated</li> <li>■ HM-100 to HM-300: Nodular cast iron &amp; high grade aluminium alloy with anti-corrosion coated</li> </ul>		
<b>Power supply</b>	<ul style="list-style-type: none"> <li>■ 110/220 V ac, 1 ph, 50/60 Hz (HM-040 requires 220 V ac or more)</li> <li>■ 220/380/420/440/460/480 – 600 V ac, 3 ph, 50/60 Hz</li> </ul>		
<b>Power voltage tolerance</b>	±10%	<b>Starting voltage drop (Max.)</b>	-15%
<b>Duty cycle (on-off)</b>	1 ph: S2 15 min, 3 ph: S2 30 min (room temp., average load of 50% of max. torque)		
<b>Duty cycle (modulating)</b>	1 ph: S4 25%, 3 ph: S4 35%, 60 – 200 starts/hour (room temp., average load of 50% of max. torque)		
<b>Torque</b>	<ul style="list-style-type: none"> <li>■ 3 ph: 35 – 3,000 Nm. When combined with a gearbox up to 43,000 Nm or 500,000 Nm</li> <li>■ 1 ph: 24 – 450 Nm.</li> </ul>		
<b>Ambient temperature</b>	<ul style="list-style-type: none"> <li>■ Standard: -20 to +70 °C</li> <li>■ Flame proof: -20 to +60 °C</li> </ul>	<b>Monitoring switches</b>	<ul style="list-style-type: none"> <li>■ Standard: 4 switches, 250 V ac 16 A rating</li> <li>■ Option: 8 – 16 switches</li> </ul>
<b>Motor</b>	Induction motor (reversible motor)		
<b>Signal lamp unit</b>	Red: open, Green: close, Yellow: fault		
<b>Self locking</b>	By worm gear		
<b>Travel angle</b>	0 – 10,000,000 turns		
<b>Design life</b>	Torque & thrust test: 50,000 cycles		
<b>Manual override</b>	Declutchable manual override		
<b>Mounting base</b>	Multi-turn: ISO 5210, Part turn: ISO 5211 MSS SP-102		
<b>Local/remote control</b>	Local control: two rotary selector switches (function selector & operation selector), remote control: setting tool (LCD window)		

### Optional Specification

<b>EXD</b>	Flame proof enclosure IECEx & KCs: Ex d IIB T4, ATEX II 2 G EX d IIB T4 Gb (-20 to +60 °C)		
<b>MGO</b>	Declutchable manual worm gear override	<b>WTA</b>	Watertight enclosure (IP68 10 m / 72 hours)
<b>PCU</b>	Proportional Control Unit (input/output: 0 – 10 V dc or 4 – 20 mA dc)	<b>AMS</b>	Additional Monitoring Switches (4 x SPST, 250 V ac 16 A rating)
<b>ECU</b>	External Control Unit (LCU + digital indicator)	<b>CPT</b>	Current Position Transmitter (output: 4 – 20 mA dc)
<b>FPA1</b>	Fire Proofing Actuator (1050±5 °C / 50 min)	<b>FPA2</b>	Fire Proofing Actuator (250±5 °C / 150 min)
<b>MODBUS</b>	Modbus modules	<b>PROFIBUS</b>	Registered profibus DP interface modules

### Mechanical Data

Model	HM-004	HM-008	HM-011	HM-020	HM-040	HM-060	HM-100	HM-150	HM-200	HM-300
<b>Flange size (ISO 5210)</b>	F10	F10	F10	F14	F14	F16	F25	F25	F30	F30
<b>Weight (kg)</b>	40	40	40	65	65	75	190	190	200	200
<b>Thrust rating (kN)</b>	44	44	44	100	100	150	220	220	334	445
<b>Hand wheel ratio</b>	Direct	Direct	Direct	Direct	Direct	Direct	Direct	18 : 1	18 : 1	18 : 1
<b>MGO ratio</b>	15 : 1	15 : 1	15 : 1	15 : 1	15 : 1	23 : 1	54 : 1	54 : 1	54 : 1	54 : 1

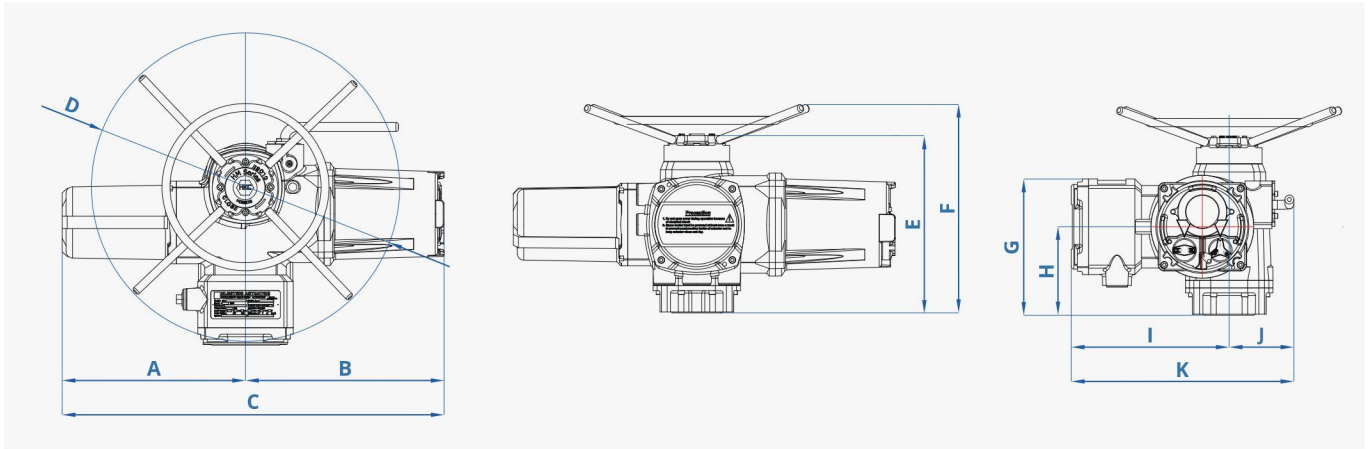
### Applicable Maximum Stem Diameter - Base

Model		HM-004	HM-008	HM-011	HM-020	HM-040	HM-060	HM-100	HM-150	HM-200	HM-300
<b>Thrust</b>	<b>Rising</b>	32	32	32	38	38	54	64	70	70	83
	<b>Non-rising</b>	26	26	26	32	32	45	51	57	57	73
<b>Non-Thrust</b>	<b>Large type</b>	42	42	42	60	60	80	100	100	120	120
	<b>ISO type</b>	20	20	20	30	30	40	50	50	50	N/A
	<b>*Blank type</b>	20	20	20	30	30	44	50	60	60	N/A

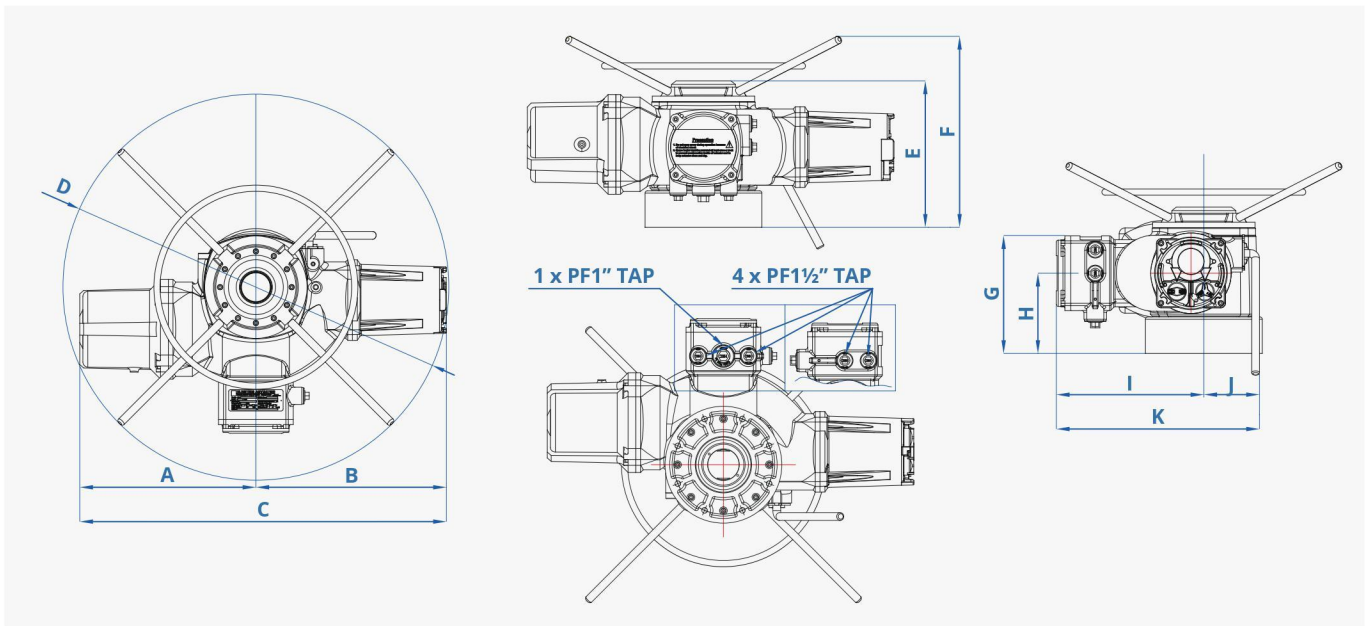
\*Standard type

## Dimensional Drawing

HM-004, HM-008, HM-011, HM-020, HM-040, HM-060



HM-100, HM-150, HM-200, HM-300



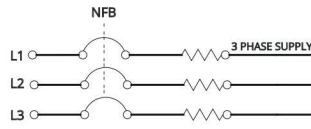
### Dimension

Model	A	B	C	D	E	F	G	H	I	J	K	unit (mm)
HM-004	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-008	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-011	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-020	369	399.5	768.5	Φ620	356.8	420	273.8	177.8	317.7	130	447.7	
HM-040	369	399.5	768.5	Φ620	356.8	420	273.8	177.8	317.7	130	447.7	
HM-060	383.5	407	790.5	Φ835	392.5	481	293.9	197.9	319.7	132	451.7	
HM-100	452.5	489.5	942	Φ995	379	493.5	305	209	379	143	522	
HM-150	452.5	489.5	942	Φ995	379	493.5	305	209	379	143	522	
HM-200	507.5	489.5	997	Φ995	418.5	611	305	209	379	143	522	
HM-300	507.5	489.5	997	Φ995	418.5	611	305	209	379	143	522	

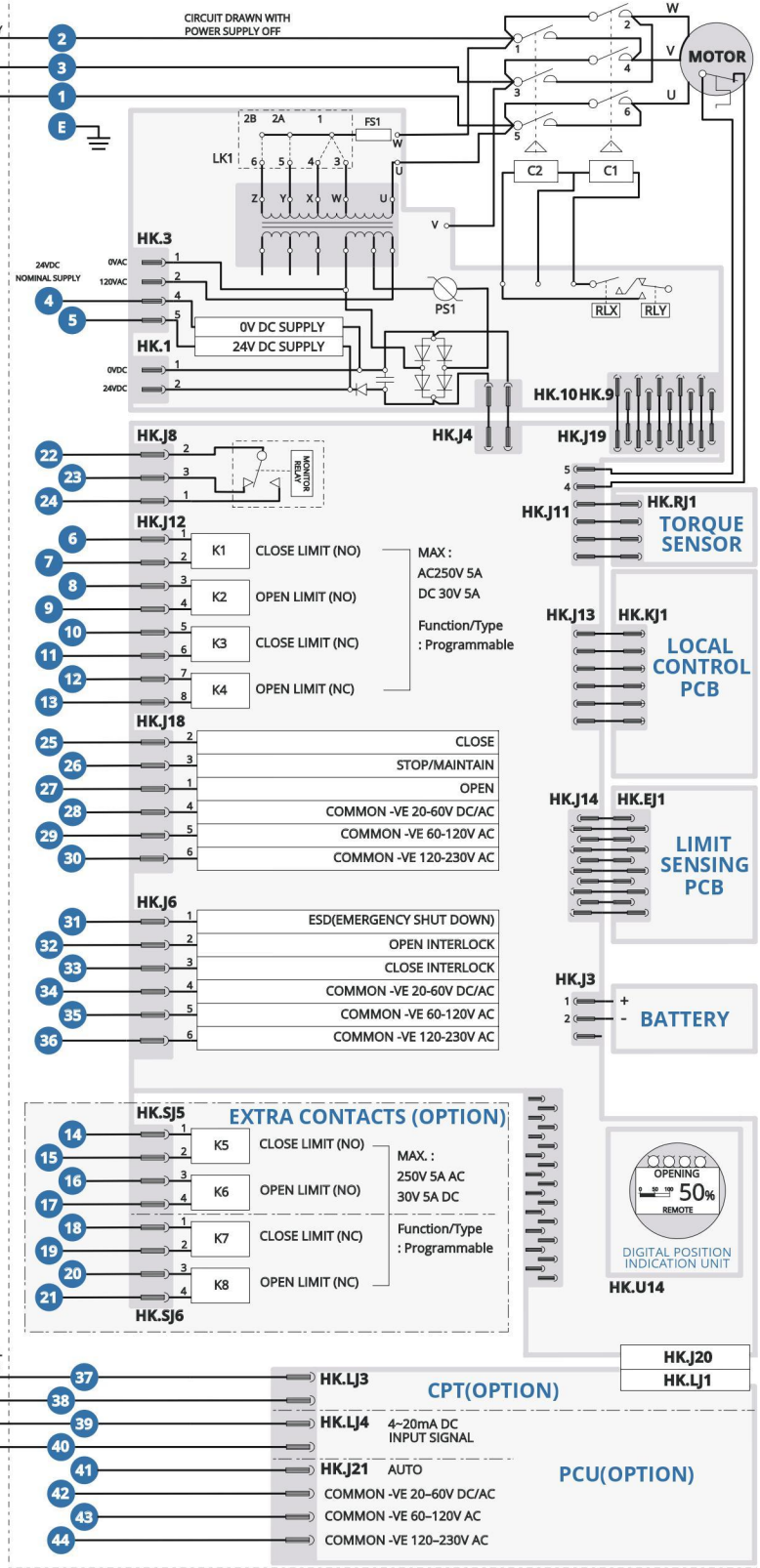


## Wiring Diagram (HM-series 3 ph)

### CUSTOMER SUPPLY FIELD WIRING



### CONTROLLER & ACTUATOR ASS'Y



# Quality Assurance



**"Quality is never an accident. It is always the result of intelligent effort."**

- John Ruskin.

In accordance with ISO 9001, the quality management system is established to maximize customer satisfaction through the highest quality and service based on the latest technology. To achieve such, considerable amount of intelligent effort has been applied. The HM-series actuator has been developed with well calculated design and careful selection of materials to ensure high performance and reliability. To ensure consistent product quality, precision machining is used and the individual parts are pre-inspected prior to assembly to further check the quality consistency. After the assembly, every actuators are thoroughly tested with HKC's inspection specification and a test report is recorded as shown on the right.

Our quality activity does not stop here. Utilizing many testing equipments, HKC's R&D department is constantly developing all of our actuators to further improve their quality.

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### HM Actuator Test Report

Customer: NA      WO No.: DW 1511-1261  
 Project: NA      Inv. No.: 14 1211 1264  
 PO No.:      Remark:

1. Actuator Description

Serial No.	FW 211-961-00022	Power Supply	200V, 3 Phase, 50 Hz
Model - Type	H3C40 - Installation type	0 Case Ratio of DP4	60 - 1      24
Motor	LS-60 4 - K200000	Worm Gear Ratio	
Control Unit	Proportional P07	Bevel Gear Ratio	
Valve Size (mm)	NA	Spur Gear Ratio	
Valve Size (mm)		D-Bushing Output	sec.
Stroke (mm)	Stroke: 300	Push	sec.
Operating Time	Exhausting to 60 degree	Spec. @ 20 Hz	sec. ± 10%

2. Functional Test

Traveling	100% to 100% setting	Set lower stroke	380V, 3 Phase, 50Hz
Traveling setting	100 Hz	Traveling / Open to Close	sec
Traveling setting	NA	Close to Open	sec
Drive Speed	24 rpm	Number of Turns	Turns to open

Motor	Size	LS-60	Insulation Class	F
	Duty	50 S with 15 Minutes	Peak Qty	4
	Flow Search	780 Hz	3 Phase	
	Control Source	0	1 to	
	Break Current	2.0 Amp	Starting Current	14.4 Amp

3. Optional Specifications (if applicable)

	EA	Exhaustion Proof Protection	FF47	Fire Proofing Actuator (FF47)
	WT5	Water Tight Enclosure (IP50)	600000	Module Modules
	MCO	Modular Manual W-Gear	PROF-BJ2	Probus DP Installation Module
	OC	Proportional Control Unit		
	AMS1	Address Installation Search		
	CCU	External Control Unit (LSD, DP)		
	CPI	Current Position Indicator		
	FF47	Fire Proofing Actuator (FF47)		

4. Test Inspection Results

- 1. Lubrication system
- 2. Hit switch setting
- 3. Traveler setting
- 4. Wiring (IR-A3020-50)2-01A
- 5. Inlet cart leakage
- 6. Appearance confirm
- 7. Dural connection
- 8. POU test InOut-4-25u A
- 9. Drive

Issued by: J.Y. Jeon  
 Approved by: J.Y. Jeon  
 Date: Dec 28, 2015  
 I/C Co. Ltd.

HKC-2016-01 Rev.2





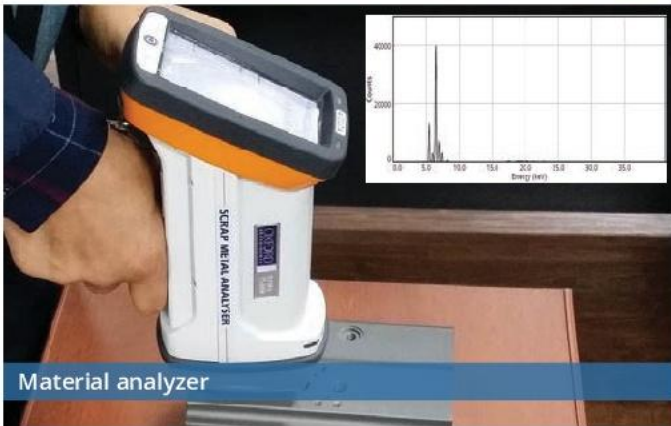
## Quality Control Facilities



Computerized numerical control machining



Reliability torque testing equipment



Material analyzer



Torque testing equipments



Valve leakage testing equipment



Computerized numerical control machining



Endurance testing equipment



Salt spray & low temperature testing equipments



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