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**Fluid Power Products, Including Aerospace - 1997 (Final Report)**

**MA35N(97)-1**

**Issued February 11, 1999**

Information about the scope of the survey, methodology, explanation of terms, and historical notes for this survey may be found in the introduction of the 1996 Manufacturing Profiles, issued July 1998.

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**Summary of Findings:** In 1997, fluid power product manufacturers, including aerospace, had shipments of \$11,593.8 million, an increase of 10 percent from \$10,530.0 reported in 1996. Hydraulic and pneumatic valves increased 10 percent to \$3,226.4 million in 1997 from \$2,935.0 million in 1996. Fittings and assemblies for tubing and hose, excluding plumbers' brass goods, increased 9 percent to \$2,400.5 million in 1997 from \$2,205.8 million in 1996. Hydraulic and pneumatic cylinders, actuators, accumulators, cushion, and nonvehicular shock absorbers increased by 9 percent to \$2,999.3 million in 1997 from \$2,755.7 million in 1996. Compressed air and gas dryers and lubricators increased 3 percent to \$89.8 million in 1997 from \$87.5 million in 1996. Filters of hydraulic and pneumatic systems increased to \$528.7 million in 1997 from \$474.2 million in 1996, a 12-percent increase. Hydraulic and pneumatic pumps, motors, and hydrostatic transmission components incurred a 13-percent increase to \$2,349.1 million in 1997 from \$2,071.8 million in 1996.

Table 1. Value of Shipments of Fluid Power Products, Including Aerospace: 1997 and 1996  
 [Value in thousands of dollars]

| Product code | Product description   | 1997       | 1996          |
|--------------|---|------------|---------------|
|              | Fluid power products, including aerospace. . . . .  | 11,593,751 | r/ 10,530,027 |
| 3492C        | Nonaerospace-type hydraulic directional control valves. . . . .   | 543,580    | 486,428       |
| 3492D        | Nonaerospace-type hydraulic valves (except directional control). . . . .  | 865,757    | 741,248       |
| 3492E        | Nonaerospace-type pneumatic directional control valves. . . . .   | 513,507    | 464,947       |
| 3492F        | Nonaerospace-type pneumatic valves (except directional control). . . . .  | 264,140    | r/ 240,183    |
| 3492A        | Aerospace-type hydraulic fluid power valves. . . . .  | 383,342    | r/ 370,535    |
| 3492B        | Aerospace-type pneumatic fluid power valves. . . . .  | 351,485    | r/ 343,185    |
| 3492G        | Parts for fluid power valves. . . . .   | 304,555    | r/ 288,507    |
| 3492J        | Nonaerospace-type flared (metal) fittings and couplings for, and assemblies of tubing used in fluid power transfer systems. . . . . | 336,123    | 310,670       |
| 3492K        | Nonaerospace-type flareless fittings and couplings, including nonmetal fittings, used in fluid power transfer systems. . . . .      | 481,120    | 454,820       |
| 3492M        | Nonaerospace-type hydraulic and pneumatic fittings and couplings for hose, and manifolds. . . . .                                   | 808,649    | 742,012       |
| 3492N        | Nonaerospace-type hydraulic and pneumatic assemblies of hose. . . . .   | 255,252    | 281,567       |
| 3492H        | Aerospace-type hydraulic and pneumatic hose or tube end fittings and assemblies and manifolds. . . . .                              | 519,377    | 416,713       |
| 35694        | Nonaerospace-type filters for hydraulic fluid power systems. . . . .  | 347,900    | 317,953       |
| 35695        | Nonaerospace-type filters for pneumatic fluid power systems. . . . .  | 108,883    | 106,571       |
| 35696        | Aerospace-type hydraulic and pneumatic filters. . . . .   | 71,961     | 49,656        |
| 35699 pt.    | Compressed air and gas dryers, and lubricators. . . . .   | 89,756     | 87,454        |
| 35934        | Nonaerospace-type hydraulic fluid power cylinders and actuators, linear and rotary. . . . .   | 1,205,303  | 1,104,783     |
| 35935        | Nonaerospace-type pneumatic fluid power cylinders and actuators, linear and rotary. . . . .   | 460,644    | 417,801       |
| 35939        | Parts for nonaerospace-type hydraulic and pneumatic fluid power cylinders, actuators, and related items, n.e.c. . . . .             | 278,280    | r/ 263,369    |
| 35932        | Aerospace-type fluid power cylinders and actuators, hydraulic and pneumatic. . . . .  | 1,055,050  | r/ 969,778    |
| 35943        | Nonaerospace-type reciprocating pumps. . . . .  | 580,923    | 521,968       |
| 35944        | Nonaerospace-type rotary and other fluid power pumps. . . . .   | 460,498    | 432,652       |
| 35945        | Nonaerospace-type fluid power motors. . . . .   | 579,486    | 487,548       |
| 35946        | Aerospace-type fluid power pumps and motors. . . . .  | 264,624    | r/ 233,178    |
| 35949        | Parts for fluid power pumps, motors, and hydrostatic transmissions. . . . .   | 463,556    | 396,501       |

n.e.c. Not elsewhere classified.

pt. Part.

r/Revised by 5 percent or more from previously published data.

Table 2. Manufacturer's Shipments of Fluid Power Products by Type, Including Aerospace: 1997 and 1996  
 [Quantity in units. Value in thousands of dollars]

| Product code | Product description  | No. of cos. | 1997       |            | No. of cos. | 1996          |               |
|--------------|--|-------------|------------|------------|-------------|---------------|---------------|
|              |  |             | Quantity   | Value      |             | Quantity      | Value         |
| 3492C --     | Fluid power products, including aerospace. . . . .                           | (X)         | (X)        | 11,593,751 | (X)         | (X)           | r/ 10,530,027 |
|              | Nonaerospace-type hydraulic directional control valves. . . . .              | (X)         | 7,483,981  | 543,580    | (X)         | 6,742,502     | 486,428       |
|              | Manual:  |             |            |            |             |               |               |
| 3492C 22     | 3- and 4-way monoblock. . . . .  | 27          | 3,667,163  | 124,998    | 26          | 3,210,336     | 103,857       |
| 3492C 24     | 3- and 4-way sectional. . . . .  | 19          | 977,029    | 186,243    | 21          | 1,029,572     | 173,493       |
|              | Solenoid:  |             |            |            |             |               |               |
| 3492C 26     | 2-way types. . . . .   | 16          | 413,459    | 30,460     | 15          | 337,550       | 19,329        |
| 3492C 28     | 3- and 4-way types. . . . .  | 25          | 1,092,258  | 134,955    | 25          | r/ 984,525    | r/ 129,767    |
| 3492C 25     | Other directional control. . . . .   | 30          | 1,334,072  | 66,924     | 29          | r/ 1,180,519  | r/ 59,982     |
| 3492D --     | Nonaerospace-type hydraulic valves (except directional control). . . . .     | (X)         | 21,216,208 | 865,757    | (X)         | 18,387,946    | 741,248       |
|              | Pressure control:  |             |            |            |             |               |               |
| 3492D 31     | Relief valves. . . . .   | 27          | 1,826,435  | 41,817     | 26          | 1,804,787     | 38,231        |
| 3492D 33     | Other, including load sensing and manual types. . . . .                      | 17          | 1,821,063  | 29,987     | 17          | 774,656       | r/ 26,466     |
|              | Flow control:  |             |            |            |             |               |               |
| 3492D 34     | Manual types. . . . .  | 21          | 1,185,480  | 27,027     | 22          | 1,077,312     | r/ 26,043     |
| 3492D 35     | Other flow control valves. . . . .   | 23          | 3,098,486  | 67,551     | 25          | 2,686,122     | 65,337        |
| 3492D 38     | Cartridge valves, all types. . . . .   | 20          | 10,387,822 | 222,699    | 20          | 9,151,052     | 193,661       |
|              | Electrohydraulic valves:   |             |            |            |             |               |               |
| 3492D 49     | Pilot operated, torque motor servovalves. . . . .                            | 10          | (D)        | 108,990    | 10          | (D)           | 75,325        |
| 3492D 50     | Other types, including proportional. . . . .                                 | 11          | (D)        | 93,253     | 11          | (D)           | 62,205        |
| 3492D 48     | Other nonaerospace type hydraulic valves, including stack and logic. . . . . | 26          | 2,426,351  | 274,433    | 26          | 1,891,607     | r/ 253,980    |
| 3492E --     | Nonaerospace-type pneumatic directional control valves. . . . .              | (X)         | 17,663,375 | 513,507    | (X)         | 15,571,304    | 464,947       |
| 3492E 51     | Manual . . . . .   | 38          | 3,866,905  | 77,884     | 40          | 3,775,930     | 74,275        |
|              | Solenoid:  |             |            |            |             |               |               |
| 3492E 54     | Under 1/8 inchg port diameter. . . . .                                       | 12          | 3,079,737  | 57,169     | 11          | 2,682,175     | 46,781        |
|              | 1/8 inch up to and including 1/4 inch port diameter:                         |             |            |            |             |               |               |
| 3492E 56     | 3-way types. . . . .   | 24          | 2,617,715  | 61,813     | 24          | 2,238,882     | 55,967        |
| 3492E 57     | 4-way types. . . . .   | 22          | 2,733,507  | 116,204    | 23          | 2,377,875     | 99,245        |
|              | Over 1/4 inch port diameter:   |             |            |            |             |               |               |
| 3492E 58     | 3-way types. . . . .   | 20          | 665,886    | 47,365     | 20          | r/ 663,697    | r/ 48,246     |
| 3492E 59     | 4-way types. . . . .   | 17          | 1,457,082  | 84,015     | 18          | 1,490,501     | r/ 85,925     |
| 3492E 55     | Mechanical, remote pilot and all other types. . . . .                        | 30          | 3,242,543  | 69,057     | 31          | r/ 2,342,244  | r/ 54,508     |
| 3492F --     | Nonaerospace-type pneumatic valves (except directional control). . . . .     | (X)         | 14,093,482 | 264,140    | (X)         | r/ 13,133,412 | r/ 240,183    |
| 3492F 61     | Filter-regulator combination units, integral types. . . . .                  | 14          | 1,386,920  | 27,373     | 14          | r/ 1,323,437  | r/ 25,989     |
| 3492F 62     | Other FRs and filter-regulator-lubricator combo units. . . . .               | 15          | 526,703    | 20,794     | 15          | r/ 434,574    | r/ 17,793     |
| 3492F 64     | Regulators, sold separately. . . . .   | 20          | 4,928,867  | 78,919     | 21          | 4,756,726     | 75,489        |
| 3492F 65     | Flow control valves. . . . .   | 32          | 4,014,158  | 101,820    | 32          | r/ 3,705,698  | r/ 89,343     |
| 3492F 69     | Check, shuttle, exhaust, needle and all other types. . . . .                 | 30          | 3,236,834  | 35,234     | 30          | r/ 2,912,977  | r/ 31,569     |
| 3492A --     | Aerospace-type hydraulic fluid power valves. . . . .                         | (X)         | 1,269,378  | 383,342    | (X)         | r/ 1,195,226  | r/ 370,535    |
|              | 2-, 3-, and 4-way directional control valves:                                |             |            |            |             |               |               |
| 3492A 71     | Manually or mechanically operated. . . . .                                   | 17          | (D)        | 77,729     | 17          | (D)           | (D)           |
| 3492A 72     | Solenoid operated. . . . .   | 25          | 75,652     | 54,849     | 25          | r/ 67,917     | r/ 49,875     |
| 3492A 73     | Motor operated. . . . .  | 9           | (D)        | 26,832     | 9           | (D)           | (D)           |
| 3492A 74     | Electrohydraulic servovalves. . . . .  | 7           | 93,305     | 125,529    | 7           | r/ 81,936     | r/ 122,872    |
| 3492A 75     | Flow, pressure, and other types of hydraulic valves. . . . .                 | 28          | 382,975    | 98,403     | 26          | r/ 352,031    | r/ 82,586     |
| 3492B --     | Aerospace-type pneumatic fluid power valves. . . . .                         | (X)         | 1,155,250  | 351,485    | (X)         | r/ 1,156,986  | r/ 343,185    |
| 3492B 79     | Pneumatic valves, all types. . . . .   | 28          | 1,155,250  | 351,485    | 25          | r/ 1,156,986  | r/ 343,185    |
| 3492G --     | Parts for fluid power valves. . . . .  | (X)         | (X)        | 304,555    | (X)         | (X)           | r/ 288,507    |

Table 2. Manufacturer's Shipments of Fluid Power Products by Type, Including Aerospace: 1997 and 1996  
 [Quantity in units. Value in thousands of dollars]

| Product code | Product description   | No. of cos. | 1997       |         | No. of cos. | 1996            |         |
|--------------|---|-------------|------------|---------|-------------|-----------------|---------|
|              |   |             | Quantity   | Value   |             | Quantity        | Value   |
| 3492G 96     | Parts for nonaerospace-type hydraulic and pneumatic valves, sold separately. . . . .  | 60          | (X)        | 209,281 | 62          | (X) r/          | 198,833 |
| 3492G 98     | Parts for aerospace-type hydraulic and pneumatic valves, sold separately. . . . .   | 23          | (X)        | 95,274  | 22          | (X) r/          | 89,674  |
| 3492J --     | Nonaerospace-type flared (metal) fittings and couplings for, and assemblies of tubing used in fluid power transfer systems. . . . . | (X)         | (X)        | 336,123 | (X)         | (X)             | 310,670 |
|              | Flared fittings:  |             |            |         |             |                 |         |
| 3492J 11     | Brass and bronze (SAE 45 degrees and 37 degrees). . . . .   | 9           | (X)        | (D)     | 9           | (X)             | (D)     |
| 3492J 13     | Carbon steel (JIC 37 degrees). . . . .  | 12          | (X)        | 139,476 | 13          | (X)             | 136,414 |
| 3492J 15     | Other, including alloy steel. . . . .   | 14          | (X)        | 60,966  | 15          | (X)             | 57,268  |
| 3492J 41     | Assemblies of tubing. . . . .   | 7           | (X)        | (D)     | 7           | (X)             | (D)     |
| 3492J 42     | Assemblies of tubing and hose. . . . .  | 7           | (X)        | 46,475  | 7           | (X)             | 41,539  |
| 3492K --     | Nonaerospace-type flareless fittings and couplings, including nonmetal fittings, used in fluid power transfer systems. . . . .      | (X)         | (X)        | 481,120 | (X)         | (X)             | 454,820 |
|              | Metal types:  |             |            |         |             |                 |         |
| 3492K 21     | Brass and bronze. . . . .   | 16          | (X)        | 90,977  | 16          | (X)             | (D)     |
| 3492K 23     | Carbon steel. . . . .   | 13          | (X)        | 88,800  | 13          | (X) r/          | 71,030  |
| 3492K 24     | Stainless steel. . . . .  | 15          | (X)        | 290,408 | 16          | (X) r/          | 276,656 |
| 3492K 28     | Other, including alloy steel. . . . .   | 8           | (X)        | 7,498   | 9           | (X)             | (D)     |
| 3492K 38     | Nonmetal fittings, including plastics. . . . .  | 9           | (X)        | 3,437   | 10          | (X)             | 8,842   |
| 3492M --     | Nonaerospace-type hydraulic and pneumatic fittings and couplings for hose, and manifolds. . . . .                                   | (X)         | (X)        | 808,649 | (X)         | (X)             | 742,012 |
| 3492M 44     | Permanent hose end fittings (crimped and swaged). . . . .   | 19          | (X)        | 327,165 | 21          | (X)             | 298,582 |
| 3492M 46     | Hydraulic and pneumatic reusable end fittings. . . . .  | 28          | (X)        | 131,376 | 28          | (X)             | 117,083 |
| 3492M 47     | Hydraulic quick connect and disconnect couplings. . . . .   | 18          | (X)        | 152,523 | 18          | (X) r/          | 148,606 |
| 3492M 48     | Pneumatic quick connect and disconnect couplings. . . . .   | 23          | (X)        | 80,966  | 23          | (X)             | 68,450  |
| 3492M 49     | Manifolds and manifold assemblies for fluid power systems. . . . .  | 22          | (X)        | 75,700  | 21          | (X)             | 66,580  |
| 3492M 50     | All other, including steel adaptor, swivel, rotating, and extension fittings. . . . .   | 24          | (X)        | 40,919  | 23          | (X)             | 42,711  |
| 3492N --     | Nonaerospace-type hydraulic and pneumatic assemblies of hose. . . . .   | (X)         | (X)        | 255,252 | (X)         | (X)             | 281,567 |
| 3492N 51     | Assemblies with permanent end fittings. . . . .   | 21          | (X)        | 213,582 | 23          | (X)             | 241,494 |
| 3492N 53     | Assemblies with reusable end fittings. . . . .  | 8           | (X)        | 41,670  | 11          | (X)             | 40,073  |
| 3492H --     | Aerospace-type hydraulic and pneumatic hose or tube end fittings and assemblies and manifolds. . . . .                              | (X)         | (X)        | 519,377 | (X)         | (X)             | 416,713 |
| 3492H 61     | Assemblies of hose and/or tubing. . . . .   | 13          | (X)        | 151,938 | 13          | (X) r/          | 120,247 |
| 3492H 62     | Quick connect, rotating, swivel, and extension fittings. . . . .  | 10          | (X)        | 152,000 | 10          | (X) r/          | 126,551 |
| 3492H 63     | Manifolds for aerospace hydraulic systems. . . . .  | 6           | (X)        | 45,059  | 6           | (X) r/          | 33,132  |
| 3492H 69     | Aerospace hose and tube fittings, n.e.c. . . . .  | 14          | (X)        | 170,380 | 14          | (X)             | 136,783 |
| 35694 --     | Nonaerospace-type filters for hydraulic fluid power systems. . . . .  | (X)         | (X)        | 347,900 | (X)         | (X)             | 317,953 |
|              | Hydraulic fluid filter assemblies, with or without filter element installed:  |             |            |         |             |                 |         |
| 35694 11     | Low pressure (below 301 psi). . . . .   | 27          | 1,108,625  | 53,030  | 28          | r/ 1,001,825    | 48,632  |
| 35694 12     | Medium pressure (301 - 2,999 psi). . . . .  | 17          | 847,824    | 27,972  | 18          | 743,294 r/      | 24,040  |
| 35694 14     | High pressure (3,000 psi and above). . . . .  | 13          | 138,116    | 21,575  | 14          | 128,035         | 19,474  |
|              | Filter replacement elements:  |             |            |         |             |                 |         |
| 35694 15     | Reusable (cleanable) type. . . . .  | 15          | 1,185,096  | 20,592  | 17          | r/ 1,529,693 r/ | 22,469  |
| 35694 17     | Nonreusable type. . . . .   | 24          | 17,840,588 | 192,203 | 26          | 17,351,309      | 170,305 |
| 35694 19     | Strainers and separators, filter parts, and accessories. . . . .  | 21          | (X)        | 32,528  | 21          | (X)             | 33,033  |

Table 2. Manufacturer's Shipments of Fluid Power Products by Type, Including Aerospace: 1997 and 1996  
 [Quantity in units. Value in thousands of dollars]

| Product code | Product description  | No. of cos. | 1997      |           | No. of cos. | 1996         |           |
|--------------|--|-------------|-----------|-----------|-------------|--------------|-----------|
|              |  |             | Quantity  | Value     |             | Quantity     | Value     |
| 35695 --     | Nonaerospace-type filters for pneumatic fluid power systems. . . . .   | (X)         | (X)       | 108,883   | (X)         | (X)          | 106,571   |
|              | Air supply filter assemblies and filter replacement elements, excluding those shipped as part of a FR or FRL combo unit:                                     |             |           |           |             |              |           |
| 35695 32     | Coalescing types, including elements sold separately. . . . .  | 14          | (X)       | 44,791    | 14          | (X)          | 42,341    |
| 35695 34     | Other types, including elements sold separately. . . . .   | 13          | (X)       | 35,566    | 12          | (X) r/       | 33,246    |
| 35695 39     | Air exhaust mufflers, diffusers, filter parts, and air preparation accessories. . . . .  | 17          | (X)       | 28,526    | 18          | (X) r/       | 30,984    |
| 35696 --     | Aerospace-type hydraulic and pneumatic filters. . . . .  | (X)         | (X)       | 71,961    | (X)         | (X)          | 49,656    |
| 35696 51     | Hydraulic. . . . .   | 6           | (X)       | (D)       | 6           | (X)          | (D)       |
| 35696 53     | Pneumatic. . . . .   | 3           | (X)       | (D)       | 3           | (X)          | (D)       |
| 35699 pt.    | Compressed air and gas dryers, and lubricators. . . . .  | (X)         | 796,268   | 89,756    | (X) r/      | 780,547      | 87,454    |
|              | Compressed air and gas dryers:   |             |           |           |             |              |           |
| 35699 41     | Refrigerated dryers. . . . .   | 5           | 32,009    | 37,357    | 5           | 29,428       | 35,294    |
| 35699 42     | Dessicant dryers. . . . .  | 7           | (D)       | 31,184    | 7           | (D)          | (D)       |
| 35699 44     | Other compressed air and gas dryers. . . . .   | 4           | (D)       | 5,721     | 4           | (D)          | (D)       |
| 35699 13     | Lubricators for pneumatic systems, sold separately. . . . .  | 8           | 684,153   | 15,494    | 8 r/        | 634,105 r/   | 14,540    |
| 35934 --     | Nonaerospace-type hydraulic fluid power cylinders and actuators, linear and rotary. . . . .  | (X)         | 4,525,809 | 1,205,303 | (X) r/      | 4,122,565    | 1,104,783 |
|              | Hydraulic cylinders, excluding electrohydraulic:   |             |           |           |             |              |           |
|              | Tie-rod types:   |             |           |           |             |              |           |
|              | Standard NFPA and JIC tie-rod types:   |             |           |           |             |              |           |
| 35934 04     | Less than 1,500 psi. . . . .   | 22          | 157,427   | 39,704    | 22          | 179,830      | 42,173    |
| 35934 06     | 1,500 to 3,000 psi. . . . .  | 20          | 228,809   | 94,171    | 20          | 244,254      | 88,975    |
| 35934 08     | Greater than 3,000 psi. . . . .  | 7           | (D)       | (D)       | 8           | (D)          | (D)       |
| 35934 10     | Other tie-rod types. . . . .   | 18          | (D)       | (D)       | 18          | (D)          | (D)       |
| 35934 12     | Threaded/weld fused combination. . . . .   | 49          | 2,801,664 | 749,553   | 51 r/       | 2,536,817 r/ | 620,233   |
| 35934 13     | Telescoping. . . . .   | 20          | 109,634   | 99,070    | 22 r/       | 105,564      | 96,477    |
| 35934 15     | Mill type. . . . .   | 13          | 23,873    | 20,139    | 13 r/       | 24,603 r/    | 18,187    |
| 35934 16     | Other, including those threaded at both ends. . . . .  | 23          | 640,260   | 66,218    | 22          | 523,908      | 115,681   |
| 35934 18     | Electrohydraulic types. . . . .  | 8           | 5,888     | 19,376    | 7 r/        | 5,586 r/     | 16,230    |
| 35934 25     | Hydraulic rotary actuators. . . . .  | 14          | 59,949    | 53,946    | 14 r/       | 55,402 r/    | 46,670    |
| 35935 --     | Nonaerospace-type pneumatic fluid power cylinders and actuators, linear and rotary. . . . .  | (X)         | 6,766,388 | 460,644   | (X)         | 6,202,537    | 417,801   |
|              | NFPA interchangeable cylinders:  |             |           |           |             |              |           |
| 35935 23     | Steel. . . . .   | 17          | 272,589   | 77,115    | 17          | 266,594      | 71,502    |
|              | Aluminum:  |             |           |           |             |              |           |
| 35935 24     | Less than 1- 1/2 inch bore size. . . . .   | 6           | 55,563    | 5,529     | 7           | 53,237       | 4,290     |
| 35935 25     | 1- 1/2 inch bore size and over. . . . .  | 21          | 344,500   | 54,209    | 23 r/       | 344,055 r/   | 46,036    |
| 35935 27     | Rodless cylinders. . . . .   | 12          | 119,819   | 39,623    | 12          | 120,337      | 36,968    |
|              | Other pneumatic cylinders:   |             |           |           |             |              |           |
| 35935 28     | Less than 1- 1/2 inch bore size. . . . .   | 26          | 4,266,060 | 147,085   | 27          | 3,927,653    | 133,898   |
| 35935 29     | 1- 1/2 inch bore size and over. . . . .  | 35          | 1,608,331 | 110,400   | 34          | 1,389,896    | 96,807    |
| 35935 26     | Pneumatic rotary actuators. . . . .  | 15          | 99,526    | 26,683    | 16 r/       | 100,765      | 28,300    |
| 35939 --     | Parts for nonaerospace-type hydraulic and pneumatic fluid power cylinders, actuators, and related items, n.e.c. . . . .                                      | (X)         | (X)       | 278,280   | (X)         | (X) r/       | 263,369   |
| 35939 31     | Accumulators (bladder, piston, and other types). . . . .   | 23          | 216,170   | 43,752    | 23          | 242,523      | 46,843    |
| 35939 34     | Shock absorbers, not for vehicle suspension, and cushions (hydraulic and pneumatic). . . . .   | 17          | 2,738,874 | 69,840    | 15 r/       | 2,076,563 r/ | 62,117    |
| 35939 36     | Reservoirs, intensifiers, and other devices for fluid energy absorption and/or storage. . . . .  | 11          | 13,252    | 2,429     | 11 r/       | 13,182 r/    | 2,267     |
| 35939 96     | Parts for nonaerospace type hydraulic and pneumatic cylinders, actuators, accumulators, cushions, and nonvehicular shock absorbers, sold separately. . . . . | 57          | (X)       | 162,259   | 61          | (X) r/       | 152,142   |

Table 2. Manufacturer's Shipments of Fluid Power Products by Type, Including Aerospace: 1997 and 1996  
 [Quantity in units. Value in thousands of dollars]

| Product code | Product description  | No. of cos. | 1997      |           | No. of cos. | 1996         |            |
|--------------|--|-------------|-----------|-----------|-------------|--------------|------------|
|              |  |             | Quantity  | Value     |             | Quantity     | Value      |
| 35932 --     | Aerospace-type fluid power cylinders and actuators, hydraulic and pneumatic. . . . .   | (X)         | (X)       | 1,055,050 | (X)         | (X)          | r/ 969,778 |
|              | Hydraulic servo-actuator assemblies (linear and rotary):   |             |           |           |             |              |            |
| 35932 51     | Mechanical input. . . . .  | 6           | 28,649    | 200,312   | 6           | r/ 24,699    | 169,304    |
| 35932 52     | Electrical input. . . . .  | 7           | 18,168    | 293,500   | 7           | r/ 16,889    | r/ 269,433 |
| 35932 55     | Combination input. . . . .   | 4           | (D)       | (D)       | 4           | (D)          | (D)        |
|              | Hydraulic utility actuators:   |             |           |           |             |              |            |
| 35932 61     | Linear actuators (cylinders). . . . .  | 9           | 21,411    | 100,917   | 9           | r/ 19,141    | r/ 78,209  |
| 35932 62     | Rotary actuators (limited rotation). . . . .   | 2           | (D)       | (D)       | 2           | (D)          | (D)        |
| 35932 71     | Shock absorbers, snubbers, and cushions, all types, excluding oleo strut assemblies. . . . .   | 8           | (D)       | 22,673    | 9           | (D)          | r/ 21,556  |
| 35932 72     | Pneumatic actuators (linear and rotary). . . . .   | 8           | (D)       | (D)       | 7           | (D)          | (D)        |
| 35932 73     | Accumulators (bladder, piston, and other types). . . . .   | 11          | 10,729    | 8,482     | 10          | r/ 7,414     | r/ 6,298   |
| 35932 74     | Reservoirs, intensifiers, and other devices for fluid energy absorption and/or storage. . . . .  | 6           | 1,457     | 9,131     | 6           | r/ 1,374     | r/ 8,007   |
| 35932 79     | Other aerospace-type fluid power cylinders, rotary actuators, cushions and related items, n.e.c. . . . .                                   | 4           | (X)       | (D)       | 4           | (X)          | (D)        |
| 35939 98     | Parts for aerospace-type hydraulic and pneumatic cylinders, actuators, accumulators, cushions, and related items, sold separately. . . . . | 13          | (X)       | 21,603    | 12          | (X)          | r/ 46,885  |
| 35943 --     | Nonaerospace-type reciprocating pumps. . . . .   | (X)         | 1,894,152 | 580,923   | (X)         | r/ 1,615,541 | 521,968    |
|              | Axial piston:  |             |           |           |             |              |            |
|              | Variable displacement types:   |             |           |           |             |              |            |
| 35943 15     | Closed loop. . . . .   | 9           | 1,230,266 | 366,833   | 9           | 1,049,656    | 334,037    |
| 35943 27     | Open loop. . . . .   | 11          | 292,585   | 140,958   | 11          | r/ 276,372   | r/ 130,633 |
| 35943 37     | Fixed displacement types. . . . .  | 9           | (D)       | 66,297    | 9           | (D)          | r/ 50,853  |
| 35943 36     | Radial piston types. . . . .   | 4           | (D)       | 6,835     | 4           | (D)          | 6,445      |
| 35944 --     | Nonaerospace-type rotary and other fluid power pumps. . . . .  | (X)         | 3,075,625 | 460,498   | (X)         | 2,873,749    | 432,652    |
|              | Gear type:   |             |           |           |             |              |            |
| 35944 30     | Internal, including gerotors. . . . .  | 11          | 990,342   | 97,293    | 13          | 930,927      | 87,295     |
| 35944 34     | External type. . . . .   | 17          | 1,703,786 | 256,477   | 17          | r/ 1,572,556 | 244,139    |
| 35944 38     | Vane type. . . . .   | 9           | 381,497   | 106,728   | 9           | 370,266      | 101,218    |
| 35945 --     | Nonaerospace-type fluid power motors. . . . .  | (X)         | (X)       | 579,486   | (X)         | (X)          | 487,548    |
| 35945 40     | Pneumatic (air) motors. . . . .  | 4           | (D)       | (D)       | 5           | (D)          | (D)        |
|              | Hydraulic motors:  |             |           |           |             |              |            |
|              | Gear type:   |             |           |           |             |              |            |
| 35945 52     | Internal, excluding gerotor types. . . . .   | 7           | (D)       | (D)       | 7           | (D)          | (D)        |
| 35945 56     | Gerotor types. . . . .   | 6           | 1,232,417 | 189,582   | 6           | r/ 1,059,379 | r/ 157,537 |
| 35945 54     | External. . . . .  | 8           | 166,272   | 26,107    | 8           | 158,746      | 23,960     |
| 35945 42     | Vane types, fixed and variable. . . . .  | 7           | 13,479    | 13,987    | 7           | r/ 12,556    | r/ 12,553  |
| 35945 43     | Radial piston types, fixed and variable. . . . .   | 2           | (D)       | (D)       | 2           | (D)          | (D)        |
|              | Axial piston types:  |             |           |           |             |              |            |
| 35945 44     | Fixed displacement. . . . .  | 8           | 646,537   | 92,213    | 8           | 520,347      | r/ 79,276  |
| 35945 45     | Variable displacement. . . . .   | 8           | 130,479   | 73,489    | 7           | 97,727       | 53,721     |
| 35945 50     | Prime movers shipped with pumps or sold separately. . . . .  | 6           | (X)       | (D)       | 6           | (X)          | (D)        |
| 35946 --     | Aerospace-type fluid power pumps and motors. . . . .   | (X)         | 115,112   | 264,624   | (X)         | r/ 107,967   | r/ 233,178 |
|              | Hydraulic pumps:   |             |           |           |             |              |            |
| 35946 71     | Fixed and variable displacement types. . . . .   | 10          | 39,983    | 142,932   | 10          | r/ 33,813    | r/ 116,119 |
| 35946 72     | Pump/electric motor assemblies, fixed and variable displacement types. . . . .   | 10          | 31,658    | (D)       | 11          | r/ 33,453    | (D)        |
| 35946 73     | Other pump packages, n.e.c. . . . .  | 8           | 39,124    | 12,602    | 8           | 37,591       | 12,818     |
|              | Motors:  |             |           |           |             |              |            |
| 35946 83     | Pneumatic (air) motors and motor packages. . . . .   | -           | -         | -         | -           | -            | -          |

Continued

Table 2. Manufacturer's Shipments of Fluid Power Products by Type, Including Aerospace: 1997 and 1996  
 [Quantity in units. Value in thousands of dollars]

| Product code | Product description   | No. of cos. | 1997     |         | No. of cos. | 1996     |         |
|--------------|---|-------------|----------|---------|-------------|----------|---------|
|              |   |             | Quantity | Value   |             | Quantity | Value   |
| 35946 86     | Hydraulic motors, fixed and variable displacement types. . . .  | 3           | (D)      | (D)     | 3           | (D)      | (D)     |
| 35946 87     | Hydraulic motor packages, including motor/gearbox, motor/valve, motor/generator, and similar combination units. | 4           | (D)      | 8,507   | 4           | (D)      | 5,546   |
| 35949 --     | Parts for fluid power pumps, motors, and hydrostatic transmissions. . . . .                                     | (X)         | (X)      | 463,556 | (X)         | (X)      | 396,501 |
|              | Hydraulic:  |             |          |         |             |          |         |
| 35949 91     | Nonaerospace. . . . .   | 31          | (X)      | 386,791 | 32          | (X) r/   | 340,751 |
| 35949 93     | Aerospace. . . . .  | 8           | (X)      | 69,492  | 8           | (X) r/   | 51,945  |
|              | Pneumatic:  |             |          |         |             |          |         |
| 35949 95     | Nonaerospace. . . . .   | 1           | (X)      | (D)     | 3           | (X)      | (D)     |
| 35949 97     | Aerospace. . . . .  | 2           | (X)      | (D)     | 2           | (X)      | (D)     |

- Represents zero.  
 D Withheld to avoid disclosing data for individual companies.  
 n.e.c. Not elsewhere classified.  
 pt. Part.  
 r/ Revised by 5 percent or more from previously published data.  
 X Not applicable.

Table 3. Shipments, Exports, and Imports of Fluid Power Products: 1997  
 [Quantity in units. Value in thousands of dollars]

| Product code                          | Product description  | Manufacturers' shipments |           | Export shipments 1/ |         | Import shipments 2/ |         |
|---------------------------------------|--|--------------------------|-----------|---------------------|---------|---------------------|---------|
|                                       |  | Quantity                 | Value     | Quantity            | Value   | Quantity            | Value   |
| 3492A,<br>3492C,<br>3492D             | Hydraulic fluid power valves. . . . .  | 29,969,567               | 1,792,679 | 2,493,564           | 171,426 | 7,861,093           | 125,582 |
| 3492B,<br>3492E,<br>3492F             | Pneumatic fluid power valves. . . . .  | 32,912,107               | 1,129,132 | 2,224,120           | 92,616  | 17,476,864          | 109,544 |
| 3492G                                 | Parts for fluid power valves: hydraulic, pneumatic, and whether or not aerospace. . . . .  | (X)                      | 304,555   | (X)                 | 70,511  | (X)                 | 82,064  |
| 35932 pt.,<br>35934 pt.               | Hydraulic cylinders and hydraulic linear actuators (except electrohydraulic types). . . . .  | 4,487,271                | 1,252,274 | 348,230             | 93,008  | 880,184             | 163,065 |
| 35935 pt.                             | Pneumatic cylinders (tie-rod types). . . . .   | 672,652                  | 136,853   | 633                 | 1,031   | 22,050              | 2,447   |
| 35935 pt.                             | Pneumatic cylinders (except tie-rod types). . . . .  | 5,994,210                | 297,108   | 410,375             | 31,662  | 321,525             | 25,468  |
| 35932 pt.,<br>35934 pt.,<br>35935 pt. | Fluid power accumulators, hydraulic and pneumatic, and other hydraulic, pneumatic or combination devices for fluid energy absorption and/or storage, whether or not aerospace. . . . . | 536,959                  | 274,814   | 134,830             | 98,314  | 270,045             | 57,875  |
| 35945 pt.                             | Pneumatic (air) motors and motor packages, whether or not aerospace. . . . .   | (D)                      | (D)       | 42,674              | 14,647  | 13,771              | 1,458   |
| 35945 pt.,<br>35946 pt.               | Hydraulic motors, whether or not aerospace. . . . .  | 3,069,538                | 528,703   | 110,014             | 34,682  | 179,241             | 134,955 |
| 35943,<br>35944 pt.,<br>35946 pt.     | Hydraulic pumps, whether or not aerospace. . . . .   | 5,009,760                | 1,184,353 | 3,330,245           | 280,650 | 2,475,166           | 251,388 |
| 35939 pt.,<br>35949                   | Parts for fluid power pumps and motors. . . . .  | (X)                      | 1,272,418 | (X)                 | 307,874 | (X)                 | 249,754 |

D Withheld to avoid disclosing data for individual companies.  
 pt. Part.  
 X Not applicable.

1/Source: Bureau of the Census report, EM 545, U.S. Exports.  
 2/Source: Bureau of the Census report, IM 145, U.S. Imports for Consumption.



Table 4. Comparison of Standard Industrial Classification-Based Product Codes with Schedule B Export Numbers, and HTSUSA Numbers: 1997

| Product code                          | Product description  | Export number 1/ | Import number 2/             |
|---------------------------------------|--|------------------|------------------------------|
| 3492A,                                | Hydraulic fluid power valves. . . . .  | 8481.10.0020     | 8481.10.0020                 |
| 3492C,                                |  | 8481.20.0010     | 8481.20.0010                 |
| 3492D                                 |  | 8481.20.0020     | 8481.20.0020                 |
|                                       |  | 8481.20.0030     | 8481.20.0030                 |
|                                       |  | 8481.20.0040     | 8481.20.0040                 |
|                                       |  | 8481.20.0050     | 8481.20.0050                 |
| 3492B,                                | Pneumatic fluid power valves. . . . .  | 8481.10.0040     | 8481.10.0040                 |
| 3492E,                                |  | 8481.10.0060     | 8481.10.0060                 |
| 3492F                                 |  | 8481.20.0060     | 8481.20.0060                 |
|                                       |  | 8481.20.0070     | 8481.20.0070                 |
|                                       |  | 8481.20.0080     | 8481.20.0080                 |
| 3492G                                 | Parts for fluid power valves: hydraulic, pneumatic, and whether or not aerospace. . . . .  | 8481.90.9010     | 8481.90.9020<br>8481.90.9040 |
| 35932 pt.,<br>35934 pt.               | Hydraulic cylinders and hydraulic linear actuators (except electrohydraulic types). . . . .  | 8412.21.0015     | 8412.21.0015                 |
|                                       |  | 8412.21.0030     | 8412.21.0030                 |
|                                       |  | 8412.21.0045     | 8412.21.0045                 |
|                                       |  | 8412.21.0060     | 8412.21.0060                 |
|                                       |  | 8412.21.0075     | 8412.21.0075                 |
| 35935 pt.                             | Pneumatic cylinders, tie-rod types. . . . .  | 8412.31.0040     | 8412.31.0040                 |
| 35935 pt.                             | Pneumatic cylinders (except tie-rod types). . . . .  | 8412.31.0080     | 8412.31.0080                 |
| 35932 pt.,<br>35934 pt.,<br>35935 pt. | Fluid power accumulators, hydraulic and pneumatic, and other hydraulic, pneumatic or combination devices for fluid energy absorption and/or storage, whether or not aerospace. . . . . | 8412.29.8075     | 8412.29.8075                 |
|                                       |  | 8412.39.0080     | 8412.39.0080                 |
|                                       |  | 8479.89.9065     | 8479.89.9065                 |
|                                       |  | 8479.89.9565     | 8479.89.9565                 |
| 35945 pt.                             | Pneumatic (air) motors and motor packages, whether or not aerospace. . . . .   | 8412.39.0040     | 8412.39.0040                 |
| 35945 pt.,<br>35946 pt.               | Hydraulic motors, whether or not aerospace. . . . .  | 8412.29.8015     | 8412.29.8015                 |
|                                       |  | 8412.29.8030     | 8412.29.8030                 |
|                                       |  | 8412.29.8045     | 8412.29.8045                 |
|                                       |  | 8412.29.8060     | 8412.29.8060                 |
| 35943,<br>35944 pt.,<br>35946 pt.     | Hydraulic pumps, whether or not aerospace. . . . .   | 8413.50.0070     | 8413.50.0070                 |
|                                       |  | 8413.50.0080     | 8413.50.0080                 |
|                                       |  | 8413.60.0020     | 8413.60.0020                 |
|                                       |  | 8413.60.0030     | 8413.60.0030                 |
|                                       |  | 8413.60.0040     | 8413.60.0040                 |
| 35939 pt.,<br>35949                   | Parts for fluid power pumps and motors. . . . .  | 8412.90.9005     | 8412.90.9005                 |
|                                       |  | 8412.90.9015     | 8412.90.9015                 |
|                                       |  | 8412.90.9025     | 8412.90.9025                 |
|                                       |  | 8412.90.9035     | 8412.90.9035                 |
|                                       |  | 8413.91.9050     | 8413.91.9050                 |

pt. Part.

1/Source: 1997 edition, Harmonized System-Based Schedule B, Statistical Classification of Domestic and Foreign Commodities Exported from the United States.

2/Source: Harmonized Tariff Schedule of the United States, Annotated (1997).