

CURRENT INDUSTRIAL REPORTS SERIES

2008

MA333N — FLUID POWER PRODUCTS FOR MOTION CONTROL (INCLUDING AEROSPACE) (SHIPMENTS)

DEFINITIONS AND SPECIAL INSTRUCTIONS

1. Scope of survey

This survey covers fluid power products manufactured in the United States. Fluid power products use compressed fluid (liquid or gas) as a medium for transferring power and controlling motion. The focus of this report is fluid power products for motion control applications (some additional categories for non-motion control products are included to help ensure data integrity by keeping any of these products that may be reported separate).

The following products should be excluded from reporting:

- plumbing and heating valves and specialties (3329191);
- metal fittings, flanges and unions for piping systems (3329193)
- automatic regulating and control valves (332911F);
- solenoid-operated valves not used in a fluid power motion control system (332911H);
- nuclear valves (332911D);
- other industrial valves (3329111-332911B);
- non-fluid power industrial pumps and pumping equipment;
- pumps for farm and home use (3339111-3339115);
- constant speed drivers (3336123 and 3336127).

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 listed on the report form or write to the U.S. Census Bureau for additional forms. If you prefer reporting on a domestic consolidated basis, please call the contact shown on the report form.

a. Resales

Products bought and resold without further manufacture should not be included in shipments (this is regardless of whether or not they were imported). Further manufacture includes assembly of parts into finished fluid power products (pumps, valves, cylinders, etc).

b. Quantity and value of shipments

The figures on quantity and value of shipments should include physical shipment of products sold or shipped, whether for domestic or export sale. The value represents the net sales price, f.o.b. plant, net of discounts,

allowances, freight charges and returns.

Do not combine product lines.

In addition, these figures should include:

- Physical shipments of products manufactured and shipped from the reporting location to customers and distributors.
- Physical shipments of products manufactured and shipped for private labeling by another company.

The figures on quantity and value of shipments should NOT include:

- Physical shipments of products received from another division of your company and resold without further manufacture should not be included in shipments (this is regardless of whether or not they were imported). Further manufacture includes assembly of parts into finished fluid power products (pumps, valves, cylinders, etc).

Note: The quantity and value of hydrostatic transmissions and power units should be reported into their respective categories. The quantity and value for the pumps, motors, valves, and prime mover used in the hydrostatic transmissions and power units should also be reported into their respective categories for these products if manufactured in the U.S. by your company. The quantity and value of hydrostatic transmissions and power units will not be added into overall report totals.

c. Columnar structure of report

When entering your figures on the original report, please be sure to report the information in the correct columns.

Column 1 — Total Quantity

Column 2 — Total Shipments Value

Section I — Report all fluid power valves for motion control, including parts.

Section II — Report all fluid power fittings and assemblies for motion control.

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DEFINITIONS AND SPECIAL INSTRUCTIONS — Continued

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3. Definitions — Continued

Section III — Report all fluid power filters for motion control, including parts.

Section IV — Report all fluid power cylinders, rotary actuators, accumulators, cushions, and non-vehicular shock absorbers, including parts.

Section V — Report all fluid power pumps and motors for motion control, including parts.

3. Definitions

Accumulators (hydraulic only) — Devices that store hydraulic fluid under pressure as a source of fluid power

Actuators — Devices that convert fluid power into linear or rotary mechanical force. Linear types are typically referred to as cylinders. Rotary types are referred to as rotary actuators and motors. Motors have shafts that rotate continuously in the same direction. Rotary actuator shafts do not rotate continuously. Typically, the shafts rotate a certain number of degrees before rotating in the opposite direction to their point of origin.

Air dryer — A device for reducing the moisture vapor content of the compressed air in a pneumatic system

Bulk hose— A hose and/or tubing to which fittings have not been attached.

Assembly — A length of hose and/or tubing that fittings have been attached to.

Cushion — A device that provides controlled resistance to non-linear motion.

Cylinder, electrohydraulic — A hydraulic, linear actuator that produces a continuously variable mechanical output, as a function of a continuously variable electronic input signal (voltage or current).

Cylinder, mill type — A linear actuator that has circular flanges welded to the cylinder barrel ends. This type of cylinder is used in severe duty applications like the steel mills from which it derived its name.

Cylinder, rodless (shuttle) — A linear actuator with a rod that never leaves its case, that is sealed lengthwise. Typically used in position control applications.

Cylinder, telescoping — A linear actuator with nested tubular rod segments that provide a long working stroke in a short retracted envelope.

Cylinder, threaded/weld fused combination — A linear actuator with one threaded end and one weld fused end.

Cylinder, tie rod — A linear actuator with head and cap end closures that are secured by tie rods.

Filter (filter assembly) — A device whose primary function is the retention of insoluble contaminants in a fluid by a porous media.

Filter element — That part of a filter that retains contaminants. Some elements are permanent (reusable or cleanable) and others are disposable (nonreusable). Disposable elements must eventually be replaced.

Fittings — Devices used to connect hoses and tubing to components (valves, cylinders, motors, pumps) of a fluid power system. They are constructed from metal or plastic, and are sometimes referred to as connectors or couplings.

Gerotor/Gerolor — A special type of internal gear motor where the internal gear is always in sliding contact with the external gear.

Hydrostatic transmission — A device that combines a hydraulic pump with an hydraulic motor. The quantity and value of hydrostatic transmissions should be reported to the hydrostatic transmission line. The quantity and value of pumps and motors sold together as hydrostatic transmissions should also be reported separately in the relevant pump and motor categories, if manufactured in the U.S. by your company.

Intensifier — Devices driven by a low pressure fluid to produce fluid at a higher pressure.

Lubricator — A device that adds controlled or metered amounts of lubricant into a pneumatic system.

Manifold (manifold assembly) — A fluid conductor that can provide multiple connection ports. In a fluid power system, manifolds are typically used as housings for cartridge valves.

Motor — A device that transforms fluid power into rotary mechanical force. Motors can be hydraulic or pneumatic.

Motor, axial piston — A motor with several parallel pistons arranged around a common axis.

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DEFINITIONS AND SPECIAL INSTRUCTIONS — Continued

3. Definitions — Continued

Motor, external gear — A motor that has only external gears and no internal gear.

Motor, internal gear — A motor with an internal gear that meshes with one or more external gears. See also gerotor/gerolor.

Motor, radial piston — A motor with several pistons arranged to operate radially.

Motor, vane — A motor with multiple vanes that cause rotation of internal member when under pressure.

Power unit — A device that combines a hydraulic pump with a prime mover (usually an electric motor), and hydraulic valves. As is done for hydrostatic transmissions, the quantity and value of power units should be reported to the power unit line. The quantity and value of pumps, prime movers and valves should also be reported to those respective categories, if manufactured in the U.S. by your company.

Pump, axial piston — A reciprocating pump with several parallel pistons arranged around a common axis.

Pump, external gear — A rotary pump that has only external gears, and no internal gear.

Pump, internal gear — A rotary pump that has an internal gear in engagement with one or more external gears. An internal gear pump generally has external gears that rotate on a fixed axis. A gerotor pump differs from other internal gear types in that its internal gear is always in sliding contact with the external gear.

Pump, radial piston — A reciprocating pump with several pistons arranged radially within the pump chamber.

Pump, reciprocating — A pump that uses pistons to create a partial vacuum to draw hydraulic fluid through the pump inlet. The return strokes of the pistons unseat outlet check valves and force the fluid through the pump outlet.

Pump, rotary — A pump that uses gears or vanes to cause rotary motion that moves hydraulic fluid from the pump inlet to the pump outlet.

Pump, vane — A rotary pump with multiple vanes within a supporting rotor.

Reservoir, hydraulic — A container for storage of hydraulic fluid under pressure.

Sealing devices — A dynamic or static devices for preventing fluid leakage (air or liquid) to the external environment or within sections of a component.

Valves, cartridge — Valves with working parts contained in a cylindrical body. The body must be inserted into a housing (usually a manifold) for use. Ports through the body of the valve align with ports in the housing.

Valves, electrohydraulic — Valves that use continuously variable electronic input (voltage or current) to produce a continuously variable hydraulic output.

Valves, manually operated — Valves actuated by means of a hand lever, or other manual energizing device.

Valves, mechanical — Valves that are actuated by cams, levers, rollers, screws, springs, stems or other mechanical energizing devices. Should not include hydraulically or pneumatically actuated valves for non-fluid power applications.

Valves, relief — Direct acting or pilot operated valves that are used to prevent a hydraulic system from exceeding its maximum pressure limits.

Valves, remote pilot — Pilot operated valves that are controlled remotely through the use of air pressure.

Valves, solenoid — Valves that are operated by a solenoid.

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4. Comparability

Data reported in this survey should correspond to data reported in the Annual Survey of Manufactures form. The sum of values for item codes shown in column (a) should correspond to dollar values reported under product class codes indicated in column (b) below.

Current Industrial Reports (Form MA333N) Item codes (a)	Annual Survey of Manufactures Product class codes (b)
1201 through 1219	3329125
1221 through 1249	3329127
1251 through 1269	3329129
1271 through 1279	332912B
1281 through 1289	3329121
1291	3329123
1293, 1295	332912D
2201 through 2209	332912H
2211 through 2221	332912J
2241 through 2251	332912L
2261 through 2265	332912N
2271 through 2275	332912F
3301 through 3309	3339993
3311 through 3323	3339994
3325, 3327	3339996
3340, 3347	3339997
4501 through 4519	3339951
4601 through 4619	3339953
4841 through 4847, 4893	3339955
4851 through 4877	3339957
5504 through 5517	3339961
5534 through 5537	3339963
5548 through 5571	3339965
5581 through 5586	3339967
5591 through 5597	3339969

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REFERENCE LIST

FORM MA333N FLUID POWER PRODUCTS FOR MOTION CONTROL (INCLUDING AEROSPACE) (SHIPMENTS)		
Product code	Item code	Item description
3329125		Section I – FLUID POWER VALVES (hydraulic and pneumatic valves and parts) (Report quantity in number of units) NONAEROSPACE TYPE HYDRAULIC DIRECTIONAL CONTROL VALVES, excluding cartridge, stack, logic and electrohydraulic types Manual: 3- & 4-way monoblock 3- & 4-way sectional Other manual Solenoid: 2-way types 3- & 4-way types Other directional control
3329125110	1201	
3329125120	1205	
3329125130	1209	
3329125140	1211	
3329125150	1215	
3329125160	1219	
3329127		NONAEROSPACE TYPE HYDRAULIC VALVES (EXCEPT DIRECTIONAL CONTROL) Pressure control: Relief valves Other, including load sensing and manual types Flow control: Manual types Other flow control types Cartridge valves (except directional control) Electrohydraulic valves: Pilot operated, torque motor servovalves Other types, including proportional Other nonaerospace type hydraulic valves, including stack and logic
3329127110	1221	
3329127120	1225	
3329127130	1231	
3329127140	1235	
3329127155	1240	
3329127160	1241	
3329127170	1243	
3329127180	1249	
3329129		NONAEROSPACE TYPE PNEUMATIC DIRECTIONAL CONTROL VALVES Manual Solenoid: Under 1/8" port diameter 1/8" up to and including 1/4" port diameter: 3-way types 4-way types Over 1/4" port diameter: 3-way types 4-way types All other solenoid Mechanical, remote pilot and all other types
3329129110	1251	
3329129120	1253	
3329129130	1255	
3329129140	1257	
3329129150	1265	
3329129160	1267	
3329129170	1268	
3329129180	1269	

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FORM MA333N		
Product code	Item code	Item description
332912B		<p>Section I – FLUID POWER VALVES (hydraulic and pneumatic valves and parts) – Continued</p> <p>(Report quantity in number of units)</p> <p>NONAEROSPACE TYPE PNEUMATIC VALVES (EXCEPT DIRECTIONAL CONTROL)</p>
332912B110	1271	Filter-regulator combination units, integral types
332912B120	1273	Other FRs and filter-regulator-lubricator combo units
332912B130	1275	Regulators sold separately
332912B140	1277	Flow control valves
332912C000	1278	Nonaerospace-type pneumatic valves-for non-motion control applications
332912B150	1279	Check, shuttle, exhaust, needle, and all other types
3329121		<p>AEROSPACE TYPE HYDRAULIC FLUID POWER VALVES</p> <p>2-, 3-, and 4-way directional control valves:</p>
3329121110	1281	Manually or mechanically operated
3329121120	1283	Solenoid operated
3329121130	1285	Motor operated
3329121140	1287	Electrohydraulic servovalves
3329121150	1289	Flow, pressure, and other types of hydraulic valves
3329123		AEROSPACE TYPE PNEUMATIC FLUID POWER VALVES
3329123110	1291	Pneumatic valves (all types)
332912D		PARTS FOR FLUID POWER VALVES
332912D110	1293	Parts for nonaerospace type hydraulic and pneumatic valves, sold separately
332912D120	1295	Parts for aerospace type hydraulic and pneumatic valves, sold separately
332912H		<p>Section II – FLUID POWER FITTINGS AND ASSEMBLIES (fittings for and assemblies of tubing and hose used in fluid power transfer systems)</p> <p>NONAEROSPACE TYPE FLARED (METAL) FITTINGS AND COUPLINGS FOR, AND ASSEMBLIES OF TUBING USED IN FLUID POWER TRANSFER SYSTEMS</p>
332912H110	2201	Flared fittings: Brass and bronze (SAE 45 degrees and 37 degrees)
332912H120	2203	Carbon steel (JIC 37 degrees)
332912H130	2205	Other, including alloy steel
332912H140	2207	Assemblies of tubing
332912H150	2209	Assemblies of tubing and hose

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FORM MA333N		
Product code	Item code	Item description
332912J		<p>Section II – FLUID POWER FITTINGS AND ASSEMBLIES (fittings for and assemblies of tubing and hose used in fluid power transfer systems) – Continued</p> <p>NONAEROSPACE TYPE FLARELESS FITTINGS AND COUPLINGS, INCLUDING NONMETAL FITTINGS, USED IN FLUID POWER TRANSFER SYSTEMS</p> <p>Metal types:</p> <ul style="list-style-type: none"> Brass and bronze Carbon steel Stainless steel Other, including alloy steel
332912J110	2211	
332912J120	2213	
332912J130	2215	
332912J140	2217	
332912J150	2221	Nonmetal fittings, including plastic
332912L		NONAEROSPACE TYPE HYDRAULIC AND PNEUMATIC FITTINGS AND COUPLINGS FOR HOSE, AND MANIFOLDS
332912L110	2241	Permanent hose end fittings (crimped and swaged)
332912L120	2243	Hydraulic and pneumatic reusable end fittings
332912L130	2245	Hydraulic quick connect and disconnect couplings
332912L140	2247	Pneumatic quick connect and disconnect couplings
332912L150	2249	Manifolds and manifold assemblies for fluid power systems
332912L160	2251	All other, including steel adaptor, swivel, rotating, and extension fittings
332912N		NONAEROSPACE TYPE HYDRAULIC AND PNEUMATIC ASSEMBLIES OF HOSE
332912N110	2261	Assemblies with permanent end fittings
332912N120	2263	Assemblies with reusable fittings
332912N130	2265	Nonaerospace-type hydraulic and pneumatic bulk hose
332912F		AEROSPACE TYPE HYDRAULIC AND PNEUMATIC HOSE OR TUBE END FITTINGS AND ASSEMBLES AND MANIFOLDS
332912F110	2271	Assemblies of hose and/or tubing
332912F125	2272	Hose and/or tube fittings, all types
332912F130	2275	Manifolds for aerospace hydraulic systems

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FORM MA333N		
Product code	Item code	Item description
3339993		<p>Section III — FILTERS FOR HYDRAULIC AND PNEUMATIC FLUID POWER SYSTEMS</p> <p>(Report quantity in number of units)</p> <p>NONAEROSPACE TYPE FILTERS FOR HYDRAULIC FLUID POWER SYSTEMS</p> <p>Hydraulic fluid filter assemblies, with or without filter element installed:</p> <p style="padding-left: 20px;">Low pressure (below 301 psi)</p> <p style="padding-left: 20px;">Medium pressure (301 - 2,999 psi)</p> <p style="padding-left: 20px;">High pressure (3,000 psi and above)</p> <p>Filter replacement elements:</p> <p style="padding-left: 20px;">Reusable (cleanable) type</p> <p style="padding-left: 20px;">Nonreusable type</p> <p style="padding-left: 20px;">Strainers and separators, filter parts, and accessories</p>
3339993110	3301	
3339993120	3302	
3339993130	3304	
3339993140	3305	
3339993150	3307	
3339993160	3309	
3339994		<p>NONAEROSPACE TYPE FILTERS FOR PNEUMATIC FLUID POWER SYSTEMS</p> <p>Air supply filter assemblies and filter replacement elements, excluding those shipped as part of a FR or FRL combo unit:</p> <p style="padding-left: 20px;">Coalescing types, including elements sold separately</p> <p style="padding-left: 20px;">Other types, including elements sold separately</p> <p style="padding-left: 20px;">Air exhaust mufflers, diffusers, filter parts and air preparation accessories</p>
3339994110	3311	
3339994120	3313	
3339994130	3323	
3339996		<p>AEROSPACE TYPE HYDRAULIC AND PNEUMATIC FILTERS</p>
3339996110	3325	Hydraulic
3339996120	3327	Pneumatic
3339997		<p>COMPRESSED AIR AND GAS DRYERS, AND LUBRICATORS</p>
3339997A00		
3339997880	3340	Compressed air and gas dryers
	3347	Lubricators for pneumatic systems, sold separately

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FORM MA333N		
Product code	Item code	Item description
3339951		<p>Section IV — HYDRAULIC AND PNEUMATIC CYLINDERS, ACTUATORS, ACCUMULATORS, CUSHIONS, NONVEHICULAR SHOCK ABSORBERS, AND PARTS</p> <p>(Report quantity in number of units)</p> <p>NONAEROSPACE TYPE HYDRAULIC FLUID POWER CYLINDERS AND ACTUATORS, LINEAR AND ROTARY</p> <p>Hydraulic cylinders, excluding electrohydraulic: Tie-rod types: Standard NFPA and JIC tie-rod types: Less than 1500 psi 1500 to 3000 psi Greater than 3000 psi Other tie-rod types</p> <p>3339951110 4501 Threaded/weld fused combination 3339951120 4503 Telescoping 3339951130 4505 Mill type 3339951140 4507 Other, including those threaded at both ends 3339951150 4509 Electrohydraulic types 3339951160 4511 3339951170 4513 3339951180 4515 3339951190 4517 33399511A0 4519 Hydraulic rotary actuators</p>
3339953		<p>NONAEROSPACE TYPE PNEUMATIC FLUID POWER CYLINDERS AND ACTUATORS, LINEAR AND ROTARY</p> <p>NFPA interchangeable cylinders: Steel Aluminum: Less than 1 ½ " bore size 1 ½ " bore size and over</p> <p>3339953110 4601 Rodless cylinders 3339953120 4603 Other pneumatic cylinders: 3339953130 4605 Less than 1 ½ " bore size 3339953140 4607 1 ½ " bore size and over 3339953150 4609 Pneumatic rotary actuators 3339953160 4611 3339953170 4619</p>
3339955		<p>PARTS FOR NONAEROSPACE TYPE HYDRAULIC AND PNEUMATIC FLUID POWER CYLINDERS, ACTUATORS, AND RELATED ITEMS N.E.C.</p> <p>3339955110 4841 Accumulators (bladder, piston, and other types) 3339955120 4843 Shock absorbers, not for vehicle suspension, and cushions (hydraulic and pneumatic) 3339955130 4845 Reservoirs, intensifiers, and other devices for fluid energy absorption and/or storage 3339955140 4847 Parts for nonaerospace type hydraulic and pneumatic cylinders, actuators, accumulators, cushions, and nonvehicular shock absorbers, sold separately</p>

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REFERENCE LIST — Continued

FORM MA333N		
Product code	Item code	Item description
Section IV — HYDRAULIC AND PNEUMATIC CYLINDERS, ACTUATORS, ACCUMULATORS, CUSHIONS, NONVEHICULAR SHOCK ABSORBERS, AND PARTS — Continued (Report quantity in number of units)		
3339957		AEROSPACE TYPE FLUID POWER CYLINDERS AND ACTUATORS, HYDRAULIC AND PNEUMATIC
3339957110	4851	Hydraulic servo-actuator assemblies (linear and rotary):
3339957120	4853	Mechanical input
3339957130	4855	Electrical input Combination input
3339957140	4861	Hydraulic utility actuators:
3339957150	4863	Linear actuators (cylinders) Rotary actuators (limited rotation)
3339957160	4865	Shock absorbers, snubbers, and cushions (all types), excluding oleo strut assemblies
3339957170	4871	Pneumatic actuators (linear and rotary)
3339957180	4873	Accumulators (bladder, piston, and other types)
3339957190	4875	Reservoirs, intensifiers, and other devices for fluid energy absorption and/or storage
33399571A0	4877	Other aerospace type fluid power cylinders, rotary actuators, cushions and related items, n.e.c.
3339555150	4893	Parts for aerospace type hydraulic and pneumatic cylinders, actuators, accumulators, cushions, and related items, sold separately
Section V — FLUID POWER PUMPS AND MOTORS, AND PARTS (Report quantity in number of units)		
3339961		NONAEROSPACE TYPE RECIPROCATING PUMPS Axial piston:
3339961110	5504	Variable displacement types:
3339961120	5514	Closed loop
3339961130	5515	Open loop
		Fixed displacement types
3339961140	5517	Radial piston types
3339963		NONAEROSPACE TYPE ROTARY AND OTHER FLUID POWER PUMPS
3339963110	5534	Gear type:
3339963120	5535	Internal, including gerotors
		External type
3339963150	5537	Vane type: Fixed and variable displacement vanes

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FORM MA333N		
Product code	Item code	Item description
Section V — FLUID POWER PUMPS AND MOTORS, AND PARTS — Continued		
(Report quantity in number of units)		
3339965		NONAEROSPACE TYPE FLUID POWER MOTORS
		Hydraulic motors:
		Gear type:
3339965120	5548	Internal, excluding gerotor types
3339965130	5550	Gerotor types
3339965140	5551	External
3339965150	5553	Vane types, fixed and variable
3339965160	5555	Radial piston types, fixed and variable
		Axial piston types:
3339965170	5557	Fixed displacement
3339965180	5559	Variable displacement
3339965110	5560	Pneumatic (air) motors
3339965190	5571	Prime movers shipped with pumps or sold separately
3339967		AEROSPACE TYPE FLUID POWER PUMPS AND MOTORS
		Hydraulic pumps:
3339967110	5581	Fixed and variable displacement types
3339967120	5583	Pump/electric motor assemblies, fixed, and variable displacement types
3339967130	5585	Other pump packages n.e.c.
		Motors:
3339967170	5586	Aerospace-type fluid power motors, all kinds
3339969		PARTS FOR FLUID POWER PUMPS, MOTORS, AND HYDROSTATIC TRANSMISSIONS
		Hydraulic:
3339969110	5591	Nonaerospace
3339969120	5593	Aerospace
		Pneumatic:
3339969130	5595	Nonaerospace
3339969140	5597	Aerospace
333996A	5599	Nonaerospace hydrostatic transmissions
333996B	5600	Nonaerospace hydraulic power units