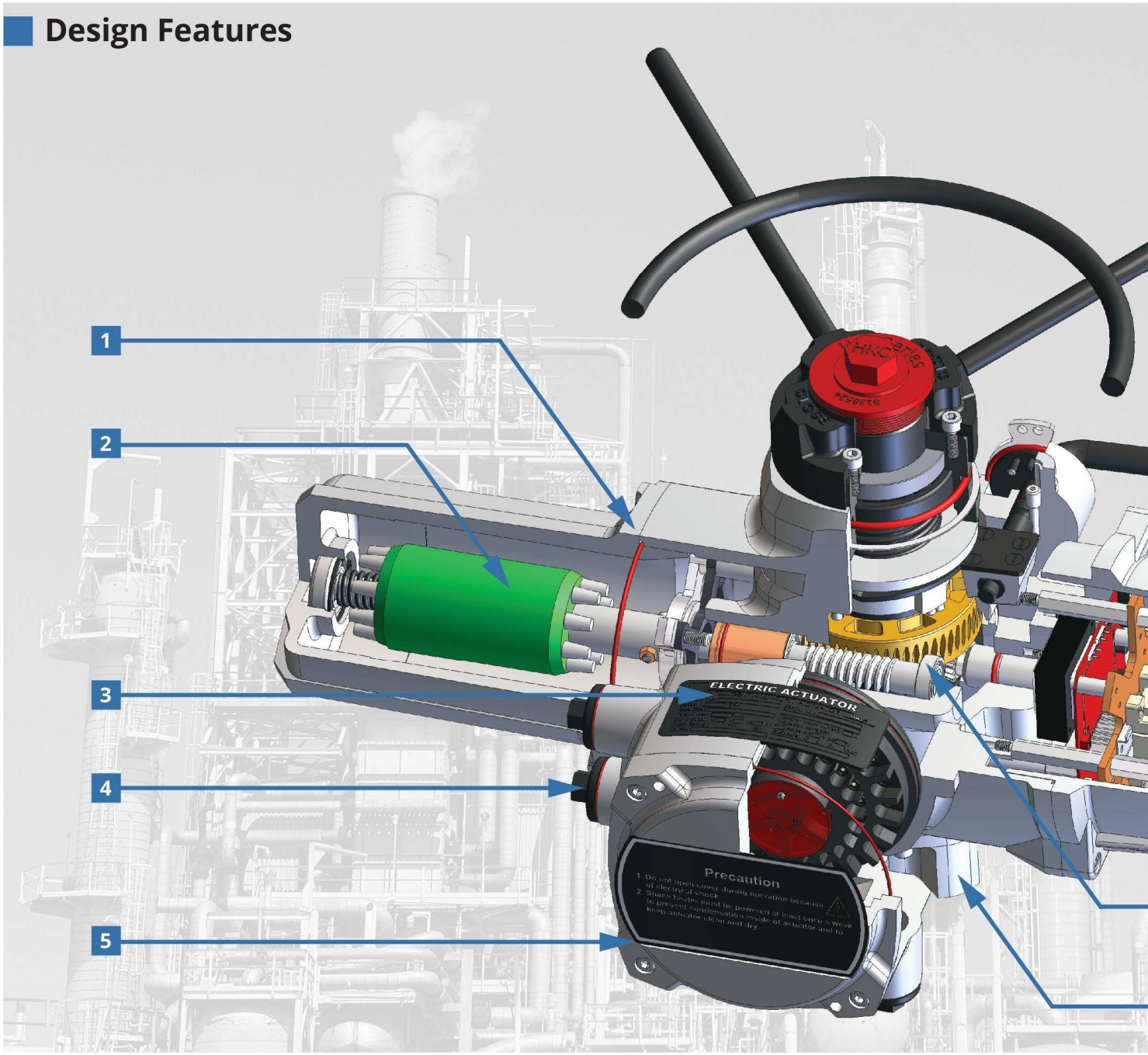
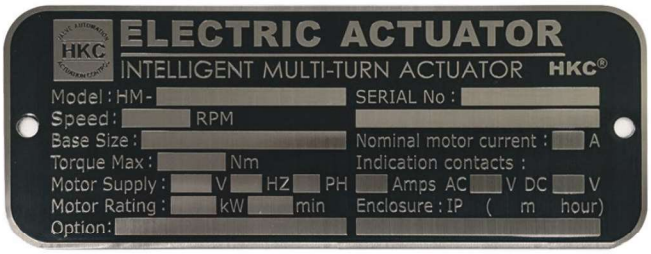
Design Features

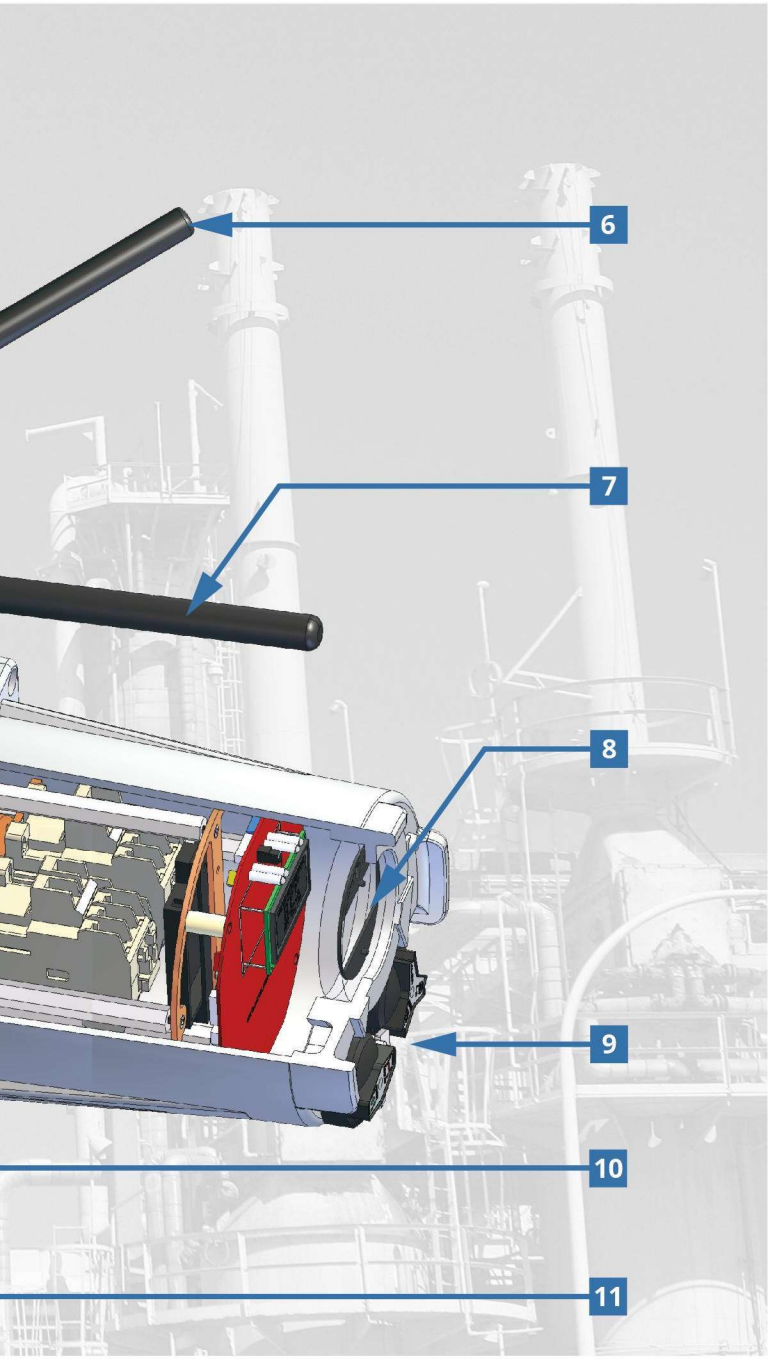


1 Body & cover: High grade aluminium alloys with high corrosion resistance due to anodizing on the inside and outside. Epoxy-polyurethane coating is further applied to enhance corrosion resistance. At our factory site, all bodies and covers are precisely machined between the maximum and minimum permissible 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 manufacutred 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 seperated 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 availalbe 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	■ 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	■ 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	■ 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	■ Standard: -20 to +70 °C ■ Flame proof: -20 to +60 °C	**Monitoring switches**	■ Standard: 4 switches, 250 V ac 16 A rating ■ Option: 8 – 16 switches
Motor	Induction motor (reversible motor)	**Cable entries**	■ Standard: 4 x PF1", 1 x PF1½" ■ Flame proof: 4 x NPT1", 1 x NPT1½" or 4 x M33, 1 x M45
Signal lamp unit	Red: open, Green: close, Yellow: fault		
Self locking	By worm gear		
Travel angle	0 – 10,000,000 turns	**Lubrication**	■ Standard: grease moly (EP type) ■ Option: Tribolube-18 (for low temperature)
Design life	Torque & thrust test: 50,000 cycles		
Manual override	Declutchable manual override	**Indicator**	Digital display position indicator
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

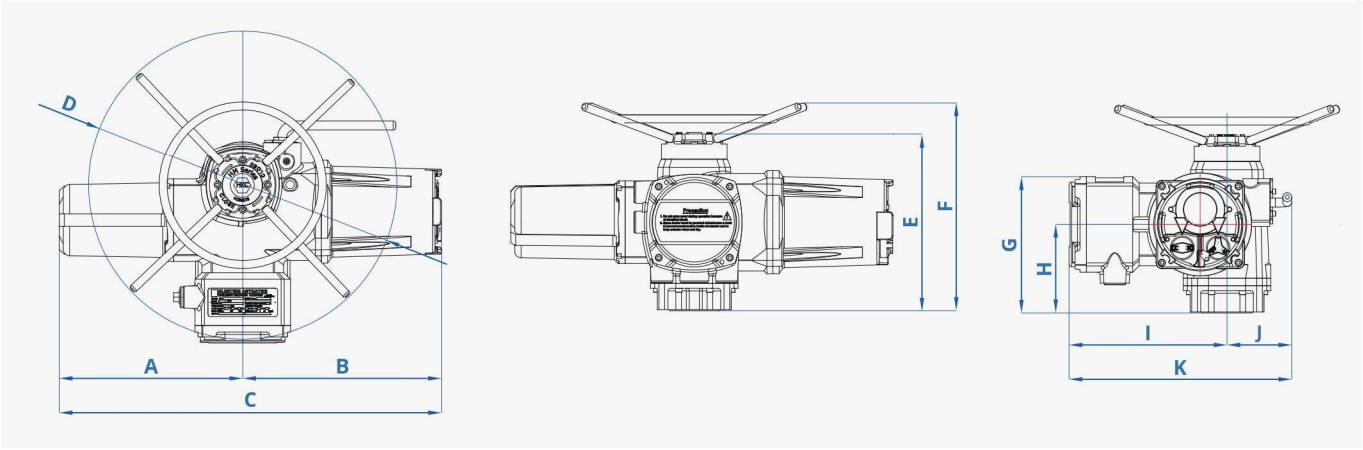
unit (mm)

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

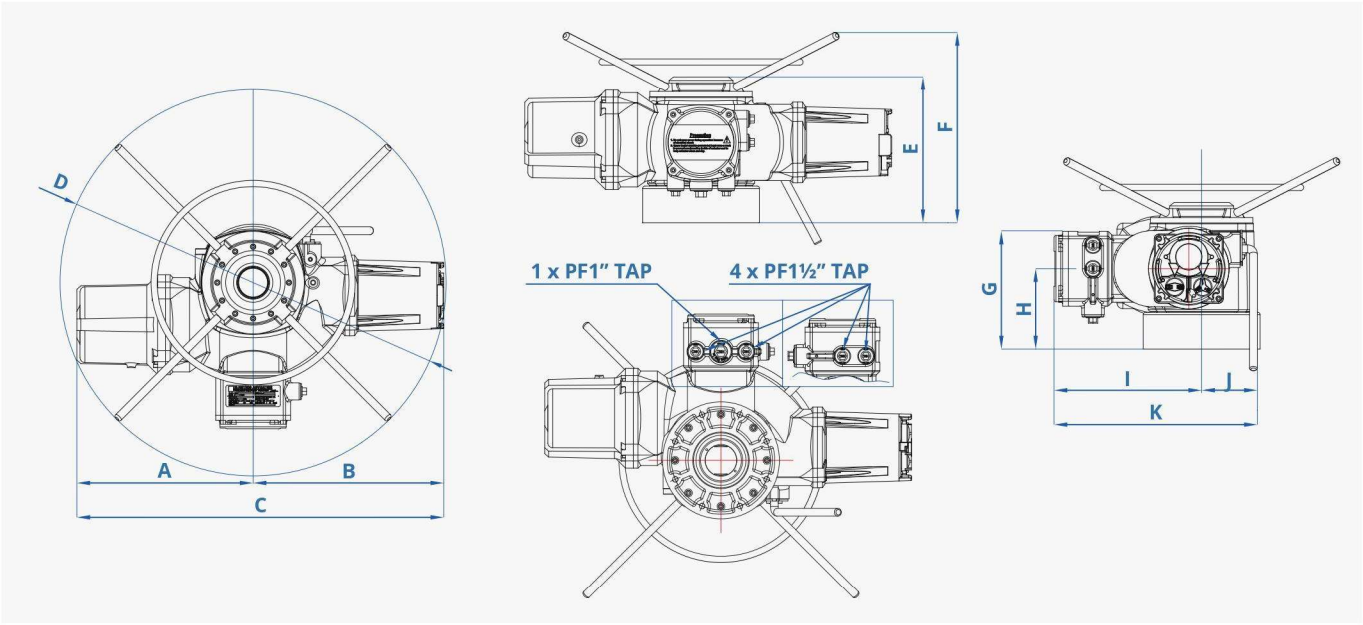
***Standard type**

Dimensional Drawing

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



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



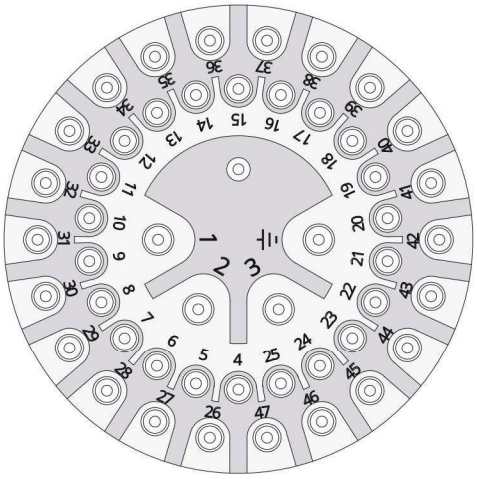
Dimension

unit (mm)

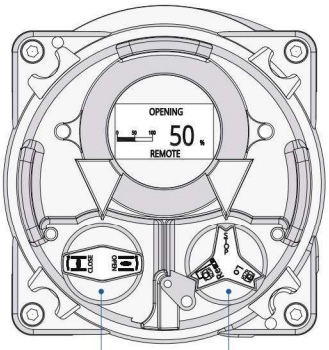
Model	A	B	C	D	E	F	G	H	I	J	K
HM-004	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407
HM-008	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407
HM-011	291	381.5	672.5	Φ490	264.5	316	226.5	130.5	277	130	407
HM-020	369	399.5	768.5	Φ620	356.8	420	273.8	177.8	317.7	130	447.7
HM-040	369	399.5	768.5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

Terminal Block - Numbering

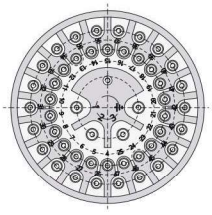


Intelligent Digital Control Unit



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.

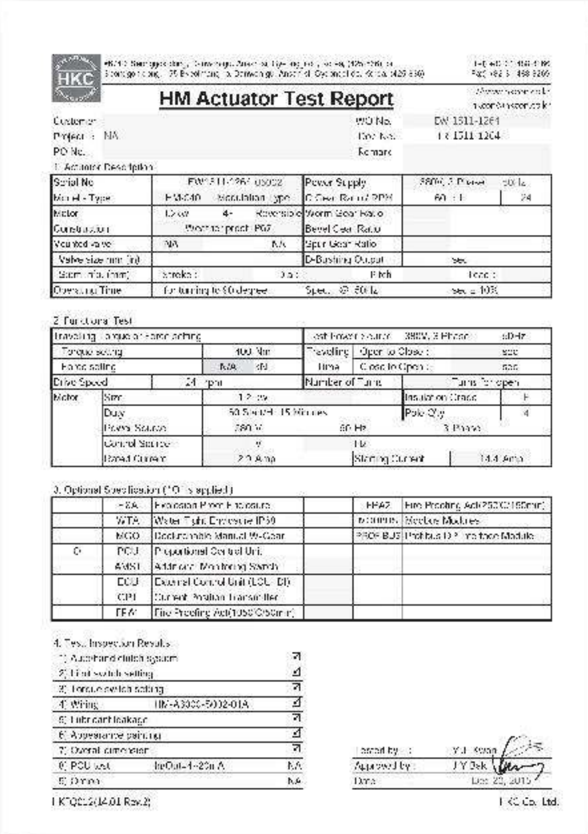
Quality Assurance

"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.



HKC

HM Actuator Test Report

Customer :		WO No.	EW 1511-1264
Project :	NA	Doc No.	[illegible] 1511-1264
PO No.		Remark	

1. Actuator Description

Serial No	[illegible]	Power Supply	380V, 3 Phase [illegible]
Model - Type	HM-040 Modulation type	[illegible] Gear Ratio / RPM	60 : 1 / 24
Motor	1.2 kW 4- Reversible	Worm Gear Ratio	
Construction	Weatherproof IP67	Bevel Gear Ratio	
Mounted valve	NA NA	Spur Gear Ratio	
Valve size mm (in)		D-Bushing Output	sec
Stem info. (mm)	Stroke : Dia : Pitch	Lead :	
Operating Time	for turning to 90 degree	Spec. @ 60Hz	sec ± 10%

2. Functional Test

Traveling torque or force setting		Test Power Source	380V, 3 Phase 60Hz
Torque setting	400 Nm	Traveling time: Open to Close :	sec
Force setting	NA kN	Close to Open :	sec
Drive Speed	24 rpm	Number of Turns	Turns for open
Motor: Size	1.2 kW	Insulation Grade	F
Duty	[illegible] 15 Minutes	Pole Q'ty	4
Power Source	380 V 60 Hz	3 Phase	
Control Source	V Hz		
Rated Current	2.0 Amp	Starting Current	14.4 Amp

3. Optional Specification ("O" is applied)

	EXA	Explosion Proof Enclosure		FPA2	Fire Proofing Act(250°C/165min)
	WTA	Water Tight Enclosure IP68		MODBUS	Modbus Modules
	MGO	Declutchable Manual W-Gear		PROFIBUS	Profibus DP Interface Module
O	PCU / AMST	Proportional Control Unit / Additional Monitoring Switch			
	ECU / CPT	External Control Unit (LCU - BI) / Current Position Transmitter			
	FPA	Fire Proofing Act(1050°C/60min)			

4. Test Inspection Results

1) Auto/hand clutch system		☑
2) Limit switch setting		☑
3) Torque switch setting		☑
4) Wiring	HM-A3000-5002-01A	☑
5) Lubricant leakage		☑
6) Appearance painting		☑
7) Overall dimension		☑
8) PCU test	[illegible] 4~20mA	NA
9) Others		NA

Tested by : Y.J. Kwon
Approved by : J.Y. Bak
Date : Dec 23, 2015

HKTQ012(14.01 Rev.2) HKC Co., Ltd.