

Electric Motor Performance Data for IQM & IQML New Generation Modulating Actuators – 3 Phase Power Supplies

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Introduction

60HZ: 460 480

50Hz: 380 400 415

Important Notes

- For any voltage, “apply” indicates that the particular motor has not been systemised. Contact Rotork.
- IQM and IQML have the same electrical characteristics. IQML actuators incorporate a linear output shaft. Refer to publication E410E for more information. For IQML actuator motor data use the appropriate IQM data for the same speed and voltage. e.g. For IQML10 at 24 rpm, look up IQM10 at 24 rpm.

Glossary

- Seating Torque – Corresponds to 100% torque switch setting. This torque is available for end of travel seating.
- Modulating Torque – Corresponds to maximum average modulating torque for S4, 50% duty cycle
- Locked Rotor – motor starting and stalled condition
- Rated Amps – current at 100% torque switch setting
- Modulating (nominal) load.-. Motor loading corresponding to modulating torque.
- Efficiency – electrical efficiency of the actuator motor.

Design criteria

Motors designed for operation of valve actuators require special consideration. For IQM actuators, continuous running at the S4 50%, 1200 starts per hour rate is a requirement. Rotork recognise the special nature of actuator motors and have therefore designed the IQM motor and its control package with this unique duty at the forefront.

IQ Motor Design

IQ motors are of a low inertia, squirrel cage induction design, reaching full speed in 3 cycles of the mains frequency. In their standard 3 phase form they are class F insulated, rated S4, 50% at specified modulating load torque. The motor torque/speed characteristic has been designed to fulfil the following requirements:

- High stall torque in comparison with that required to operate and seat the valve. This is essential in maintaining rated torque at depressed voltage conditions as torque varies with the square of the voltage. Rotork are able to guarantee actuator performance at –10% of nominal voltage.
- Pull out torque available at speed (50-70% of synchronous). For modulating duty, without lost motion, starting torque is high, at least 80% of pull out torque.

IQM motor control protection

The primary protection for the motor is torque switch protection. By measuring the actuator output torque and comparing to the open and close torque switch setting, effective motor and more importantly, valve protection is achieved.

IQ motors are also protected by two thermostats embedded in the motor end windings providing over temperature protection if the duty cycle exceeds actuator rating. IQM control protection will prevent motor stall in the event of valve jamming *. Phase rotation protection and lost phase protection are also incorporated as standard.

*If "Boost" open torque or torque switch bypass function "At" is set the actuator can develop torque in excess of rated and may stall in attempting to unseat a jammed valve. If the actuator stalls, jammed valve protection will trip the motor within 4 seconds.

IQM solid state starter

IQM utilise a solid state starter to achieve increased design life. Five pairs of 1600 volt thyristors switch all three phases of the incoming power supply. Thyristors are considered to be more suitable than triacs for reversing applications and have a higher resistance to transients in the power supply. The IQM solid state starter also includes snubbing and transient protection circuits.

Dynamic braking

The solid state starter can also provide dynamic braking by sequencing the thyristors to feed a direct current into the motor when a stop command is applied or a run signal is withdrawn. The induced magnetic field acts against the original rotary movement, stopping the motor dead. Overrun is minimised and positioning accuracy increased. The brake is enabled by fitting an electrical link at the actuator terminal block.

Power supply cable sizing

As a minimum requirement, cables must be sized to ensure volt drop does not exceed 15% of nominal supply voltage at locked rotor current.

Fuse selection

In common with all solid state switching power applications, it is strongly recommended that the power supply for each IQM actuator is protected by suitably rated high speed fuses mounted at the power distribution panel. The required fuse characteristics are as follows:

	IQM10, 12 & 20	IQM25 & 35
Rated Current	10A	20A
Pre-arcing I²t	5.4A²s	30A²s
Rated Voltage	660V	660V
Suggested Fuse	Ferraz G330010	Ferraz K330013

Frequency converters and UPS

Frequency converters for variable speed drives are not recommended as a suitable supply for IQM actuators. Where UPS systems are required, the power supply should have negligible harmonic distortion. In general terms actuators are designed to operate on power supplies conforming to recognised power supply standards such as EN 50160 – Voltage Characteristics of Electricity Supplied by Public Distribution systems. Please apply to Rotork with specific UPS supply characteristics if different from above.

460 3 Phase 60Hz

ACTUATOR RPM	TORQUE		MOTOR Poles	LOCKED ROTOR		RATED Amps	MODULATING LOAD			
	Seat. lbs.ft.	Mod. lbs.ft.		Amps	P.F.		Amps	Kw	P.F.	Effy.%
IQM10										
21	25	12.5	4	1.50	0.85	0.44	0.32	0.10	0.60	63.00
29	25	12.5	4	2.00	0.86	0.55	0.44	0.12	0.55	62.00
43	23	11.5	4	2.00	0.86	0.61	0.46	0.15	0.64	62.00
57	20	10	4	2.00	0.86	0.65	0.47	0.15	0.66	62.00
IQM12										
21	45	25	4	3.10	0.82	0.73	0.57	0.19	0.64	66.00
29	40	25	4	3.10	0.82	0.77	0.59	0.24	0.68	74.00
43	40	22	4	3.10	0.82	0.99	0.65	0.28	0.70	77.00
57	35	20	4	3.10	0.82	1.04	0.70	0.31	0.73	76.00
IQM20										
21	90	60	4	6.10	0.85	1.25	0.97	0.46	0.69	86.00
29	80	60	4	4.60	0.80	1.38	1.07	0.57	0.78	86.00
43	60	50	4	5.30	0.79	1.32	1.14	0.64	0.86	82.00
57	50	40	4	4.60	0.80	1.39	1.14	0.62	0.80	85.00
86	40	35	4	5.30	0.79	1.42	1.24	0.74	0.88	85.00
IQM25										
21	150	113	4	8.80	0.80	2.08	1.68	0.87	0.76	85.00
29	150	113	4	8.80	0.80	2.49	2.01	1.07	0.82	82.00
43	120	95	4	8.80	0.80	2.68	2.27	1.21	0.83	81.00
57	100	75	4	8.80	0.80	2.68	2.16	1.16	0.83	81.00
86	100	75	4				apply			
IQM35										
21	400	200	4	20.00	0.86	4.76	2.89	1.53	0.74	90.00
29	400	200	4	22.00	0.86	6.20	3.32	1.90	0.79	91.00
43	300	187	4	20.00	0.86	6.20	3.96	2.39	0.85	89.00
57	230	150	4	15.50	0.87	5.75	3.79	2.31	0.88	87.00
86	160	150	4	15.50	0.87	6.02	5.48	3.17	0.92	79.00

400 3 Phase 50Hz

ACTUATOR RPM	TORQUE		MOTOR Poles	LOCKED ROTOR		RATED Amps	MODULATING LOAD			
	Seat. lbs.ft.	Mod. lbs.ft.		Amps	P.F.		Amps	Kw	P.F.	Effy.%
IQM10										
18	25	12.5	4	1.40	0.85	0.42	0.30	0.08	0.60	63.00
24	25	12.5	4	1.40	0.85	0.43	0.32	0.10	0.67	66.00
36	23	11.5	4	1.40	0.85	0.57	0.37	0.12	0.73	65.00
48	20	10	4	1.80	0.86	0.62	0.45	0.13	0.66	62.00
IQM12										
18	45	25	4	2.10	0.87	0.70	0.46	0.16	0.68	73.00
24	40	25	4	2.10	0.87	0.72	0.53	0.20	0.76	71.00
36	40	22	4	2.80	0.82	0.94	0.63	0.23	0.70	77.00
48	35	20	4	2.80	0.82	0.99	0.67	0.26	0.73	76.00
IQM20										
18	90	60	4	4.20	0.80	1.20	0.89	0.38	0.72	86.00
24	80	60	4	4.20	0.80	1.31	1.02	0.48	0.78	86.00
36	60	50	4	4.00	0.79	1.29	1.14	0.53	0.79	85.00
48	50	40	4	4.20	0.80	1.32	1.09	0.51	0.80	85.00
72	40	35	4	4.80	0.79	1.35	1.19	0.62	0.88	85.00
IQM25										
18	150	113	4	8.00	0.80	1.98	1.61	0.72	0.76	85.00
24	150	113	4	8.00	0.80	2.37	1.92	0.90	0.82	82.00
36	120	95	4	8.00	0.80	2.55	2.17	1.01	0.83	81.00
48	100	75	4	8.00	0.80	2.55	2.07	0.96	0.83	81.00
72	100	75	4	8.00	0.80	3.87	2.81	1.32	0.87	78.00
IQM35										
18	400	200	4	19.00	0.86	4.52	2.77	1.28	0.74	90.00
24	400	200	4	19.00	0.86	5.89	3.18	1.58	0.79	91.00
36	300	187	4	19.00	0.86	5.89	3.80	1.99	0.85	89.00
48	230	150	4	14.00	0.87	5.46	3.59	1.93	0.88	88.00
72	160	150	4	14.00	0.87	5.42	5.18	2.64	0.92	80.00

380 3 Phase 50Hz

ACTUATOR RPM	TORQUE		MOTOR Poles	LOCKED ROTOR		RATED Amps	MODULATING LOAD			
	Seat. lbs.ft.	Mod. lbs.ft.		Amps	P.F.		Amps	Kw	P.F.	Effy.%
IQM10										
18	25	12.5	4	1.30	0.85	0.44	0.32	0.08	0.60	63.00
24	25	12.5	4	1.70	0.86	0.55	0.44	0.10	0.55	62.00
36	23	11.5	4	1.70	0.86	0.61	0.47	0.12	0.64	62.00
48	20	10	4	1.70	0.86	0.65	0.48	0.13	0.66	62.00
IQM12										
18	45	25	4	2.70	0.82	0.73	0.57	0.16	0.64	66.00
24	40	25	4	2.70	0.82	0.77	0.60	0.20	0.68	74.00
36	40	22	4	2.70	0.82	0.99	0.66	0.23	0.70	77.00
48	35	20	4	2.70	0.82	1.04	0.70	0.26	0.73	76.00
IQM20										
18	90	60	4	5.30	0.85	1.25	0.98	0.38	0.69	86.00
24	80	60	4	4.00	0.80	1.38	1.08	0.48	0.78	86.00
36	60	50	4	4.60	0.79	1.32	1.15	0.53	0.86	82.00
48	50	40	4	4.00	0.80	1.39	1.15	0.51	0.80	85.00
72	40	35	4	4.60	0.79	1.42	1.25	0.62	0.88	85.00
IQM25										
18	150	113	4	7.60	0.80	2.08	1.70	0.72	0.76	85.00
24	150	113	4	7.60	0.80	2.49	2.02	0.90	0.82	82.00
36	120	95	4	7.60	0.80	2.68	2.29	1.01	0.83	81.00
48	100	75	4	7.60	0.80	2.68	2.18	0.96	0.83	81.00
72	100	75	4				apply			
IQM35										
18	400	200	4	18.00	0.86	4.76	2.91	1.28	0.74	90.00
24	400	200	4	18.00	0.86	6.20	3.35	1.58	0.79	91.00
36	300	187	4	18.00	0.86	6.20	4.00	1.99	0.85	89.00
48	230	150	4	18.00	0.86	5.68	3.92	1.93	0.84	89.00
72	160	150	4	13.50	0.87	5.70	5.46	2.64	0.92	80.00

480 3 Phase 60Hz

ACTUATOR RPM	TORQUE		MOTOR Poles	LOCKED ROTOR		RATED Amps	MODULATING LOAD			
	Seat. lbs.ft.	Mod. lbs.ft.		Amps	P.F.		Amps	Kw	P.F.	Effy.%
IQM10										
21	25	12.5	4	1.70	0.85	0.42	0.30	0.10	0.60	63.00
29	25	12.5	4	1.70	0.85	0.43	0.32	0.12	0.67	66.00
43	23	11.5	4	1.70	0.85	0.57	0.37	0.15	0.73	65.00
57	20	10	4	2.20	0.86	0.62	0.45	0.15	0.66	62.00
IQM12										
21	45	25	4	2.50	0.87	0.70	0.46	0.19	0.68	73.00
29	40	25	4	2.50	0.87	0.72	0.53	0.24	0.76	71.00
43	40	22	4	3.40	0.82	0.94	0.63	0.28	0.70	77.00
57	35	20	4	3.40	0.82	0.99	0.67	0.31	0.73	76.00
IQM20										
21	90	60	4	5.00	0.80	1.20	0.89	0.46	0.72	86.00
29	80	60	4	5.00	0.80	1.31	1.02	0.57	0.78	86.00
43	60	50	4	4.80	0.79	1.29	1.14	0.64	0.79	85.00
57	50	40	4	5.00	0.80	1.32	1.09	0.62	0.80	85.00
86	40	35	4	5.80	0.79	1.35	1.19	0.74	0.88	85.00
IQM25										
21	150	113	4	9.60	0.80	1.98	1.61	0.87	0.76	85.00
29	150	113	4	9.60	0.80	2.37	1.92	1.07	0.82	82.00
43	120	95	4	9.60	0.80	2.55	2.17	1.21	0.83	81.00
57	100	75	4	9.60	0.80	2.55	2.07	1.16	0.83	81.00
86	100	75	4	9.60	0.80	3.87	2.81	1.59	0.87	78.00
IQM35										
21	400	200	4	23.00	0.86	4.52	2.77	1.53	0.74	90.00
29	400	200	4	23.00	0.86	5.89	3.18	1.90	0.79	91.00
43	300	187	4	23.00	0.86	5.89	3.80	2.39	0.85	89.00
57	230	150	4	17.00	0.87	5.46	3.59	2.31	0.88	88.00
86	160	150	4	17.00	0.87	5.42	5.18	3.17	0.92	80.00

415 3 Phase 50Hz

ACTUATOR RPM	TORQUE		MOTOR Poles	LOCKED ROTOR		RATED Amps	MODULATING LOAD				
	Seat. lbs.ft.	Mod. lbs.ft.		Amps	P.F.		Amps	Kw	P.F.	Effy.%	
IQM10											
18	25	12.5	4	1.40	0.85	0.40	0.29	0.08	0.60	63.00	
24	25	12.5	4	1.40	0.85	0.45	0.31	0.10	0.67	66.00	
36	23	11.5	4	1.40	0.85	0.55	0.36	0.12	0.73	65.00	
48	20	10	4	1.90	0.86	0.59	0.44	0.13	0.66	62.00	
IQM12											
18	45	25	4	2.20	0.87	0.67	0.45	0.16	0.68	73.00	
24	40	25	4	2.20	0.87	0.69	0.51	0.20	0.76	71.00	
36	40	22	4	2.90	0.82	0.91	0.60	0.23	0.70	77.00	
48	35	20	4	2.90	0.82	0.95	0.64	0.26	0.73	76.00	
IQM20											
18	90	60	4	4.40	0.80	1.16	0.86	0.38	0.72	86.00	
24	80	60	4	4.40	0.80	1.26	0.99	0.48	0.78	86.00	
36	60	50	4	4.10	0.79	1.24	1.10	0.53	0.79	85.00	
48	50	40	4	3.50	0.77	1.28	1.04	0.51	0.84	82.00	
72	40	35	4	4.10	0.79	1.32	1.20	0.62	0.88	81.00	
IQM25											
18	150	113	4	9.00	0.80	1.90	1.55	0.72	0.76	85.00	
24	150	113	4	9.00	0.80	2.28	1.85	0.90	0.82	82.00	
36	120	95	4	9.00	0.80	2.45	2.09	1.01	0.83	81.00	
48	100	75	4	6.50	0.78	2.48	1.90	0.96	0.86	82.00	
72	100	75	4	9.00	0.80	3.73	2.71	1.32	0.87	78.00	
IQM35											
18	400	200	4	15.00	0.87	4.52	2.38	1.28	0.82	91.00	
24	400	200	4	20.00	0.86	5.68	3.07	1.58	0.79	91.00	
36	300	187	4	15.00	0.87	5.92	3.35	1.99	0.89	93.00	
48	230	150	4	15.00	0.87	5.26	3.46	1.93	0.88	88.00	
72	160	150	4	15.00	0.87	5.22	5.00	2.64	0.92	80.00	