

CURRENT INDUSTRIAL REPORTS SERIES

2007

MA334C — CONTROL INSTRUMENTS

DEFINITIONS AND SPECIAL INSTRUCTIONS

1. Scope of this survey

This survey covers the manufacture of control instruments.

2. Figures to be reported

Companies with more than one establishment manufacturing the products covered by this survey are requested to complete a separate report form for each location. If you have not received a separate form for each of your establishments, please call the contact shown on the report form or write to the U.S. Census Bureau for additional forms.

a. Quantity and Value of Shipments

The figures on quantity and value of shipments should include the physical shipments of all products sold, transferred to other establishments within your company, or shipped on consignment, whether for domestic or export sale. The value represents the net sales price, f.o.b. plant, to the customer or branch to which the products are shipped, net of discounts, allowances, freight charges and returns. Shipments to your own branches should be assigned the same value as comparable sales to unaffiliated customers, i.e., the value includes an appropriate allocation of company overhead and profit. Products bought and resold without further manufacture should not be included in shipments.

b. Unit of measure

When posting your figures to the original report, please be sure to report information in the correct columns. These are:

Column 1 – Quantity of shipments

Column 2 – Value (Report shipments in thousands of dollars. (Example: \$1,000,000, report as \$1,000)

Report value figures in thousands of dollars. Each product should be reported separately. Do not combine product lines.

3. Definitions

Many of the products are listed separately, either as control components or as control assemblies. Report separate data for such products, but do not report separate control components which are sold as an integral part of a control assembly.

Relay—A device that is operative by a variation in the conditions of one circuit to effect the operation of other devices in the same or another electric circuit.

Control relay—A relay which functions to initiate or to permit the next desired operation in a control circuit or scheme.

Overload relay—A relay which functions at a predetermined value of current (overcurrent relay).

Busway—A prefabricated electric distribution system consisting of bus bars in a protective enclosure, together with associated fittings. All busways include as a minimum: bus bars, some supporting means for these bars, and a housing around them.

Industrial control relays (all voltages)—A.c. and d.c. operated electromagnetic relays rated for resistive loads and used to perform logic functions in industrial electronic applications. Includes plug-in, ice cube, printed circuit card mounted and base mounted relays with mounted timer attachments. Excludes timer attachments sold separately, relays designed for use with metal mill or crane control, and relays incorporated in products covered by other categories. Also excludes solid-state relays and relays designed for military applications, or for the appliance or telephone industry.

3. Definitions—Continued

Electronic relays (all voltages)—A.c. and d.c. operated electromagnetic relays rated for resistive loads and used to perform logic functions in industrial electronic applications. Includes plug-in, ice cube, printed circuit card mounted and base mounted relays with mounted timer attachments. Excludes timer attachments sold separately, relays designed for use with metal mill or crane control, and relays incorporated in products covered by other categories. Also excludes solid-state relays and relays designed for military applications.

Solid-state relays (all voltages)—Solid-state relays sold as individual items. Typically, these are single circuit devices that use a logic level signal to control a 120 volt circuit. Excludes overcurrent relays and output devices of logic systems sold separately, mill and crane accessories, and similar items incorporated in a product covered by any other category.

Solid-state industrial control timers (all voltages)— Interval and time-delay relays that have their timing period controlled by a circuit using semiconductors, regardless of output means. Excludes relays with solid-state timer attachments and timers designed as solid-state logic units or for metal mill or crane applications or incorporated in products covered by other categories.

Nonsolid-state industrial control timers (all voltages)—Mechanically or electrically operated a.c. or d.c. timers designed primarily to operate in logic and

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control circuits of industrial applications. Includes mechanically programmed timers, timing attachments used with contactors or relays, motor driven, and pneumatic timing relays, time delay relays (nonelectric), interval timers and under voltage time delay relays. Excludes solid-state timers, relays with timer attachments mounted and timers designed as solid-state logic units or for metal mill or crane applications or incorporated in products covered by other categories.

SPECIFIC APPLICATION OR SPECIFIC INDUSTRY CONTROLS:

Metal mill controls and accessories (all voltages)—Any a.c. or d.c. power or control circuit device designed for and sold separately for metal mill applications. Includes master switches, limit switches (power or control circuits), timers, relays, etc.

Crane and hoist controls (all voltages)—A.c. or d.c. control assemblies designed to control hoist, trolley, and/or bridge motion for application in mines, traffic carrying bridges, elevators, and general industry. Includes crane protective panels, hoist or crane master switches and adjustable speed drives for these purposes, except those for marine applications. Excludes crane and hoist controls for marine applications, pendant control stations, and other accessories sold separately.

Definite purpose contactors and starters (600 volts or less)—Definite purpose full voltage contactors and starters, including open and enclosed devices. Including, but not limited to, heating loads, lighting loads, refrigeration, solid-state starters and contact, etc.

Computer numerical controls—A computer-based motion control device programmable in numerical word address format, such as EIA RS-274D, RS-494, or equivalent international standard. A computer numerical control (CNC) product typically includes a CPU module, associated panel and processor rack equipment, operator interface devices, input/output signal and data devices, software and related peripheral apparatus.

Robotic controls—A computer-based motion control device primarily designed to control the motion of a robot. A robot is defined as a “reprogrammable multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable program motions for the performance of a variety of tasks.”

Other stand alone motion controls—Self-contained, processor-based motion/positioning control devices for single axis and multiaxis applications, programmable in various languages, for control of servo or stepper drives and motors.

Subordinate motion controls—Processor-based devices which internally execute motion programs, yet rely on

connection to an external bus or rack for power, communications, and supervisor control.

Programmable control motion module—A subordinate motion control device which is intended for use in or with a programmable controller.

Bus motion module—A subordination motion control device which is intended for use with general purpose computers, such as personal computers, VME, STD, Multibus.

Chip-level device—Integrated circuit-based motion control devices intended for incorporation in circuit board designs.

Other specific purpose equipment (all voltages)—Any industrial control equipment designed for a specific application which is not covered by any other category, such as aircraft contactors and controllers rated 601V up to 2,200V, dynamic braking controls sold separately, dimmers, and automatic transfer switches.

3. Definitions—Continued

SPECIFIC APPLICATION OR SPECIFIC INDUSTRY CONTROLS—Continued

A.c. or d.c. control panels (all voltages)—Assemblies of components in which the principal power circuits are a.c. or d.c., for applications other than welding, marine auxiliaries, crane, hoist, or adjustable speed drives. Also excluded are panels which have been the outputs controlled by solid-state digital logic. Specifically included are analog controllers, furnace and lifting magnet controls, regulators, and motor controls which provide for plugging and/or dynamic braking.

GENERAL PURPOSE CONTROLS:

A.c. full voltage, noncombination magnetic starters (1,000 volts or less)—Electromagnetic switches with overload protection rated in amperes, horsepower, or kilowatts for application at full voltage with nonsynchronous motors. Includes open and enclosed; single and multispeed; reversing and nonreversing; electrically, mechanically, or magnetically held; a.c. or d.c. operated; and controls for one or more squirrel cage or wound rotor motors. Excludes those starters which qualify for any “Specific application” item.

A.c. full voltage combination magnetic starters (1,000 volts or less)—Electromagnetic switches with or without overload protection combined with a disconnect device, rated in amperes, horsepower, or kilowatts for application at full voltage with nonsynchronous motors. Includes open and enclosed; single and multispeed; reversing and nonreversing; electrically, mechanically, or magnetically held; a.c. or d.c. operated; and controls for one or more squirrel cage or wound rotor motors. Variations include those with fusible or nonfusible

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disconnect switch or circuit breaker; all those for oil well, irrigation, or other pumping application. Excludes those starters which qualify for any "Specific application" item.

Disconnect switches (600 volts or less)—A 600 volt rated switch intended primarily to be used with electric motor controls, and where available, fault currents greater than 10 KA RMS symmetrical are likely to be encountered. The device may be HP and ampere rated, and may meet the requirements for service entrance disconnecting means. "Safety Switches" are not included in this category.

A.c. full voltage manual controllers (1,000 volts or less)—Manual switches with or without overload protection, with or without disconnect devices, rated in amperes, horsepower, or kilowatts for application at full voltage with nonsynchronous motors. Includes open and enclosed; single and multispeed; reversing and nonreversing; electrically, mechanically, or magnetically held; a.c. or d.c. operated; and controls for one or more squirrel cage or wound rotor motors. Variations include toggle switches, drum switches, and loop switches. Excludes those starters which qualify for any "Specific application" item.

A.c. magnetic contactors (1,000 volts or less)—Electromagnetic switches without overload protection, and without disconnect devices, rated in amperes, horsepower, or kilowatts for application at full voltage with nonsynchronous motors. Includes open and enclosed; single and multispeed; reversing and nonreversing; electrically, mechanically, or magnetically held; a.c. or d.c. operated, for lighting, heating, motor, power distribution, or high frequency applications.

A.c. reduced voltage magnetic or manual controllers (1,000 volts or less)—Magnetic switches without overload protection, with or without disconnect devices, rated in amperes, horsepower, or kilowatts, which start nonsynchronous motors. Includes open and enclosed, single and multispeed, reversing and nonreversing types. Variations include controllers with a primary or secondary resistor, reactor, auto-transformer, part-winding, and stardelta starters. Excludes those devices which qualify for any "Specific application" item.

Synchronous motor controllers (1,000 volts or less)—Armature and field controls for synchronous motors, starting at full or reduced voltage. Excludes those devices which qualify for any "Specific application" item.

Motor control centers (1,000 volts or less)—Factory-built customer-assembled control centers, including the sections and units sold separately.

Medium voltage nonsynchronous and synchronous motor controllers (over 1,000 through 7,200 volts)—Manual and magnetic devices for the control of squirrel cage, wound

rotor, and synchronous motors. Includes open and enclosed; combination and noncombination starters and contractors; full or reduced voltage; and reversing and nonreversing air break, vacuum break, and immersed. Excludes those devices which qualify for any "Specific application" item.

A.c. or d.c. friction brakes and clutches (all voltages)—All devices used to engage or control motion by slowing or stopping, provided the clutch or brake is operated or released electrically. Braking or clutch action may be controlled mechanically, hydraulically, or magnetically, using shoes or discs. Excludes dynamic braking controls.

3. Definitions—Continued

GENERAL PURPOSE CONTROLS—Continued

Electromechanical positioning sensors (all voltages)—A.c. or d.c. switches and sensors which respond to movement or position. Includes mechanical and air operated limited switches, and rotating CAM switches. Excludes those devices used in or covered by "solid state digital control systems" or are classified as "precision (1/8" gap or less) snap-acting switches."

Movement sensors (all voltages)—A device that detects if an object is moving in relation to the sensors. Such devices would include speed switches, encoders, resolvers, tachometers, etc.

Non-optical proximity sensors—An a.c. or d.c. device that detects a specified change in the energy field within the sensing zone of the switch, and causes the output to change its state. The energy field may be magnetic, electromagnetic, acoustical or dielectric.

Optical proximity sensors (all voltages) (photo-electrics)—A device that detects a specified change in light sensitivity (i.e., absence, presence, intensity) within the sensing zone of the switch, and causes output to change its state.

D.c. power circuit devices (all voltages)—Manual and magnetic devices sold separately for the control of d.c. power. Includes open and enclosed, combination and noncombination, full or reduced voltage, reversing or nonreversing, air brake oil immersed. Excludes those devices which qualify for any "Specific application" item.

Industrial control pushbuttons, selector switches, pilot lights, and foot switches (all voltages)—A.c. or d.c. manually operated devices designed primarily to operate in the control circuits or industrial applications. Includes control stations, reed devices, and rotary switches with control circuit ratings. Excludes metal mill and crane accessories and similar items incorporated in products covered by other categories, such as conversion kits to starters, and those designed for aircraft, appliances, business machines, computers, or elevator applications.

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Resistors and rheostats—Separate components and assemblies of carbon and metal resistors designed to function in a power or motor field circuit. Includes manual and motor operated rheostats, cast and wound metal resistors, and carbon pile resistors. Excludes resistors designed for use in electronics circuits.

A.c. and d.c. adjustable speed drive controls (all voltages)—The control portion of adjustable (regulated) speed drives, controlling motors by adjusting voltage or adjusting frequency. Includes single and multimotor drive controls, eddy current coupling drives, all elements of the power units (except motor generators), and all auxiliary controls sold as part of the drive system. Excludes all rotating equipment.

Packaged a.c. adjustable speed drive—All equipment required to adjust the speed or torque of an a.c. electric motor(s) by controlling both frequency and voltage applied to the motor(s). Includes rotating equipment.

Packaged d.c. adjustable speed drive—All equipment required to adjust the speed or torque of a d.c. electric motor(s) by controlling both frequency and voltage applied to the armature and/or field of the motor(s). Excludes rotating equipment.

A.c. and d.c. drive systems—An engineering system built to meet customer specifications, incorporating one or more power conversion modules; may control several motors in a coordinated manner. Includes a.c. and d.c. types. Excludes rotating equipment.

Solid-state contactors—All primarily solid-state devices designed to be used in the power circuit or control of ovens, furnaces, lighting, or other power consuming devices. This group also includes power switching devices used for turning motors on and off only. This does not include resistance welding controls, adjustable speed drive controls, and any other product which qualifies for inclusion in other “Specific application” or “General industry control” categories.

This group also includes solid-state braking devices. This does not include resistance welding controls, adjustable speed drive controls, and any other product which qualifies for inclusion in other “Specific application” or “General industry control” categories.

All other general industry devices and systems—Solid-state digital panels using either wired or retentive memory logic to provide data or control processes or machine functions systems, n.e.c.

Motor controller accessories—Those items which are sold separately but become part of a motor controller. Includes overload relays, auxiliary contacts, heater elements, mechanical interlocks, control transformers, kits to add pushbuttons, selector switches, pilot lights, separate controller enclosure and enclosure fittings, reset mechanisms, etc. Excludes motor circuit switches sold separately.

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4. Comparability

Data reported in this survey should correspond to data reported in the Economic Census - Manufacturing Sector form. The sum of values for item codes shown in column (a) should correspond to dollar values reported under product codes indicated in column (b) below.

Current Industrial Reports (Form MA334C) Item codes (a)	Economic Census - Manufacturing Sector Product codes (b)
2005 through 2035	3345120000
3007 through 3085	3345130000
3108 through 3118	3353131000
3305 through 3345	3353133000
3505 through 3510	3353135000
3705 through 3720	3353137000
3805	3353139000
3905 through 3945	335313A000
4105 through 4130	3353141000
4305 through 4335	3353143000
4505 through 4595	3353146000
4708 and 4713	3353147000

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REFERENCE LIST

FORM MA334C		CONTROL INSTRUMENTS
Product code	Item code	Item Description
CONTROLS FOR MONITORING RESIDENTIAL AND COMMERCIAL ENVIRONMENTS		
3345120102	2005	Temperature responsive (thermostats)
3345120115	2010	Igniters
3345120221	2015	Computerized energy control systems for buildings
3345120224	2020	Other automatic controls
3345120225	2025	Temperature responsive controls for major appliances
3345120227	2030	All other controls for appliances
3345120229	2035	Parts and components for controls for monitoring residential and commercial environments
3345120000	2097	Total controls for monitoring residential and commercial environments (<i>sum of item codes 2005–2035</i>)
PROCESS CONTROL INSTRUMENTS		
3345130101	3007	Unified electronic systems: controllers
3345130106	3010	Unified electronic systems: other
3345130107	3017	Unified electronic systems: auxiliary stations and analog computer devices
3345130109	3020	Nonunified electronic systems
3345130111	3025	Industrial multifunction process computers
3345130127	3030	Pneumatic systems and annunciators
334513022G	3035	Other industrial type instruments
334513021F	3040	Continuous process instruments
334513021V	3045	Instruments for all process variables not listed above
334513032S	3050	Parts for process control instruments
3345130240	3055	Temperature measuring instruments: electrical and electronic measuring types
3345130248	3060	Other temperature measuring instruments
3345130249	3065	Primary temperature sensors, excluding aircraft types: thermocouples
3345130251	3070	Primary temperature sensors, excluding aircraft types: other
3345130264	3075	Pressure and draft measuring instruments
3345130290	3080	Flow and liquid level measuring instruments: differential pressure types
3345130293	3085	Humidity instruments
3345130000	3097	Total process control instruments (<i>sum of item codes 3005–3085</i>)
POWER CIRCUIT BREAKERS		
3353131101	3108	Power circuit breakers (sold separately) for use in metal-clad switchgear (oil and oil-less), over 1,000 volts (report in number of breakers)
3353131103	3110	All other power circuit breakers, sold separately
3353131129	3118	Parts for all power circuit breakers
3353131000	3197	Total power circuit breakers (<i>sum of item codes 3105–3115</i>)
LOW VOLTAGE PANELBOARDS, DISTRIBUTION BOARDS, AND OTHER SWITCHING AND INTERRUPTING DEVICES		
3353133104	3305	Panelboards (include enclosing cabinets), circuit breaker
3353133201	3310	Panelboards (include enclosing cabinets), fusible

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REFERENCE LIST—Continued

FORM MA334C		
Product code	Item code	Item Description
		LOW VOLTAGE PANELBOARDS, DISTRIBUTION BOARDS, AND OTHER SWITCHING AND INTERRUPTING DEVICES—Continued
3353133207	3315	Distribution switchboards, fusible
3353133211	3320	Distribution switchboards, circuit breaker
3353133216	3325	Knife switches, enclosed: heavy duty
3353133225	3330	Knife switches, enclosed: circuit breaker
3353133227	3335	Knife switches, enclosed: other
3353133233	3340	Other switches
3353133237	3345	Other low voltage switchgear apparatus
3353133000	3397	Total low voltage panelboards, distribution boards, and other switching and interrupting devices (sum of item codes 3305–3345)
		FUSES AND FUSE EQUIPMENT
3353135109	3505	Nonrenewable plug and cartridge fuses
3353135113	3510	Other fuses and open fuse material (including renewable, cutouts, clips, bases, etc.)
3353135000	3597	Total fuses and fuse equipment (sum of item codes 3505 and 3510)
		MOLDED CASE CIRCUIT BREAKERS
3353137105	3705	Molded case circuit breakers, industrial type
3353137112	3710	Molded case circuit breakers, residential or light duty type
3353137117	3715	Other: Marine, Navy, aircraft, and aerospace
3353137131	3720	All other types, including automotive and electronic
3353137000	3797	Total molded case circuit breakers (sum of item codes 3705–3720)
3353139000	3805	Ducts, including plug-in units and accessories (not exceeding 1,000 volts), consisting of enclosed sectionalized prefabricated bus bars rated 20 amperes or more and associated structures and fittings (report quantity in number of units)
		SWITCHGEAR, EXCEPT DUCTS
335313A101	3905	Automatic and manual control panels
335313A204	3910	Metal clad switchgear (using power circuit breakers, oil and oil-less), all voltages above 1,000 volts, up to and including 38kV, excluding load interrupter switchgear
335313A307	3915	Metal enclosed load interrupter switchgear
335313A311	3920	Metal enclosed low voltage power circuit breaker
335313A313	3925	Metal enclosed bus when sold separately
335313A321	3930	Power switching equipment, indoor and outdoor
335313A332	3935	Connectors, all types (power and ground, overhead transmission and distribution, and transmission and distribution)
335313A335	3940	Power fuses, fuse links, and distribution cutouts
335313A337	3945	Other switchgear devices
335313A000	3997	Total switchgear, except ducts (sum of item codes 3905–3945)

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REFERENCE LIST—Continued

FORM MA334C		
Product code	Item code	Item Description
RELAYS		
3353141101	4105	Industrial control relays (all types)
3353141112	4110	General purpose: Over 100 MV and sealed
3353141117	4115	General purpose: Over 100 MV and NOT sealed
3353141153	4120	High performance military/aerospace/aircraft relays
3353141180	4125	Timing relays (timers)
3353141183	4130	All other general purpose and special purpose relays, including parts
3353141000	4197	Total general purpose and other relays (sum of item codes 4105–4130)
SPECIFIC PURPOSE INDUSTRIAL CONTROLS		
3353143301	4305	U.S. Coast Guard/Marine auxiliary controls and accessories
3353143307	4310	Crane and hoist controls, constant and adjustable voltage (including operators' desks and stations)
3353143311	4315	Definite purpose contactors and starters
3353143317	4320	Stand alone motion controllers: computer numerical controls
3353143323	4325	Stand alone motion controllers: other (include robotic controls)
3353143328	4330	Programmable controllers
3353143333	4335	Other specific or special purpose a.c. and d.c. controllers, other definite purpose devices (Specify kind)
3353143000	4397	Total specific purpose industrial controls and power circuits devices (sum of item codes 4305–4335)
GENERAL PURPOSE CONTROLS		
3353146101	4505	A.c. full voltage noncombination magnetic starters (1,000 volts or less)
3353146109	4510	A.c. full voltage combination magnetic starters (1,000 volts or less)
3353146111	4515	Disconnect switches
3353146117	4520	A.c. full voltage manual controllers (1,000 volts or less)
3353146123	4525	A.c. contactors (1,000 volts or less)
3353146131	4530	Motor control centers
3353146137	4535	Brakes and clutches
3353146142	4540	Other general purpose controls
3353146143	4545	Electromedical positioning switches
3353146146	4550	Movement sensors
3353146149	4553	Nonoptical proximity sensors
3353146152	4555	Optical proximity sensors
3353146169	4560	Pushbuttons, under 30mm
3353146171	4565	Pushbuttons, 30mm and larger
3353146176	4570	Controls for a.c. packaged drives
3353146179	4575	Controls for d.c. packaged drives
3353146182	4580	A.c. drives systems
3353146185	4585	D.c. drives systems
3353146188	4590	Solid state motor controllers
3353146192	4595	All other general industry devices
3353146000	4598	Total general purpose industrial controls and power circuit devices (sum of item codes 4505–4595)

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FORM MA334C		
Product code	Item code	Product description
MOTOR CONTROLLER ACCESSORIES		
3353147102	4708	Motor controller accessories
3353147104	4713	Parts for industrial controls
3353147000	4797	Total motor controller accessories and parts for industrial controls (<i>sum of item codes 4708 and 4713</i>)
SELECTED NONMANUFACTURING REVENUES		
999998900	8500	Resales—Sales of products bought and sold without further manufacture, processing, or assembly
999998041	8501	Research and development
999998045	8504	Process control software products
NOTES:		

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