

# MICROMASTER

The universal frequency inverter  
for drive technology

Brochure · April 2008



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**SIEMENS**

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## The universal frequency inverter for drive technology

### Application:

Everywhere in the manufacturing and process industry

MICROMASTER is used:

- For outputs ranging from 0.12 kW to 250 kW
- In the manufacturing and process industry
- In applications ranging from pumps and fans, to extruders and winding machines, to conveyor systems

### Perfect for centralized requirements

Thanks to its compact design, MICROMASTER is perfectly suited for control cabinet mounting, just as it can be integrated into the design of stand-alone and series machines.

MICROMASTER enables maximum utilization of the available mounting surface, from small outputs to large outputs, with a wide range of supply voltages. As such, it covers a wide field of applications.

The options concept opens up additional possibilities for customization:

- Different communication interfaces enable use in the most common network applications
- Plain-text operator panels simplify operation and also support a wide range of languages
- Base components such as reactors and filters complement the compact solution



### MICROMASTER – The family

MICROMASTER represents system and family cohesiveness: Three models with a comprehensive cross-platform standard and balanced, graded performance features. Tried and tested millions of times worldwide!

Introducing the family members:

- MICROMASTER 420: The universal
- MICROMASTER 430: The specialist for pumps and fans
- MICROMASTER 440: The all-rounder



### Highlights of the entire MICROMASTER family

#### Mechanical components

- Compact, standardized drilling template
- Standardized base components
- Screwless control terminals
- Fulfills the requirements of a wide range of standards

#### Electronics




- Graded I/O quantity structure
- Various supply voltages

#### Communication

- Different fieldbus interfaces (PROFIBUS, CAN, DeviceNet, RS485)
- Integrated into Totally Integrated Automation

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## The universal frequency inverter for drive technology

Feature	MM420 	MM430 	MM440 	Benefits
<b>Type of construction</b>	A-C	C-FX/GX	A-FX/GX	<ul style="list-style-type: none"> <li>Standardized, graded types of construction for all three models</li> <li>Identical drilling template for each type of construction saves time when fitting control cabinets</li> <li>Standardized base components allow for space-saving control cabinet solutions for various applications</li> </ul>
<b>HMI</b>	BOP AOP AAOP CAOP	BOP-2	BOP AOP AAOP CAOP	<ul style="list-style-type: none"> <li>Standard diagnostics via LEDs on every inverter</li> <li>Various operator panel options: from the basic operator panel (BOP) to plain-text operator panels (AOP), also available for Chinese (AAOP) and Cyrillic (CAOP) languages</li> <li>BOP-2 customized for the requirements of industrial pumps and fans</li> <li>Identical operating concepts for all operator panels. "Learn one – operate them all. Anywhere in the world!"</li> </ul>
<b>Motor protection</b>	Locked rotor protection  Motor overtemperature $I_{max}$ controller	Locked rotor protection  Motor overtemperature PTC/KTY84 input $I_{max}$ controller	Locked rotor protection Motor stall prevention  Motor overtemperature PTC/KTY84 input $I_{max}$ controller	<ul style="list-style-type: none"> <li>Standard feature: <math>I^2t</math> motor protection without external sensors or evaluation units</li> <li>In the event of overload, the drive can continue to operate at reduced speed thanks to the <math>I_{max}</math> controller. This ensures a high degree of plant availability.</li> <li>Refined motor protection with MM430 and MM440 by means of a special PTC/KTY84 input</li> </ul>
<b>Braking</b>	Control of external motor holding brakes  DC braking Compound braking	Control of external motor holding brakes  DC braking Compound braking	Control of external motor holding brakes  DC braking Compound braking Integrated brake-chopper control (up to 75 kW)	<ul style="list-style-type: none"> <li>Standard braking option as basic functionality. Can thus be used for many applications even without additional components</li> <li>For stringent braking requirements, dynamic braking with integrated chopper control. Thus, the load can be stopped in a controlled manner, irrespective of the load.</li> </ul>
<b>Inverter protection</b>	Undervoltage Overvoltage Overload Overtemperature $V_{dc\ max}$ controller	Undervoltage Overvoltage Overload Overtemperature $V_{dc\ max}$ controller Phase failure	Undervoltage Overvoltage Overload Overtemperature $V_{dc\ max}$ controller  Phase failure Kinetic buffering ( $V_{dc\ min}$ controller)	<ul style="list-style-type: none"> <li>Extensive safety mechanisms protect your investment and installation</li> <li>High availability in the event of voltage fluctuations on the power supply. With the <math>V_{dc\ max}</math> controller, automatic adjustment of the deceleration ramp prevents the inverter from shutting off unintentionally during deceleration with high inertia loads. This enables controlled deceleration of the motor in the event of a power failure. During short voltage drops, the <math>V_{dc\ min}</math> controller bridges the power failure without compromising application performance.</li> </ul>
<b>Special functions</b>	DIP 50/60 Hz BICO	DIP 50/60 Hz BICO Free function blocks Pump functions (motor staging, power-save mode, dry-run detection, bypass support)	DIP 50/60 Hz BICO Free function blocks	<ul style="list-style-type: none"> <li>Just the right device for every application thanks to graded functionality of all three models</li> <li>DIP switch for easy switchover of the factory setting from IEC to NEMA motor data</li> <li>Free function blocks allow for simple logic tasks and sequence control tasks such as interlocks directly in the inverter even without external miniature controllers. Thanks to the BICO functionality, the assignment of inputs and outputs is user-definable, as is the wiring of parameters.</li> </ul>

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## References

### MICROMASTER 420: Heavy-duty frequency inverter for Schulthess: Industrial washing machines

#### The task

Schulthess, a well-established Swiss company, has been successfully manufacturing washing machines for industrial and commercial applications for the past 100 years. In order to achieve optimum results, washing machines for use in industry must exhibit flexibility and the ability to adapt to an intelligent wash process. During this process, the heavy drum filled with laundry must operate at various speeds, including high speeds during the spin cycle.



#### The solution

The MICROMASTER 420 frequency inverter scores points here with two main performance features: A high output frequency of up to 650 Hz in conjunction with the use of asynchronous motors allows for drum speeds of up to 1100 rpm during the spin cycle. Factory-equipped lacquered electronic boards make the inverter extremely rugged, enabling it to withstand the constantly prevailing high temperatures within the machine, the humidity, and the accumulating dust. The manufacturer is highly satisfied by the software-supported commissioning procedure with "STARTER", the menu-assisted commissioning tool: When developing new washing machines and optimizing wash programs, modified drive parameters can be loaded to the inverter via the standard RS485 interface on an entirely individual basis. So the next time around, the laundry will be washed clean with even more gentle care!

### MICROMASTER 430: Fully automatic water treatment at the zoo: High-performance inverters for a wide range of tasks

#### The task

Visitors to the zoo in Nuremberg, Germany can experience polar bears first-hand, even under water, because the bears' living area includes a tank with a viewing window. In this compound comprising 1,700 m<sup>2</sup> in total with 600 m<sup>2</sup> of water surface area, 1200 m<sup>3</sup> must be cleaned on a daily basis. Keeping the viewing tank clean and clear throughout requires an extremely effective water treatment process. The tank must be cleaned to remove not only waste from the bears, but also trash, leaves, and branches. In addition, the extensive compound includes a waterfall and a water-jet fountain, which must also be operated. Thus, the task was to implement a powerful, integrated, and open speed control application that could adapt its pumping performance precisely to the job at hand.



#### The solution

A centralized pump assembly comprising five pumps is connected to the pipe system via automated valves and gates. The MICROMASTER frequency inverter operates these pumps with controlled speed. This is where the MICROMASTER 430 can really play up its strengths: gentle start-up of the pumps prevents water surges in the pipe system. The adjustment of speed enables efficient use of energy in the partial load operational range, thus enabling cost-effective operation. The drive technology is connected to a SIMATIC S7 programmable logic controller via PROFIBUS DP. The open, integrated automation technology, which extends from the sensors and drives all the way to the controller, is the highlight for the operator: with Totally Integrated Automation, he and his fellow employees have direct access to everything, "from top to bottom". And the polar bears and visitors can enjoy the clear view!

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## References

### MICROMASTER 440: Frequency inverters improve process technology in glass-fiber fleece production at Symalit

#### The task

Glass fiber fleeces are an important base material in the production of high-strength molded-plastic components, such as those used for automobile instrument panels or to form wheel housing covers. A homogeneous structure of these so-called composite boards is the number one objective of the production process. For drive technology, the challenge is to provide an extremely refined control process.

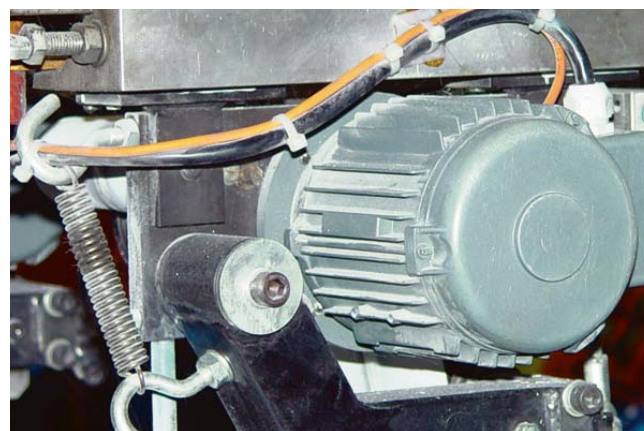
#### The solution

To produce the fleece, capillary-sized glass fibers are unrolled from a bobbin and placed onto conveyor belts in a continuous stream.

The vector control of the MICROMASTER 440 frequency inverter operates the machine axes with precise speed control and ensures an optimal distribution of fibers. An addi-

tional speed sensor is located on the actual belt drive. This signal feedback is evaluated by an optional module that can be plugged onto the inverter and provides the advantages of enabling the vector control of the inverter to operate even more accurately and increasing the dynamic response of the entire drive train.

In order to achieve the required long operating time of the installations, important drive axes are equipped in a redundant configuration with MICROMASTER 440 and operated alternately. Each time the equipment stops, the frequency inverter switches over automatically, thus increasing the overall production safety. During device replacement, the "fine tuning" that has been achieved remains intact in the parameters and is transferred to other devices by means of a data interface or via a plug-on operator panel. Thanks to drive control with MICROMASTER 440, targeted, precise improvements in the production process can be made on a continuous basis. And the tangible results can truly be felt in the homogeneous weight distribution of each composite board produced!



## Technical data

MICROMASTER 420 inverter		
Supply voltage and output ranges	200 to 240 V 1 AC ± 10 % 200 to 240 V 3 AC ± 10 % 380 to 480 V 3 AC ± 10 %	0.12 to 3 kW 0.12 to 5.5 kW 0.37 to 11 kW
Degree of protection	IP20	
Operating temperature	-10 to +50 °C (+14 to +122 °F)	
Overload capability/cycle time	Overload current 1.5 x rated output current (i.e., 150 % overload capability) for 60 s; cycle time 300 s	
Digital inputs	3 fully programmable isolated digital inputs; switchable PNP/NPN	
Analog input	1, for setpoint or PI controller (0 to 10 V, scalable or for use as 4 <sup>th</sup> digital input)	
Relay output	1, programmable, 30 V DC/5 A (resistive load), 250 V AC/2 A (inductive load)	
Analog output	1, programmable (0 to 20 mA)	
Control method	Linear V/f characteristic; quadratic V/f characteristic; multipoint characteristic (programmable V/f characteristic); flux current control (FCC)	
Fixed frequencies	7, programmable	

## Technical data

MICROMASTER 430 inverter		
Supply voltage and output ranges	380 to 480 V 3 AC $\pm$ 10 %	7.5 to 250 kW (variable torque)
Degree of protection	IP20	
Operating temperature	0 to +40 °C (+32 to +104 °F)	
Overload capability/cycle time	<b>at 7.5 to 90 kW:</b> Overload current 1.4 x rated output current (i.e., 140 % overload capability) for 3 s and 1.1 x rated output current (i.e., 110 % overload capability) for 60 s; cycle time 300 s <b>at 110 to 250 kW:</b> Overload current 1.5 x rated output current (i.e., 150 % overload capability) for 1 s and 1.1 x rated output current (i.e., 110 % overload capability) for 60 s; cycle time 300 s	
Digital inputs	6 fully programmable isolated digital inputs; switchable PNP/NPN	
Analog input	2 programmable analog inputs, both can be used as 7 <sup>th</sup> /8 <sup>th</sup> digital input 0 to 10 V, 0 to 20 mA and –10 to +10 V (AIN1) 0 to 10 V and 0 to 20 mA (AIN2)	
Relay output	3, programmable, 30 V DC/5 A (resistive load), 250 V AC/2 A (inductive load)	
Analog output	2, programmable (0/4 to 20 mA)	
Control method	Linear <i>V/f</i> characteristic; quadratic <i>V/f</i> characteristic; multipoint characteristic (programmable <i>V/f</i> characteristic); flux current control (FCC), power save mode	
Fixed frequencies	15, programmable	

MICROMASTER 440 inverter			
Supply voltage and output ranges	200 to 240 V 1 AC $\pm$ 10 %	CT (constant torque)	VT (variable torque)
	200 to 240 V 3 AC $\pm$ 10 %	0.12 to 3 kW	–
	380 to 480 V 3 AC $\pm$ 10 %	0.12 to 45 kW	5.5 to 55 kW
	500 to 600 V 3 AC $\pm$ 10 %	0.37 to 200 kW	7.5 to 250 kW
		0.75 to 75 kW	1.5 to 90 kW
Degree of protection	IP20		
Operating temperature	<b>at CT, 0.12 to 75 kW:</b> –10 to +50 °C (+14 to +122 °F) <b>at VT, 0.12 to 75 kW:</b> –10 to +40 °C (+14 to +104 °F) <b>at 90 to 200 kW:</b> 0 to +40 °C (+32 to +104 °F)		
Overload capability/cycle time	<b>at CT, 0.12 to 75 kW:</b> Overload current 1.5 x rated output current (i.e., 150 % overload capability) for 60 s; cycle time 300 s and 2 x rated output current (i.e., 200 % overload capability) for 3 s; cycle time 300 s <b>at CT, 90 to 200 kW:</b> Overload current 1.36 x rated output current (i.e., 136 % overload capability) for 57 s; cycle time 300 s and 1.6 x rated output current (i.e., 160 % overload capability) for 3 s; cycle time 300 s <b>at VT, 5.5 to 90 kW:</b> Overload current 1.4 x rated output current (i.e., 140 % overload capability) for 3 s and 1.1 x rated output current (i.e., 110 % overload capability) for 60 s; cycle time 300 s <b>at VT, 110 to 250 kW:</b> Overload current 1.5 x rated output current (i.e., 150 % overload capability) for 1 s and 1.1 x rated output current (i.e., 110 % overload capability) for 59 s; cycle time 300 s		
Digital inputs	6 fully programmable isolated digital inputs; switchable PNP/NPN		
Analog input	2 programmable analog inputs, both can be used as 7 <sup>th</sup> /8 <sup>th</sup> digital input 0 to 10 V, 0 to 20 mA and –10 to +10 V (AIN1) 0 to 10 V and 0 to 20 mA (AIN2)		
Relay output	3, programmable, 30 V DC/5 A (resistive load), 250 V AC/2 A (inductive load)		
Analog output	2, programmable (0/4 to 20 mA)		
Control method	Vector control, torque control, linear <i>V/f</i> characteristic; quadratic <i>V/f</i> characteristic; multipoint characteristic (programmable <i>V/f</i> characteristic); flux current control (FCC)		
Fixed frequencies	15, programmable		

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Nd. 0908 7.0 VOG / 822358  
Printed in Germany  
© Siemens AG 2008  
Modification January 2009

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