

MXG461B Series

Modulating Control Valves with Magnetic Actuators, Positioning Control and Position Feedback for Domestic Water



Description	Control valves with magnetic actuators, for modulating control of domestic water, cold water and hot water systems.							
Features	• Fast positioning time (< 2 seconds) • Selectable valve characteristic: Equal percentage or linear • Selectable standard interface: 0/2 to 10 Vdc or 0/4 to 20 mA • High resolution (>1:1000) • High rangeability • Wear-free inductive stroke measurement • Spring return A → AB closed when de-energized • Positioning control and position feedback signal • Low-friction, heavy-duty and maintenance-free • Accepts 0 to 20 Vdc phase-cut control signal input							
Product Numbers	See Table 1.							
Warning/Caution Notations	<table><tr><td>WARNING:</td><td></td><td>Personal injury or loss of life may occur if you do not follow the procedures as specified.</td></tr><tr><td>CAUTION:</td><td></td><td>Equipment damage or loss of data may occur if you do not follow the procedures as specified.</td></tr></table>		WARNING:		Personal injury or loss of life may occur if you do not follow the procedures as specified.	CAUTION:		Equipment damage or loss of data may occur if you do not follow the procedures as specified.
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Application

The MX4G61B Series valves are through-port or mixing valves with magnetic actuators. The actuator is equipped with an electronics module for positioning control and position feedback. If the power is off, the valve control path A → AB is closed.

The short positioning time, high resolution and high rangeability make these valves ideal for modulating control of domestic, hot and cold-water systems.

Table 1. Product Numbers.

Product Number	Line Size (in)	Cv			S _{NA} (VA)	P _{med} (W)	I _N Fuse	Wire Gauge (AWG)		
			Δp _S	Δp _{max}				16	14	12
			(psi)	(psi)					L (ft)	
MXG461B15-0.6	1/2	0.7	145	70	33	15	3.15	130	215	360
MXG461B15-1.5	1/2	1.8	145	70	33	15	3.15	130	215	360
MXG461B15-3	1/2	3.5	145	70	33	15	3.15	130	215	360
MXG461B20-5	3/4	5.8	116	70	33	15	3.15	130	215	360
MXG461B25-8	1	9.3	102	40	33	15	3.15	130	215	360
MXG461B32-12	1-1/4	14	87	40	43	20	4	100	165	260
MXG461B40-20	1-1/2	23	87	40	43	20	4	100	165	260
MXG461B50-30	2	35	87	40	65	22	6.3	65	100	185

Key:

- Δp_{max} = Maximum permissible differential pressure across the valve's control path, valid for the entire actuating range of the motorized valve (maximum recommended operating differential pressure).
- Δp_S = Maximum permissible differential pressure at which the motorized valve will close securely against the pressure (close-off pressure).
- S_{NA} = Nominal apparent power for selecting the transformer.
- P_{med} = Average true power.
- I_N = Slow fuse (mandatory).
- Cv = Nominal flow rate of cold water [41°F to 86°F (5°C to 30°C)].
- L = Maximum cable length. With four-wire connections the maximum permissible length of the separate 14 AWG Cu signal cable is 656 feet (200 m).

Ordering

- The valve body and magnetic actuator assemblies cannot be separated.
- The brass/bronze fittings are included.
- When placing an order, specify the quantity, product number and description.

Example: 1 MXG461B15-0.6 valve and 1 ASE12 Replacement Circuit Board

Accessory

ASE12 Replacement Circuit Board

Technical/ Mechanical Design

Operation Control

The electronics module converts the positioning signal to a phase-cut power signal, which generates a magnetic field in the coil. This causes the armature to change its position according to the interacting forces (magnetic field, counterspring, hydraulics, etc.). The armature responds rapidly to any change in signal, transferring the corresponding movement directly to the valve plug. This enables fast changes in load to be corrected quickly and accurately.

The valve's position is measured continuously. Any disturbance in the system is rapidly corrected by the internal positioning controller, which ensures that the positioning signal and the valve stroke are exactly proportional, and also delivers the position feedback signal.

Control

The magnetic actuator can be driven by any controller with a 0/2 to 10 Vdc or 0/4 to 20 mA output signal.

To achieve optimum control performance, it is recommended to use a 4-wire connection for the valve.

NOTE: When using a dc power supply a 4-wire connection is **mandatory**.

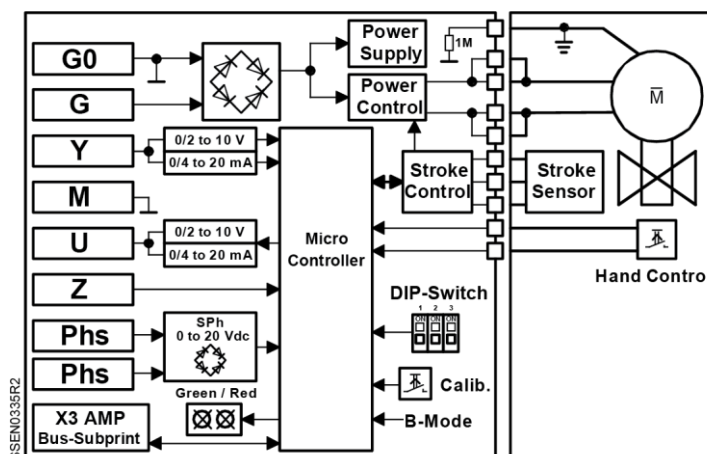
The controller's signal ground terminal M must be connected to the valve's terminal M. Terminals M and G0 have the same potential and are internally interconnected in the valve's electronics.



CAUTION:

You must use a four-wire connection with Vdc power supply.

Basic Diagram



Spring Return Action

If the power or positioning signal is switched off or fails, the valve control path (port A → AB) is automatically closed by the force of the spring.

Table 2. Indication of Operating State.

LED	Indication	Operating State, Function	Remarks, Troubleshooting
Green	Lit	Control mode	Normal operation; everything OK.
	Flashing	Calibration	Wait until calibration is finished (green or red LED will be lit).
		In manual control	Hand wheel in Man or Off position.
Red	Lit	Calibration error	Recalibrate (bridge contacts behind the calibration slot).
		Internal error	Replace electronics module.
	Flashing	Mains fault	Check electric main network (outside the frequency or voltage range);
		DC Supply +/-	Vdc supply +/- connection polarity.
Both	Dark	No power supply Electronics faulty	Check electric main network, check wiring. Replace electronics module.

Manual Adjustment

Press (a) and turn the hand wheel (b):

- clockwise (CW). Control path A → AB can be mechanically opened to between 80% and 90%, or
- counterclockwise (CCW). The actuator will be switched off and the valve closed.

As soon as the hand wheel is pressed and turned, neither the forced control signal Z, the input signal Y, nor the phase-cut signal acts on the actuator. The green LED will flash.

For automatic control, the hand wheel must be set to the Auto position. The green LED will be lit.

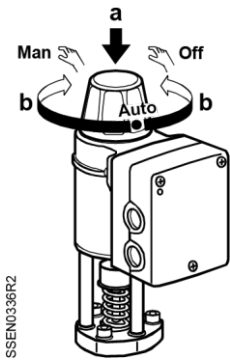


Figure 1.

Calibration

If the electronics module is replaced or the actuator turned through 180°, the valve's electronics must be recalibrated. To recalibrate, the hand wheel must be set to Auto.

The printed circuit board has a slot (see Figure 2). Calibrate by bridging the contacts located behind the slot on the printed circuit board, using a screwdriver. The valve will then travel across the full stroke to store the end positions.

While calibration is in progress, the green LED will flash for about 10 seconds (see *Indication of Operating State*).

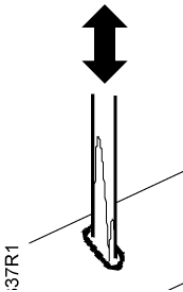


Figure 2.

DIP Switches

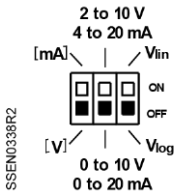


Figure 3. Configuration DIP Switches.

DIP	Function	OFF (Default)	ON	Remarks
1 ON OFF	Voltage or current input	[V]	[mA]	Assignment of terminal Y: Voltage or current
2 ON OFF	Correcting span Terminals Y and U	0 to 10 Vdc, 0 to 20 mA	2 to 10 Vdc, 4 to 20 mA	Offset settings of input and output
3 ON OFF	Characteristic	Vlog (equal percentage)	Vlin (linear)	—

DIP Switches, Continued

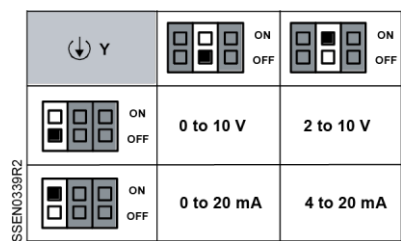


Figure 4. Assignment of Positioning Signal Y: Voltage or Current.

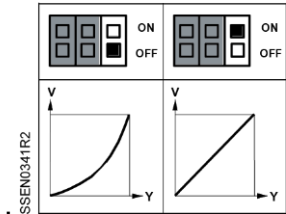


Figure 5. Selection of Valve Characteristic: Equal-Percentage or Linear.

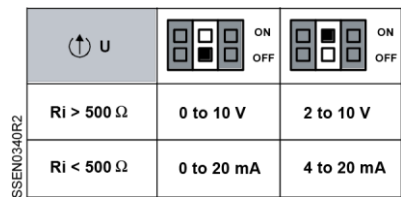


Figure 6. Assignment of Correcting Span Y and U: 0 to 10 Vdc/0 to 20 mA or 2 to 10 Vdc/4 to 20 mA.

Output signal U (position feedback signal) is dependent on the load resistance. Above 500 ohm, it is automatically a voltage signal; below 500 ohm a current signal.

Forced Control Input

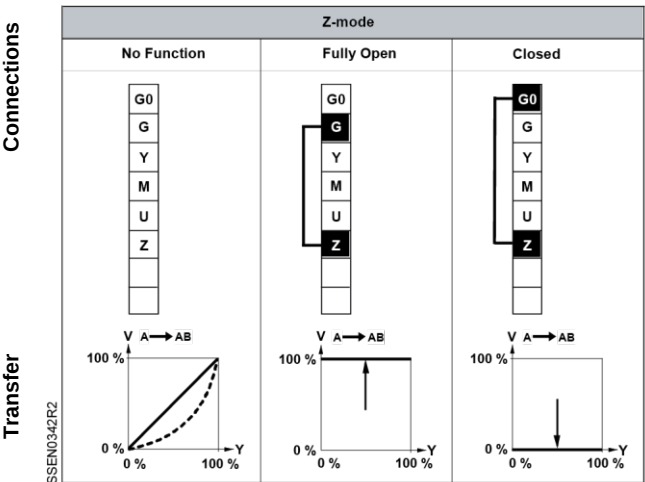


Figure 7.

- If terminal Z for the forced control input is:
- not connected, the valve will follow the Y-signal or the phase-cut signal.
 - connected to G, the valve will fully open via control path A → AB.
 - connected to G0, the valve will close via control path A → AB.

Signal Priority

1. Hand wheel position Man or Off
2. Forced control signal Z
3. Phase-cut signal
4. Signal input Y

Valve Sizing
Characteristic

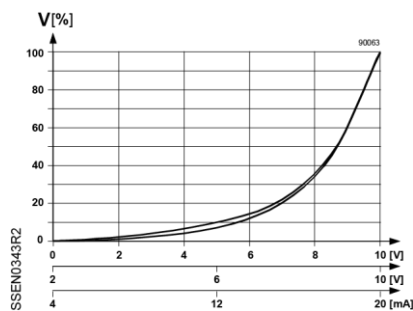


Figure 8. Equal Percentage.

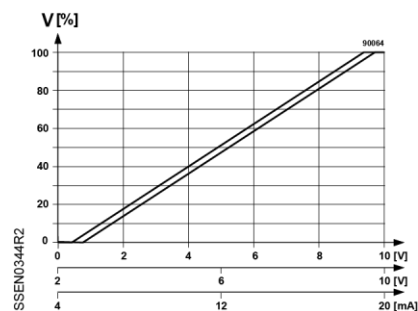


Figure 9. Linear.

Installation Notes

- Installation instructions for the valve and terminal housing are enclosed with the valve.
- Valves are supplied complete with brass/bronze fittings.
- The screwed valves are flat-faced to facilitate sealing with the gaskets supplied. The use of sealing compounds, tape or hemp thread is not recommended.
- For electrical installation, see *Wiring Diagrams*.



CAUTION:

- Always disconnect the power before fitting or removing the terminal housing. The terminal housing is calibrated and matched to the actuator and should be replaced only by qualified personnel.
- Use the valve only as a mixing or straight-through valve, not as a diverting valve. Note the flow direction.
- Do not allow the surface temperature of the actuator to fall below the dew point temperature of the surrounding air (causing condensation). If necessary, insulate the valve. Do not insulate the actuator.

Use in Straight-through Applications

Only three-way valves are supplied. These may be used as straight-through valves by closing off port B with the accessories supplied (nut, cover and gasket).

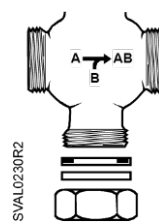


Figure 10. Straight-through Application.

Mounting Position

Vertical to horizontal mounting:
Do not mount the valve below the horizontal.

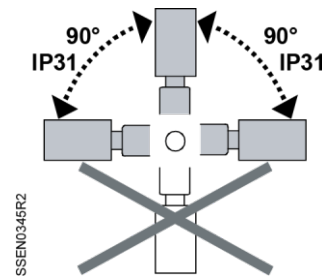


Figure 11. Acceptable Mounting Positions.

Specifications	Low-voltage use only		Class 2 (SELV, PELV)
	24 Vac		
Electrical	Operating voltage		24 Vac $\pm$ 20%
	Frequency		45 to 65 Hz
	Typical power consumption		See Table 1 P_{med}
	Standby		<1 W (valve fully closed)
	Nominal apparent power		See Table 1, S_{NA}
	Suitable fuse		Slow, see Table 1, I_N
	24 Vdc		
	Operating voltage		20 to 30 Vdc
	Current draw		0.5A/4A (maximum)
Functional data, actuator	Input		
	Positioning signal Y		0/2 to 10 Vdc or 0/4 to 20 mA, or 0 to 20 Vdc Phs phase cut
	Impedance	0/2 to 10Vdc 0/4 to 20 mA	100K ohm//5nF (load < 0.1mA) 240 ohm//5nF
	Forced control		
	Impedance		22K ohm
	Closing the valve (Z connected to G0)		<1 Vac; <0.8 Vdc
	Opening the valve (Z connected to G0)		>6 Vac; >5 Vdc
	No function (Z not wired)		Phase-cut or positioning signal Y active
	Output		
	Position feedback signal U	voltage current	0/2 to 10 Vdc; load resistance > 500 Ω 0/4 to 20 mA; load resistance $\leq$ 500 Ω
Functional data, valve	Stroke measurement		Inductive
	Nonlinearity		$\pm$ 3% of end value
	Nominal pressure		ANSI 125 (PN 16)
	Operating pressure $p_{e,max}$ ¹⁾		232 psi (16 bar)
	Pressure differential $\Delta p_{v,max}$		See Table 1
	Leakage at		A $\rightarrow$ AB max. 0.05% Cv
	$\Delta p = 14.5$ psi (1 bar)		B $\rightarrow$ AB < 0.2% Cv depending on operating conditions
	Permissible media		Drinking water, cooling, cold and hot water, water with anti-freeze
	Water temperature		–4°F to 266°F (–20°C to 130°C)
	Valve characteristic ²⁾		Equal percentage or linear, optimized near the closing point
Materials	Resolution $\Delta H/H_{100}$		1 : 1000 (H = Stroke)
	Type of operation		Modulating
	Position when de-energized		A $\rightarrow$ AB closed
	Orientation:		Upright to horizontal
	Positioning time		<2 seconds
	Valve body		Red bronze (CC499K)
	Cover flange		Red bronze (CC499K)
	Seat/Inner valve		Stainless Steel
	Valve stem seal		EPDM (O-ring)

1. Tested at 1.5 $\times$ PN (24 bar), similar to DIN 3230-3

2. Can be selected via DIP switch.

Specifications,
Continued

Pipe connections	Screwed fittings	Bronze/brass
Electrical connections	Cable entries Connection terminals Min. cross-sectional area ¹⁾ Max. cable length	2 × Ø 20.5 mm (for M20) Screw terminals for up to 12 AWG wires 0.75 mm ² See Table 1, 9 (AWG)
Ambient conditions	Temperature Operation and storage Transport Humidity	23°F to 113°F (-5°C to 45°C) -13°F to 158°F (-25°C to 70°C) 5 to 95% rh (non-condensing)
Agency approvals	Degree of protection	IP31 to EN60529 Conforms to CE requirements CA2T4461.1 UL 873 Certified to Canadian standard C22.2 No. 24 C-Tick N-474 PED 2014/68/EU DW-6340BR0230
	DVGW-Reg.-Nr. (EU potable water standard)	
Miscellaneous	Weight Dimensions	See Figure 15 See Figure 15

Connection
Terminals



WARNING:

If the controller and the valve receive their power supply from separate sources, the valve transformer must not be grounded on the secondary side.

A four-wire connection is mandatory with DC power supply.

Controllers with:
0 to 10 Vdc
2 to 10 Vdc
0 to 20 mA
4 to 20 mA

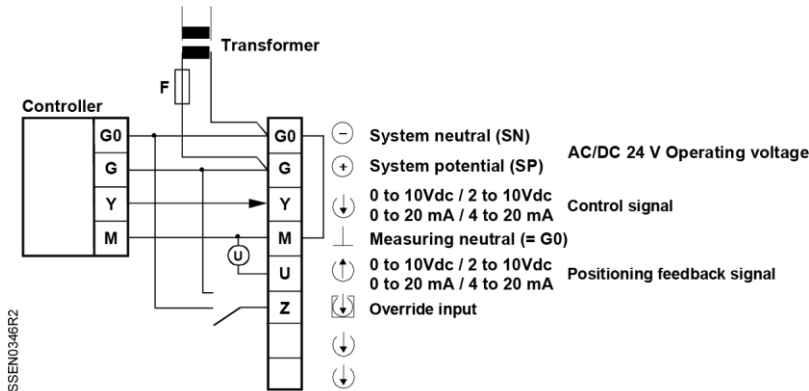


Figure 12.

1. In case of strong vibrations, use high-flex stranded wires.

Connection Terminals, Continued

Controllers with phase-cut
0 to 20 Vdc

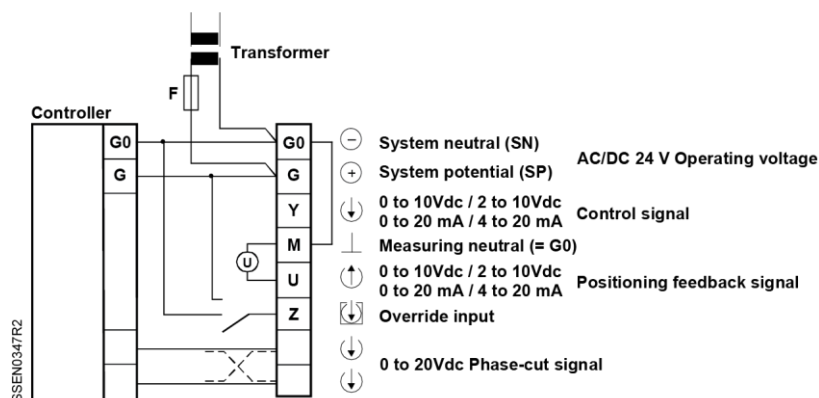


Figure 13.

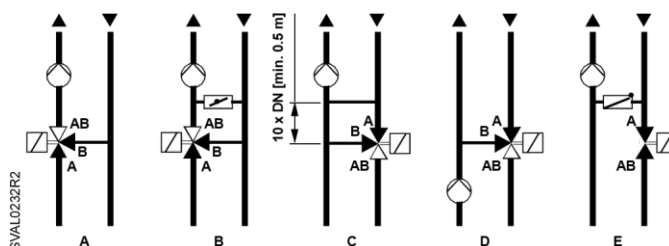
Application Examples

This example shows only a schematic diagram, without installation-specific details.



CAUTION:

1. Use the valve only as a mixing or straight-through valve, not a diverting valve. Note the direction of flow.
2. Ensure that adequate air venting is provided for the entire hydronic system.
3. Select a non-return valve with minimum pressure loss for the circulating pipes.



Key :

- | | | | |
|---|---|---|---|
| A | Mixing circuit | C | Injection circuit |
| B | Mixing circuit with bypass
(underfloor heating system) | D | Diverting circuit |
| | | E | Injection circuit with through-port valve |

Figure 14.

Service



CAUTION:

Do not disassemble the valve and actuator combination. This assembly is factory-calibrated and should only be replaced by qualified personnel.

- The low-friction and robust, maintenance-free design makes regular servicing unnecessary and ensures a long service life.
- The valve stem is sealed from external influences by a maintenance-free gland.
- If the red LED is lit, the electronics must be recalibrated or replaced.
- If required, the circuit board can be replaced. Order part number ASE12.

Dimensions

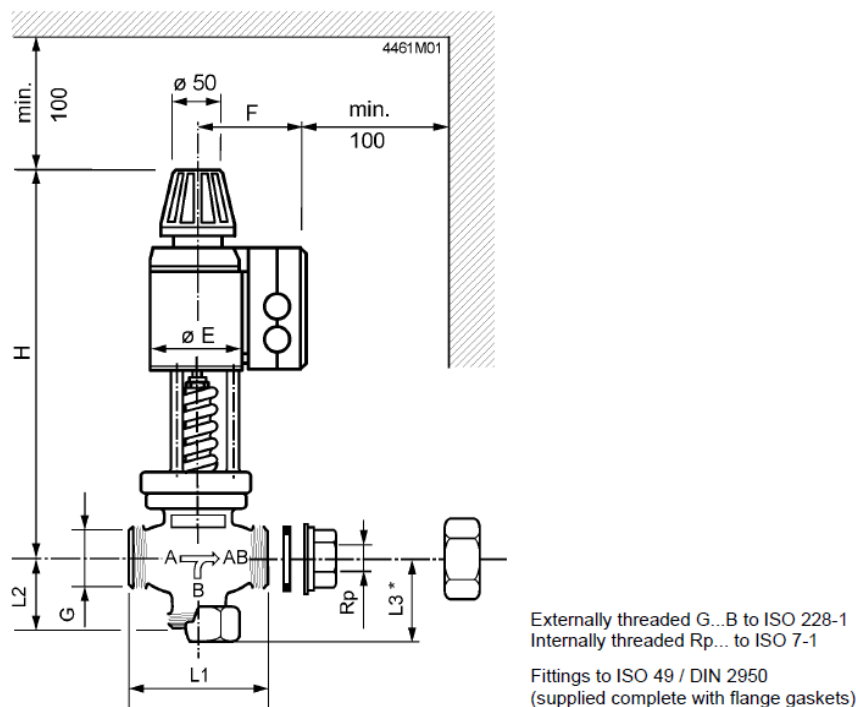


Figure 15. Dimensions in Inches (Millimeters).

NOTE: The screwed fittings and gaskets are supplied with these valves.

Product Number	DN		G (in)	L1	L2	L3	H	E	F	W lb (kg)
	(mm)	(in)								
MXG461B15-0.6	15	Rp ½	G1B	3.15 (80)	1.67 (42.5)	1.97 (50)	13.4 (340)	3.15 (80)	4.53 (115)	15.65 (7.1)
MXG461B15-1.5	15	Rp ½	G1B	3.15 (80)	1.67 (42.5)	1.97 (50)	13.4 (340)	3.15 (80)	4.53 (115)	16.09 (7.3)
MXG461B15-3	15	Rp ½	G1B	3.15 (80)	1.67 (42.5)	1.97 (50)	13.4 (340)	3.15 (80)	4.53 (115)	16.09 (7.3)
MXG461B20-5	20	Rp ¾	G1¼B	3.74 (95)	2.07 (52.5)	2.36 (60)	13.3 (339)	3.15 (80)	4.53 (115)	16.97 (7.7)
MXG461B25-8	25	Rp 1	G1½B	4.33 (110)	2.22 (56.5)	2.52 (64)	13.6 (346)	3.15 (80)	4.53 (115)	18.73 (8.5)
MXG461B32-12	32	Rp 1¼	G2B	4.92 (125)	2.66 (67.5)	2.95 (75)	15.12 (384)	3.94 (100)	4.92 (125)	28.22 (12.8)
MXG461B40-20	40	Rp 1½	G2¼B	5.51 (140)	3.17 (80.5)	3.66 (93)	15.79 (401)	3.94 (100)	4.92 (125)	32.19 (14.6)
MXG461B50-30	50	Rp 2	G2¾B	6.69 (170)	3.68 (93.5)	4.2 (108)	402 (15.83)	3.94 (100)	4.92 (125)	41.00 (18.6)

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Document No. 125-4461
Printed in the USA
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