PowerBack™ Regenerative Drive

Regenerative Drives Return Power to Building Supply

Traction elevators use a counterweight to offset the weight of the elevator car and passengers. The counterweight is sized to approximate a car loaded to 40% - 50% of capacity and is effective at leveling energy use in both up and down directions. When the elevator car is not loaded to this capacity, light cars traveling up and heavy cars traveling down must use braking to maintain their rated speed. Braking is provided by allowing the AC motor to operate as a generator, converting mechanical energy to electrical energy which is dissipated as heat by special resistors.

You can capture that energy and re-use it with MCE PowerBack R6 regenerative drives. Add a PowerBack unit to the MCE TorqMax AC drive in our Motion 4000 or iControl AC controllers and lighten the environmental load:

- Return power to the utility and reduce kW hours consumed by the building.
- Eliminate braking resistors and the heat they radiate into the building – saving space and reducing cooling costs.

How does the PowerBack R6 regenerative drive work?

- PowerBack operates at a fixed frequency, synchronized to the AC line, and at a variable voltage which is higher than the AC line.
- The PowerBack and TorqMax drives share a common DC bus.
- When the elevator AC motor acts as a generator to slow the load, DC bus voltage is greater than the peak of the AC line voltage and the PowerBack drive starts operating in "regen" mode.
- In regen mode, excess DC voltage is inverted, filtered into AC voltage and synchronously returned to the AC line.

Applications

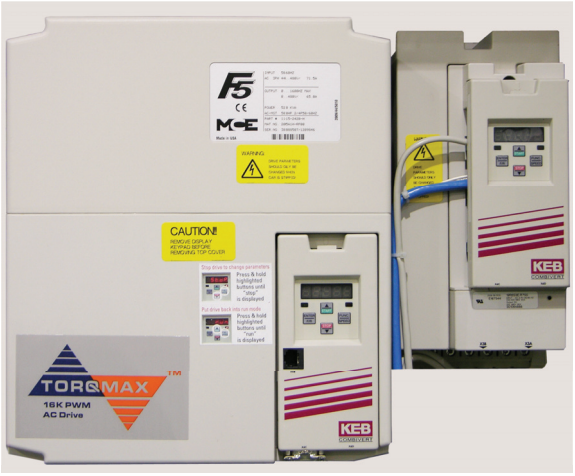
- AC induction and permanent magnet motors/machines
- If the capacity of one R6 is not sufficient, two may be connected in parallel – effectively doubling capacity

Features

- Compact size (5.2"/13.2 cm x 11.4"/29 cm x 8.75"/22.2 cm deep)
- Minimal wiring
- Standard commutation choke returns synchronous AC with AC motor control equivalent harmonics
- Optional harmonic filter returns synchronous AC with THiD reduced below 8%

Benefits

- Saves energy by returning power generated during overhauling to the AC line
- Saves building cooling dollars by eliminating braking resistors



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Motion Control Engineering®
A Kinetek Company®

The leader in non-proprietary controllers, technical services and repair solutions for elevator modernization.

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Example Analysis

Regen power savings: ***500 ft/min 3000 lb***
30hp gearless PM machine

Load weight:	3000	lb	
Car weight:	6100	lb	
Counter weight:	50%		7600 lb
Rope weight:	800	lb	
Compensation chain	800	lb	
Rated speed:	500	ft/min	
Maximum acceleration:	3	ft/s^2	
Efficiency gearbox:	100	%	
Efficiency, shaft:	85	%	
Total mechanical system efficiency:			85 %
Mechanical Lifting Power (full load):			26.8 hp
Mechanical Lowering Power (full load) (power returning to motor):			19.3 hp
Gear Reduction:	1		
Roping ratio:	2		
Sheave diameter:	15.5	in	
Motor speed:			246 rpm
Lifting torque:			572.0 lbft
Motor Power, Estimate:			30.0 hp
Efficiency motor:	95	%	
Load inertia at motor:			1916.8 $lbft^2$
Acceleration torque (full load up)			716 lbft
Maximum required torque (full load up):			1288 lbft
Peak motor power (full load up)			60 hp
Regen power from motor (full load down contract speed)			18 hp
Peak regen power from motor(full load down, deceleration)			43 hp

Car calls per hour (peak period):	60	calls/hr
Duration of peak period	12	hrs
Car calls per hour (off period):	20	calls/hr
Duration of off period	12	hrs
Average travel distance	8	floors
Floor Height	14	ft

Run time at contract speed	10.7 sec
Decel time	2.8 sec
Total travel time	16.3 sec
Total operations per day	960 calls

Assumptions
Energy is returned to the line during the decel of every call
Energy is returned to the line during the run at contact speed for only half of the calls, the other half the motor is under load and drawing power from the line.

Energy run = Operations x 1/2 x Run time x Regen power contract speed
Energy decel = Operations x Decel time x Peak regen power

Energy run	19.5 kWhr
Energy decel	23.7 kWhr
Total Energy returned per day	43.3 kWhr
Average per hour reduction in machine room cooling	6148.9 BTU/hr
Kilowatt hours per day which would be required to operate cooling equipment to remove this heat from machine room	14.8 kWhr

Energy cost	0.10	$/kWhr
Number of days in use per year	365	days

Office buildings = 260
apartments/hotels 365

Annual savings due to returned energy	$1,579
Annual savings due to reduction in machine room cooling	$539
Total annual savings	**$2,118**

TECHNICAL SPECIFICATIONS	UNIT SIZE	15	19
HOUSING SIZE		E	E
Rated Voltage	VAC	400 V	
Operating Voltage Range	VAC	330...550 ± 0% 180...260 ± 0% (see note 1)	
Operating Frequency	Hz	50 / 60 Hz ± 2	
REGENERATIVE OPERATION			
Rated Power	KVA	22.5	45.0
Rated Power (active)	KW	20.5	41.0
Maximum Power	KVA	33.8	67.5
Regen Rated Current	A AC	33	65
Regen DC Current	A DC	40	80
Peak Regen Current (see note 2)	A AC	48.8	97.5
Peak Regen DC Current	A DC	60	120

1) 230V operation possible from unit - divide power ratings by 1.73, current ratings remain the same.
2) Peak overload current can be maintained for 60 seconds. Overload cycle period is 300 seconds.

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