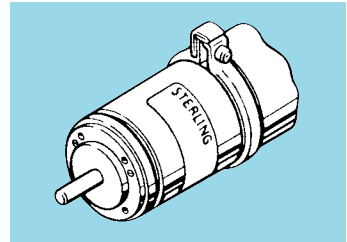
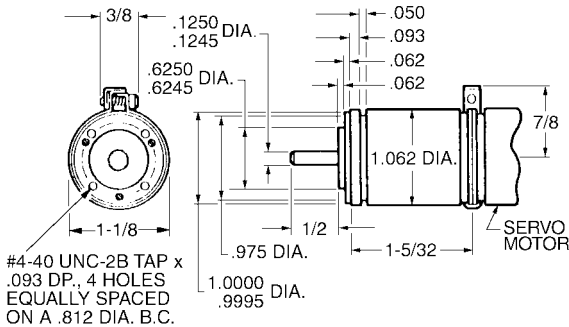


■ 1-1/16 INCH OUTSIDE DIAMETER

■ PAT. NO. 2,892,357



**SPECIFICATIONS:**

**Input Pinion (Motor)** – 13 Teeth-120 Pitch

**Maximum Backlash** – 0°30'

**Maximum Starting Torque** – .01 oz. in.

**Rated Output Torque** – 30 oz. in.

**CATALOG NUMBER DESIGNATION:**

**S 9 1 1 1 A - T 6 1 7 -**

Insert Dash No. from table below.

Example: S9111A-T617-16 has a 40.15: 1 ratio.

**NOTES:** (1) "S" indicates output rotates in the same direction as input; "R" denotes opposite rotation.  
(2) Ball bearings used throughout.

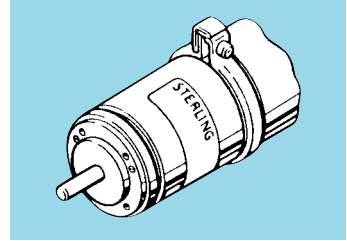
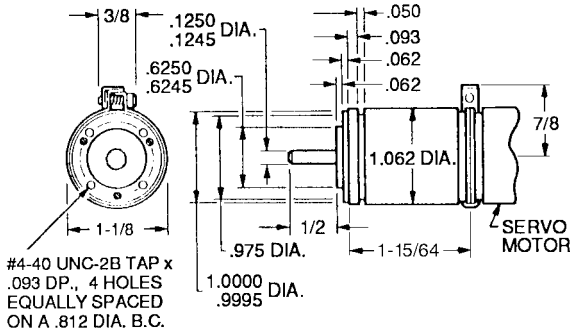
Dash No.	Ratio To 1	Rotation
-01	5.29	S
-02	6.83	S
-03	9.00	S
-04	10.44	S
-05	11.89	R
-06	13.80	R
-07	15.38	R
-08	17.84	R
-09	20.25	R
-10	23.50	R
-11	27.27	R
-12	26.76	S
-13	31.05	S
-14	34.59	S
-15	36.04	S
-16	40.15	S
-17	45.56	S
-18	46.59	S
-19	52.88	S
-20	61.36	S
-21	71.21	S
-22	60.21	R
-23	69.87	R

Dash No.	Ratio To 1	Rotation
-24	77.84	R
-25	81.08	R
-26	90.33	R
-27	94.10	R
-28	102.52	R
-29	104.83	R
-30	118.97	R
-31	121.65	R
-32	138.06	R
-33	160.22	R
-34	185.94	R
-35	135.47	S
-36	157.21	S
-37	175.13	S
-38	182.44	S
-39	203.24	S
-40	211.72	S
-41	230.66	S
-42	235.86	S
-43	245.70	S
-44	267.68	S
-45	273.71	S
-46	310.64	S

Dash No.	Ratio To 1	Rotation
-47	317.64	S
-48	360.50	S
-49	418.35	S
-50	485.50	S
-51	304.80	R
-52	353.72	R
-53	394.04	R
-54	410.49	R
-55	457.29	R
-56	476.37	R
-57	518.99	R
-58	530.68	R
-59	552.83	R
-60	602.28	R
-61	615.85	R
-62	641.55	R
-63	698.94	R
-64	714.69	R
-65	811.12	R
-66	829.39	R
-67	941.30	R
-68	1092.37	R
-69	1267.69	R

Zero backlash, lower backlash, exact ratios, etc., are available on special order.  
For additional information, see preceding technical data and special gearhead pages.

### ■ HIGH-PRECISION



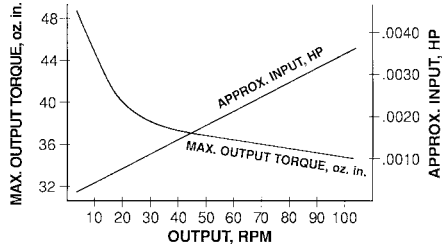
**S** Precision Component

#### SPECIFICATIONS:

Input Pinion (Motor) – 13 Teeth-120 Pitch

Maximum Backlash – 0°30'

Maximum Starting Torque – .01 oz. in.



- NOTES:** (1) "S" indicates output rotates in the same direction as input; "R" denotes opposite rotation.  
 (2) Ball bearings used throughout.

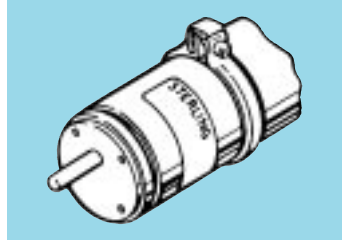
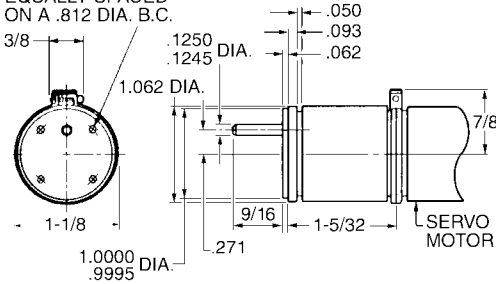
Catalog Number	Ratio	Rotation
S9111A-P0018S3	17.67	S
S9111A-P0021R3	20.61	R
S9111A-P0025R3	24.86	R
S9111A-P0028R3	28.27	R
S9111A-P0035R3	34.53	R
S9111A-P0040R3	39.75	R
S9111A-P0046R3	46.13	R
S9111A-P0050R3	49.88	R
S9111A-P0054S3	53.82	S
S9111A-P0065S3	64.92	S
S9111A-P0080S3	79.81	S
S9111A-P0090S3	90.16	S
S9111A-P0104S3	103.79	S
S9111A-P0120S3	120.45	S
S9111A-P0141S3	140.84	S
S9111A-P0170R3	169.52	R
S9111A-P0198R3	198.23	R

Catalog Number	Ratio	Rotation
S9111A-P0235R3	235.42	R
S9111A-P0275R3	275.29	R
S9111A-P0340R3	340.09	R
S9111A-P0398R3	397.68	R
S9111A-P0464S3	463.96	S
S9111A-P0560S3	559.69	S
S9111A-P0636S3	636.28	S
S9111A-P0777S3	777.28	S
S9111A-P0895S3	894.78	S
S9111A-P1038S3	1038.38	S
S9111A-P1211R3	1211.45	R
S9111A-P1461R3	1461.43	R
S9111A-P1661R3	1661.41	R
S9111A-P2030R3	2029.56	R
S9111A-P2319R3	2318.72	R
S9111A-P2711R3	2711.33	R
S9111A-P3170R3	3170.42	R

Zero backlash, lower backlash, exact ratios, etc., are available on special order.

### ■ 1-1/16 INCH OUTSIDE DIAMETER

#4-40 UNC-2B TAP X  
.093 DP, 4 HOLES  
EQUALLY SPACED  
ON A .812 DIA. B.C.



**S** Precision Component

#### SPECIFICATIONS:

**Input Pinion (Motor)** – 13 Teeth-120 Pitch

**Maximum Backlash** – 0°30'

**Maximum Starting Torque** – .01 oz. in.

**Rated Output Torque** – 30 oz. in.

#### CATALOG NUMBER DESIGNATION:

**S 9 1 1 1 A - T 6 1 8 -**

Insert Dash No. from table below.  
Example: S9111A-T618-16 has  
a 40.15: 1 ratio.

- NOTES:** (1) "S" indicates output rotates in the same direction as input; "R" denotes opposite rotation.  
(2) Ball bearings used throughout.

Dash No.	Ratio To 1	Rotation
-01	5.29	S
-02	6.83	S
-03	9.00	S
-04	10.44	S
-05	11.89	R
-06	13.80	R
-07	15.38	R
-08	17.84	R
-09	20.25	R
-10	23.50	R
-11	26.76	S
-12	27.27	R
-13	31.05	S
-14	34.59	S
-15	36.04	S
-16	40.15	S
-17	45.56	S

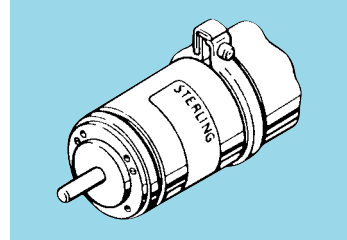
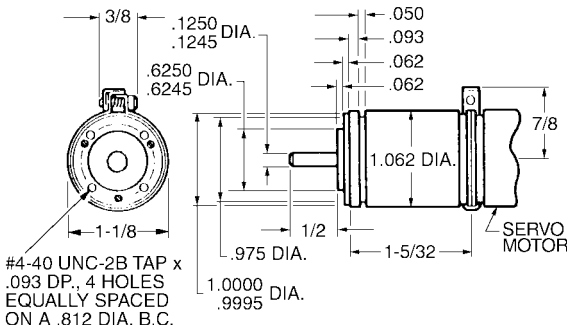
Dash No.	Ratio To 1	Rotation
-18	46.59	S
-19	52.88	S
-20	60.21	R
-21	61.36	S
-22	69.87	R
-23	71.21	S
-24	77.84	R
-25	81.08	R
-26	90.33	R
-27	94.10	R
-28	102.52	R
-29	104.83	R
-30	118.97	R
-31	121.65	R
-32	135.47	S
-33	138.06	R
-34	157.21	S

Dash No.	Ratio To 1	Rotation
-35	160.22	R
-36	175.13	S
-37	182.44	S
-38	185.94	R
-39	203.24	S
-40	211.72	S
-41	230.66	S
-42	235.86	S
-43	245.70	S
-44	267.68	S
-45	273.71	S
-46	310.64	S
-47	317.64	S
-48	360.50	S
-49	418.35	S
-50	485.50	S

Zero backlash, lower backlash, exact ratios, etc., are available on special order.  
For additional information, see preceding technical data and special gearhead pages.

■ 1-1/16 INCH OUTSIDE DIAMETER

■ PAT. NO. 3,396,594



**S** Precision Component

The S9111A-T619 series is an extremely low backlash Bu-Ord Size 11 gearhead for servo applications. All backlash components due to gear-induced factors are eliminated. Hence, the name "Zero-Backlash Gearhead" has been applied. The zero-backlash feature will remain fully effective up to the Z-B torque limit. In the Size 11 units, the Z-B torque limit (in oz. in.) is approximately 1/2 of the ratio. If the load torque exceeds the Z-B torque limit, backlash is introduced. The backlash will be eliminated when the load torque decreases below the Z-B limit. No permanent damage will occur providing the load torque does not exceed the unit's maximum rated torque. The angular compliance (not to be confused with backlash) is approximately 1 arc minute per ounce inch.

**SPECIFICATIONS:**

- Backlash** – Zero with load torque less than Z-B torque limit
- Z-B Torque Limit** – Approximately 1/2 of the ratio (oz. in.)
- Angular Compliance** – .015° / oz. in.
- Starting Torque** – .20 oz. in.
- Rated Output Torque** – 30 oz. in.

**CATALOG NUMBER DESIGNATION:**

**S 9 1 1 1 A - T 6 1 9 -**

Insert Dash No. from table below.  
 Example: S9111A-T619-16 has a 40.15: 1 ratio.

**NOTES:** (1) "S" indicates output rotates in the same direction as input; "R" denotes opposite rotation.  
 (2) Ball bearings used throughout.

Dash No.	Ratio To 1	Rotation
- 01	5.29	S
- 02	6.83	S
- 03	9.00	S
- 04	10.44	S
- 05	11.89	R
- 06	13.80	R
- 07	15.38	R

Dash No.	Ratio To 1	Rotation
- 08	17.84	R
- 09	20.25	R
- 10	23.50	R
- 11	26.76	S
- 12	27.27	R
- 13	31.05	S
- 14	34.59	S

Dash No.	Ratio To 1	Rotation
- 15	36.04	S
- 16	40.15	S
- 17	45.56	S
- 18	46.59	S
- 19	52.88	S
- 21	61.36	S
- 23	71.21	S

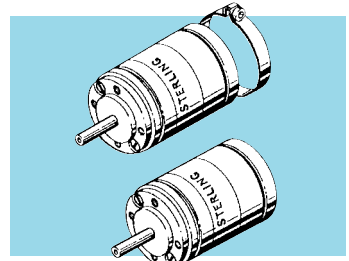
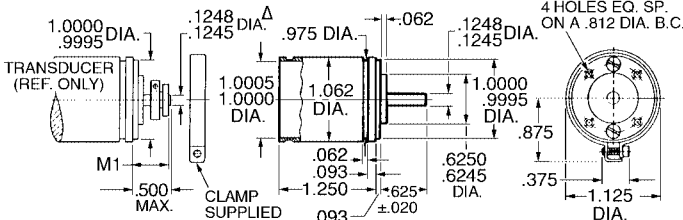
For additional information, see preceding technical data and special gearhead pages.

■ STANDARD BACKLASH T640 SERIES

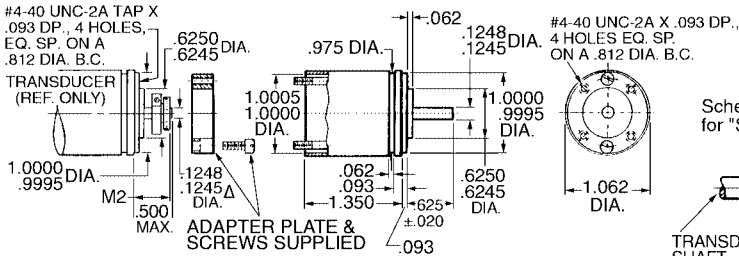
■ 1-1/16 OUTSIDE DIAMETER

■ U.S. PAT. #2,892,357

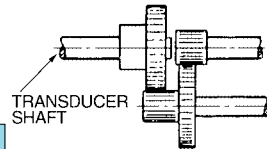
### MOUNTING TYPE C (Attach to Transducer using Clamp)



### MOUNTING TYPE A (Attach to Transducer using Adapter Plate and Screws)



Schematic Representation for "S" Rotation



### Specifications

Maximum operating torque, oz. in.	20
Maximum Backlash, arc minutes	20
Total transmission error (max.), arc minutes	20
Breakaway Torque, oz. in.	.02
Integrated Position Error (max.), arc minutes	40
Lubrication	Oil per Mil-L-6085
Shaft end play with 1 lb. gage load	.001 in. max.
Shaft radial play with 4 oz. gage load	.001 in./in. max.

This **S** series is for use in applications that can tolerate a moderate amount of backlash. Examples of this type of application are velocity feedback systems or systems that are unidirectional in nature.

MOUNTING TYPE C		MOUNTING TYPE A		Rotation**	Output Gear *120 D.P. No. of Teeth	Ratio To 1
Catalog Number	Mounting Dist. M1	Catalog Number	Mounting Dist. M2			
S9111A-T640C02S	.540 Max.	S9111A-T640A02S	.640 Max.	S	33	2
S9111A-T640C03S		S9111A-T640A03S			39	3
S9111A-T640C04S		S9111A-T640A04S			44	4
S9111A-T640C06S		S9111A-T640A06S			48	6
S9111A-T640C08S		S9111A-T640A08S			52	8
S9111A-T640C09S		S9111A-T640A09S			48	9
S9111A-T640C10S		S9111A-T640A10S			50	10
S9111A-T640C12S		S9111A-T640A12S			52	12
S9111A-T640C12R		S9111A-T640A12R			48	12
S9111A-T640C15R		S9111A-T640A15R			48	15
S9111A-T640C16R	.410 Max.	S9111A-T640A16R	.510 Max.	R	48	16
S9111A-T640C20R		S9111A-T640A20R			50	20
S9111A-T640C24R		S9111A-T640A24R			52	24
S9111A-T640C30R		S9111A-T640A30R			50	30
S9111A-T640C32R		S9111A-T640A32R			52	32
S9111A-T640C36R		S9111A-T640A36R			52	36

\* Supplied with gear clamp.

\*\* "S" indicates output rotates in the same direction as input; "R" denotes reverse rotation.

Δ For transducer shaft Ø .1200/.1195 add "2" to the end of the part number.

Example: S9111A-T640C30R2.

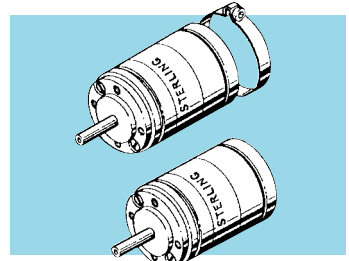
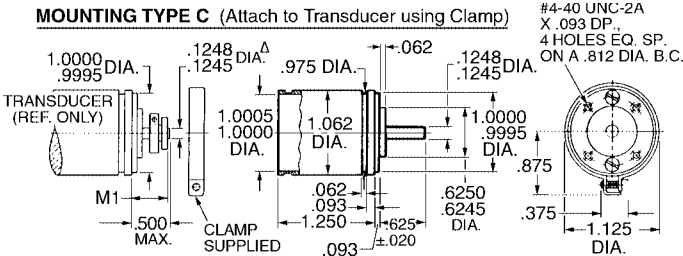
Other ratios and sizes available on special order.

■ ANTI-BACKLASH T641 SERIES

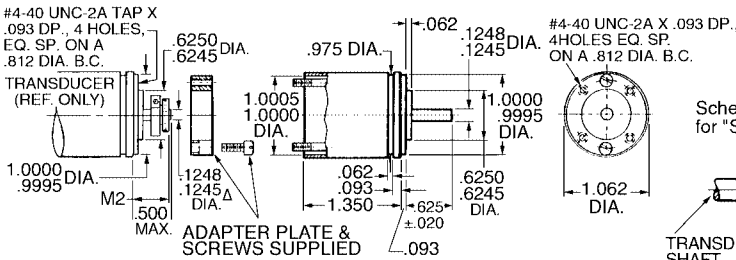
■ U.S. PAT. #2,892,357

■ 1-1/16 OUTSIDE DIAMETER

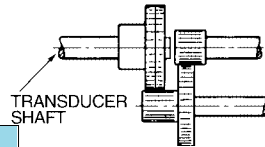
### MOUNTING TYPE C (Attach to Transducer using Clamp)



### MOUNTING TYPE A (Attach to Transducer using Adapter Plate and Screws)



Schematic Representation for "S" Rotation



### Specifications

Maximum operating torque, oz. in.	20
Maximum anti-backlash torque, oz. in.	2
Maximum Backlash, arc minutes	10
Total transmission error (max.), arc minutes	20
Breakaway Torque, oz. in.	.07
Integrated Position Error (max.), arc minutes	30
Lubrication	Oil per Mil-L-6085
Shaft end play with 1 lb. gage load	.001 in. max.
Shaft radial play with 4 oz. gage load	.001 in./in. max.

This **S** series is for use in applications that can tolerate a limited amount of backlash. This series finds wide usage in positioning servos in robotic systems. It is also used in position data transmitting loops and only slightly more expensive than the Standard Backlash series.

MOUNTING TYPE C		MOUNTING TYPE A		Rotation**	Output Gear *120 D.P. No. of Teeth	Ratio To 1
Catalog Number	Mounting Dist. M1	Catalog Number	Mounting Dist. M2			
S9111A-T641C02S	.540 Max.	S9111A-T641A02S	.640 Max.	S	33	2
S9111A-T641C03S		S9111A-T641A03S			39	3
S9111A-T641C04S		S9111A-T641A04S			44	4
S9111A-T641C06S		S9111A-T641A06S			48	6
S9111A-T641C08S		S9111A-T641A08S			52	8
S9111A-T641C09S	.410 Max.	S9111A-T641A09S	.510 Max.	R	48	9
S9111A-T641C10S		S9111A-T641A10S			50	10
S9111A-T641C12S		S9111A-T641A12S			52	12
S9111A-T641C12R		S9111A-T641A12R			48	12
S9111A-T641C15R		S9111A-T641A15R			48	15
S9111A-T641C16R		S9111A-T641A16R			48	16
S9111A-T641C20R		S9111A-T641A20R			50	20
S9111A-T641C24R		S9111A-T641A24R			52	24
S9111A-T641C30R		S9111A-T641A30R			50	30
S9111A-T641C32R		S9111A-T641A32R			52	32
S9111A-T641C36R	S9111A-T641A36R	52	36			

\* Supplied with gear clamp.

\*\* "S" indicates output rotates in the same direction as input; "R" denotes reverse rotation.

△ For transducer shaft Ø .1200/.1195 add "2" to the end of the part number.

Example: S9111A-T641C30R2.

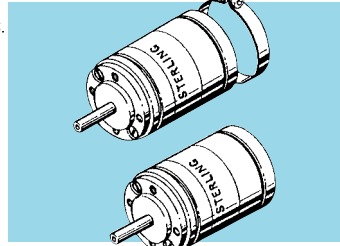
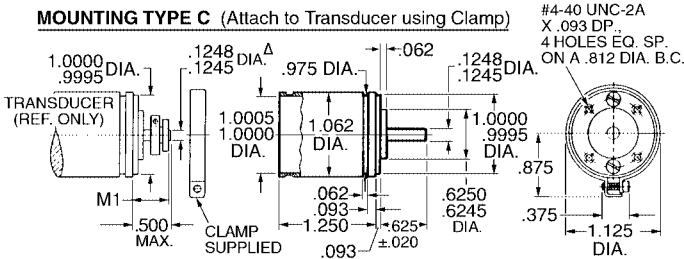
Other ratios and sizes available on special order.

■ ZERO-BACKLASH T642 SERIES

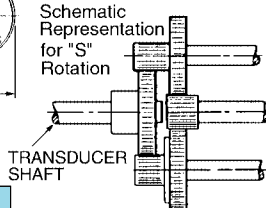
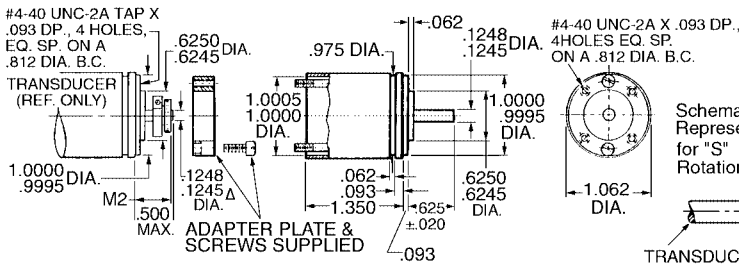
■ U.S. PAT. #2,892,357, #3,396,594

■ 1-1/16 O.D.

### MOUNTING TYPE C (Attach to Transducer using Clamp)



### MOUNTING TYPE A (Attach to Transducer using Adapter Plate and Screws)



Specifications	
Maximum operating torque, oz. in.	20
Maximum anti-backlash torque, oz. in.	5
Maximum Backlash, arc minutes	<1
Total transmission error (max.), arc minutes	15
Breakaway Torque, oz. in.	.15
Integrated Position Error (max.), arc minutes	15
Lubrication	Oil per Mil-L-6085
Shaft end play with 1 lb. gage load	.001 in. max.
Shaft radial play with 4 oz. gage load	.001 in./in. max.

This **S** series is for use in applications that require that the backlash from all sources be as close to zero as possible. Typically, the backlash is less than 1 arc minute. This series of units is widely used in aircraft and satellite systems that require the utmost in performance.

MOUNTING TYPE C		MOUNTING TYPE A		Rotation**	Output Gear *120 D.P. No. of Teeth	Ratio To 1
Catalog Number	Mounting Dist. M1	Catalog Number	Mounting Dist. M2			
S9111A-T642C02S	.540 Max.	S9111A-T642A02S	.640 Max.	S	33	2
S9111A-T642C03S		S9111A-T642A03S			39	3
S9111A-T642C04S		S9111A-T642A04S			44	4
S9111A-T642C06S		S9111A-T642A06S			48	6
S9111A-T642C08S		S9111A-T642A08S			52	8
S9111A-T642C09S		S9111A-T642A09S			48	9
S9111A-T642C10S		S9111A-T642A10S			50	10
S9111A-T642C12S		S9111A-T642A12S			52	12
S9111A-T642C12R	.410 Max.	S9111A-T642A12R	.510 Max.	R	48	12
S9111A-T642C15R		S9111A-T642A15R			48	15
S9111A-T642C16R		S9111A-T642A16R			48	16
S9111A-T642C20R		S9111A-T642A20R			50	20
S9111A-T642C24R		S9111A-T642A24R			52	24
S9111A-T642C30R		S9111A-T642A30R			50	30
S9111A-T642C32R		S9111A-T642A32R			52	32
S9111A-T642C36R		S9111A-T642A36R			52	36

\* Supplied with gear clamp.  
 \*\* "S" indicates output rotates in the same direction as input; "R" denotes reverse rotation.  
 Δ For transducer shaft Ø .1200/.1195 add "2" to the end of the part number.  
 Example: S9111A-T642C30R2.

Other ratios and sizes available on special order.