



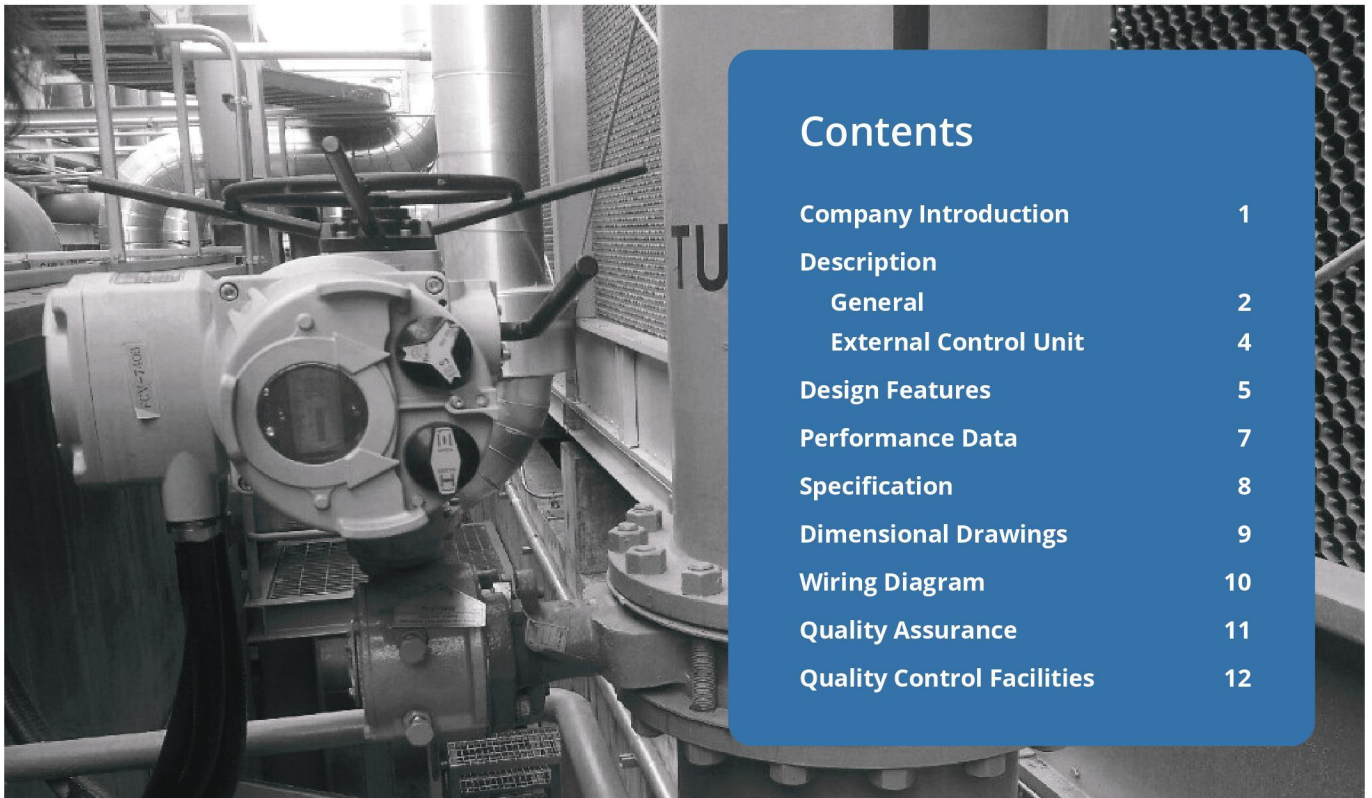
ELECTRIC MULTI-TURN ACTUATOR HM-SERIES



IECEX CE 0344 Ex I C^s 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

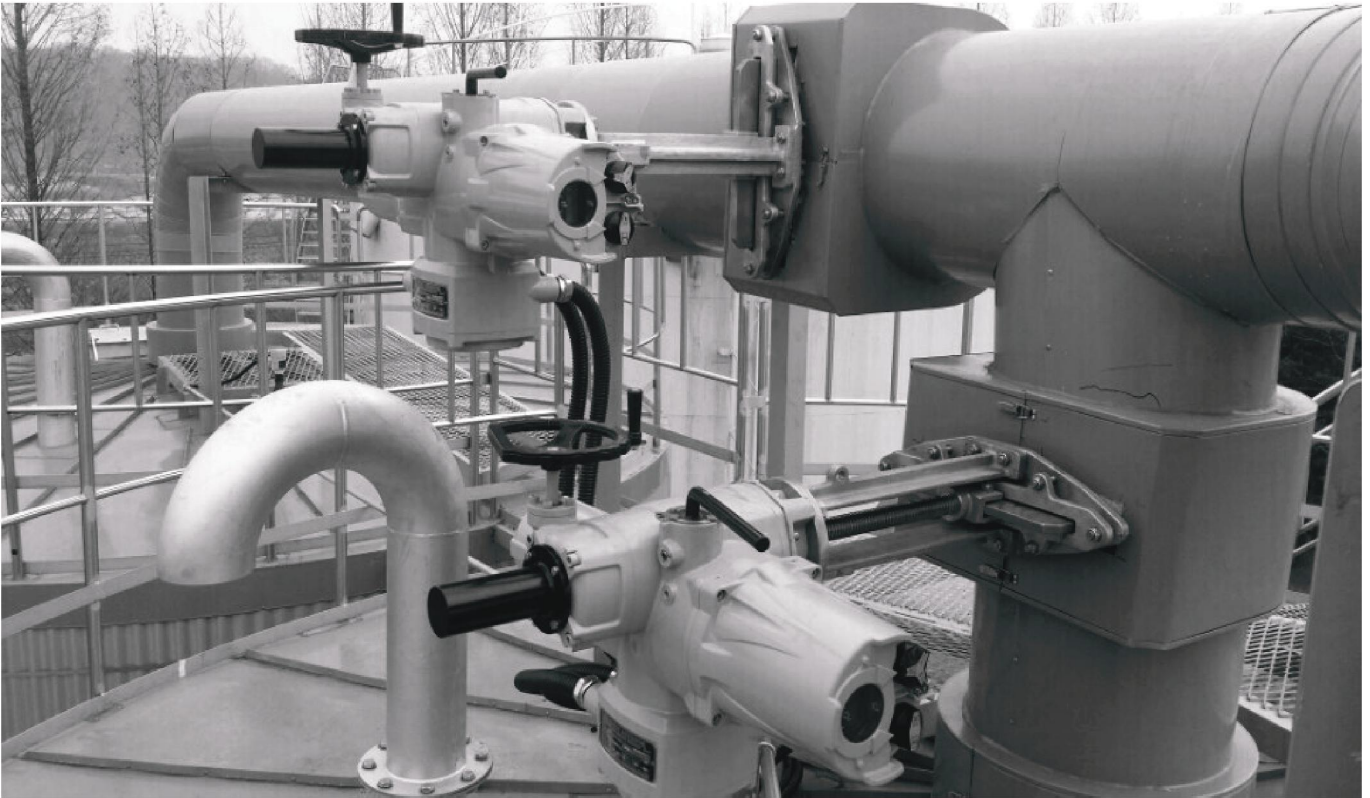
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Description

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 acutator 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.

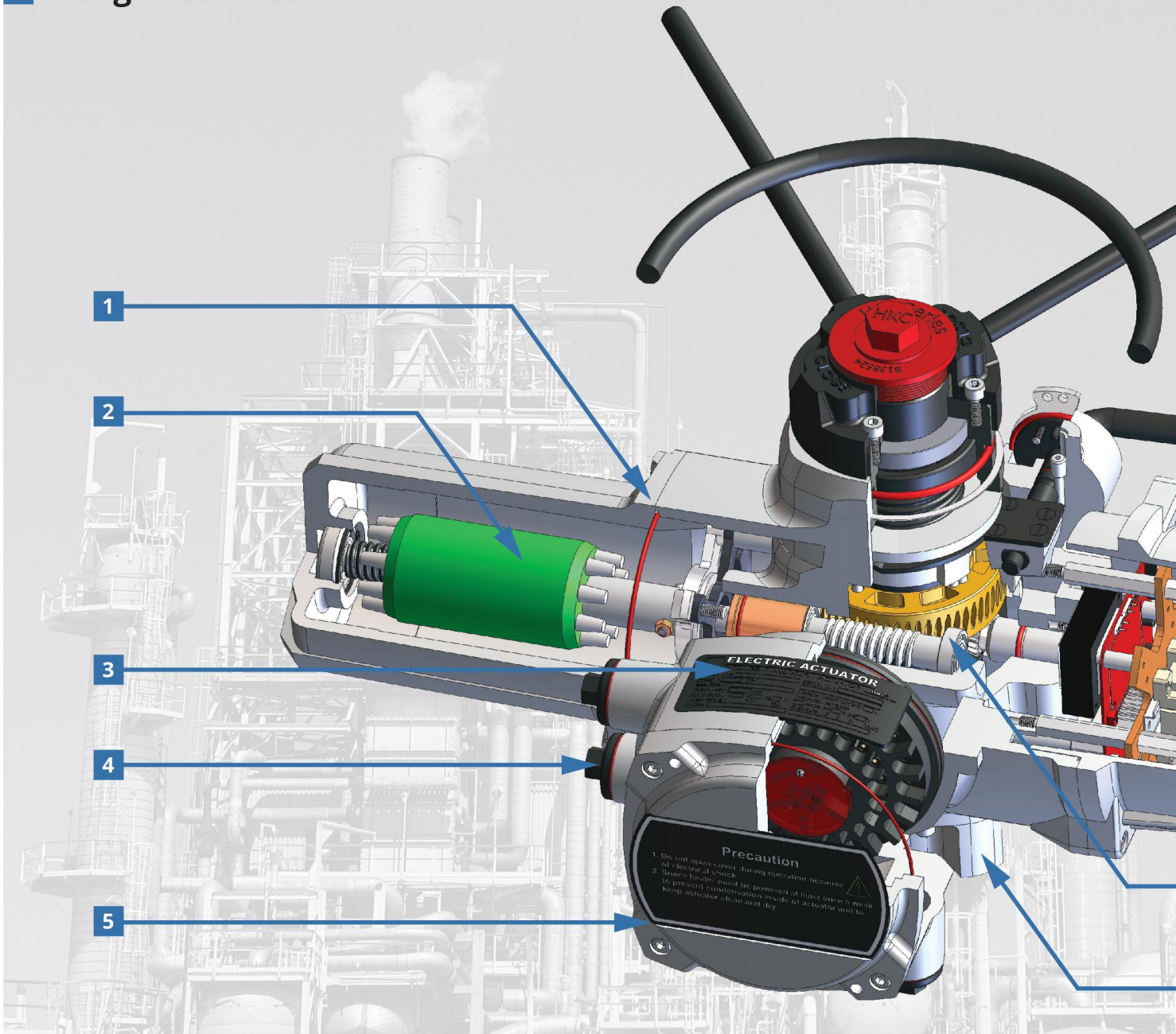
Features

- 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

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

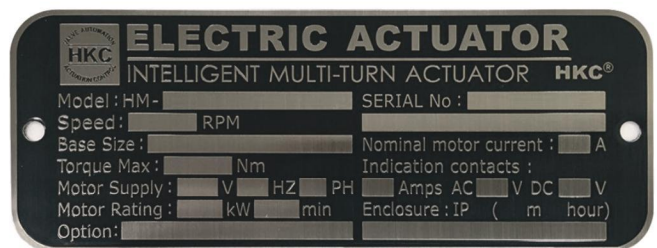
Design Features

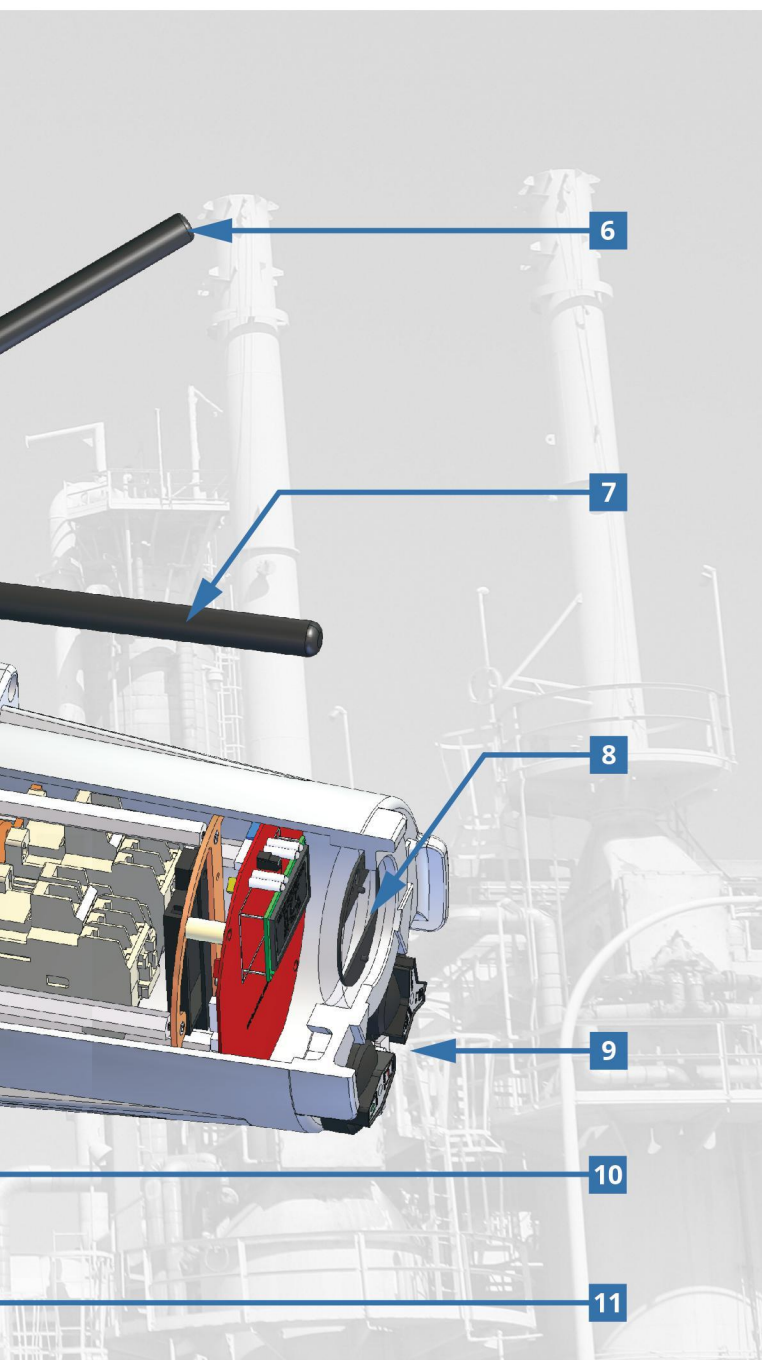


1 Body & cover: High grade aluminium alloys with high corrosion resistance due to anodizing on the inside and outside. Epoxy-polyurethane coating is further applied to enhance corrosion resistance. At our factory site, all bodies and covers are precisely machined between the maximum and minimum permissible 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

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

Optional Specification

EXD	Flame proof enclosure IECEx & KCs: Ex d IIB T4, ATEX II 2 G EX d IIB T4 Gb (-20 to +60 °C)		
MGO	Declutchable manual worm gear override	WTA	Watertight enclosure (IP68 10 m / 72 hours)
PCU	Proportional Control Unit (input/output: 0 – 10 V dc or 4 – 20 mA dc)	AMS	Additional Monitoring Switches (4 x SPST, 250 V ac 16 A rating)
ECU	External Control Unit (LCU + digital indicator)	CPT	Current Position Transmitter (output: 4 – 20 mA dc)
FPA1	Fire Proofing Actuator (1050±5 °C / 50 min)	FPA2	Fire Proofing Actuator (250±5 °C / 150 min)
MODBUS	Modbus modules	PROFIBUS	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
Flange size (ISO 5210)	F10	F10	F10	F14	F14	F16	F25	F25	F30	F30
Weight (kg)	40	40	40	65	65	75	190	190	200	200
Thrust rating (kN)	44	44	44	100	100	150	220	220	334	445
Hand wheel ratio	Direct	Direct	Direct	Direct	Direct	Direct	Direct	18 : 1	18 : 1	18 : 1
MGO ratio	15 : 1	15 : 1	15 : 1	15 : 1	15 : 1	23 : 1	54 : 1	54 : 1	54 : 1	54 : 1

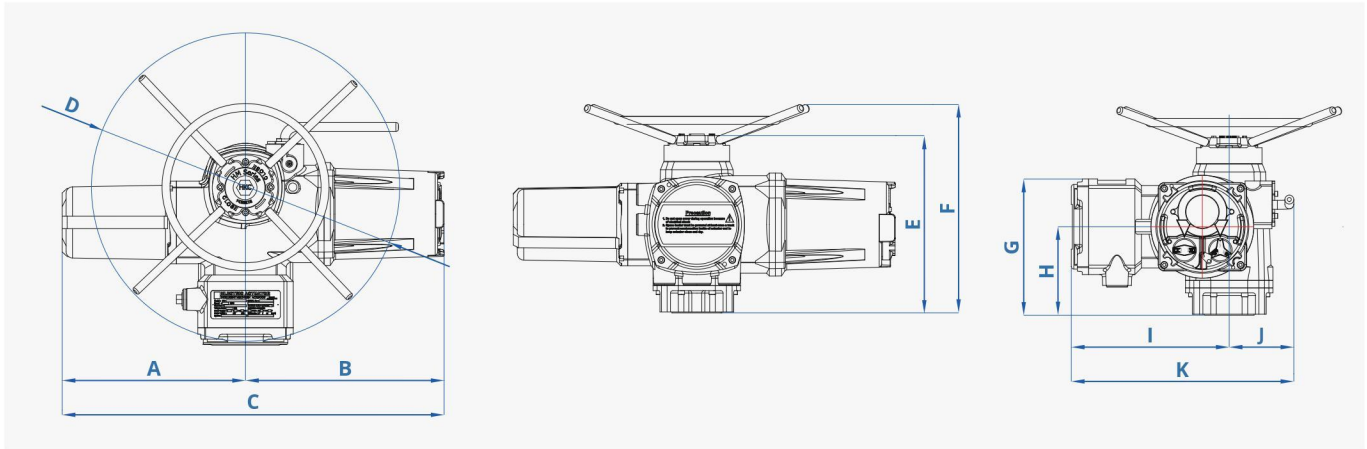
Applicable Maximum Stem Diameter - Base

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

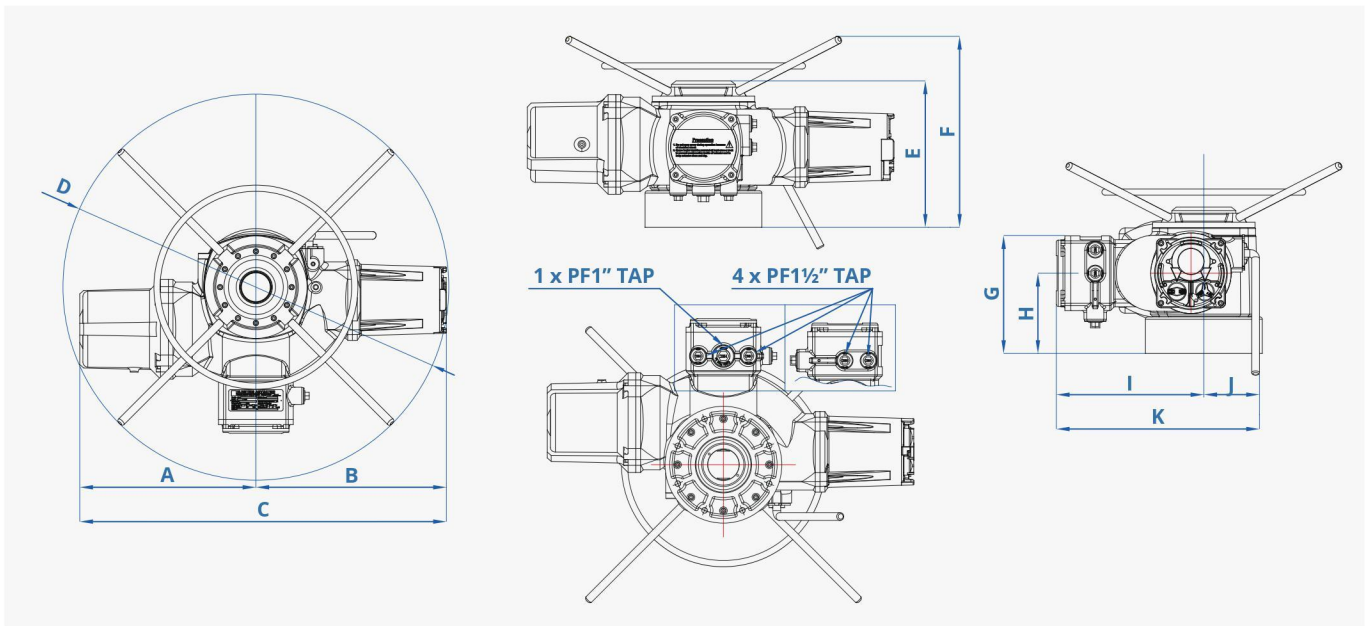
*Standard type

Dimensional Drawing

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



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

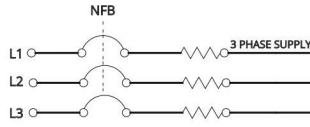


Dimension

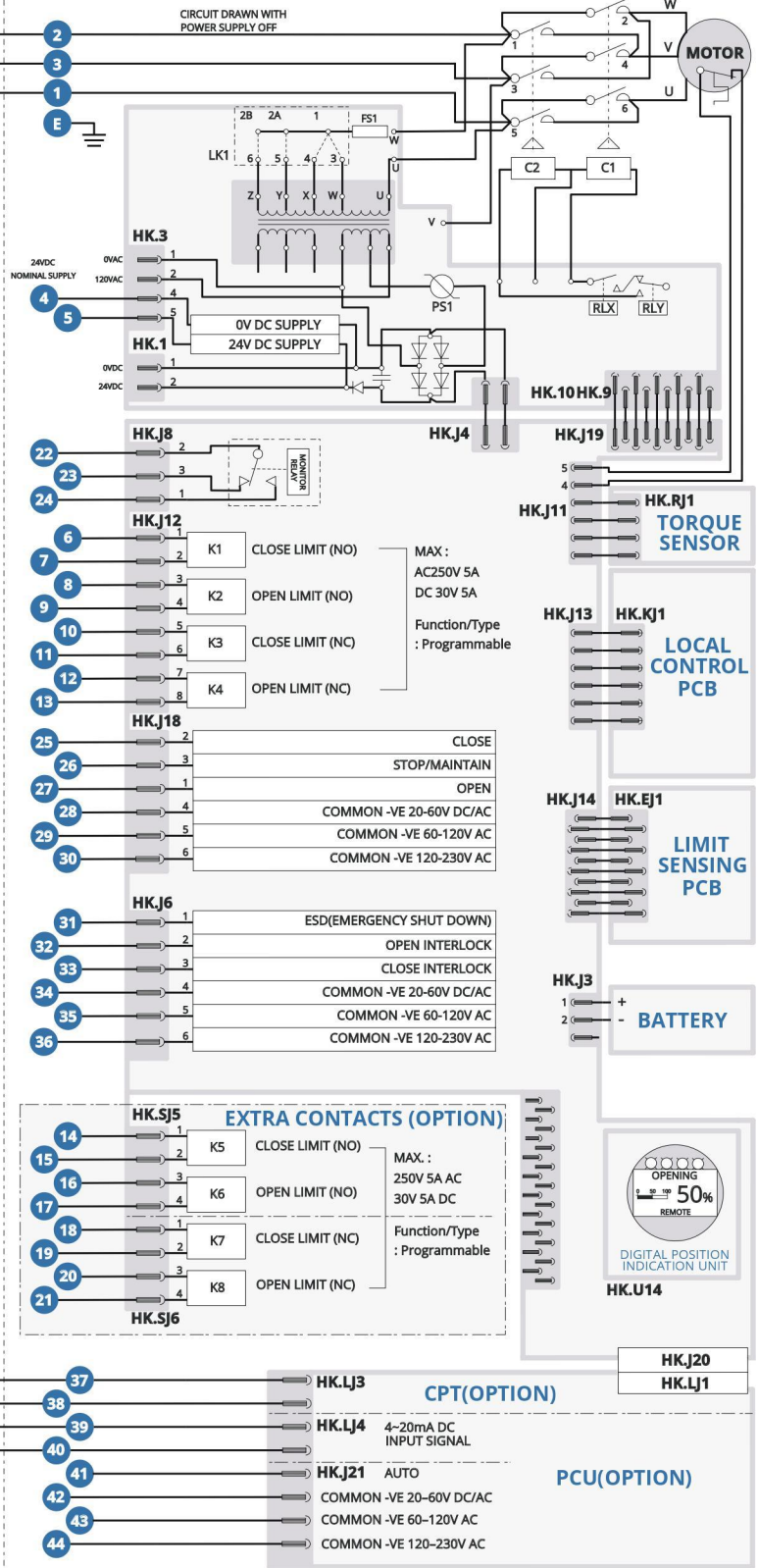
Model	A	B	C	D	E	F	G	H	I	J	K	unit (mm)
HM-004	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-008	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-011	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407	
HM-020	369	399.5	768.5	Φ620	356.8	420	273.8	177.8	317.7	130	447.7	
HM-040	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)

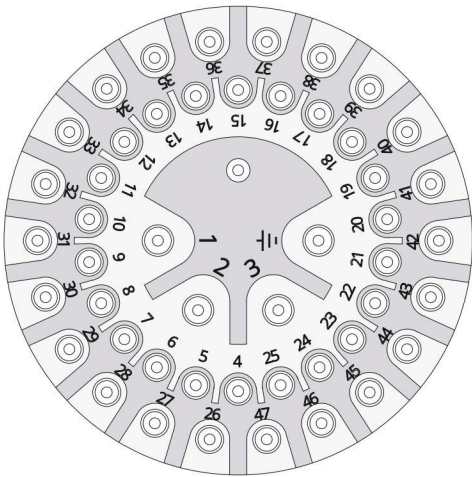
CUSTOMER SUPPLY FIELD WIRING



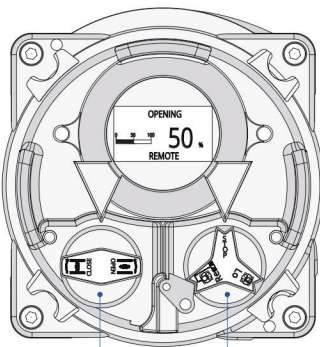
CONTROLLER & ACTUATOR ASS'Y



Terminal Block - Numbering



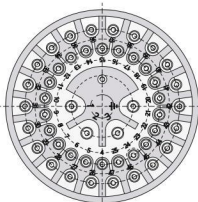
Intelligent Digital Control Unit



Selector Switch (Spring Return Type) Selector Switch

Terminal Block

Power Source	
→	3Ø 220 V
	3Ø 380 V
	3Ø 440 V
	3Ø 460 V
	3Ø 480 V
	50/60 Hz



Note: wiring diagrams are provided with the actuators.

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		Power Supply	380V, 3 Phase	50 Hz
Serial No.	FW-211-961-03022	0.5kW (0.7HP)	60-1	24
Model - Type	H3C-30	Insulation	IP67	
Motor	LS-00	4-Phase		
Control Unit	Proportional	Motor		
Rated Voltage	NA	Rated Gear Ratio		
Valve Size (mm)		Rated Gear Ratio		
Stroke (mm)		Rated Gear Ratio		
Operating Time		Rated Gear Ratio		

2. Functional Test

Traveling	100%	Set lower stroke	380V, 3 Phase	50Hz
Traveling	100%	Traveling	Open to Close	200%
Traveling	100%	Traveling	Close to Open	200%
Drive Speed	24 rpm	Number of Turns	Turns to Open	
Motor	Size	1.7 kw	Insulation Class	F
	Duty	50% (1/4 - 15 Minutes)	Phase Qty	4
	Rated Voltage	380 V	Rated Power	1.7 kw
	Rated Current	3.9 A	Rated Torque	1.44 N.m

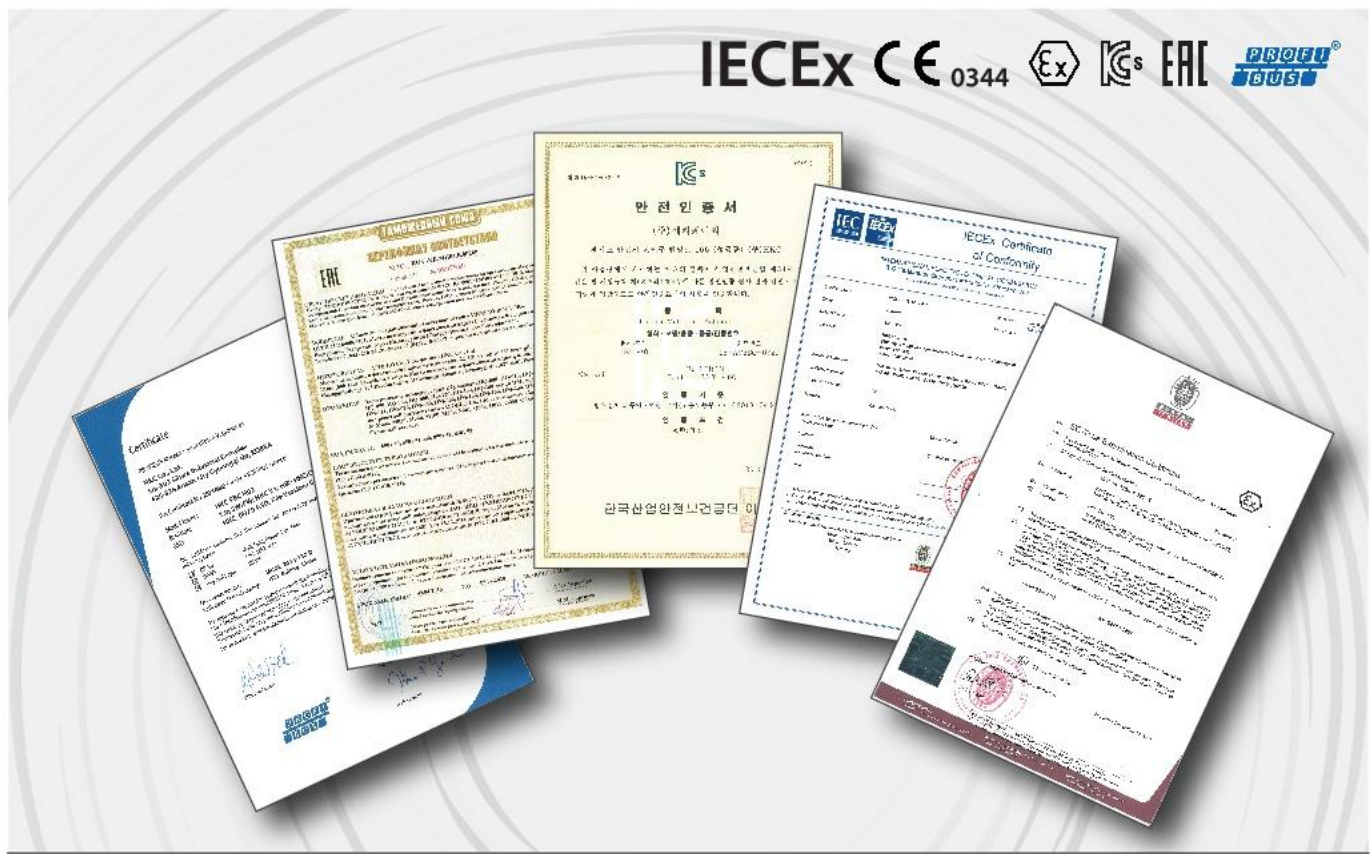
3. Optional Specifications (if applicable)

EA	Exhaustion Protection	FF-02	Fire-Proofing Actuator (IP67)
WT	Water Tight, Explosion IP69	IP67	Module Modulus
MG	Modular Manual W-Gear	PROF-BUS	Probus IP67 Protection Module
PCU	Proportional Control Unit		
AMSI	Address Allocation Search		
CCU	External Control Unit (LSD, DI)		
CPI	Current Position Indicator		
FF	Fire-Proofing Actuator (IP67)		

4. Test Inspection Results

- 1. Lubrication system
- 2. Oil seal setting
- 3. Traveling setting
- 4. Drive speed setting
- 5. Motor leakage
- 6. Appearance inspection
- 7. Torque conversion
- 8. PCU test InOut-4-25mA
- 9. Drive

Tested by: J.Y. Jeon
 Approved by: J.Y. Jeon
 Date: Dec 23, 2015
 I/C Co., Ltd.



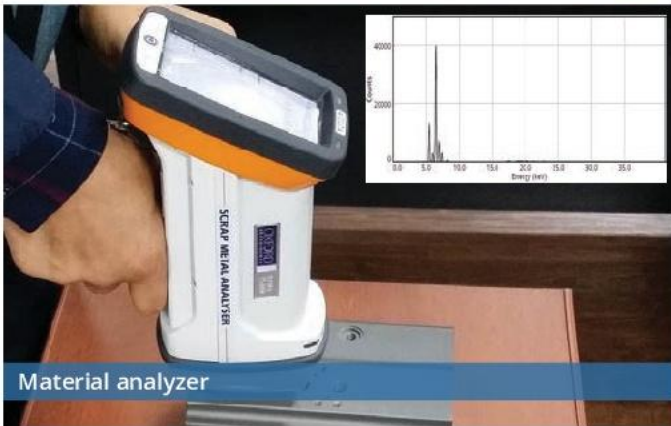
Quality Control Facilities



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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Valve automation leader HKC