

Q2A

Driving Quality

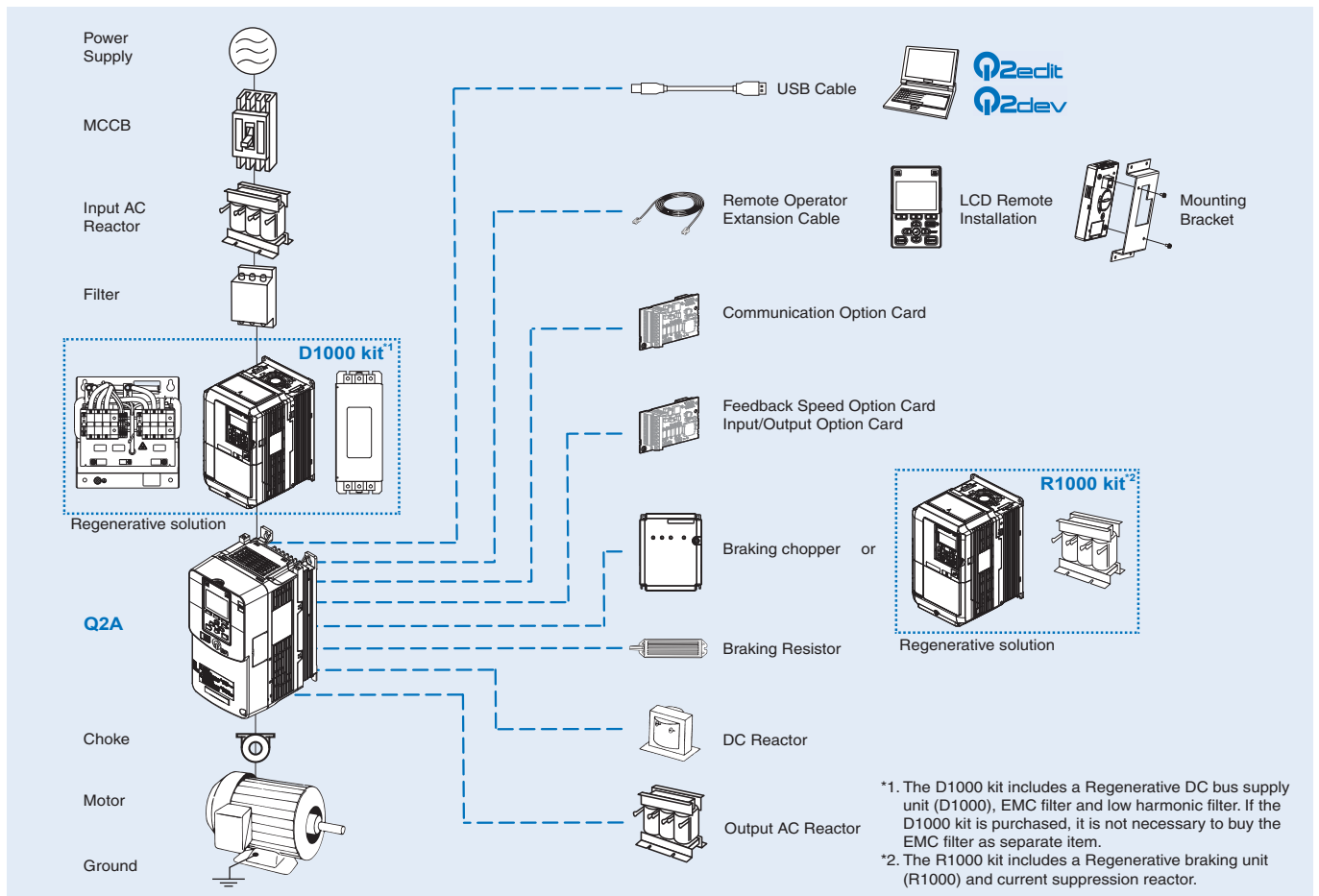
- Advanced motor control for IM, PM & SynRM motors
- Open/closed loop speed or torque control
- Embedded functional safety (STO SIL3)
- Built-in C3 class EMC filter
- Conform to EN 60721-3-3, 3S2 and 3C2
- Built-in braking transistor (models up to 90 kW)
- Quick and easy setup with intuitive keypad and navigation
- Micro SD for data storage
- Real-Time Clock
- 24 VDC power supply input for control board
- Communication options: EtherCAT, EtherNet/IP, PROFINET, Modbus TCP/IP, POWERLINK
- Up to 5 Q2A with a single communication option card
- PC configuration tools: Q2edit and Q2dev
- Mobile Device connectivity (via USB or optional Bluetooth)
- Regenerative solutions as option
- CE, UL, cUL, EAC, RoHS

Ratings

- 400 V class: 0.55 to 315 kW

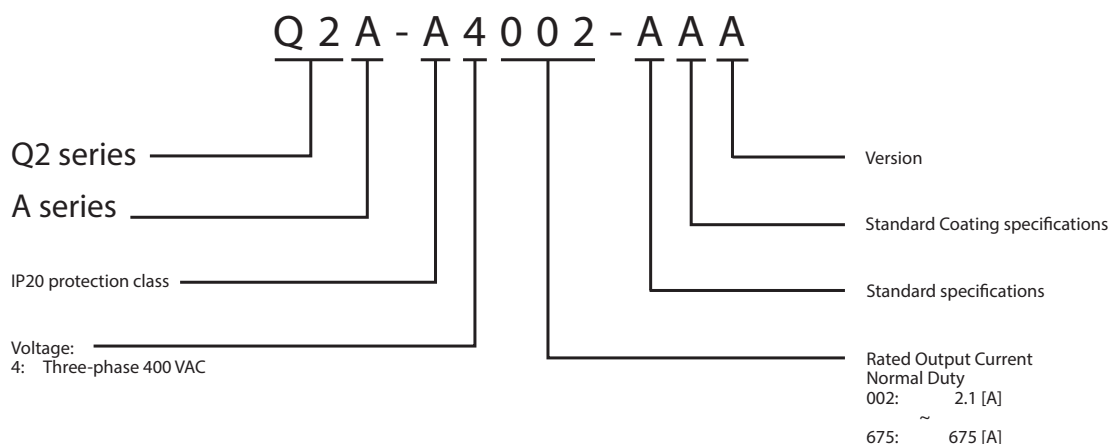


System configuration



Specifications

Type designation



400 V class

Q2A-A□		Input voltage	Duty rating	4002	4004	4005	4007	4009	4012	4018	4023	4031	4038	4044	4060	4075				
Max. applicable motor output (kW)	< 460 V ^{*1}	HD		0.55	0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30				
		ND		0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30	37				
	≥ 460 V ^{*2}	HD		0.55	0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30				
		ND		0.75	1.5	2.2	3.0	3.7	5.5	7.5	11	15	18.5	22	30	37				
Output characteristics	Inverter capacity (kVA)	< 460 V ^{*3}	HD	1.2	2.2	3.2	3.6	4.7	6.1	10	12	16	20	26	30	39				
			ND	1.4	2.7	3.6	4.7	5.9	7.8	12	15	20	25	29	39	49				
		≥ 460 V ^{*4}	HD	1.3	1.7	2.7	3.8	5.5	6.1	8.8	11	17	22	27	32	41				
			ND	1.7	2.4	3.8	5.5	6.1	8.8	11	17	22	27	32	41	52				
	Rated output current (A)	< 460 V	HD	1.8	3.4	4.8	5.5	7.2	9.2	14.8	18	24	31	39	45	60				
			ND	2.1	4.1	5.4	7.1	8.9	11.9	17.5	23.4	31	38	44	59.6	74.9				
		≥ 460 V	HD	1.6	2.1	3.4	4.8	6.9	7.6	11	14	21	27	34	40	52				
			ND	2.1	3.0	4.8	6.9	7.6	11	14	21	27	34	40	52	65				
Overload tolerance ^{*5}			<ul style="list-style-type: none"> HD: 150% of the rated output current for 60 seconds ND: 110% of the rated output current for 60 seconds 																	
Carrier frequency ^{*6} (without derating the drive capacity)			<ul style="list-style-type: none"> HD: 8 kHz ND: 2 kHz 																	
Max. output voltage			<ul style="list-style-type: none"> Proportional to input voltage: 380-480 V 																	
Max. output frequency			<ul style="list-style-type: none"> AOLV, EZOLV: 120 Hz CL-V/f, CLV, AOLV/PM, CLV/PM: 400 Hz V/f, OLV, OLV/PM: 590 Hz 																	
Power supply	Rated voltage and frequency			<ul style="list-style-type: none"> 3-phase AC power supply 380-480 V at 50/60 Hz DC power supply 513-679 VDC 																
	Allowable voltage fluctuation			-15% to +10%																
	Allowable frequency fluctuation			±5%																
	Input Power (kVA)	< 460 V	HD	1.5	2.8	3.7	5.3	7.1	9.3	13	17	24	33	40	34	46				
ND			2.0	3.7	5.3	7.1	9.3	13	17	24	33	40	48	46	57					
≥ 460 V		HD	1.3	1.7	3.2	4.6	6.1	7.5	11	15	21	28	35	30	40					
		ND	2.1	4.0	5.6	7.5	9.1	13	18	26	35	42	50	49	60					
Weight (kg)			3.5			3.9			4.2			6.0			7.5		12		17	

Q2A-A□		Input voltage	Duty rating	4089	4103	4140	4168	4208	4250	4296	4371	4389	4453	4568	4675	
Max. applicable motor output (kW)	< 460 V ^{*1}	HD		37	45	55	75	90	110	132	160	200	220	250	315	
		ND		45	55	75	90	110	132	160	200	220	250	315	355	
	≥ 460 V ^{*2}	HD		37	45	55	75	90	110	150	185	220	260	300	335	
		ND		45	55	75	90	110	150	185	220	260	300	335	370	
Output characteristics	Inverter capacity (kVA)	< 460 V ^{*3}	HD		49	60	74	99	118	142	171	200	244	272	298	398
			ND		59	68	92	111	137	165	195	244	256	298	374	444
		≥ 460 V ^{*4}	HD		52	61	76	99	124	143	191	241	288	330	380	410
	ND			61	76	99	124	143	191	241	288	330	380	410	482	
	Rated output current (A)	< 460 V	HD		75	91	112	150	180	216	260	304	371	414	453	605
			ND		89.2	103	140	168	208	250	296	371	389	453	568	675
	≥ 460 V	HD		65	77	96	124	156	180	240	302	361	414	477	515	
		ND		77	96	124	156	180	240	302	361	414	477	515	605	
Overload tolerance ^{*5}				<ul style="list-style-type: none"> • HD: 150% of the rated output current for 60 seconds • ND: 110% of the rated output current for 60 seconds 												
Carrier frequency ^{*6} (without derating the drive capacity)				<ul style="list-style-type: none"> • HD: 8 kHz • ND: 2 kHz • HD: 5 kHz • ND: 2 kHz • HD: 2 kHz • ND: 2 kHz 												
Max. output voltage				<ul style="list-style-type: none"> • Proportional to input voltage: 380-480 V 												
Max. output frequency				<ul style="list-style-type: none"> • AOLV, EZOLV: 120 Hz • CL-V/f, CLV, AOLV/PM, CLV/PM: 400 Hz • V/f, OLV, OLV/PM: 590 Hz 												
Rated voltage and frequency				<ul style="list-style-type: none"> • 3-phase AC power supply 380-480 V at 50/60 Hz • DC power supply 513-679 VDC 												
Allowable voltage fluctuation				-15% to +10%												
Allowable frequency fluctuation				±5%												
Power supply	Rated voltage and frequency	< 460 V	HD	57	69	84	113	136	165	198	239	297	327	370	465	
			ND	69	84	113	136	165	198	239	297	327	370	465	523	
	Input Power (kVA)	≥ 460 V	HD	49	59	72	98	117	142	193	240	288	335	382	429	
			ND	73	88	120	143	174	236	295	352	410	468	526	584	
Weight (kg)				22	25	38	39	71			122	126	198		207	

- *1. The maximum applicable motor output complies with 380 V motor ratings as specified in Annex G of IEC 60947-4-1. The rated output current of the drive output amps must be equal to or more than the motor rated current.
- *2. The maximum applicable motor output complies with 460 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.
- *3. The rated output capacity is calculated with a rated output voltage of 380 V.
- *4. The rated output capacity is calculated with a rated output voltage of 460 V.
- *5. Derating may be necessary for applications that start and stop frequently.
- *6. Derate the drive capacity to use values to 15 kHz maximum (4002 to 4103 models), 10 kHz maximum (4140 to 4389 models) or 5 kHz maximum (4453 to 4675 models).

Common specifications

Model number Q2A-A□	Specifications
Control methods	V/f Control (V/f), Closed Loop V/f Control (CL-V/f), Open Loop Vector Control (OLV), Closed Loop Vector Control (CLV), Advanced Open Loop Vector Control (AOLV), Open Loop Vector Control for PM (OLV/PM), Advanced Open Loop Vector Control for PM (AOLV/PM), Closed Loop Vector Control for PM (CLV/PM), EZ Open Loop Vector Control (EZOLV)
Frequency control range	<ul style="list-style-type: none"> • AOLV, EZOLV: 0.01 to 120 Hz • CL-V/f, CLV, AOLV/PM, CLV/PM: 0.01 to 400 Hz • V/f, OLV, OLV/PM: 0.01 to 590 Hz
Frequency tolerance	<ul style="list-style-type: none"> • Digital inputs: ±0.01% of the max. output frequency (-10 to +40 °C) • Analog inputs: ±0.1% of the max. output frequency (25 ±10 °C)
Frequency setting resolution	<ul style="list-style-type: none"> • Digital inputs: 0.01 Hz • Analog inputs: 1/2048 of the max. output frequency (11-bit signed)
Output frequency resolution	0.001 Hz
Frequency setting signal	<ul style="list-style-type: none"> • Main speed freq reference: -10 to +10 VDC (20 kΩ), 0 to 10 VDC (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω) • Main speed reference: Pulse train input (max. 32 kHz)
Starting torque ^{*1}	<ul style="list-style-type: none"> • V/f, CL-V/f: 150%/3Hz • OLV, AOLV: 200%/0.3Hz • CLV, AOLV/PM, CLV/PM: 200%/0 rpm (rev/min) • OLV/PM: 100%/5% speed • EZOLV: 100%/1% speed
Speed control range	<ul style="list-style-type: none"> • V/f, CL-V/f: 1:40 • OLV, AOLV: 1:200 • CLV, CLV/PM: 1:1500 • OLV/PM: 1:20 • AOLV/PM: 1:100 (when high frequency injection is enabled) • EZOLV: 1:100
Zero speed control	Possible in these control methods: CLV, AOLV/PM, CLV/PM
Torque limits	Parameter settings allow different limits in four quadrants in these control methods: OLV, CLV, AOLV, AOLV/PM, CLV/PM, EZOLV
Accel/Decel Time	0.0 to 6000.0 s (the drive can set four pairs of different acceleration and deceleration times)

Control functions	Braking torque	<p>Approximately 20%</p> <p>Approximately 125% with a dynamic braking option</p> <p>Short-time average deceleration torque:</p> <ul style="list-style-type: none"> • Motor output 0.4/0.75 kW: over 100% • Motor output 1.5 kW: over 50% • Motor output 2.2 kW or higher: over 20%, over-excitation braking/high slip braking allow for approximately 40% <p>Continuous regenerative torque: approx. 20%, dynamic braking option allows for approximately 125%, 10% ED, 10 s⁻²</p> <p>Models 4002 to 4168 have a built-in braking transistor.</p> <p>Short-time average deceleration torque refers to the torque needed to decelerate the motor (uncoupled from the load) from the rated speed to zero. Motor characteristics can change the actual specifications.</p> <p>Motor characteristics change the continuous regenerative torque and short-time average deceleration torque for motors of 2.2 kW or higher.</p>
	V/f characteristics	Select from 15 pre-defined V/f patterns or a user-set V/f pattern
Functionality	Main control functions	Torque control, Droop control, Speed/Torque control switching, Feed forward control, Zero servo function, Restart after momentary power loss, Speed search, Overtorque/Undertorque detection, Torque limit, 17 step speed (max), Accel/Decel switch, S-curve acceleration/deceleration, 3-wire sequence, Auto-tuning (rotational and stationary), Dwell function, Cooling fan ON/OFF, Slip compensation, Torque compensation, Frequency Jump, Upper/lower limits for frequency reference, DC injection braking at start and stop, Overexcitation braking, High slip braking, PID control (with sleep function), Energy saving control, MEMOBUS/Modbus communication (RS-485 max. 115.2 kbps), Auto restart, Application presets, Q2dev (customized functions), Removable terminal block with parameter backup function, Online tuning, KEB, Overexcitation deceleration, Inertia (ASR) tuning, Overvoltage suppression, High frequency injection
Protection functions	Motor	Electronic thermal overload protection
	Momentary overcurrent	Drive stops when the output current exceeds 200% of the HD output current
	Overload	Drive stops when the output current exceeds 150% of the HD output current for 60 seconds ^{*3}
	Overvoltage	Stops when the DC bus voltage is more than approximately 820 V
	Undervoltage	Stops when the DC bus voltage decreases to less than approximately 380 V
	Momentary power loss ride-thru	<p>Stops when power loss is longer than 15 ms.</p> <p>Continues operation if power loss is shorter than 2 s (depending on parameter settings).</p> <p>Stop time may be shortened depending on the load and motor speed.</p> <p>Drive capacity will change the continuous operation time. A momentary power loss recovery unit is necessary to continue operation through a 2 s power loss on models 4002 to 4031.</p>
	Heatsink overheat	Protected by thermistor
	Stall prevention	Stall prevention is available during acceleration, deceleration and during run
	Ground fault	<p>Electronic circuit protection</p> <p>This protection detects ground faults during run. The drive will not provide protection when there is a low-resistance ground fault for the motor cable or terminal block or energizing the drive when there is a ground fault.</p>
DC Bus charge LED	Charge LED illuminates when DC bus voltage is more than 50 V.	
Environment	Area of use	Indoor (no corrosive gas, dust, etc...)
	Power supply	Overvoltage Category III
	Ambient temperature	-10°C to +50°C
	Humidity	95% RH or less (without condensation)
	Storage temperature	-20°C to +70°C (short-term temperature during transportation)
	Surrounding area	<p>Pollution degree 2 or less</p> <p>Install the drive in an area without:</p> <ul style="list-style-type: none"> • Oil mist, corrosive or flammable gas or dust • Metal powder, oil, water or other unwanted materials • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight
	Altitude	Up to 1000 meters max. (output derating of 1% per 100 m above 1000 m, max. 3000 m)
	Vibration	<ul style="list-style-type: none"> • 10 Hz to 20 Hz: 1G (9.8 m/s²) • 20 Hz to 55 Hz: 4002 to 4168 - 0.6G (5.9 m/s²) / 4208 to 4675 - 0.2G (2 m/s²)
Installation orientation	Install the drive vertically for sufficient airflow to cool the drive.	
Safety standard	<ul style="list-style-type: none"> • UL61800-5-1 • EN61800-3 • IEC/EN61800-5-1 • Two Safe Disable inputs and one EDM output according to ISO/EN13849-1 Cat.III PLe, IEC/EN61508 SIL3 	
Protection design ^{*4}	Open chassis type: IP20	

*1. Correctly select drive capacity for this starting torque in these control methods: OLV, CLV, AOLV, AOLV/PM, CLV/PM.

*2. Set L3-04 to 0 (Stall Prevention during Decel = Disabled) when operating the drive with a regenerative converter, regenerative unit, braking resistor or braking resistor unit. Failure to obey could prevent the drive from stopping in the specified deceleration time and cause serious injury or death.

*3. The drive can trigger the overload protection function at 150% of the drive rated output in less than 60 seconds if the output frequency is less than 6 Hz.

*4. Install an UL Type 1 kit on an Open-chassis type (IP20) to convert the drive to a Enclosed wall-mounted type (UL Type 1).