

AMETEK®

Series 2000 Gemco™ Rotary Limit Switches

worm gear type

SUPERIOR DESIGN AND OPERATING FEATURES

Heavy-Duty, Shock Resistant FIBRALLOY® Case ...

- resists shocks, acids, alcohol, etc.
- withstands more punishment than die cast enclosures.

Gear Ratio Selection

- Eighteen standard gear ratios — 5:1 to 5333.3:1.

External mounting holes ...

- permit mounting without removing the cover and interfering with electrical connections.

U.L. Listed — Snap Action Switches

- Both switches have single pole double throw contacts for versatility of control circuits.

Self-Lubricating Bearings

Powdered metal impregnated bearings for life-time lubrication.

"1/2" Input Shaft

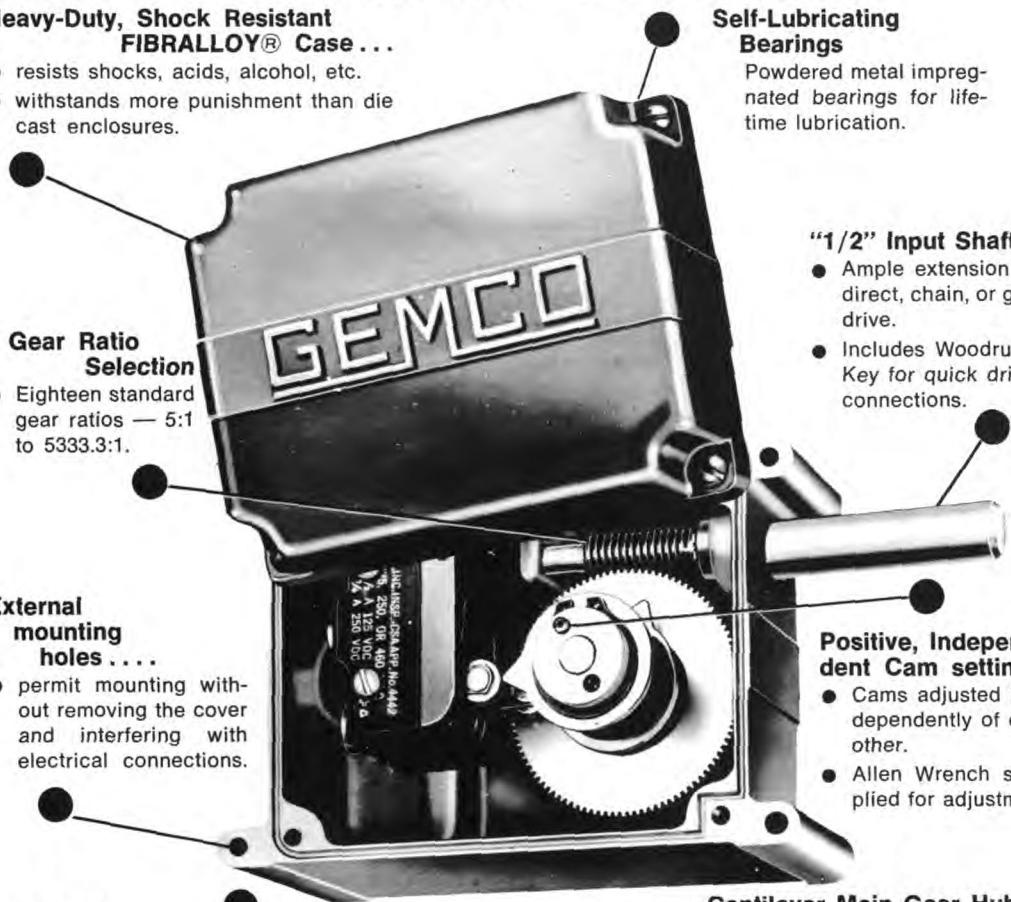
- Ample extension for direct, chain, or gear drive.
- Includes Woodruff Key for quick drive connections.

Positive, Independent Cam settings

- Cams adjusted independently of each other.
- Allen Wrench supplied for adjustment.

Cantilever Main Gear Hub

- Bronze gear and steel cams are ...
- mounted on common cam block.
 - supported on a sturdy shaft.
 - requires no support in cover.



Rotary Limit Switches

Application

Gemco's Rotary Limit Switches are primarily used for machine tools, handling devices, and rotary operators where motion is expressed in shaft rotation. The primary purpose of the switch is to control the intermediate or end limits of a linear or rotary motion. The switch is often used as a safety device to protect against accidental damage to equipment.

Description

Quality parts make each Rotary Limit Switch highly dependable.

- The 1/2" input shaft (includes Woodruff Key) drives a bronze gear which rotates the cam block. The cam block houses independently adjustable cams that actuate the precision type snap action switches.
- Each switch can be provided with one to four single pole, double throw switches or a maximum of two double pole, double throw switches for versatility of control circuits.
- No minimum speed is specified because snap action contacts are used. Maximum rated speed of the worm shaft is **1000 RPM** and can be rotated clockwise or counterclockwise.
- Gemco's Rotary Limit Switch offers the broadest range of standard gear selections of any switch available. Standard ratios range from **5:1** through **5333.3:1**.
- Max. Operating Temperature 180°F

Enclosures

NEMA Type 1 and 12 (General Purpose) enclosures are molded from **FIBRALLOY®** a special fiber glass material that is resistant to acids, alcohols, hydrocarbons and heat. A tight fitting synthetic gasket prevents the entrance of oil and coolants. External mounting holes enable switch mounting without internal interference. (See Figures 1 and 2.)

NEMA Type 4 (Watertight) enclosures are made of cast aluminum; cast iron or cast bronze enclosures can be provided upon request.

NEMA Type 7 & 9 (Hazardous Location) enclosures are designed to meet the requirements of the National Electrical Code for Class 1, Group D, and

Class 2. Groups E, F & G. The enclosures are made of cast aluminum; cast iron or bronze enclosures can be provided upon request. (See Figure 3.)



Figure 1 NEMA 1 Enclosure
2 circuit



Figure 2 NEMA 1 Enclosure
4 circuit



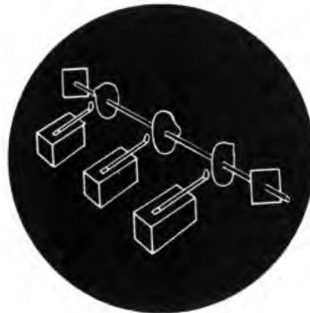
Figure 3 NEMA 7 Enclosure
2 circuit

Rotary Limit Switches

check these advantages.....

worm gear type

✓ exposed switches



The GEMCO Rotary Limit Switch

- reduces hazards to inexperienced users.
- removes danger of terminal shorting from water, corrosion, or accidental shorting from other metal objects because of its insulating properties.
- enclosures are made of FIBRALLOY® — an electrical insulator.

✓ cams & gears



The GEMCO Rotary Limit Switch

- reduces design time.
- reduces machine work on special cams and gears for different operating ratios.
- cams are all standard regardless of ratios.
- offers special cams upon request.

✓ linkages



The GEMCO Rotary Limit Switch ...

- often pays for itself by eliminating cost of stampings and machined bushings in linkages.
- reduces assembly time.

Mounting

The switch may be mounted in any convenient position. An "L" shaped mounting bracket which permits innumerable mounting positions for all enclosures, can be supplied upon request.

Adjustment

- Front cam "A" actuates switch "F"; rear cam "D" actuates switch "E".
- Both switches "E" and "F" have independent adjustable cams.
- To adjust cam "A" loosen Allen Screw "B".
- To adjust cam "D" loosen Allen Screw "C".

When the cam rotates, the switches "E" and "F"

are actuated and the contacts change from the normally closed to open position and normally open to the closed position.

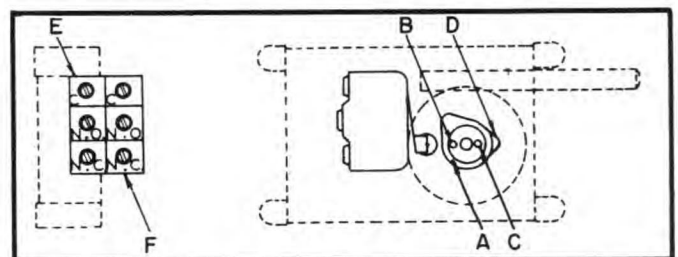


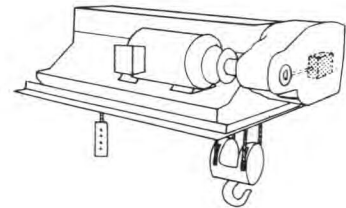
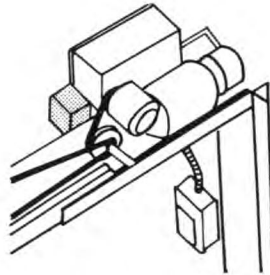
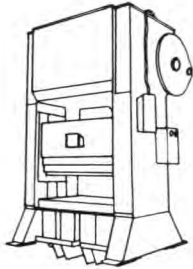
Figure 4 Diagram showing:

- independent adjustable cams A-D
- switches E-F
- Allen Screws B-C

Rotary Limit Switches

worm gear type

.....plus a broad range
of application



✓ mechanical presses

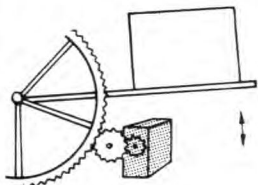
Both die and press, worth thousands the cost of the Gemco Rotary Limit Switch, are safely protected when the connecting rod length is adjusted.

✓ door operators

The Gemco Rotary Limit Switch is mounted on the drive unit, with gear take-off from the main drive shaft. Much wiring is eliminated. Cam accuracy maintains door closing to practical limits.

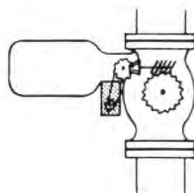
✓ hoists

Gemco switches on this line of hoists protect power unit from damage by controlling critical upper and lower limit.



✓ loaders

You can control travel of pushers, grabs, and other reciprocating parts handlers directly from drive shafts.



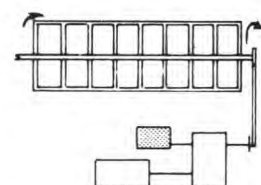
✓ valves

One or more open and close limits on pipe line, pumping station and machinery valves are accurately controlled with Gemco Rotary Limit Switches.



✓ handling fixtures

Assures accurate movement and placement of parts, plus control of mechanical clamping in welding, induction heating or machining fixtures.



✓ windows

Gemco Rotary Limit Switches are used for window operators in skylights and monitors, for central station control.

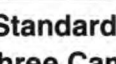
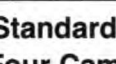
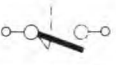
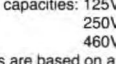
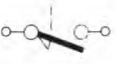
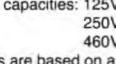
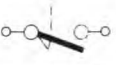
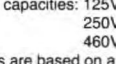
- ✓ motor operated valves
- ✓ packaging machinery
- ✓ tapping heads
- ✓ elevating mechanisms

- ✓ pipe threading machines
- ✓ index tables
- ✓ transformer tap changers
- ✓ conveyors

Rotary Limit Switches

Max Speed — 1000 RPM

worm gear type

Standard Two Cam S.P.D.T.* Contact Symbol For Each Cam  Deduct \$12.00 list If One Switch Is Omitted.	Input Shaft Rev.	Cam Block Rev.	NEMA 1* & 12 Encl.		NEMA 4 Encl. (1)		NEMA 7 Encl. (1)		Input Shaft Turns****	
			Catalog No.		Catalog No.		Catalog No.		Max. Setting	To Reset
	5 10 20	1	2000-1B 2000-38B 2000-2B		2000-9B 2000-39B 2000-10B		2000-17B 2000-40B 2000-18B		4 1/2 9 1/4 18	1/16 1/8 1/8
Standard Two Cam D.P.D.T.** Contact Symbol For Each Cam   	30 40 50	1	2000-3B 2000-4B 2000-5B		2000-11B 2000-12B 2000-13B		2000-19B 2000-20B 2000-21B		28 37 46	1/4 1/4 1/4
	60 80 100	1	2000-6B 2000-7B 2000-8B		2000-14B 2000-15B 2000-16B		2000-22B 2000-23B 2000-24B		58 77 94	1 1/2 3/4 3/4
	150 250 300	1	2000-129B 2000-28B 2000-130B		2000-132B 2000-31B 2000-133B		2000-135B 2000-34B 2000-136B		135 230 265	4 6 6 1/2
	500 600 1000	1	2000-29B 2000-131B 2000-30B		2000-32B 2000-134B 2000-33B		2000-35B 2000-143B 2000-36B		460 555 920	15 1/4 16 29
	2000 4000 5333.3	1	2000-292B 2000-279B 2000-281B		2000-299B 2000-127B 2000-157B		2000-291B 2000-128B 2000-158B		Consult Factory	
	5 10 20	1	2000-137B 2000-138B 2000-25B		2000-145B 2000-146B 2000-147B		2000-159B 2000-160B 2000-161B		4 3/4 9 1/4 19	1/8 1/4 1/2
	30 40 50	1	2000-47B 2000-139B 2000-73B		2000-148B 2000-149B 2000-150B		2000-160B 2000-162B 2000-163B		28 1/2 37 3/4 46 3/4	1/2 3/4 3/4
	60 80 100	1	2000-75B 2000-77B 2000-43B		2000-151B 2000-152B 2000-153B		2000-164B 2000-165B 2000-166B		58 75 95	1 1/2 1 3/4 2
	150 250 300	1	2000-1130B 2000-140B 2000-1133B		2000-1131B 2000-140B 2000-1134B		2000-1132B 2000-167B 2000-1135B		135 237 265	4 6 6 1/2
	500 600 1000	1	2000-141B 2000-1136B 2000-142B		2000-155B 2000-1137B 2000-156B		2000-168B 2000-1138B 2000-169B		460 555 920	15 1/4 16 29
	2000 4000 5333.3	1	2000-1139B 2000-1142B 2000-1145B		2000-1140B 2000-1143B 2000-1146B		2000-1141B 2000-1144B 2000-1147B		Consult Factory	
Standard Three Cam S.P.D.T.*** Contact Symbol For Each Cam   	Input Shaft Rev.	Cam Block Rev.	NEMA 1* & 12 Encl.		NEMA 4 Encl. (1)		NEMA 7 Encl. (1)		Input Shaft Turns****	
			Catalog No.		Catalog No.		Catalog No.		Max. Setting	To Reset
	5 10 20	1	2000-174B 2000-175B 2000-176B		2000-188B 2000-189B 2000-190B		2000-263B 2000-264B 2000-265B		4 3/4 9 1/2 19 1/4	1/16 1/16 1/8
Standard Four Cam S.P.D.T.*** Contact Symbol For Each Cam   	30 40 50	1	2000-177B 2000-178B 2000-179B		2000-191B 2000-192B 2000-193B		2000-266B 2000-267B 2000-268B		28 1/2 38 47	1/4 1/2 1/2
	60 80 100	1	2000-180B 2000-181B 2000-182B		2000-194B 2000-195B 2000-196B		2000-269B 2000-270B 2000-271B		57 1/2 76 3/4 96 1/4	1/2 1/2 1 1/2
	150 250 300	1	2000-170B 2000-183B 2000-187B		2000-171B 2000-197B 2000-300B		2000-186B 2000-272B 2000-301B		135 234 265	4 2 6 1/2
	500 600 1000	1	2000-184B 2000-1100B 2000-185B		2000-198B 2000-1101B 2000-199B		2000-273B 2000-1102B 2000-274B		460 555 920	7 16 10
	2000 4000 5333.3	1	2000-1103B 2000-1106B 2000-1109B		2000-1104B 2000-1107B 2000-1110B		2000-1105B 2000-1108B 2000-1111B		Consult Factory	
Standard Four Cam S.P.D.T.*** Contact Symbol For Each Cam   	Input Shaft Rev.	Cam Block Rev.	NEMA 1* & 12 Encl.		NEMA 4 Encl. (1)		NEMA 7 Encl. (1)		Input Shaft Turns****	
			Catalog No.		Catalog No.		Catalog No.		Max. Setting	To Reset
	5 10 20	1	2000-89B 2000-90B 2000-91B		2000-101B 2000-102B 2000-103B		2000-113B 2000-114B 2000-115B		4 3/4 9 1/2 19 1/4	1/16 1/16 1/8
Standard Four Cam S.P.D.T.*** Contact Symbol For Each Cam   	30 40 50	1	2000-92B 2000-93B 2000-94B		2000-104B 2000-105B 2000-106B		2000-116B 2000-117B 2000-118B		28 1/2 38 47	1/4 1/2 1/2
	60 80 100	1	2000-95B 2000-96B 2000-97B		2000-107B 2000-108B 2000-109B		2000-119B 2000-120B 2000-121B		57 1/2 76 3/4 96 1/4	1/2 1/2 1 1/2
	150 250 300	1	2000-1112B 2000-98B 2000-1115B		2000-1113B 2000-110B 2000-1116B		2000-1114B 2000-122B 2000-1117B		135 234 265	4 2 6 1/2
	500 600 1000	1	2000-99B 2000-1118B 2000-100B		2000-111B 2000-1119B 2000-112B		2000-123B 2000-1120B 2000-124B		460 555 920	7 16 10
	2000 4000 5333.3	1	2000-1121B 2000-1124B 2000-1127B		2000-1122B 2000-1125B 2000-1128B		2000-1123B 2000-1126B 2000-1129B		Consult Factory	

*Switch capacities: 125V. - 15 amps. A.C., 1/2 amp. D.C. **Switch capacities: 125 or 250V. A.C. - 10 amps. ***Switch capacities:

250V. - 15 amps. A.C., 1/4 amp. D.C.

125V. D.C. - 1/2 amp.

Mechanical rating - 20 million cycles

460V. - 15 amps. A.C.

250V. D.C. - 1/4 amp.

Electrical rating -

125V. A.C. - 10 amps. resistive load

250V. A.C. - 10 amps. resistive load

30V. D.C. - 7 amps. inductive load

****Figures are based on a switch using a standard 25° cam; maximum setting between limits.

(1) — For Cast Iron or Bronze Enclosure Contact Factory.

Rotary Limit Switches

worm gear type

Special Cams*

Cam** Part No.	Period for which switch contacts are opened or closed	
S-55-A Standard	25° or 335°	
S-68-A	54° or 306°	
S-84-A	75° or 285°	
S-69-A	90° or 270°	
S-85-A	105° or 255°	
S-86-A	135° or 225°	
S-87-A	150° or 210°	
S-70-A	180°	
S-71-A	240° or 120°	
S-127-A	360° Blank Cam	

*Special cams not listed, can be furnished on special order. When ordering, please specify cam angle.

Ordering

When ordering desired switch, specify:

- | | |
|-------------------|-----------------------|
| 1. Catalog Number | 3. Desired Gear Ratio |
| 2. Number of Cams | 4. Type of Enclosure |

Example: If a four circuit standard enclosure, 5:1, is required with four 90° cams, order Catalog No. 2000-89 with four Part No. S-69-A Cams. See Special Cam Chart above.

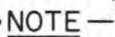
In selecting a gear ratio, maximum accuracy and ease of adjustment are more easily obtained if full travel of drive equals, or is less than maximum setting between limits.

Example: If 90 revolutions of a window drive opens a window, a gear ratio of 100:1 should be selected.

Design Service

Gemco Design Engineers will be pleased to assist in the solution of any special control problems and to recommend the most suitable Gemco Rotary Limit Switch for your needs. Custom designed switches are available to specifications.

WORM GEAR TYPE — NEMA 1 & 12



Approximate shipping weight 2 lbs.

D-10-C (NEMA 7)



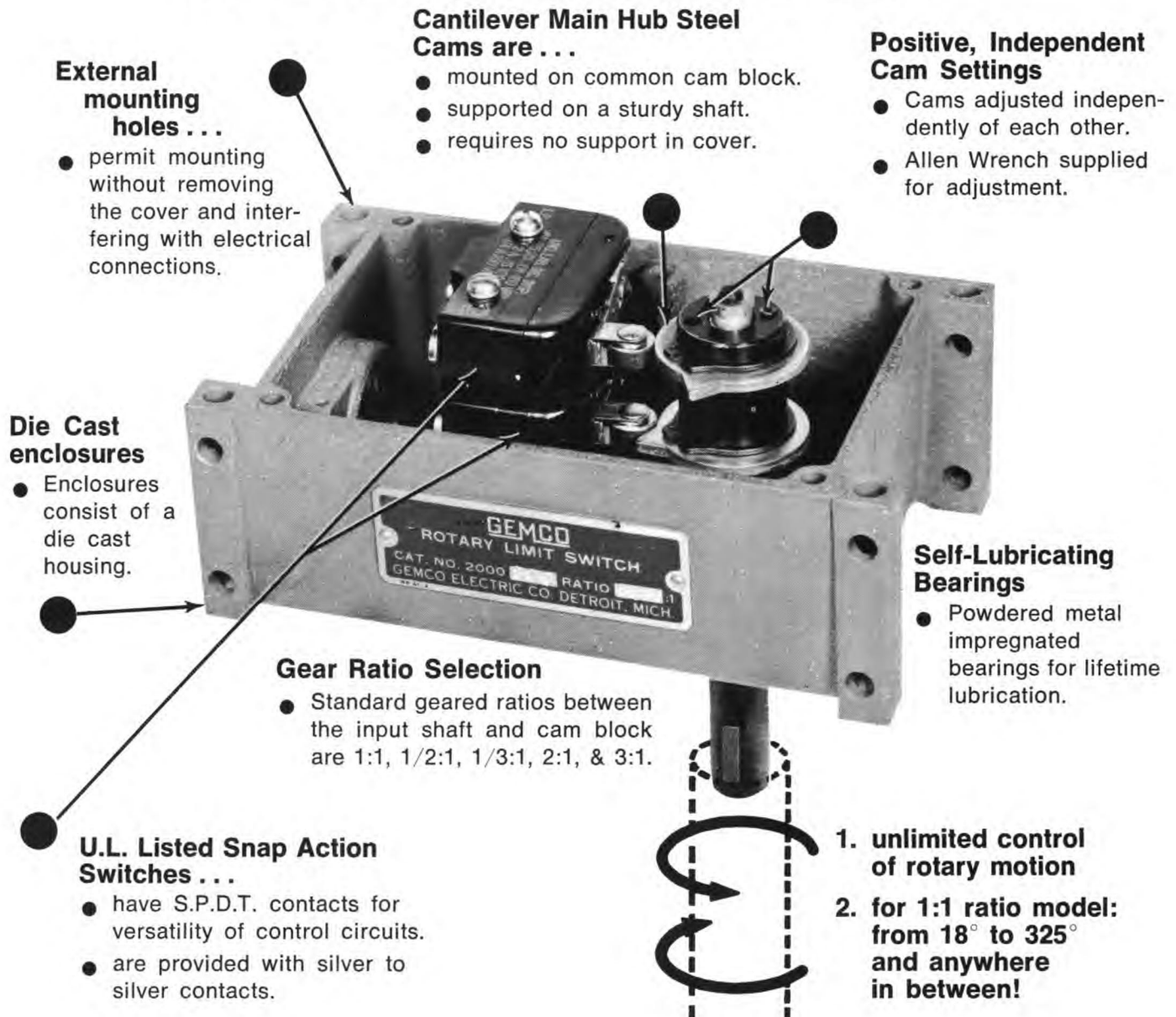
Approximate shipping weight 4 1/4 lbs.

7

Rotary Limit Switches

spur gear type

SUPERIOR DESIGN AND OPERATING FEATURES



Rotary Limit Switches

Application

GEMCO'S Spur Gear Type Rotary Limit Switch is used in applications requiring ratios below **3:1** and **1:3** for controlling the end and/or intermediate limits of reciprocating or rotary motion. This device extends the present line of Gemco Rotary Limit Switches by providing ultra-sensitive control for small increments of motion.

Many beneficial features include:

- Control of motor-operated valves, dampers and hopper gates used in pipe lines, ventilating equipment and material handling systems.
- Improved environmental conditions for longer switch life.
- Smaller space requirements.
- Material and labor savings of reduced drilling, tapping, piping, and wiring.
- Economies afforded when Gemco units are applied for many short travel end limit uses instead of conventional lever operated limit switches actuated by cams or dogs.
- Unique mounting which permit these switches to be installed in convenient mounting positions. Mounting holes are provided for either direct or sprocket drive applications in three different positions.

Description

The basic switch units are actuated by independently adjustable cams which are driven by the input shaft. All cams are mounted on a common block which is directly coupled or geared to the drive shaft.

● Ratios

Standard geared ratios between the input shaft and cam block are **1:1**, **1/2:1**, **1/3:1**, **2:1**, and **3:1**. The **1:1** ratio may be supplied with a potentiometer gear coupled to the input shaft with ratios of **1:1**, **1:2** and **1:3**.

● Long Life Switches

Each enclosure can accommodate from two to four S.P.D.T. switches. All switches are provided with silver to silver contacts for reliability along with screw type terminals.

spur gear type

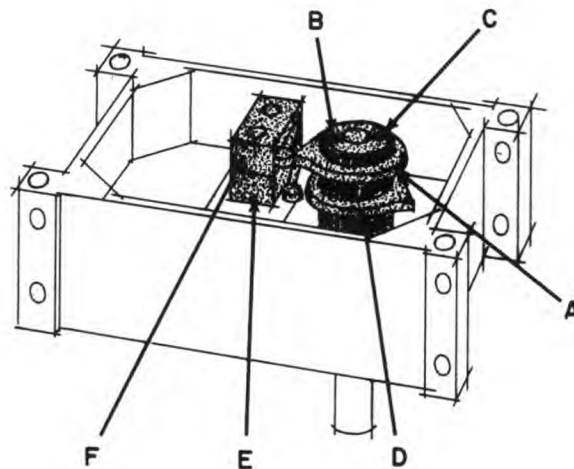


Figure 5 Sketch showing:

- independent adjustable cams A-D
- switches E-F
- Allen screws B-C for cam adjustment

Mounting

Unique mounting features permit these switches to be installed in any of three different positions. Mounting holes are provided for either direct or sprocket drive applications.

Adjustment

- Top cam 'A' actuates switch 'F'; bottom cam 'D' actuates switch 'E'.
- Adjustment of cam 'A' is independent of cam 'D'.
- To adjust cam 'A', loosen cam locking screw 'C' and rotate cam 'A' until trip point of switch 'F' is reached.
- To adjust cam 'D', loosen cam locking screw 'B' and rotate cam 'D' until trip point of switch 'E' is reached.

When the cams rotate, the switches are actuated and the contacts change from the normally closed to open position. (See Figure 5.)

Rotary Limit Switches

spur gear type

Enclosures

NEMA Type 1 and 12 (General Purpose) enclosures consist of a die cast housing and **FIBRALLOY®** cover. All mounting holes are external to the wiring cavity eliminating interference with internal wiring when the switch is mounted. Captive screws fasten the cover to the die cast housing and eliminate problems of misplaced screws. (See Figure 6.)

NEMA 4 and 7 enclosures are constructed of aluminum to prevent corrosion. The NEMA 7 (Hazardous Location) enclosure is available for use in Class 1, Group D, areas as outlined in the National Electrical Code. Cast iron enclosures can also be provided on special request. All units are provided with an attractive red wrinkle finish. (See Figure 7.)

Potentiometer

An optional salient feature of mounting a 2 watt potentiometer within the enclosure, and gear coupled to the input shaft, is offered. This feature permits the potentiometer to be used as a remote position indicator or as a constant output auxiliary control device for open or closed loop feedback systems. (See Figure 8.)

- Step-up geared ratios between the input shaft and the potentiometer are available to provide a choice of sensitivity and resolution to meet most applications.
- The special type potentiometer allows continuous rotation of the drive and a zero or reference point to be adjusted without removing any gears or components.



Figure 6 NEMA 1 Enclosure
2 circuit



Figure 7 NEMA 7 Enclosure
2 circuit



Figure 8 NEMA 1 Enclosure
4 circuit with Gear Coupled
Potentiometer

Rotary Limit Switches

SG TYPE.....

.... Rotary Application

- **reciprocating motions**

Assures accurate movement and placement of parts in all types of handling and positioning fixtures.

► **NOTE** — Replaces two limit switches and electrical piping.

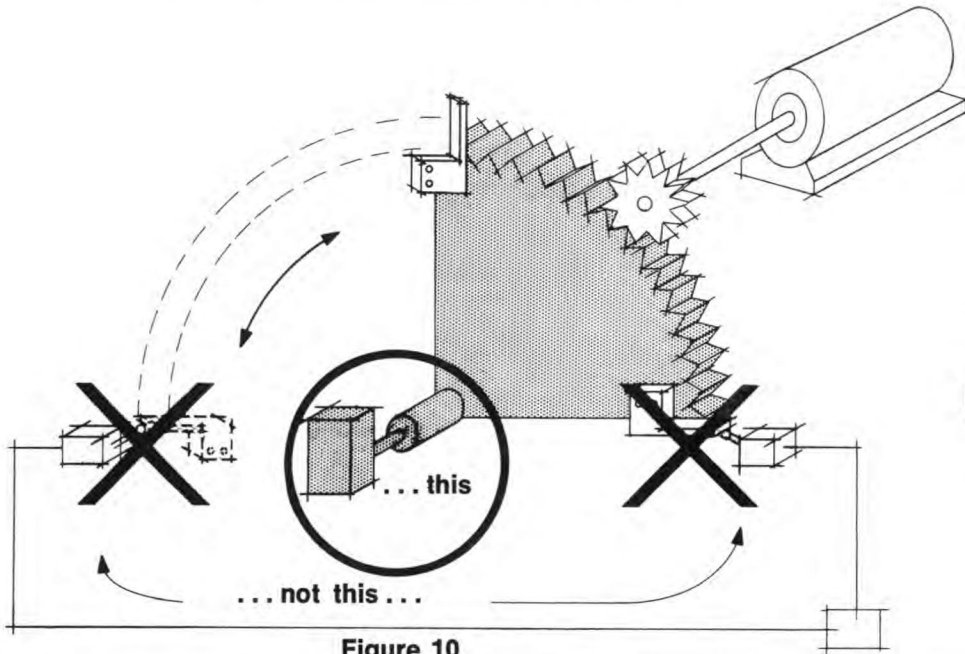


Figure 10

Rotary Limit Switches

spur gear type

ROTARY LIMIT SWITCH

Enclosure Type	Input Shaft Rev.	Cam Block Rev.	Two Circuit S. P. D. T. Symbol A		Two Circuit D. P. D. T. Symbol B		Three Circuit S. P. D. T. Symbol C		Four Circuit S. P. D. T. Symbol C	
			Catalog Number		Catalog Number		Catalog Number		Catalog Number	
NEMA 1 & 12	1	1	2000-800		2000-805		2000-810		2000-815	
	1/2	1	2000-801		2000-806		2000-811		2000-816	
	1/3	1	2000-802		2000-807		2000-812		2000-817	
	2	1	2000-803		2000-808		2000-813		2000-818	
	3	1	2000-804		2000-809		2000-814		2000-819	
NEMA 4 (1)	1	1	2000-832		2000-837		2000-842		2000-847	
	1/2	1	2000-833		2000-838		2000-843		2000-848	
	1/3	1	2000-834		2000-839		2000-844		2000-849	
	2	1	2000-835		2000-840		2000-845		2000-850	
	3	1	2000-836		2000-841		2000-846		2000-851	
NEMA 7 (1)	1	1	2000-864		2000-869		2000-874		2000-879	
	1/2	1	2000-865		2000-870		2000-875		2000-880	
	1/3	1	2000-866		2000-871		2000-876		2000-881	
	2	1	2000-867		2000-872		2000-877		2000-882	
	3	1	2000-868		2000-873		2000-878		2000-883	

ROTARY LIMIT SWITCH WITH POTENTIOMETER

Enclosure Type	Input Shaft Rev.	Cam Block Rev.	Pot. Rev.	Two Circuit S. P. D. T. Symbol A		Two Circuit D. P. D. T. Symbol B		Three Circuit S. P. D. T. Symbol C		Four Circuit S. P. D. T. Symbol C	
				Catalog Number		Catalog Number		Catalog Number		Catalog Number	
NEMA 1 & 12	1	1	1	2000-820		2000-823		2000-826		2000-829	
	1	1	2	2000-821		2000-824		2000-827		2000-830	
	1	1	3	2000-822		2000-825		2000-828		2000-831	
NEMA 4	1	1	1	2000-852		2000-855		2000-858		2000-861	
	1	1	2	2000-853		2000-856		2000-859		2000-862	
	1	1	3	2000-854		2000-857		2000-860		2000-863	
NEMA 7	1	1	1	2000-884		2000-887		2000-890		2000-893	
	1	1	2	2000-885		2000-888		2000-891		2000-894	
	1	1	3	2000-886		2000-889		2000-892		2000-895	

(1) Contact Factory for Cast Iron or Bronze Enclosure.

Ordering

When ordering desired switch, specify:

1. Catalog Number
2. Quantity Required
3. Desired Gear Ratio
4. Resistance of Potentiometer (if used)

Rotary Limit Switches

Potentiometer

Potentiometers can be provided with resistance of 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10,000, or 20,000 ohms. All potentiometers are rated at 2 watts. (Linear taper).

Gear Ratio Selection

In selecting a gear ratio, maximum accuracy and ease of adjustment are more easily obtained if rotation of input shaft between limits is equal to, or less than, maximum settings between limits. For example, if .8 revolutions of the input shaft is required to open and close a valve, a gear ratio of 1:1 input to cam should be selected.

TABLE 1 — engineering data

Input Shaft Rev.	Cam Block Rev.	TURNS OF INPUT SHAFT*		
		Max. Setting Between Limits	Min. Setting Between Limits	To Reset
1	1	0.9	0.05	0.025
1/2	1	0.45	0.025	0.012
1/3	1	0.30	0.016	0.008
2	1	1.8	0.1	0.050
3	1	2.7	0.15	0.075

*Figures are based on a switch using standard 25° cams and with Symbol A contacts as noted in Table 2.

TABLE 2 — basic switch data

Symbol A S. P. D. T.	Symbol B D. P. D. T.	Symbol C S. P. D. T.
		
Ratings 125 V-15 A., A.C. 1/2 Amp. D.C. 250 V-15 A., A.C. 1/4 Amp. D.C. 460 V-15 A., A.C.	Ratings 125-250 V.A.C. 10 Amps. 125 - V.D.C. 1/2 Amp. 250 - V.D.C. 1/4 Amp.	Ratings 125-250 V.A.C. 10 Amps. 30 - V.D.C. 10 Amps.

Special Cams*

Cam** Part No.	Period for which switch contacts are opened or closed	
S-55-A Standard	25° or 335°	
S-68-A	54° or 306°	
S-84-A	75° or 285°	
S-69-A	90° or 270°	
S-85-A	105° or 255°	
S-86-A	135° or 225°	
S-87-A	150° or 210°	
S-70-A	180°	
S-71-A	240° or 120°	
S-127-A	360° Blank Cam	

*Special cams not listed, can be furnished on special order. When ordering, please specify cam angle.

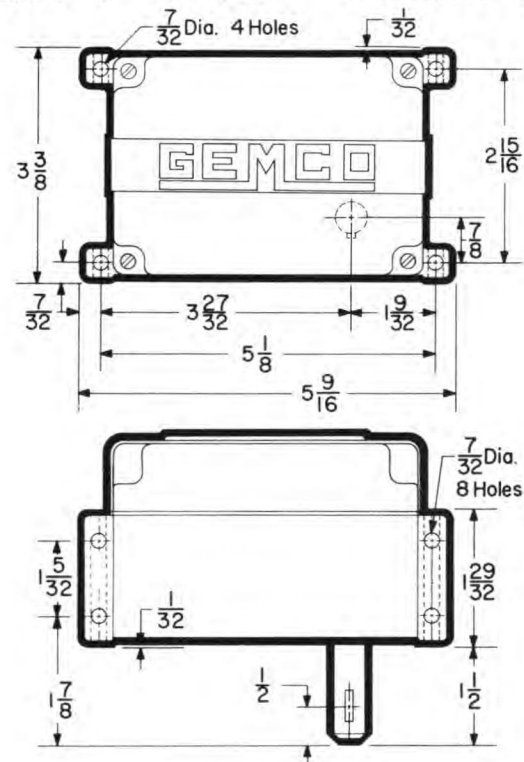
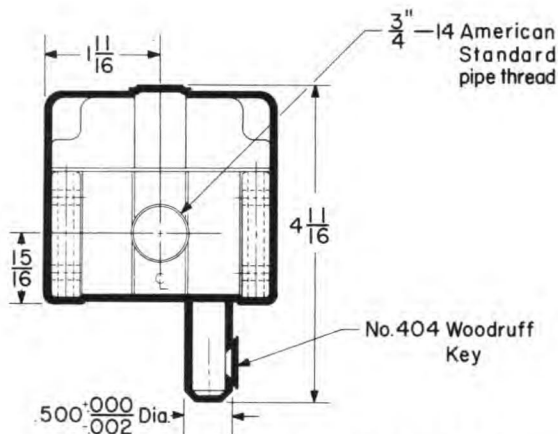
Rotary Limit Switches

SPUR GEAR TYPE — NEMA 1 & 12

DWG. NO. D-34-C

Input Shaft Has Snap Ring
Grooves For Sect. 3001
Adjustable Coupling

NOTE —
Approximate dimensions — not for construction unless certified.
Shipping weight 2lb. 8oz.

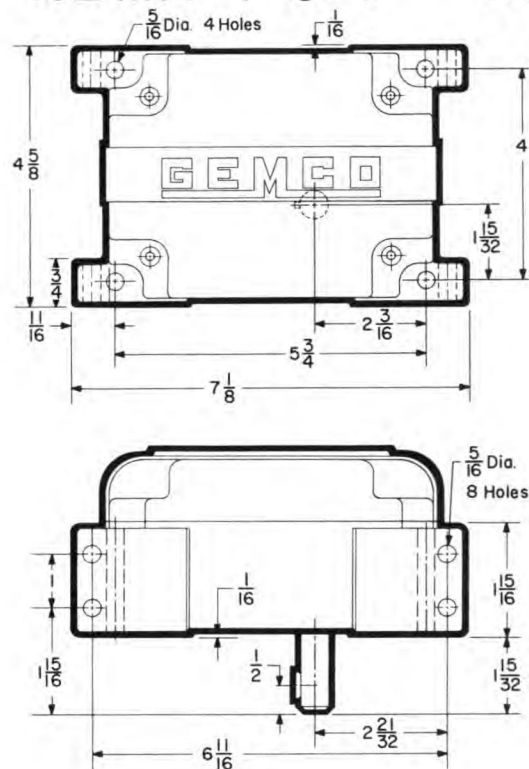
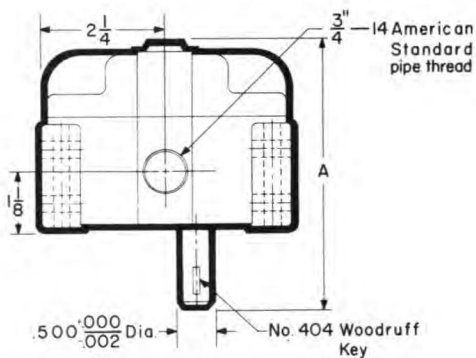


SPUR GEAR TYPE — NEMA 4 & 7

DWG. NO. D-35-C

NOTE —
Approximate dimensions — not for construction unless certified.
Approximate shipping weight 4lb. 12oz.

UNIT	A HEIGHT
NEMA 4	4 15/16
NEMA 7	4 29/32



Rotary Limit Switches

Heavy Duty...

Rotary Limit Switch

with reduction ratios to ...

3000:1



Figure 10 NEMA 12 Heavy Duty Rotary Limit Switch 2 circuit

Application:

Ruggedly built, GEMCO'S heavy duty Rotary Limit Switches have gained wide acceptance on installations such as mechanical press ram adjustments, press extractors and shuttles which require dependable trouble-free performance. These installations require a limit switch that will withstand rapid starting and stopping, shock, vibration and still successfully control the end or intermediate limits of such devices. Because of these demands and the high reliability required, GEMCO'S heavy-duty Rotary Limit Switch far exceeds any on the market.

Cams

The input shaft (includes Woodruff Key) drives a bronze gear which rotates the cam block. The cam block houses independently adjustable cams that actuate the precision type snap action switches.

Input Speed

Maximum rated speed of the input shaft is 1800 RPM; can be rotated clockwise or counterclockwise.

NEMA 12

Reduction Ratios	TWO CIRCUIT S.P.D.T. - Symbol A*		TWO CIRCUIT D.P.D.T. - Symbol B*		THREE CIRCUIT S.P.D.T. - Symbol C*		FOUR CIRCUIT S.P.D.T. - Symbol C*	
								
	Catalog No.		Catalog No.		Catalog No.		Catalog No.	
5:1	2000-2000		2000-2006		2000-2012		2000-2018	
7.5:1	2000-2001		2000-2007		2000-2013		2000-2019	
10:1	2000-2002		2000-2008		2000-2014		2000-2020	
15:1	2000-2003		2000-2009		2000-2015		2000-2021	
20:1	2000-2004		2000-2010		2000-2016		2000-2022	
30:1	2000-2005		2000-2011		2000-2017		2000-2023	
125:1	2000-2024		2000-2039		2000-2054		2000-2069	
156.25:1	2000-2025		2000-2040		2000-2055		2000-2070	
187.5:1	2000-2026		2000-2041		2000-2056		2000-2071	
250:1	2000-2027		2000-2042		2000-2057		2000-2072	
312.5:1	2000-2028		2000-2043		2000-2058		2000-2073	
375:1	2000-2029		2000-2044		2000-2059		2000-2074	
500:1	2000-2030		2000-2045		2000-2060		2000-2075	
625:1	2000-2031		2000-2046		2000-2061		2000-2076	
750:1	2000-2032		2000-2047		2000-2062		2000-2077	
1000:1	2000-2033		2000-2048		2000-2063		2000-2078	
1250:1	2000-2034		2000-2049		2000-2064		2000-2079	
1500:1	2000-2035		2000-2050		2000-2065		2000-2080	
2000:1	2000-2036		2000-2051		2000-2066		2000-2081	
2500:1	2000-2037		2000-2052		2000-2067		2000-2082	
3000:1	2000-2038		2000-2053		2000-2068		2000-2083	

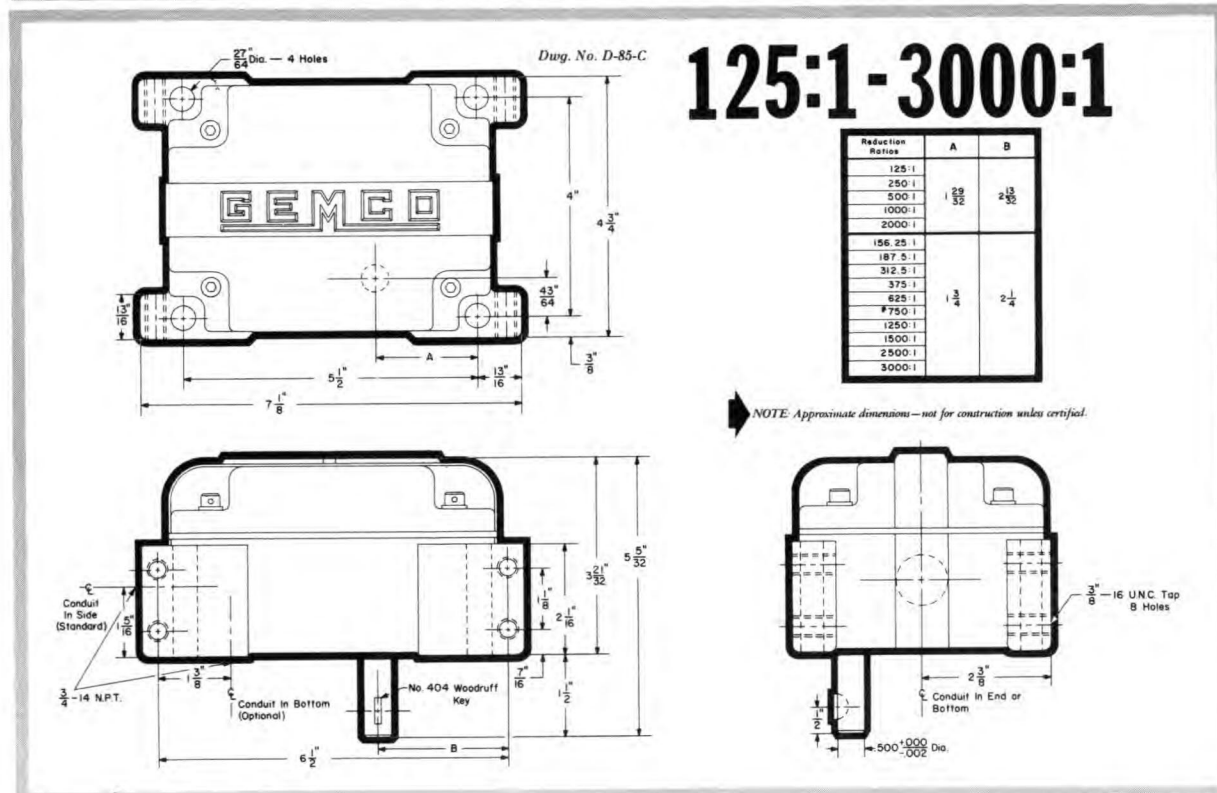
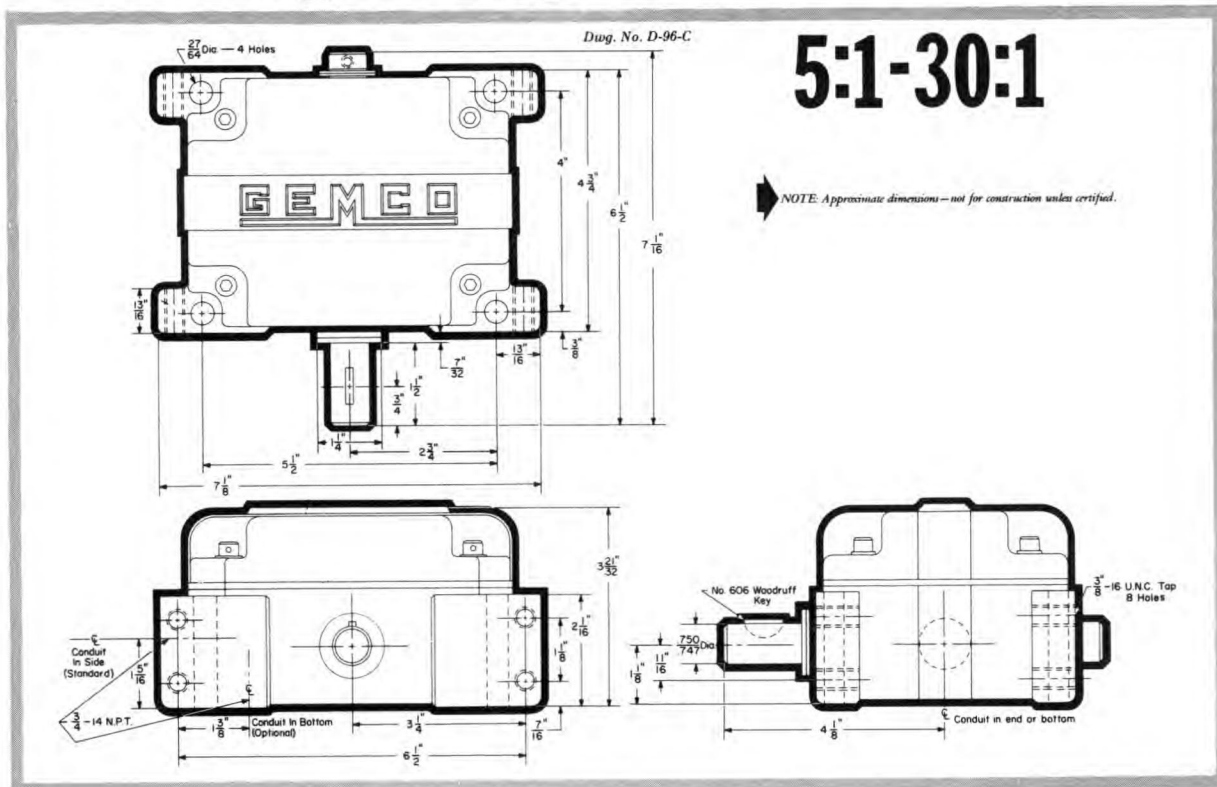
Dwg. No. D-96-C

Dwg. No. D-85-C

* For switch capacities, see page 13
For Cast Iron or Bronze Enclosure Contact Factory.

Rotary Limit Switches

Heavy-Duty Dimensions



Type K Rotary Limit Switches

GENERAL PURPOSE ROTARY LIMIT SWITCHES

- FEATURING:**
- S.P.D.T. or D.P.D.T. INDUSTRIAL DUTY SWITCHES WITH ISOLATED CONTACTS
 - EASE OF WIRING WITH DIRECT ACCESS TO ALL SWITCH TERMINALS
 - GEAR RATIOS FROM 5:1 TO 1080:1
 - POSITIVE, INDEPENDENT CAM SETTINGS
 - RUGGED DUTY DIE CAST ENCLOSURES
 - LARGE COVER OPENINGS FOR EASE OF WIRING
 - NEMA 4 & 5 OILTIGHT—WATERTIGHT—DUSTTIGHT



2 CIRCUIT



4 CIRCUIT

Type K Rotary Limit Switches

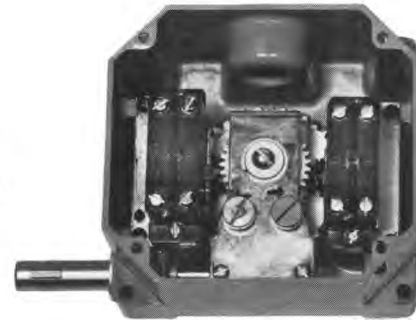
TWO (2) CIRCUIT ROTARY LIMIT SWITCH CATALOG NUMBERING SYSTEM

2006—402—L—5—A

CATALOG SECTION

Two (2) Circuit
NEMA 4 Enclosure

CROSS REFERENCE 2 CIRCUIT ROTARY LIMIT SWITCH	
CUTLER HAMMER PART NO.	GEMCO PART NO.
10316H-155-1	2006-402-L-120-A
10316H-156-1	2006-402-L-60-A
10316H-157-1	2006-402-L-40-A
10316H-167-1	2006-402-L-357-A
10316H-169-1	2006-402-L-1080-A
10316H-179-1	2006-402-R-120-A
10316H-180-1	2006-402-R-60-A
10316H-181-1	2006-402-R-40-A
10316H-1016-1	2006-402-L-10-A
10316H-1017-1	2006-402-L-20-A
10316H-1018-1	2006-402-R-10-A
10316H-1019-1	2006-402-R-20-A
10316H-4556-1	2006-402-L-5-A
10316H-4557-1	2006-402-L-30-A
10316H-4559-1	2006-402-L-80-A
10316H-4560-1	2006-402-R-5-A
10316H-4561-1	2006-402-R-30-A
10316H-4563-1	2006-402-R-80-A
10316H-4591-1	2006-402-R-357-A
10316H-4595-1	2006-402-R-1080-A
10316H-4599-1	2006-402-L-270-A
10316H-4606-1	2006-402-R-270-A



SWITCH TYPE	
A	All S.P.D.T.
B	1-D.P.D.T., Balance S.P.D.T.
C	2-D.P.D.T.,
R	1950-1408 (Quick Reset)

All Switches have Isolated Contacts
S.P.D.T. 1 NO—1 NC Contacts
D.P.D.T. 2 NO—2 NC Contacts

RATIO	
5	5:1
10	10:1
20	20:1
30	30:1
40	40:1
60	60:1
80	80:1
120	120:1
270	270:1
357	357:1
1080	1080:1

SHAFT EXTENSION	
L*	Left Hd. Shaft Ext.
R	Right Hd. Shaft Ext.

* Available from stock

"L" SHAPE BRACKET

When "L" Shape Bracket
is purchased, use

CATALOG NUMBER	
C-6131-B (2 circuit unit)	
C-6132-B (4 circuit unit)	

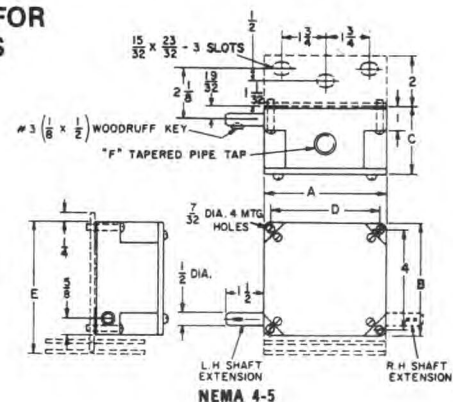
APPROXIMATE DIMENSIONS AND SHIPPING WEIGHTS FOR 2 AND 4 CIRCUIT UNITS

Circuits	Dimensions in Inches					Lbs. Boxed
	A	B	C	D	E	
2 Circuit Enclosure	4 $\frac{7}{8}$	4 $\frac{1}{2}$	2 $\frac{5}{8}$	4 $\frac{3}{8}$	5 $\frac{1}{4}$	3
4 Circuit Enclosure	6 $\frac{7}{8}$	5	3 $\frac{3}{8}$	6 $\frac{3}{8}$	5 $\frac{7}{32}$	4 $\frac{1}{2}$

① Includes half inch hub extension.

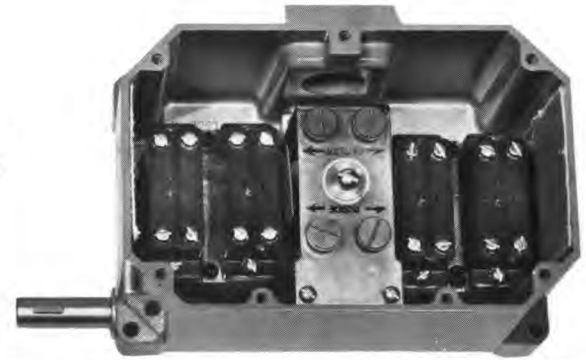
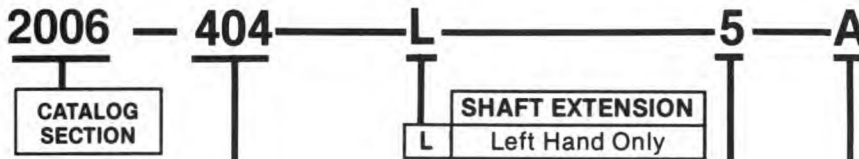
LEFT HAND EXTENSION SHOWN

("L" shape mounting bracket, when purchased separately, is shown in some of the possible mounting positions by broken lines.)



Type K Rotary Limit Switches

FOUR (4) CIRCUIT ROTARY LIMIT SWITCH CATALOG NUMBERING SYSTEM



SWITCH TYPE	
A	All S.P.D.T.
B	1-D.P.D.T., Balance S.P.D.T.
C	2-D.P.D.T., Balance S.P.D.T.
D	3-D.P.D.T., Balance S.P.D.T.
E	4-D.P.D.T.,
R	Quick Reset

All Switches have Isolated Contacts
S.P.D.T. 1 NO—1 NC Contacts
D.P.D.T. 2 NO—2 NC Contacts

CROSS REFERENCE 4 CIRCUIT ROTARY LIMIT SWITCHES	
CUTLER HAMMER PART NO.	GEMCO PART NO.
10316H-158-1	2006-404-L-120-A
10316H-159-1	2006-404-L-60-A
10316H-160-1	2006-404-L-40-A
10316H-173-1	2006-404-L-1080-A
10316H-175-1	2006-404-L-357-A
10316H-1026-1	2006-404-L-10-A
10316H-1027-1	2006-404-L-20-A
10316H-4568-1	2006-404-L-5-A
10316H-4569-1	2006-404-L-30-A
10316H-4571-1	2006-404-L-80-A
10316H-4600-1	2006-404-L-270-A

RATIO	
5	5:1
10	10:1
20	20:1
30	30:1
40	40:1
60	60:1
80	80:1
120	120:1
270	270:1
357	357:1
1080	1080:1

SPARE SNAP SWITCHES

CUTLER HAMMER PART NUMBER	GEMCO PART NUMBER	
SPDT 10316H89A	1950-1-B-A-DO	
DPDT 10316H2000	1950-4-B-A-DO	
Quick Reset	1950-1408	



ELECTRICAL CONTACT RATINGS

Switch Type	Contacts	Volts	AC						Volts	DC	
			Inductive Pilot Duty 35% Power Factor					Resistive 75% Power Factor		Inductive Pilot Duty and Resistive	
			Make		Break		Con- tinuous Carrying Amperes	Make, Break and Continuous Carrying Amperes		Make and Break Amperes	Con- tinuous Carrying Amps
			Amps.	VA	Amps.	VA				Double Throw	
1950-1-B-A-DO	SPDT	110	40	.....	15	.....	15	15	115	0.25	15
		220	20	.....	10	.....	15	15	230	0.1	15
		440	10	.....	6	.....	15	15	600	.....	15
		600	8	.....	5	.....	15	15			
1950-4-B-A-DO	DPDT	115	30	3450	3	345	10	10	115	0.2	10
		230	15	3450	1.5	345	10	10	230	0.1	10
		440	7.5	3450	0.75	345	10	10	600	.....	10
		575	6	3450	0.6	345	10	10			

NOTE: The maximum period for which the switch contacts are opened or closed during one revolution (360°) of the cam block assembly is 25° or 335°. Multiply the Rotary Limit Switch gear ratio times 25° or 335° to obtain the input shaft rotation which will yield 25° or 335° of cam block rotation.

Type K Rotary Limit Switches

APPLICATION:

The Type K Rotary Limit Switch is used in applications requiring ratios from 5:1 to 1080:1 for controlling the end and/or intermediate limits of a reciprocating or rotary motion. Two circuit and four circuit assemblies are available from stock.

The NEMA 4 & 5 enclosure provides a clean environmental condition for the industrial duty snap action switches. Where motion can be expressed in shaft rotation either through a roller chain, gear train or direct coupling, the Type K Rotary Limit Switch makes it possible to open or close up to four independent circuits at the desired angular positions.

Ease of Making Cam Settings



DESCRIPTION:

Precision rugged duty snap action switches, combined with a wide selection of gear ratios provides reliable electrical signals as a function of the shaft rotation. No minimum speed is specified due to the snap action contacts of the switch. The cam settings and the switch wiring can be easily accomplished through the full size cover.

With the two circuit assembly, either a left hand or right hand shaft extension can be supplied. This provides the added versatility when packaging this assembly in hard-to-get-at locations.

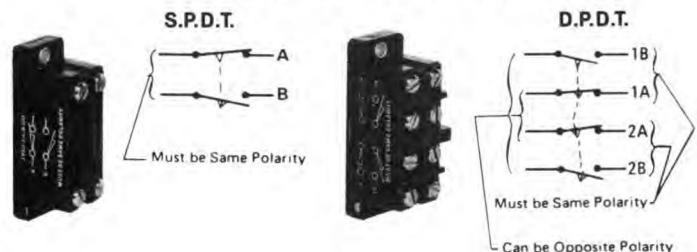
Easy to Wire Terminals



TYPICAL APPLICATIONS ARE:

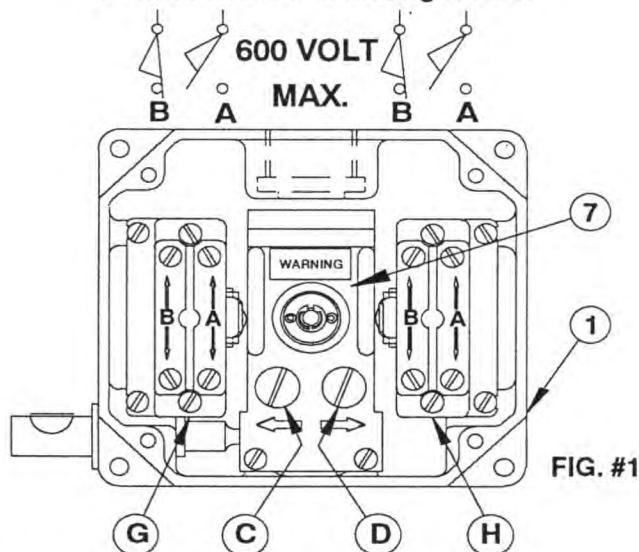
- Door Operators
- Hoists
- Valves
- Elevating Jack Mechanisms
- Tapping Heads
- Packaging Machinery
- Index Tables
- Material Handling Equipment
- Reciprocating Linear Actuators
- Dampers
- End Limits on Machine Tool Lead Screws
- Shuttles
- Conveyors

Industrial Duty Switches With Isolated Contacts



Type K Rotary Limit Switches

Contact positions shown are when cams ARE NOT actuating levers.



DESCRIPTION

This rotary limit switch is designed to control the limits of travel of rotating reversing equipment.

The limit switch input shaft is connected to a worm gear. Adjustable self lubricating nylon roller cams are concentrically mounted to the worm gear. These adjustable cams actuate the precision limit switches by utilizing a lever assembly.

INSTALLATION

This limit switch may be mounted in any convenient position. When installed this limit switch will provide long life with a minimum amount of service maintenance.

The following recommendations will prove helpful.

- 1 - Install the limit switch so that the shaft load will not exceed (5) five pounds.
- 2 - A flexible coupling is recommended for all installation other than gear drive application.
- 3 - Coupling should be employed in a manner that results in a minimum of thrust loading on the shaft. If switches are mounted with the shaft up or down, some additional thrust loading resulting from the weight of the shaft plus a very light coupling is permissible.
- 4 - Whenever possible, a separate support bearing for the drive sprocket should be used.
- 5 - Permissible speed of the input shaft 2000 R.P.M.

LUBRICATION

This limit switch was lubricated at the factory and should not require lubrication for the life of the switch.

ADJUSTMENT

Refer to figure 1. The electrical switch units "G" and "H" are shown with the contact positions assumed when the cams are not actuating the switch units.

When the cam rotates and actuates the switch, the "B" (closed) contact opens and the "A" (open) contact closes. Each precision switch has (1) one independent adjustable cam.

TO ADJUST SWITCH "G"

1. Loosen Red Set Screw
2. Turn "C" to Trip "G"
3. Tighten Red Set Screw

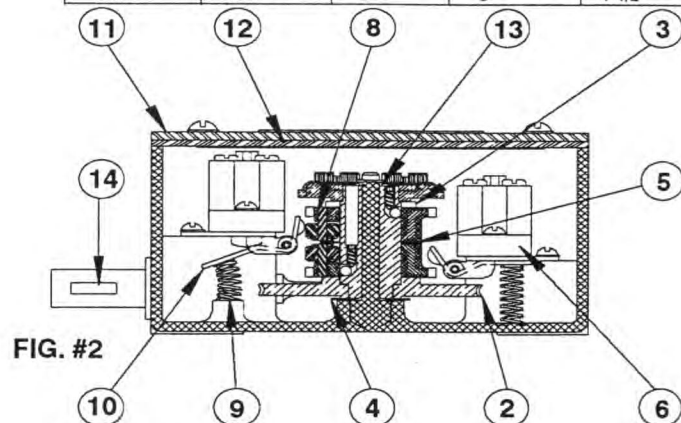
TO ADJUST SWITCH "H"

1. Loosen Blue Set Screw
2. Turn "D" to Trip "H"
3. Tighten Blue Set Screw

WARNING:

LOOSEN CAM SET SCREW BEFORE ADJUSTING OR DAMAGE OF CAMS WILL OCCUR

Nominal Input Shaft to Cam Ratio	Turns of Input Shaft			
	Maximum	Minimum	Over Travel	To Reset
5:1	4	1/8	1/8	1/16
10:1	8-1/2	1/4	1/4	1/8
20:1	17	1/2	1/2	1/4
30:1	26	1	3/4	3/8
40:1	35	1	1	1/2
60:1	53	2	2	3/4
80:1	72	2-1/2	2-1/2	1
120:1	108	3	3	1-1/2



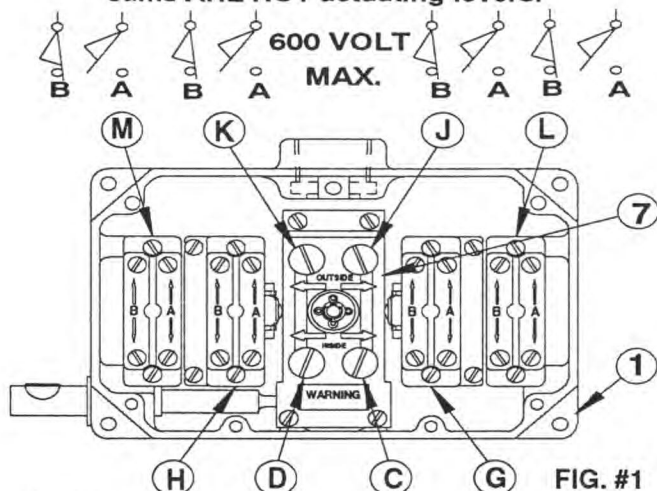
RENEWAL PARTS

When ordering Renewal Parts give this form No. PF-046, Item No., Description, Part No., Quantity, and the Complete Unit Number stamped on the label. Reference FIG. #1 and FIG. #2 above.

ITEM	DESCRIPTION	PART NUMBER	QTY.
1	Case and Shaft assembly		1
	5:1 Ratio	PSD-0091300-DN	.....
	10:1 Ratio	PSD-0091400-DN	.....
	20:1 Ratio	PSD-0091500-DN	.....
	30:1 Ratio	PSD-0091600-DN	.....
	40:1 Ratio	PSD-0091700-DN	.....
	60:1 Ratio	PSD-0091800-DN	.....
	80:1 Ratio	PSD-0091900-DN	.....
	120:1 Ratio	PSD-0092000-DN	.....
2	Cam block & Worm Gear assy.		1
	5:1 Ratio	PSD-0090500-DN	.....
	10:1 Ratio	PSD-0090600-DN	.....
	20:1 Ratio	PSD-0090700-DN	.....
	30:1 Ratio	PSD-0090800-DN	.....
	40:1 Ratio	PSD-0090900-DN	.....
	60:1 Ratio	PSD-0091000-DN	.....
	80:1 Ratio	PSD-0091100-DN	.....
	120:1 Ratio	PSD-0091200-DN	.....
3	Shim Cam Block (.080 THK.)..	PS-0003300-A	1
4	Shim Cam Block (.020 THK.)..	PS-0000800-A	1
5	Shim Cam Block (.016 THK.)..	PS-0003200-A	2
6	Limit Switch Standard S.P.D.T.	1950-1-B-A-D0	2
	Optional D.P.D.T.	1950-4-B-A-D0	.....
	Optional S.M.S.B.	1950-1408	.....
7	Adjusting Bracket Assembly ..	PSD-0024600-B	1
8	Gear and Roller Assembly	PSD-00904-00-A	2
9	Spring, Compression	PM-0018000-A	2
10	Lever Assembly	PSD-0024400-A	2
11	Cover	PC-0069100-A	1
12	Cover Gasket	PS-0000900-A	1
13	Spacer Center Post	M-0073000-A	1
14	Woodruff Key (#404)	04-564019-DN	1

Type K Rotary Limit Switches

Contact positions shown are when cams ARE NOT actuating levers.



DESCRIPTION

This rotary limit switch is designed to control the limits of travel of rotating reversing equipment.

The limit switch input shaft is connected to a worm gear. Adjustable self lubricating nylon roller cams are concentrically mounted to the worm gear. These adjustable cams actuate the precision limit switches by utilizing a lever assembly.

INSTALLATION

This limit switch may be mounted in any convenient position. When installed this limit switch will provide long life with a minimum amount of service maintenance.

The following recommendations will prove helpful.

- 1 - Install the limit switch so that the shaft load will not exceed (5) five pounds.
- 2 - A flexible coupling is recommended for all installation other than gear drive application.
- 3 - Coupling should be employed in a manner that results in a minimum of thrust loading on the shaft. If switches are mounted with the shaft up or down, some additional thrust loading resulting from the weight of the shaft plus a very light coupling is permissible.
- 4 - Whenever possible, a separate support bearing for the drive sprocket should be used.
- 5 - Permissible speed of the input shaft 2000 R.P.M.

LUBRICATION

This limit switch was lubricated at the factory and should not require lubrication for the life of the switch.

ADJUSTMENT

Refer to figure 1. The electrical switch units "G", "H", "L" AND "M" are shown with the contact positions assumed when the cams ARE NOT actuating the switch units.

When the cam rotates and actuates the switch, the "B" (closed) contact opens and the "A" (open) contact closes. Each precision switch has (1) one independent adjustable cam.

TO ADJUST SWITCH "M"

1. Loosen Red Set Screw
2. Turn "K" to Trip "M"
3. Tighten Red Set Screw

TO ADJUST SWITCH "L"

1. Loosen Blue Set Screw
2. Turn "J" to Trip "L"
3. Tighten Blue Set Screw

TO ADJUST SWITCH "H"

1. Loosen Green Set Screw
2. Turn "D" to Trip "H"
3. Tighten Green Set Screw

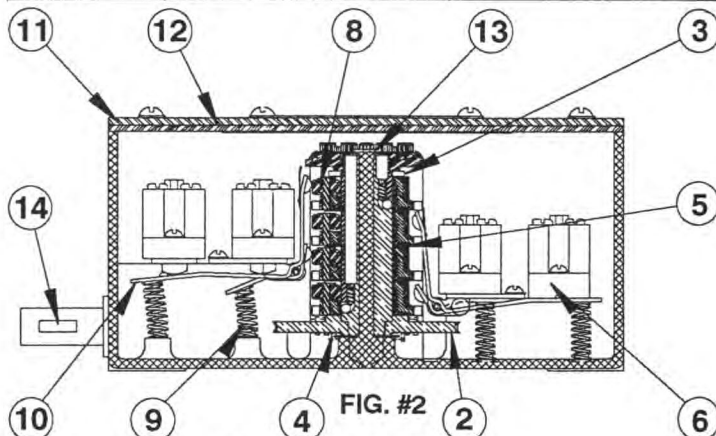
TO ADJUST SWITCH "G"

1. Loosen Yellow Set Screw
2. Turn "C" to Trip "G"
3. Tighten Yellow Set Screw

WARNING:

LOOSEN CAM SET SCREW BEFORE ADJUSTING OR DAMAGE OF CAMS WILL OCCUR

Nominal Input Shaft to Cam Ratio	Turns of Input Shaft			
	Maximum	Minimum	Over Travel	To Reset
5:1	4	1/8	1/8	1/16
10:1	8-1/2	1/4	1/4	1/8
20:1	17	1/2	1/2	1/4
30:1	26	1	3/4	3/8
40:1	35	1	1	1/2
60:1	53	2	2	3/4
80:1	72	2-1/2	2-1/2	1
120:1	108	3	3	1-1/2



RENEWAL PARTS

When ordering Renewal Parts give this form No. PF-047, Item No., Description, Part No., Quantity, and the Complete Unit Number stamped on the label. Reference FIG. #1 and FIG. #2 above.

ITEM	DESCRIPTION	PART NUMBER	QTY.
1	Case and Shaft assembly		1
	5:1 Ratio	PSD-0092400-DN	.....
	10:1 Ratio	PSD-0092500-DN	.....
	20:1 Ratio	PSD-0092600-DN	.....
	30:1 Ratio	PSD-0092700-DN	.....
	40:1 Ratio	PSD-0092800-DN	.....
	60:1 Ratio	PSD-0092900-DN	.....
	80:1 Ratio	PSD-0093000-DN	.....
	120:1 Ratio	PSD-0093100-DN	.....
2	Cam block & Worm Gear assy.		1
	5:1 Ratio	PSD-0093500-DN	.....
	10:1 Ratio	PSD-0093600-DN	.....
	20:1 Ratio	PSD-0093700-DN	.....
	30:1 Ratio	PSD-0093800-DN	.....
	40:1 Ratio	PSD-0093900-DN	.....
	60:1 Ratio	PSD-0094000-DN	.....
	80:1 Ratio	PSD-0094100-DN	.....
	120:1 Ratio	PSD-0094200-DN	.....
3	Shim Cam Block (.080 THK.)..	PS-0003300-A	1
4	Shim Cam Block (.020 THK.)..	PS-0000800-A	1
5	Shim Cam Block (.016 THK.)..	PS-0003200-A	3
6	Limit Switch Standard S.P.D.T.	1950-1-B-A-DO	4
	Optional D.P.D.T.	1950-4-B-A-DO	.....
	Optional S.M.S.B.	1950-1408	.....
7	Adjusting Bracket Assembly ..	PSD-0024700-B	1
8	Gear and Roller Assembly	PSD-00904-00-A	4
9	Spring, Compression	PM-0018000-A	4
10	Lever Assembly	PSD-0024500-A	2
11	Cover	PC-0069200-A	1
12	Cover Gasket	PS-0001000-A	1
13	Spacer Center Post	M-0073000-A	1
14	Woodruff Key (#404)	04-564019-DN	1

FORM PF-047
REV. "A" 10/94
OCT. 1990

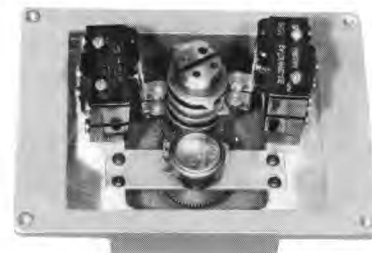
Type K Rotary Limit Switches

Special Gemco Rotary Limit Switches To Meet Your Specific Applications



Two Circuit Rotary Limit Switch with a Special Mounting Bracket and Integral Right Angle Worm Gear for Mounting on a Power Jack.

Fig. 1



Special NEMA 4 Four Circuit Rotary Limit Switch with a potentiometer for mounting on a rotary valve.

Fig. 2



Special Two Circuit Open Type Rotary Limit Switch with a Single Turn Potentiometer.

Fig. 3



Special Three Circuit Rotary Limit Switch used on a Mobile Man Lift.

Fig. 4

Rotary Limit Switches



WORM GEAR TYPE
Ratios from 5:1 to 5333.3:1



SPUR GEAR TYPE
Ratios from .5:1 to 3:1

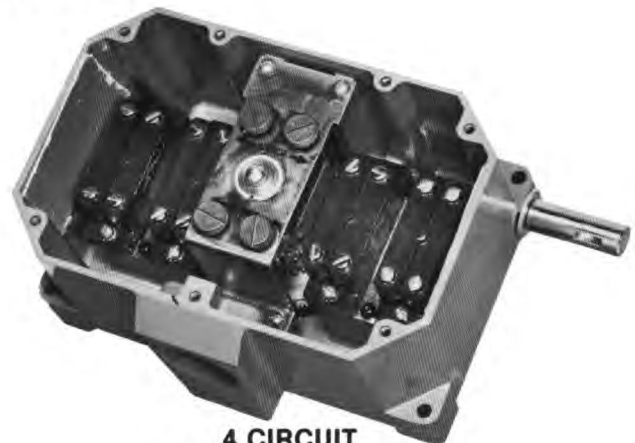


HEAVY DUTY TYPE
Ratios from 5:1 to 3000:1

CATALOG SECTION 2006 TYPE K ROTARY LIMIT SWITCH



**2 CIRCUIT
WORM GEAR TYPE**
Ratios from 5:1 to 1080:1



**4 CIRCUIT
WORM GEAR TYPE**
Ratios from 5:1 to 1080:1