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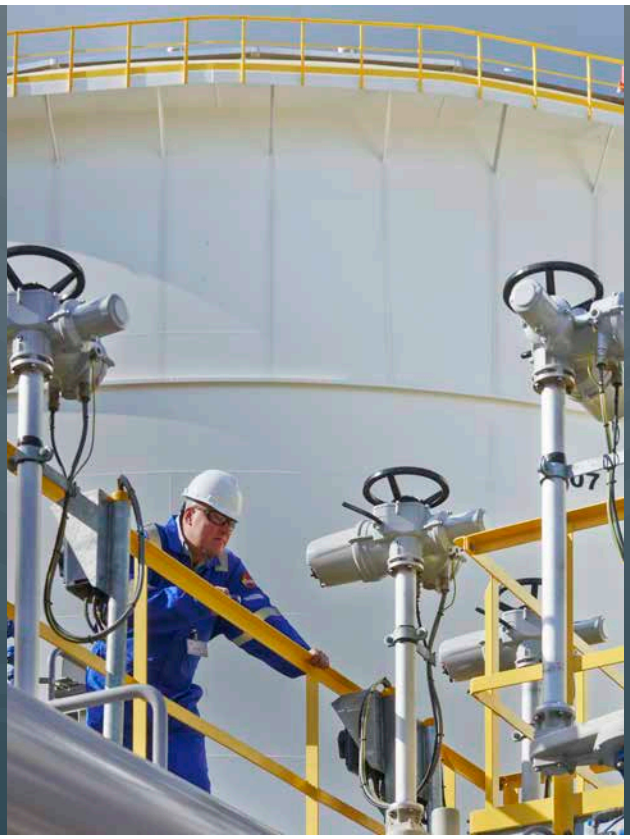
Keeping the World Flowing
for Future Generations

IQM and IQML Range

IQ3 Pro®

Electrical Data for Modulating Actuators – 3-Phase Power Supplies

Contents



Rotork is the global market leader in valve automation and flow control. Our products and services are helping organisations around the world to improve efficiency, assure safety and protect the environment.

We strive always for technical excellence, innovation and the highest quality standards in everything we do. As a result, our people and products remain at the forefront of flow control technology.

Uncompromising reliability is a feature of our entire product range, from our flagship electric actuator range through to our pneumatic, hydraulic and electro-hydraulic actuators, as well as instruments, gear boxes and valve accessories.

Rotork is committed to providing first class support to each client throughout the whole life of their plant, from initial site surveys to installation, maintenance, audits and repair. From our network of national and international offices, our engineers work around the clock to maintain our position of trust.

Introduction

This guide is provided to assist in the sizing of actuator power supply cables, circuit protection devices and calculation of electrical diversity. The data provided is averaged from actuators of the same size, speed and voltage as recorded from production test data. As such it is not exact electrical data for individual actuators, however is sufficient for the above sizing calculations.

Test certificates for individual actuators provide unit specific loadings for the starting/stall and rated torque levels and are available when requested.

The data included is for modulating duty, 3-phase supplies at the following common voltages only:

50 Hz	60 Hz
380	460
400	480
415	-

To quickly access the data for your voltage, click the value in the table above.

Important Notes

- 'Test data not available' – insufficient test data available.
- 'Not available at this voltage' – this particular build cannot be produced due to excess current draw.

Glossary

- **Rated torque** – the catalogued seating torque output of the actuator at full load. Represents a torque switch setting of 100%
- **Starting / Stall** – the value during the initial start of output movement or under motor stall conditions. IQ standard protection prevents stall by limiting torque to approximately 150% of rated torque when the breakout torque feature is enabled. Stall is also limited to a maximum of 5 seconds.
- **Rated Torque Current** – the average current drawn when the actuator is producing 100% rated seating torque.
- **Average (Modulating) Torque** – corresponds to approximately half of the rated seating torque. This value has been confirmed after decades of valve automation and provides a representative average for load across typical valve strokes.
- **Average (Modulating) Current** – the current at average modulating torque (half rated seating torque).

Design Philosophy

Actuators designed for valve automation have bespoke characteristics. Unlike conventional motors, actuators are only short time duty rated. As continuous running is a requirement with 'modulating' duty valves, actuators are rated for S4 operation at the specified modulating torque with a cyclic duration factor of 50%, or Class C as per EN15714-2 Industrial Valves - Actuators (Part 2: Electric actuators for industrial valves - Basic requirements).

Actuator loading is not constant, it can vary from light running through to full rated and even higher when unseating 'sticky' valves. Applying traditional motor protection is flawed and can lead to spurious tripping or no protection at all.

Rotork recognises the bespoke nature of actuator design and have therefore incorporated comprehensive protection in the motor and control package.

Motor Design

Motors are designed specifically for IQM actuators and have the following features:

- Low inertia rotors
- Squirrel cage construction
- Induction windings
- TENV – Totally Enclosed Non-Ventilated
- Class F insulation
- Class B temperature rise
- Dual embedded thermostat (132 °C)
- Sealed / lubricated for life bearings
- Integral to the actuator

IQM motors meet the requirements of EN15714-2 (electric actuators) and comply with IEC60034 and NEMA MG1 where applicable. The motor is designed to reach full speed within 3 cycles of the mains frequency (approximately 60 ms for 50 Hz and 50 ms for 60 Hz). The motor torque / speed characteristic has been selected to fulfil the following requirements:

High Stall Torque in comparison with that required to operate and seat the valve. This is essential in maintaining the rated seating torque at reduced voltage conditions

Pull out torque available at speed (50-70% of synchronous). Modulating duty actuators do not include lost motion drive (hammerblow), starting torque is high, at least 80% pull out torque.

Introduction

Motor Control Protection

The primary protection device is the torque switch. By direct physical measurement of the actuator output torque verses the torque switch setting, effective motor and more importantly valve protection is achieved.

The IQM motor is also protected by two thermostats embedded in the motor winding providing over temperature protection if the duty exceeds the actuator rating.

Additionally STALL, PHASE ROTATION and LOST PHASE protection is included in the standard control protection package.

Using torque as the primary means of protection along with thermostat and control protection eliminates the requirement for traditional motor protection methods and their inherent weaknesses when applied to short time duty, variable load actuators.

Solid State Starter

IQM utilises 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 DC (direct current) pulse into the motor when a stop command is applied or a run signal is withdrawn. The induced magnetic field acts against the original rotational movement, stopping the motor dead. Overrun is minimised and positioning accuracy increased. The brake is enabled through the actuator software settings.

Power Supply Cable Sizing

When sizing cables, it is important to use the STARTING/STALL figure in this document to make sure the volt drop is limited to a maximum 15% of nominal voltage under full starting conditions.

Fuse / Protection Selection

Due to the unique nature of the actuator duty and taking into account the comprehensive control protection of the IQM, sizing of fuses or trip devices should be based on protecting the supply cable under fault conditions.

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:

Actuator Size	10/12/20	25/35
Rated Current	10 A	20 A
Pre-arcing I^2t	5.4 A^2s	30 A^2s
Rated Voltage	660 V	660 V
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 for back-up operation, the power supply should have negligible harmonic distortion and should output a true sine wave. In general terms actuators are designed to operate on power supplied conforming to recognised international standards such as EN 50160:2010. Please apply to Rotork with specific UPS supply characteristics if different from above.

Motor Options

Class H insulation is available however standard IQM motors satisfy the specified duty cycle with Class F insulation.

Electrical Consumption Data

Click here to return to the voltage table on p3.

IQM	Mechanical Data				Electrical Data						
380 V 50 Hz	Speed	Poles	Rated Torque		Starting / Stall		Rated Torque Current	Average (nominal) Torque			
	rpm	qty	Nm	lbf.ft	A	Cos Ø	A	A	Cos Ø	kW	Efficiency %
10	18	4	34	25	1.3	0.85	0.44	0.32	0.6	0.08	63
	24	4	34	25	1.7	0.86	0.55	0.44	0.55	0.1	62
	36	4	30	23	1.7	0.86	0.61	0.47	0.64	0.12	62
	48	4	27	20	1.7	0.86	0.65	0.48	0.66	0.13	62
12	18	4	61	45	2.7	0.82	0.73	0.57	0.64	0.16	66
	24	4	54	40	2.7	0.82	0.77	0.6	0.68	0.2	74
	36	4	54	40	2.7	0.82	0.99	0.66	0.7	0.23	77
	48	4	48	35	2.7	0.82	1.04	0.7	0.73	0.26	76
20	18	4	122	90	5.3	0.85	1.25	0.98	0.69	0.38	86
	24	4	109	80	4	0.8	1.38	1.08	0.78	0.48	86
	36	4	81	60	4.6	0.79	1.32	1.15	0.86	0.53	82
	48	4	68	50	4	0.8	1.39	1.15	0.8	0.51	85
	72	4	54	40	4.6	0.79	1.42	1.25	0.88	0.62	85
25	18	4	204	150	7.6	0.8	2.08	1.7	0.76	0.72	85
	24	4	204	150	7.6	0.8	2.49	2.02	0.82	0.9	82
	36	4	163	120	7.6	0.8	2.68	2.29	0.83	1.01	81
	48	4	136	100	7.6	0.8	2.68	2.18	0.83	0.96	81
	72	4	136	100	8.5	0.82	3.46	2.85	0.88	1.32	80
35	18	4	544	400	18	0.86	4.76	2.91	0.74	1.28	90
	24	4	544	400	18	0.86	6.2	3.35	0.79	1.58	91
	36	4	408	300	18	0.86	6.2	4	0.85	1.99	89
	48	4	313	230	18	0.86	5.68	3.92	0.84	1.93	89
	72	4	218	160	13.5	0.87	5.7	5.46	0.92	2.64	80

IQM	Mechanical Data				Electrical Data						
400 V 50 Hz	Speed	Poles	Rated Torque		Starting / Stall		Rated Torque Current	Average (nominal) Torque			
	rpm	qty	Nm	lbf.ft	A	Cos Ø	A	A	Cos Ø	kW	Efficiency %
10	18	4	34	25	1.4	0.85	0.42	0.3	0.6	0.08	63
	24	4	34	25	1.4	0.85	0.43	0.32	0.67	0.1	66
	36	4	30	23	1.4	0.85	0.57	0.37	0.73	0.12	65
	48	4	27	20	1.8	0.86	0.62	0.45	0.66	0.13	62
12	18	4	61	45	2.1	0.87	0.7	0.46	0.68	0.16	73
	24	4	54	40	2.1	0.87	0.72	0.53	0.76	0.2	71
	36	4	54	40	2.8	0.82	0.94	0.63	0.7	0.23	77
	48	4	48	35	2.8	0.82	0.99	0.67	0.73	0.26	76
20	18	4	122	90	4.2	0.8	1.2	0.89	0.72	0.38	86
	24	4	109	80	4.2	0.8	1.31	1.02	0.78	0.48	86
	36	4	81	60	4	0.79	1.29	1.14	0.79	0.53	85
	48	4	68	50	4.2	0.8	1.32	1.09	0.8	0.51	85
	72	4	54	40	4.8	0.79	1.35	1.19	0.88	0.62	85
25	18	4	204	150	8	0.8	1.98	1.61	0.76	0.72	85
	24	4	204	150	8	0.8	2.37	1.92	0.82	0.9	82
	36	4	163	120	8	0.8	2.55	2.17	0.83	1.01	81
	48	4	136	100	8	0.8	2.55	2.07	0.83	0.96	81
	72	4	136	100	8	0.8	3.87	2.81	0.87	1.32	78
35	18	4	544	400	19	0.86	4.52	2.77	0.74	1.28	90
	24	4	544	400	19	0.86	5.89	3.18	0.79	1.58	91
	36	4	408	300	19	0.86	5.89	3.8	0.85	1.99	89
	48	4	313	230	14	0.87	5.46	3.59	0.88	1.93	88
	72	4	218	160	14	0.87	5.42	5.18	0.92	2.64	80

Electrical Consumption Data

Click here to return to the voltage table on p3.

IQM	Mechanical Data				Electrical Data						
415 V 50 Hz	Speed	Poles	Rated Torque		Starting / Stall		Rated Torque Current	Average (nominal) Torque			
	rpm	qty	Nm	lbf.ft	A	Cos Ø	A	A	Cos Ø	kW	Efficiency %
10	18	4	34	25	1.4	0.85	0.4	0.29	0.6	0.08	63
	24	4	34	25	1.4	0.85	0.45	0.31	0.67	0.1	66
	36	4	30	23	1.4	0.85	0.55	0.36	0.73	0.12	65
	48	4	27	20	1.9	0.86	0.59	0.44	0.66	0.13	62
12	18	4	61	45	2.2	0.87	0.67	0.45	0.68	0.16	73
	24	4	54	40	2.2	0.87	0.69	0.51	0.76	0.2	71
	36	4	54	40	2.9	0.82	0.91	0.6	0.7	0.23	77
	48	4	48	35	2.9	0.82	0.95	0.64	0.73	0.26	76
20	18	4	122	90	4.4	0.8	1.16	0.86	0.72	0.38	86
	24	4	109	80	4.4	0.8	1.26	0.99	0.78	0.48	86
	36	4	81	60	4.1	0.79	1.24	1.1	0.79	0.53	85
	48	4	68	50	3.5	0.77	1.28	1.04	0.84	0.51	82
	72	4	54	40	4.1	0.79	1.32	1.2	0.88	0.62	81
25	18	4	204	150	9	0.8	1.9	1.55	0.76	0.72	85
	24	4	204	150	9	0.8	2.28	1.85	0.82	0.9	82
	36	4	163	120	9	0.8	2.45	2.09	0.83	1.01	81
	48	4	136	100	6.5	0.78	2.48	1.9	0.86	0.96	82
	72	4	136	100	9	0.8	3.73	2.71	0.87	1.32	78
35	18	4	544	400	15	0.87	4.52	2.38	0.82	1.28	91
	24	4	544	400	20	0.86	5.68	3.07	0.79	1.58	91
	36	4	408	300	15	0.87	5.92	3.35	0.89	1.99	93
	48	4	313	230	15	0.87	5.26	3.46	0.88	1.93	88
	72	4	218	160	15	0.87	5.22	5	0.92	2.64	80

Electrical Consumption Data

Click here to return to the voltage table on p3.

IQM	Mechanical Data				Electrical Data						
460 V 60 Hz	Speed	Poles	Rated Torque		Starting / Stall		Rated Torque Current	Average (nominal) Torque			
	rpm	qty	Nm	lbf.ft	A	Cos Ø	A	A	Cos Ø	kW	Efficiency %
10	21	4	34	25	1.5	0.85	0.44	0.32	0.6	0.1	63
	29	4	34	25	2	0.86	0.55	0.44	0.55	0.12	62
	43	4	30	23	2	0.86	0.61	0.46	0.64	0.15	62
	57	4	27	20	2	0.86	0.65	0.47	0.66	0.15	62
12	21	4	61	45	3.1	0.82	0.73	0.57	0.64	0.19	66
	29	4	54	40	3.1	0.82	0.77	0.59	0.68	0.24	74
	43	4	54	40	3.1	0.82	0.99	0.65	0.7	0.28	77
	57	4	48	35	3.1	0.82	1.04	0.7	0.73	0.31	76
20	21	4	122	90	6.1	0.85	1.25	0.97	0.69	0.46	86
	29	4	109	80	4.6	0.8	1.38	1.07	0.78	0.57	86
	43	4	81	60	5.3	0.79	1.32	1.14	0.86	0.64	82
	57	4	68	50	4.6	0.8	1.39	1.14	0.8	0.62	85
	86	4	54	40	5.3	0.79	1.42	1.24	0.88	0.74	85
25	21	4	204	150	8.8	0.8	2.08	1.68	0.76	0.87	85
	29	4	204	150	8.8	0.8	2.49	2.01	0.82	1.07	82
	43	4	163	120	8.8	0.8	2.68	2.27	0.83	1.21	81
	57	4	136	100	8.8	0.8	2.68	2.16	0.83	1.16	81
	86	4	136	100	Apply						
35	21	4	544	400	20	0.86	4.76	2.89	0.74	1.53	90
	29	4	544	400	22	0.86	6.2	3.32	0.79	1.9	91
	43	4	408	300	20	0.86	6.2	3.96	0.85	2.39	89
	57	4	313	230	15.5	0.87	5.75	3.79	0.88	2.31	87
	86	4	218	160	15.5	0.87	6.02	5.48	0.92	3.17	79

IQM	Mechanical Data				Electrical Data						
480 V 60 Hz	Speed	Poles	Rated Torque		Starting / Stall		Rated Torque Current	Average (nominal) Torque			
	rpm	qty	Nm	lbf.ft	A	Cos Ø	A	A	Cos Ø	kW	Efficiency %
10	21	4	34	25	1.7	0.85	0.42	0.3	0.6	0.1	63
	29	4	34	25	1.7	0.85	0.43	0.32	0.67	0.12	66
	43	4	30	23	1.7	0.85	0.57	0.37	0.73	0.15	65
	57	4	27	20	2.2	0.86	0.62	0.45	0.66	0.15	62
12	21	4	61	45	2.5	0.87	0.7	0.46	0.68	0.19	73
	29	4	54	40	2.5	0.87	0.72	0.53	0.76	0.24	71
	43	4	54	40	3.4	0.82	0.94	0.63	0.7	0.28	77
	57	4	48	35	3.4	0.82	0.99	0.67	0.73	0.31	76
20	21	4	122	90	5	0.8	1.2	0.89	0.72	0.46	86
	29	4	109	80	5	0.8	1.31	1.02	0.78	0.57	86
	43	4	81	60	4.8	0.79	1.29	1.14	0.79	0.64	85
	57	4	68	50	5	0.8	1.32	1.09	0.8	0.62	85
	86	4	54	40	5.8	0.79	1.35	1.19	0.88	0.74	85
25	21	4	204	150	9.6	0.8	1.98	1.61	0.76	0.87	85
	29	4	204	150	9.6	0.8	2.37	1.92	0.82	1.07	82
	43	4	163	120	9.6	0.8	2.55	2.17	0.83	1.21	81
	57	4	136	100	9.6	0.8	2.55	2.07	0.83	1.16	81
	86	4	136	100	9.6	0.8	3.87	2.81	0.87	1.59	78
35	21	4	544	400	23	0.86	4.52	2.77	0.74	1.53	90
	29	4	544	400	23	0.86	5.89	3.18	0.79	1.9	91
	43	4	408	300	23	0.86	5.89	3.8	0.85	2.39	89
	57	4	313	230	17	0.87	5.46	3.59	0.88	2.31	88
	86	4	218	160	17	0.87	5.42	5.18	0.92	3.17	80

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