KOHLER POWER SYSTEMS

Automatic Transfer Switches
Bypass/Isolation Switches

ISO 9001 KOHLER POWER SYSTEMS NATIONALLY REGISTERED

Ratings

Voltage	208–600 VAC 50/60 Hz
Current	
Open-Transition	150–4000 amps
Programmed-Transition	150–4000 amps

Bypass/Isolation Switch Standard Features

- Bypass/isolation switches for uninterrupted power to the load during switch maintenance and testing
- Open-transition or programmed-transition modes of operation
- 2, 3, or 4 poles
- Electrically operated, mechanically held contactor
- Double-throw, inherently interlocked design (break-before-make power contacts)
- Solid, switched, or overlapping neutral (make-before-break type)
- High withstand and closing ratings
- Fully rated for use as a manual 3-position transfer switch
- Permanently mounted bypass and isolation handles
- Quick-make, quick-break bypass switch operation for load transfer between live sources
- Heavy duty mechanical interlocks
- Bypass switch and contactor position indicators
- Drawout contactor for ease of maintenance
- Design suitable for emergency and standby applications on all classes of load, 100% tungsten rated through 400 amps
- Open-transition transfer time less than 100 milliseconds (6 cycles @ 60 Hz)
- Reliable, field-proven solenoid mechanism
- Switching mechanisms lubricated for life
- Main shaft auxiliary contacts
- Front-connected style available for some amperages

MPAC 1000™ Controller Standard Features

- Microprocessor controller
- Real-time clock
- Broadrange voltage sensing (208–600 VAC) with 2% accuracy on both sources
- Frequency sensing with 1% accuracy on both sources
- Environmentally sealed user interface
- Keypad with tactile feedback pushbuttons
- LED indicators
- Selectable operating modes
- Programmable inputs and outputs
- Load/no load exercise function
- In-phase monitor
- Anti-single phasing protection
- Load control inputs and outputs
- Phase rotation sensing
- Time-stamped event log
- Gold-flashed engine start contacts
- Modbus® communication with network and setup connections

Programmable Features

- System voltage and frequency
- Adjustable over/undervoltage and over/underfrequency for the normal and emergency sources
- Adjustable time delays
- Commit/no commit transfer
- ABC/CBA phase rotation selection with error detection
- Resettable historical data
- Password protection
- Single/three-phase operation†
- Open/programmed-transition operation†
- In-phase monitor (disabled)
- Calendar mode exerciser (up to 21 events)
- Programmable inputs and outputs

Communications

- Serial port for PC connection
- Modbus® network interface

Modbus® is a registered trademark of Schneider Electric

Controller Features

Standard Controller Features

User Interface Keypad

- Start/end system test
- Set/end exercise
- End time delay
- Lamp test/service reset

User Interface Indicators

- Contactor position: Normal, Off, Emergency
- Source available: Normal, Emergency
- Service required: immediate, maintenance
- Not in automatic mode
- Four-stage time delay remaining
- Exercise: load, no load, set/disabled
- Test: load, no load
- Load control active: peak shave, load shed, pre/post-transfer signal
- In-phase monitor active

Selectable Operating Modes*

- 1 week/2 week exercise (1 week)
- Disable/enable exercise (enable)
- Load/no load exercise (no load)
- Load/no load test (load)
- Enable/disable transfer (enable)

Inputs

- One programmable input, factory-set to peak shave/area protection
- One programmable input for factory use only, inhibits transfer during travel betweenTEST and ISOLATE positions

Outputs

- Generator engine start gold-flashed contact rated 2 amps @ 30 VDC/250 VAC
- Pre-transfer load control, one normally open contact rated 10 amps @ 30 VDC/250 VAC
- One programmable output, factory-set to load bank control rated 2 amps @ 30 VDC/250 VAC

Software Event Monitoring

Use a personal computer with the optional setup software or a Modbus® link to view historical data and system events.

- Historical data (total and resettable)
- System events (time and date-stamped)
- System faults (time and date-stamped)
- Line-to-line voltage
- System frequency
- Time delay active
- Time delay remaining
- System status
- Source available
- Contactor position
- Exerciser schedule, mode, and time remaining on active exercise

* Factory default settings are shown in parentheses. All settings are stored in non-volatile memory.

† System parameters set per order.

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Programmable Features

Use a personal computer with the optional setup software or a Modbus® link to view, select, or adjust programmable features.

Programmable Features*

- System voltage†
- System frequency†
- ABC or CBA phase rotation (ABC)
- Single/three-phase operation†
- Open/programmed-transition operation†
- In-phase monitor (disabled)
- Commit/no commit switch (no commit)
- User-defined password
- Calendar mode exerciser (up to 21 events)

Programmable Inputs and Outputs

Use a personal computer with the optional setup software or a Modbus® link to define inputs and outputs.

Programmable Inputs

- End time delay input (default)
- Inhibit transfer
- Low battery fault
- Load shed (forced transfer from Emergency to OFF; programmed-transition models only)
- Peak shave/area protection input (default)
- Remote common fault
- Remote test

Programmable Outputs

- Auxiliary switch fault
- Common fault
- Contactor position
- Exercise active
- Failure to acquire standby source
- Failure to transfer fault
- Generator engine start
- Load bank control (default)
- Load control (pre/post transfer; up to 9 outputs)
- Loss of phase fault
- Low backup battery
- Modbus®-controlled relay outputs (4 maximum)
- Not in automatic mode
- Non-emergency transfer
- Over and undervoltage faults
- Over and underfrequency faults
- Peak shave/area protection active
- Phase rotation error
- Source available
- Test active

Controller Features, continued

Voltage and Frequency Sensing		
Parameter	**Default**	**Adjustment Range**
Undervoltage pickup	90% of nominal	85%–100% of nominal
Undervoltage dropout	90% of pickup	75%–98% of pickup
Overvoltage dropout	110% of nominal	105%–135% of nominal*
Overvoltage pickup	95% of dropout	95%–100% of dropout
Voltage dropout time	0.5 sec.	0.1–9.9 sec.
Underfrequency pickup	90% of nominal	80%–95% of nominal
Underfrequency dropout	99% of pickup	95%–99% of pickup
Overfrequency dropout	101% of pickup	101%–105% of pickup
Overfrequency pickup	110% of nominal	105%–120% of nominal
Frequency dropout time	3 sec.	0.1–15 sec.
* 690 volts, maximum		

Adjustable Time Delays		
Time Delay	**Default**	**Adjustment Range**
Engine start	3 sec.	0–6 sec.†
Preferred to standby	1 sec.	0–60 min.†
Standby to preferred	15 min.	
Engine cooldown	0 min.	
Failure to acquire standby source	1 min.	
Pretransfer to preferred signal	3 sec.	
Pretransfer to standby signal	3 sec.	
Post-transfer to preferred signal	0 sec.	
Post-transfer to standby signal	0 sec.	
Off to standby (programmed-transition only)	1 sec.	
Off to preferred (programmed-transition only)	1 sec.	
† Adjustable in 1 second increments. Can be extended to 60 minutes with an Extended Battery Supply Module kit.		

Application Data

UL-Listed Solderless Screw-Type Terminals for External Power Connections		
	Normal, Emergency, and Load Terminals	
Switch Rating (Amps)	**Maximum Number of Cables per Pole**	**Range of Wire Sizes, Copper or Aluminum**
150–400 KBT ‡	1	#4 AWG to 600 MCM
	2	#1/0 AWG to 250 MCM
150–400 2-, 3-pole KBP §	1	#4 AWG to 600 MCM
	2	#1/0 AWG to 250 MCM
150–400 4-pole KBP §	2	#1 AWG to 600 MCM
600 S	2	#2 AWG to 600 MCM
600 F	2	#1 AWG to 600 MCM
800 F	3	#1 AWG to 600 MCM
800–1200 S	4	#1/0 AWG to 750 MCM
1600–2000	6	#1/0 AWG to 750 MCM
2600–3000	10	#1/0 AWG to 750 MCM
4000	12	#2 AWG to 600 MCM
F Front-connected S Standard rear-connected ‡ Open-transition models only § Programmed-transition models only		

Input and Output Connection Specifications		
Component	**Number of Wires**	**Wire Size Range**
Terminal strip I/O terminals	1	#12–24 AWG
I/O module terminals	1	#14–26 AWG

Auxiliary Position Indicating Contacts (rated 10 amps @ 32 VDC/250 VAC)		
	Number of contacts indicating Normal, Emergency	
Switch Rating (Amps)	**Open-Transition**	**Programmed-Transition**
150–400	3, 3	2, 3
150–400 **	—	7, 7
600–3000	8, 8	7, 7
4000	2, 2	4, 3
** Programmed transition 4-pole		

Environmental Specifications	
Operating Temperature	–20°C to 70°C (–4°F to 158°F)
Storage Temperature	–40°C to 70°C (–40°F to 158°F)
Humidity	5% to 95% noncondensing
Altitude	0 to 3050 m (10000 ft.) without derating

Codes and Standards

The ATS meets or exceeds the requirements of the following specifications:

- Underwriters Laboratories UL 508, Standard for Industrial Control Equipment
- Underwriters Laboratories UL 1008, Standard for Automatic Transfer Switches for Use in Emergency Standby Systems
- Underwriters Laboratories Inc., Listed to Canadian Safety Standards (cUL)
- NFPA 70, National Electrical Code
- NFPA 99, Essential Electrical Systems for Health Care Facilities
- NFPA 110, Emergency and Standby Power Systems
- IEEE Standard 446, IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard IC10-1993 (formerly ICS2-447), AC Automatic Transfer Switches
- EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
- EN61000-4-4 Fast Transient Immunity Severity Level 4
- IEC Specifications for EMI/EMC Immunity:
  - CISPR 11, Radiated Emissions
  - IEC 1000-4-2, Electrostatic Discharge
  - IEC 1000-4-3, Radiated Electromagnetic Fields
  - IEC 1000-4-4, Electrical Fast Transients (Bursts)
  - IEC 1000-4-5, Surge Voltage
  - IEC 1000-4-6, Conducted RF Disturbances
  - IEC 1000-4-8, Magnetic Fields
  - IEC 1000-4-11, Voltage Variations and Interruptions

Weights and Dimensions

Bypass/Isolation Switches in NEMA 1 Enclosures

Transition	Amps	Dimensions mm (in.)			Weight kg (lb.)		
		Height	Width	Depth	2-Pole	3-Pole	4-Pole
Open-Transition	150-400	1588 (63)	724 (28.5)	489 (19) *	154 (340)	158 (350)	163 (360)
	600-800 F	2286 (90)	965 (38)	813 (32) †	685 (1510)	717 (1580)	748 (1650)
	600-1200 S	2311 (91)	965 (38)	1219 (48) ‡	685 (1510)	717 (1580)	748 (1650)
	1600-2000	2311 (91)	965 (38)	1524 (60) ‡	—	1070 (2360)	1152 (2540)
	2600-3000	2311 (91)	1981 (78)	1829 (72) ‡	—	1240 (2730)	1525 (3360)
	4000	2311 (91)	2451 (96.5)	1829 (72) §	—	2858 (6300)	3130 (6900)
Programmed-Transition	150-400	1892 (75)	724 (28.5)	489 (19) *	154 (340)	158 (350)	—
	150-400 F (4-pole)	2286 (90)	965 (38)	813 (32) †	—	—	340 (750)
	600-800 F, S	2286 (90)	965 (38)	813 (32) †	315 (695)	322 (710)	340 (750)
	1000-1200	2311 (91)	965 (38)	1219 (48) ‡	928 (2045)	1027 (2265)	1127 (2485)
	1600-2000	2311 (91)	965 (38)	1524 (60) ‡	—	1070 (2360)	1152 (2540)
	2600-3000	2311 (91)	965 (38)	1829 (72) ‡	—	1325 (2920)	1611 (3550)
	4000	2311 (91)	2451 (96.5)	1829 (72) §	—	2858 (6300)	3130 (6900)

F Front-connected

S Standard rear-connected (not available for 150-400 amp 4-pole programmed-transition)

* Handles extend 89 mm (3.5 in.).

† Handles extend 159 mm (6.25 in.). Standard enclosures for 150-400 amp 4-pole and 600-800 amp sizes are suitable for top and upper left side cable entrance only.

‡ Recommended clearance to enclosure: 0.9 m (3 ft.) from rear, 1.2 m (4 ft.) from front [0.64 m (25 in.) required for transfer switch drawout].

§ Recommended clearance to enclosure: 0.9 m (3 ft.) from rear, 1.5 m (5 ft.) from front [0.9 m (3 ft.) required for transfer switch drawout].

Withstand and Closing Ratings (WCR)

Open- and Programmed-Transition Models

Maximum current in RMS symmetrical amperes when coordinated with customer-supplied fuses or circuit breakers.

Withstand and Closing Current Ratings in RMS Symmetrical Amperes*							
	Any Circuit Breaker			Current-Limiting Fuses			
Switch Rating, Amps	Cycles @ 60 Hz	WCR, Amps@ 480 VAC	WCR, Amps @ 600 VAC	Amps	Volts, Max	Fuse Size, Amps	Type
150	3	35,000	22,000	200,000	480	450	J
225–400						600	
600–1200	3 18	50,000 36,000	50,000 36,000		600	1600	L
1600, 2000	3 30 †	100,000 65,000	100,000 65,000			3000	
2600, 3000						4000	
4000					480	6000	

* All values are available symmetrical RMS amperes and tested in accordance with the withstand and close-on requirements of UL 1008. Application requirements may permit higher withstand ratings for certain size switches. Contact Kohler Co. for assistance.

† Withstand rating only. This testing is not defined in UL 1008.

Ratings with Specific Manufacturers' Circuit Breakers

The following charts list power switching device withstand and closing ratings (WCR) in RMS symmetrical amperes for circuit breakers from specific manufacturers. Ratings apply to both open- and programmed-transition models. Circuit breakers are supplied by the customer.

Switch Rating, Amps	Molded-Case Circuit Breakers				
	Voltage, Max.	Withstand/Closing Rating (WCR), RMS Symmetrical Amps	Manufacturer	Type	Max. Size, Amps
150	480	42,000	General Electric	TEL, THED, THLC1,	150
				TFL, THLC2	225
				SFL, SFLA, SFP	250
				SGL4, SGP4, TB4, THLC4, TLB4	400
				SGLA, SGL6, SGP6 TB6	600
			ITE	CFD6, HFD6	250
				CJD6, HHJD6, HHJXD6, HJD6, SCJD6, SHJD6	400
				CLD6, HHLD6, HHLXD6, HLD6, SHLD6	600
			Square D	KC, KI	250
				LC, LI	400
			Cutler-Hammer	HJD, JDC	250
				HKD, KDC, LCL, Tri-Pac LA	400
				HLD	600
				Tri-Pac NB	800
			ABB	S3	150
			Merlin Gerin	CF250	250
				CJ400	400
225 260	480	42,000	General Electric	TFL, THLC2	225
				SFL, SFLA, SFP	250
				SGL4, SGP4, TB4, THLC4, TLB4	400
				SGLA, SGL6, SGP6, TB6	600
				SKHA, SKL8, SKP8, TKL	800
			ITE	CFD6, FD6, FXD6, HFD6	250
				CJD6, HHJD6, HHJXD6, HJD6, JD6, JXD6, SCJD6, SHJD6, SJD6	400
				CLD6, HHLD6, HHLXD6, HLD6, SCLD6, SHLD6	600
				CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800
			Square D	KC, KI	250
				LC, LI	600
				MH	800
			Cutler-Hammer	HJD, JDC	250
				HKD, KDC, LCL, Tri-Pac LA	400
				HLD	600
				Tri-Pac NB	800
			ABB	S5	400
				S6	600
			Merlin Gerin	CF250	250
				CJ400	400

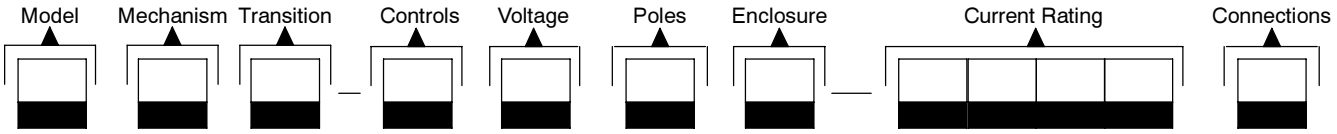
Ratings with Specific Manufacturers' Circuit Breakers, continued

Switch Rating, Amps	Molded-Case Circuit Breakers				
	Voltage, Max	Withstand/Closing Rating (WCR), RMS Symmetrical Amps	Manufacturer	Type	Max. Size, Amps
400	480	42,000	General Electric	SGL4, SGP4, TB4, THLC4, TLB4	400
				SGLA, SGL6, SGP6, TB6	600
				SKHA, SKL8, SKP8, TKL	800
			ITE	CJD6, HHJD6, HHJXD6, HJD6, SCJD6, SHJD6,	400
				CLD6, HHLD6, HHLXD6, HLD6, SCLD6, SHLD6	600
				CMD6, HMD6, HND6, MD6, MXD6, SCMD6, SHMD6, SMD6, SND6	800
			Square D	LC, LI	600
				MH	800
			Cutler-Hammer	HKD, KDC, LCL, Tri-Pac LA	400
				HLD	600
				Tri-Pac NB	800
			ABB	S5	400
				S6	800
			Merlin Gerin	CJ600	600
600 800 1000 1200	480	65,000	General Electric	TB8	800
				Microversatrip TKL	1200
			ITE	CLD6, HHLD6, HHLXD6, HLD6, SCLD6, SHLD6	600
				CMD6, HMD6, SCMD6, SHMD6	800
				CND6, HND6, SCND6, SHND6	1200
				CPD6	1600
			Square D	MH Series 2	1000
				SE (LS Trip), SEH (LS Trip)	2500
	600	65,000	Cutler-Hammer	Tri-Pac NB	800
				Tri-Pac PB	1600
				RDC	2500
	480	42,000	ABB	S6	800
				S7	1200
			Merlin Gerin	CJ600	600
				CK1200	1200

KOHLER CO., Kohler, Wisconsin 53044 U.S.A.
Phone 920-565-3381, Web site www.kohlergenerators.com
Fax 920-459-1646 (U.S.A. Sales), Fax 920-459-1614 (International)
For the nearest sales and service outlet in U.S.A. and Canada
Phone 1-800-544-2444

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65)264-6422, Fax (65)264-6455

Record the transfer switch model designation in the boxes below. The transfer switch model designation defines characteristics and ratings as explained in the accompanying chart.



Sample Model Designation: KBT-AFTA-0400S

Model
K: Model K automatic transfer switch

Mechanism
B: Bypass isolation

Transition
T: Open-transition
P: Programmed-transition

Electrical Controls
A: MPAC 1000™ (Microprocessor ATS Controls)

Voltage

C: 208 Volts/60 Hz	J: 416 Volts/50 Hz
D: 220 Volts/50 Hz	K: 440 Volts/60 Hz
F: 240 Volts/60 Hz	M: 480 Volts/60 Hz
G: 380 Volts/50 Hz	N: 600 Volts/60 Hz
H: 400 Volts/50 Hz	

Number of Poles/Wires
N: 2-pole, 3-wire, solid neutral
T: 3-pole, 4-wire, solid neutral *
V: 4-pole, 4-wire, switched neutral
W: 4-pole, 4-wire, overlapping neutral
Z: 3-pole, 4-wire, integral solid neutral †

Enclosure ‡

A: NEMA type 1	D: NEMA 4
B: NEMA type 12	F: NEMA 4X
C: NEMA type 3R	

Current Rating: Numbers indicate the current rating of the switch in amperes:

0150	0800	2000
0225	1000	2600
0260	1200	3000
0400	1600	4000
0600		

Power Connections
S: Standard
F: Front-connected (available on 600–800 amp switches)

* Solid neutral not available on 600–800 amp front-connected switches.

† Integral solid neutral is a solid neutral mounted on the contactor. This is the default selection for 600–800 amp front-connected switches. Not available on all amperages.

‡ NEMA 1 enclosure is standard on all bypass models. Consult the manufacturer for the availability of other enclosures.

Accessories

- ❑ Battery charger. Three-stage charging, dual-output battery charger (6 amps @ 12 VDC/3 amps @ 24 VDC)
- ❑ Chicago alarm module
- ❑ Digital meter kits. Display voltage, current, frequency, and power for both sources
- ❑ External battery supply module (allows extended engine start time delay)
- ❑ I/O Modules. Programmable input/output modules with 2 inputs and 6 outputs (output rating 2 amps @ 30 VDC/250 VAC). Use up to 4 I/O modules.
- ❑ Load shed, to force transfer from Emergency to Off (programmed-transition models only)
- ❑ Line-to-neutral monitoring
- ❑ Preferred source switch
- ❑ Supervised transfer control switch
- ❑ Setup software

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