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Keeping the World Flowing
for Future Generations



CKQ Range



Electrical Data



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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.

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

Supply Type	50 Hz	60 Hz
3-phase	220	220
	240	240
	380	380
	400	440
	415	460
	440	480
	500	600

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

Glossary

- **Rated Torque** – the catalogued torque output of the actuator at full load. Represents a torque switch setting for 100%
- **Starting / Stall** – the value during the initial start of output movement or under motor stall conditions
- **Rated Current** – the average current drawn when the actuator is producing the rated catalogue torque
- **Average (nominal) Torque** – corresponds to approximately one third of the rated catalogued torque. This value has been confirmed after decades of valve automation and provides a representative average for load across typical valve strokes

Design Philosophy

Actuators designed for valve automation have bespoke characteristics. Unlike conventional motors, actuators are only short time duty rated. As continuous running is not a requirement with 'isolating' and 'inching' duty valves. CKQ actuator motor duty rating is in compliance with ISO 22153 and IEC 60034-1.

3-phase - Class A & B (ISO 22153) or S2 - 15 min (IEC 60034-1)

Motor duty information is subject to the following conditions:

- Nominal supply voltage
- +40 °C (+104 °F) ambient temperature
- Average load 33% of rated torque

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 Atronik or Centronik control package.

Motor Design

Motors are designed specifically for CKQ 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
- Embedded thermostats (130 °C)
- Sealed / lubricated for life bearings
- Integral to the actuator

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 torque at reduced voltage conditions

Pull out torque available at speed (50-70% of synchronous), which combined with the lost motion drive (hammerblow), allows the motor to reach full speed with maximum available torque before the drive is applied to the valve. This ensures good un-seating of all valve types unless fully jammed.

Introduction

Motor Control Protection

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

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

Additionally PHASE ROTATION and LOST PHASE protection is included in all CKQA and CKQc actuators..


This combination of torque, thermal and electrical protection eliminates the requirement for traditional motor protection methods and their inherent weaknesses when applied to short time duty, variable load actuators.

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.

Protection Device Selection

Due to the unique nature of actuator duty and taking into account the comprehensive control protection included with CKQ actuators, sizing of fuses, MPCB or OLR devices should be based on protecting the actuator and supply cable under fault conditions.

 CKQ actuators must be protected with a fuse, MPCB or OLR device to disconnect within 5 to 10 seconds at starting/stall current. Refer to the applicable Electrical Performance Summary table for starting/stall current.

This will reduce the risk of severe motor and supply cable heating under extended stall conditions while preventing spurious trips under normal operation. It should be noted that sizing trip devices in this manner may not be possible while meeting other criteria and is purely designed to protect against extreme fault conditions such as a jammed motor starter when the standard control protection cannot de-energise the motor. All other operating conditions are fully protected by standard CKQ range protection features.

Frequency Converters and UPS

Frequency converters for variable speed drives are not normally recommended as a suitable supply for CKQ 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 supplies conforming to recognised international standards such as EN 50160:2010.

Tolerances

The following tolerances may be accommodated for short term operation. It is not intended that long term operation is undertaken at supply voltage levels other than the nominal nameplate values of the supplied actuator. In general, the electrical power supply should conform to BS EN 50160:2007 (Voltage characteristics of electricity supplied by public distribution networks) or equivalent.

The volt drop developed on actuator starting must be minimised by ensuring supply capacity and cable are sufficiently sized. Starting volt drop calculation shall be based on the starting/stall currents published.

Voltage Tolerance	+/-10%	Applies to rated torque performance only; not duty cycle and speed
Frequency Tolerance	+/-5%	Applies to rated torque performance only; not duty cycle and speed
Uninterruptable power supplied	The UPS output should conform to recognised supply standards such as BS EN 50160 in respect of waveform, harmonics etc.	

Electrical Performance Summary

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3-Phase 50 Hz

CKQ	Mechanical Data			Electrical Data					
220 V 50 Hz	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque			
		Nm	lbf.ft	A	A	A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	4.18	1.71	1.33	0.09	0.48	37
	18	135	100	2.47	1.14	0.86	0.09	0.50	55
	27	135	100	1.43	0.76	0.57	0.04	0.45	41
CKQ 400	18	400	295	7.22	2.66	1.71	0.18	0.70	39
	36	400	295	3.80	1.52	1.33	0.10	0.55	36
	54	400	295	2.47	1.33	0.95	0.06	0.40	41
CKQ 610	18	610	450	7.22	2.66	2.09	0.18	0.70	32
	36	610	450	4.56	2.09	1.71	0.13	0.48	42
	54	610	450	2.85	1.52	1.14	0.08	0.50	37
CKQ 1000	15	1000	735	8.74	2.85	1.81	0.27	0.70	56
	30	1000	735	5.70	3.42	2.95	0.15	0.45	30
	45	1000	735	2.85	1.71	1.33	0.09	0.50	36

CKQ	Mechanical Data			Electrical Data					
240V 50 Hz	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque			
		Nm	lbf.ft	A	A	A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	3.85	1.58	1.23	0.09	0.48	37
	18	135	100	2.28	1.05	0.79	0.09	0.50	55
	27	135	100	1.31	0.70	0.53	0.04	0.45	41
CKQ 400	18	400	295	6.65	2.45	1.58	0.18	0.70	39
	36	400	295	3.50	1.40	1.23	0.10	0.55	36
	54	400	295	2.28	1.23	0.88	0.06	0.40	41
CKQ 610	18	610	450	6.65	2.45	1.93	0.18	0.70	32
	36	610	450	4.20	1.93	1.58	0.13	0.48	41
	54	610	450	2.63	1.40	1.05	0.08	0.50	37
CKQ 1000	15	1000	738	8.05	2.63	1.66	0.27	0.70	56
	30	1000	738	5.25	3.15	2.71	0.15	0.45	30
	45	1000	738	2.63	1.58	1.23	0.09	0.50	35

CKQ	Mechanical Data			Electrical Data					
380 V 50 Hz	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque			
		Nm	lbf.ft	A	A	A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	2.50	1.00	0.70	0.09	0.48	41
	18	135	100	1.30	0.70	0.50	0.09	0.45	61
	27	135	100	0.80	0.50	0.40	0.04	0.40	38
CKQ 400	18	400	295	4.20	1.50	1.00	0.18	0.60	46
	36	400	295	2.20	0.90	0.80	0.10	0.50	38
	54	400	295	1.40	0.80	0.45	0.06	0.50	41
CKQ 610	18	610	450	4.20	1.50	1.10	0.18	0.60	41
	36	610	450	2.60	1.00	0.85	0.13	0.48	48
	54	610	450	1.60	0.90	0.70	0.08	0.50	35
CKQ 1000	15	1000	738	5.80	1.80	1.05	0.27	0.70	56
	30	1000	738	2.80	2.00	1.50	0.15	0.50	30
	45	1000	738	1.80	0.90	0.70	0.09	0.50	39

Values are subject to change without notice. Due to production tolerance variation, the electrical values shown are averages compiled from actuator production test data. Values are therefore provided for guidance only. Individual production test certificates are available on request (nominal load data not included). Rotork underwrite rated torque output only (specified tolerance -0/+10%).

Electrical Performance Summary

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3-Phase 50 Hz

CKQ 400 V 50 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	2.20	0.90	0.70	0.09	0.48	37
	18	135	100	1.30	0.60	0.45	0.09	0.50	56
	27	135	100	0.75	0.40	0.30	0.04	0.45	41
CKQ 400	18	400	295	3.80	1.40	0.90	0.18	0.70	40
	36	400	295	2.00	0.80	0.70	0.10	0.55	36
	54	400	295	1.30	0.70	0.50	0.06	0.40	42
CKQ 610	18	610	450	3.80	1.40	1.10	0.18	0.70	33
	36	610	450	2.40	1.10	0.90	0.13	0.48	42
	54	610	450	1.50	0.80	0.60	0.08	0.50	37
CKQ 1000	15	1000	738	4.60	1.50	0.95	0.27	0.70	56
	30	1000	738	3.00	1.80	1.55	0.15	0.45	30
	45	1000	738	1.50	0.90	0.70	0.09	0.50	36

CKQ 415 V 50 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	2.20	0.90	0.70	0.09	0.48	37
	18	135	100	1.30	0.60	0.45	0.09	0.50	56
	27	135	100	0.75	0.40	0.30	0.04	0.45	41
CKQ 400	18	400	295	3.80	1.40	0.90	0.18	0.70	40
	36	400	295	2.00	0.80	0.70	0.10	0.55	36
	54	400	295	1.30	0.70	0.50	0.06	0.40	42
CKQ 610	18	610	450	3.80	1.40	1.10	0.18	0.70	33
	36	610	450	2.40	1.10	0.90	0.13	0.48	42
	54	610	450	1.50	0.80	0.60	0.08	0.50	37
CKQ 1000	15	1000	738	4.60	1.50	0.95	0.27	0.70	56
	30	1000	738	3.00	1.80	1.55	0.15	0.45	30
	45	1000	738	1.50	0.90	0.70	0.09	0.50	36

CKQ 440V 50 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	2.38	0.90	0.70	0.09	0.48	35
	18	135	100	1.40	0.60	0.45	0.09	0.50	52
	27	135	100	0.81	0.40	0.30	0.04	0.45	39
CKQ 400	18	400	295	4.10	1.40	0.90	0.18	0.70	37
	36	400	295	2.16	0.80	0.70	0.10	0.55	34
	54	400	295	1.40	0.70	0.50	0.06	0.40	39
CKQ 610	18	610	450	4.10	1.40	1.10	0.18	0.70	31
	36	610	450	2.59	1.10	0.90	0.13	0.48	39
	54	610	450	1.62	0.80	0.60	0.08	0.50	35
CKQ 1000	15	1000	738	4.97	1.50	0.95	0.27	0.70	53
	30	1000	738	3.24	1.80	1.55	0.15	0.45	28
	45	1000	738	1.62	0.90	0.70	0.09	0.50	34

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Electrical Performance Summary

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3-Phase 50 Hz

CKQ 500 V 50 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	9	135	100	1.98	0.81	0.58	0.09	0.48	37
	18	135	100	1.17	0.54	0.37	0.09	0.50	56
	27	135	100	0.68	0.36	0.25	0.04	0.45	41
CKQ 400	18	400	295	3.42	1.26	0.75	0.18	0.70	40
	36	400	295	1.80	0.72	0.58	0.10	0.55	36
	54	400	295	1.17	0.63	0.42	0.06	0.40	42
CKQ 610	18	610	450	3.42	1.26	0.91	0.18	0.70	33
	36	610	450	2.16	0.99	0.75	0.13	0.48	42
	54	610	450	1.35	0.72	0.50	0.08	0.50	37
CKQ 1000	15	1000	738	4.14	1.35	0.79	0.27	0.70	56
	30	1000	738	2.70	1.62	1.29	0.15	0.45	30
	45	1000	738	1.35	0.81	0.58	0.09	0.50	36

3-Phase 60 Hz

CKQ 220 V 60 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	8	135	100	5.02	2.05	1.60	0.11	0.48	37
	15	135	100	2.96	1.37	1.03	0.11	0.50	55
	23	135	100	1.71	0.91	0.68	0.05	0.35	53
CKQ 400	15	400	295	8.66	3.19	2.05	0.22	0.60	46
	30	400	295	4.56	1.82	1.60	0.12	0.50	39
	45	400	295	2.96	1.60	1.14	0.07	0.50	33
CKQ 610	15	610	450	8.66	3.19	2.51	0.22	0.60	38
	30	610	450	5.47	2.51	2.05	0.16	0.48	42
	45	610	450	3.42	1.82	1.37	0.10	0.50	37
CKQ 1000	13	1000	738	10.49	3.42	2.17	0.32	0.65	60
	25	1000	738	6.84	4.10	3.53	0.18	0.55	24
	38	1000	738	3.42	2.05	1.60	0.11	0.50	36

CKQ 240 V 60 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall A	Rated A	Average (nominal) Torque			
		Nm	lbf.ft			A	kW	Cos Φ	Effy %
CKQ 135	8	135	100	4.62	1.89	1.47	0.11	0.48	37
	15	135	100	2.73	1.26	0.95	0.11	0.50	55
	23	135	100	1.58	0.84	0.63	0.05	0.45	41
CKQ 400	15	400	295	7.98	2.94	1.89	0.22	0.70	39
	30	400	295	4.20	1.68	1.47	0.12	0.50	39
	45	400	295	2.73	1.47	1.05	0.07	0.50	33
CKQ 610	15	610	450	7.98	2.94	2.31	0.22	0.60	37
	30	610	450	5.04	2.31	1.89	0.16	0.48	41
	45	610	450	3.15	1.68	1.26	0.10	0.50	37
CKQ 1000	13	1000	738	9.66	3.15	2.00	0.32	0.70	56
	25	1000	738	6.30	3.78	3.26	0.18	0.45	30
	38	1000	738	3.15	1.89	1.47	0.11	0.50	35

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Electrical Performance Summary

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3-Phase 60 Hz

CKQ	Mechanical Data			Electrical Data						
	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque				
		Nm	lbf.ft			A	A	A	kW	Cos Φ
380 V 60 Hz										
CKQ 135	8	135	100	3	1.2	0.84	0.11	0.48	35	
	15	135	100	1.56	0.84	0.6	0.11	0.50	47	
	23	135	100	0.96	0.6	0.48	0.05	0.45	29	
CKQ 400	15	400	295	5.04	1.8	1.2	0.22	0.60	39	
	30	400	295	2.64	1.08	0.96	0.12	0.50	33	
	45	400	295	1.68	0.96	0.54	0.07	0.50	35	
CKQ 610	15	610	450	5.04	1.8	1.32	0.22	0.60	36	
	30	610	450	3.12	1.2	1.02	0.16	0.48	42	
	45	610	450	1.92	1.08	0.84	0.10	0.50	30	
CKQ 1000	13	1000	738	6.96	2.16	1.26	0.32	0.65	52	
	25	1000	738	3.36	2.4	1.8	0.18	0.55	24	
	38	1000	738	2.16	1.08	0.84	0.11	0.50	34	

CKQ	Mechanical Data			Electrical Data						
	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque				
		Nm	lbf.ft			A	A	A	kW	Cos Φ
440 V 60 Hz										
CKQ 135	8	135	100	3.00	1.00	0.80	0.11	0.48	37	
	15	135	100	1.80	0.75	0.50	0.11	0.50	57	
	23	135	100	0.80	0.50	0.35	0.05	0.45	40	
CKQ 400	15	400	295	4.20	1.50	1.10	0.22	0.60	43	
	30	400	295	2.20	0.80	0.80	0.12	0.50	39	
	45	400	295	1.40	0.75	0.55	0.07	0.50	34	
CKQ 610	15	610	450	4.20	1.50	1.10	0.22	0.60	43	
	30	610	450	2.50	1.20	1.00	0.16	0.48	43	
	45	610	450	1.50	1.20	0.70	0.10	0.50	36	
CKQ 1000	13	1000	738	6.80	1.20	0.90	0.32	0.65	73	
	25	1000	738	2.60	1.40	0.90	0.18	0.55	48	
	38	1000	738	2.10	1.00	0.70	0.11	0.50	40	

CKQ	Mechanical Data			Electrical Data						
	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque				
		Nm	lbf.ft			A	A	A	kW	Cos Φ
460 V 60 Hz										
CKQ 135	8	135	100	3.50	1.40	0.80	0.11	0.48	35	
	15	135	100	1.82	0.98	0.50	0.11	0.50	54	
	23	135	100	1.12	0.70	0.60	0.05	0.35	29	
CKQ 400	15	400	295	5.88	2.10	1.20	0.22	0.60	38	
	30	400	295	3.08	1.26	0.80	0.12	0.50	38	
	45	400	295	1.96	1.12	0.55	0.07	0.50	33	
CKQ 610	15	610	450	5.88	2.10	1.20	0.22	0.60	38	
	30	610	450	3.64	1.40	1.00	0.16	0.48	41	
	45	610	450	2.24	1.26	0.60	0.10	0.50	40	
CKQ 1000	13	1000	738	8.12	2.52	1.25	0.32	0.65	50	
	25	1000	738	3.92	2.80	1.05	0.18	0.55	39	
	38	1000	738	2.52	1.26	0.90	0.11	0.50	30	

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Electrical Performance Summary

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3-Phase 60 Hz

CKQ 480 V 60 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque			
		Nm	lbf.ft	A	A	A	kW	Cos Φ	Effy %
CKQ 135	8	135	100	3.08	1.26	0.80	0.11	0.48	34
	15	135	100	1.82	0.84	0.50	0.11	0.50	52
	23	135	100	1.05	0.56	0.35	0.05	0.45	37
CKQ 400	15	400	295	5.32	1.96	1.00	0.22	0.70	37
	30	400	295	2.80	1.12	0.80	0.12	0.50	36
	45	400	295	1.82	0.98	0.55	0.07	0.50	31
CKQ 610	15	610	450	5.32	1.96	1.00	0.22	0.60	43
	30	610	450	3.36	1.54	1.10	0.16	0.48	36
	45	610	450	2.10	1.12	0.65	0.10	0.50	36
CKQ 1000	13	1000	738	6.44	2.10	1.10	0.32	0.70	51
	25	1000	738	4.20	2.52	1.65	0.18	0.45	29
	38	1000	738	2.10	1.26	0.86	0.11	0.50	30

CKQ 600 V 60 Hz	Mechanical Data			Electrical Data					
	Travel Time	Rated Torque		Starting / Stall	Rated	Average (nominal) Torque			
		Nm	lbf.ft	A	A	A	kW	Cos Φ	Effy %
CKQ 135	8	135	100	2.77	1.13	0.66	0.11	0.48	33
	15	135	100	1.64	0.76	0.42	0.11	0.50	50
	23	135	100	0.95	0.50	0.50	0.05	0.45	21
CKQ 400	15	400	295	4.79	1.76	1.00	0.22	0.70	30
	30	400	295	2.52	1.01	0.66	0.12	0.50	35
	45	400	295	1.64	0.88	0.46	0.07	0.50	30
CKQ 610	15	610	450	4.79	1.76	1.00	0.22	0.60	35
	30	610	450	3.02	1.39	0.83	0.16	0.48	38
	45	610	450	1.89	1.01	0.50	0.10	0.50	37
CKQ 1000	13	1000	738	5.80	1.89	1.04	0.32	0.70	43
	25	1000	738	3.78	2.27	0.87	0.18	0.45	44
	38	1000	738	1.89	1.13	0.75	0.11	0.50	28

Values are subject to change without notice. Due to production tolerance variation, the electrical values shown are averages compiled from actuator production test data. Values are therefore provided for guidance only. Individual production test certificates are available on request (nominal load data not included). Rotork underwrite rated torque output only (specified tolerance -0/+10%).

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