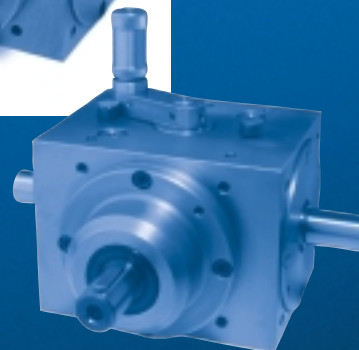


# Spiral Bevel Gearboxes

- Low Backlash
- Low Transmission Error
- Wide Range of Models
- Wide Range of Ratios
- Universal Mounting
- Special Designs



AVAILABLE THROUGH

**DIEQUA**  
Corporation

Specialists in Precision Power Transmission Components

Tandler, the world leader in precision spiral bevel gearbox manufacturing, has been satisfying the most demanding gearing requirements for over 50 years. In cooperation with DieQua Corporation, we are providing the most extensive and highest quality spiral bevel gearbox program available. With the lowest backlash and widest range of ratios and specialty models, you can be assured of maximum design versatility and superior performance.

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# Spiral Bevel Gearboxes

A Wide Selection to Meet Every Requirement

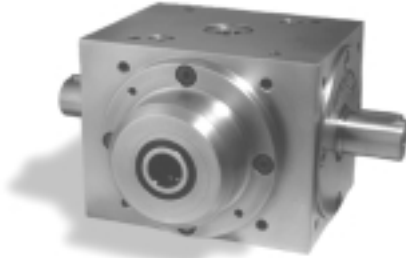
Only Tandler gives you this wide a selection of interface options and output configurations, for unsurpassed design flexibility.

TANDLER

SPIRAL BEVEL GEARBOXES



Standard Right Angle - STD



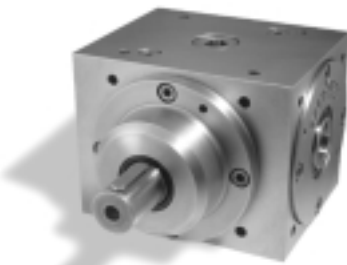
Hollow Pinion - HR



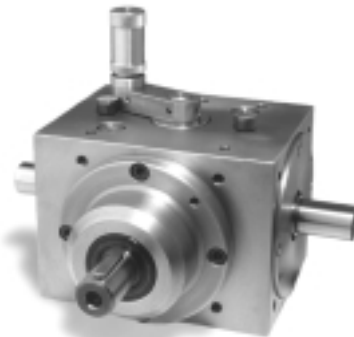
Auxiliary - EA/ZA



Flange Mount - F



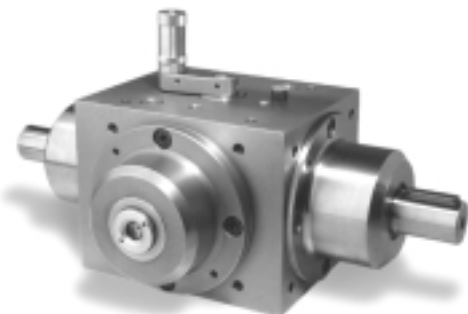
Hollow Shaft - HW



Reversing/Declutching - S/AS



Reinforced Shaft - WV



Inline Reversing - W

# Sizing Spiral Bevel Gearboxes

## Pertinent Data

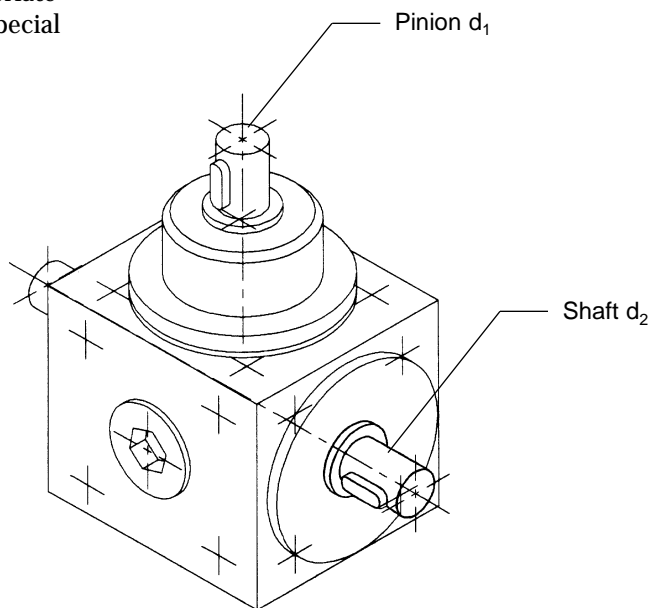
1. Input speed.
2. Gear ratio.
3. Horsepower requirement.
4. Method of shaft connection.
5. Mounting position.

## Explanation of Symbols

To select any gearbox, use the appropriate charts and tables in the pages that follow. All of them use the following symbols:

- $n_1$  = rpm on pinion  $d_1$
- $n_2$  = rpm on shaft  $d_2$
- $i$  = gear ratio =  $n_1/n_2$
- $d$  = a shaft or a pinion
- $Hp$  = horsepower
- $M$  = torque
- $Md_1$  = input torque, in Newton-meters, Nm
- $Md_2$  = output torque, in Newton-meters, Nm
- $Nm$  = Newton-meters
- $N_1$  = input power, in kilowatts, kW
- $N_2$  = output power, in kilowatts, kW
- $C$  = operational factor

All Tandler gearboxes are delivered with the appropriate quantity and type of oil for normal operation. For special lubrication and mounting requirements, consult the Technical Data section, page 32.



## Steps for Gearbox Selection

1. Calculate output torque.

$$Md_2 = \frac{7160 \times Hp \times i}{n_1}$$

2. Find the appropriate sizing chart for your gear ratio on pages 6 through 8.

3. Find output torque ( $Md_2$ ) on the vertical axis and input rpm ( $n_1$ ) on the horizontal axis. The point of intersection will fall in a range that identifies the size gearbox you need.

4. If your selection approaches the torque capacity of the gearbox, or if it is subject to extreme conditions, consult the operational factor chart on page 9.

5. If your application approaches the maximum speed of the gearbox, or is subject to high ambient temperatures, consult the thermal stress chart on page 9.

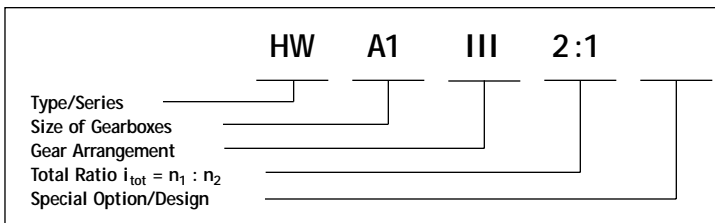
6. Select the appropriate internal gear arrangement which specifies shaft rotations.

7. Consider how the gearbox is mounted...

- If driving with a belt or gear, consult radial load capacity information for each type of gearbox.
- If connecting with rigid or flexible couplings, consider alignment requirements. Consult your DieQua representative.
- If any shafts are mounted vertically, consider special bearing lubrication options. Consult your DieQua representative.

8. Specify the Tandler part number.  
(See example below).

## Specifying the Tandler Part Number



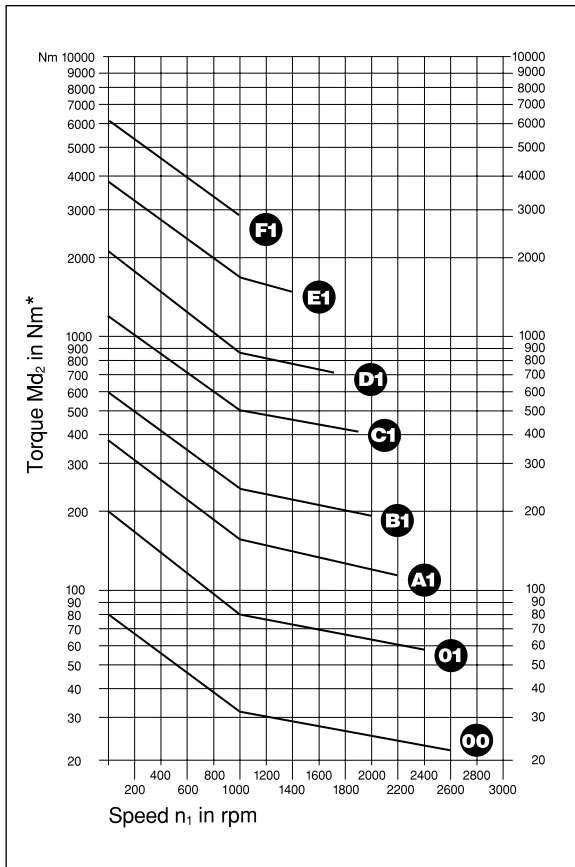
# Sizing Charts

## Spiral Bevel Gearboxes

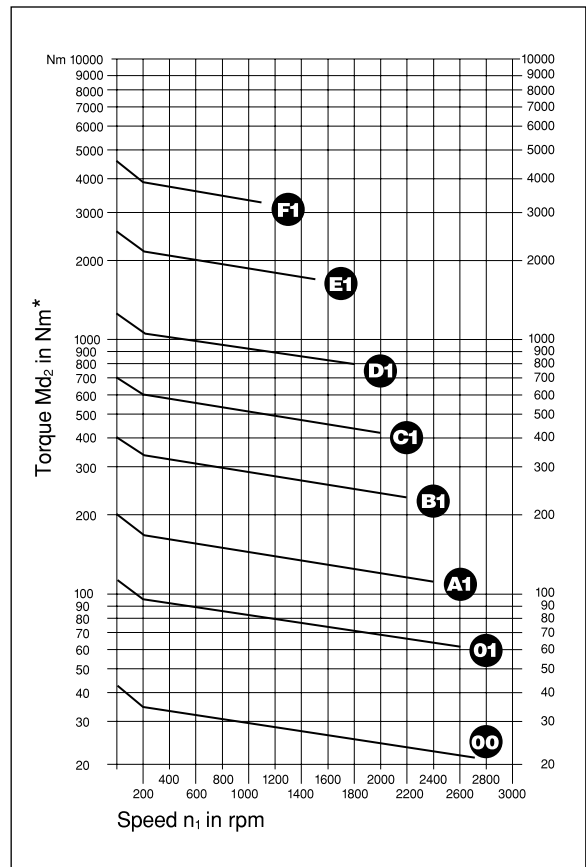
The following charts indicate the size gearbox you'll require as a function of output torque and input rpm for a specific range of gear ratios.

### Speed-reducing

#### Gear Ratio of 1:1



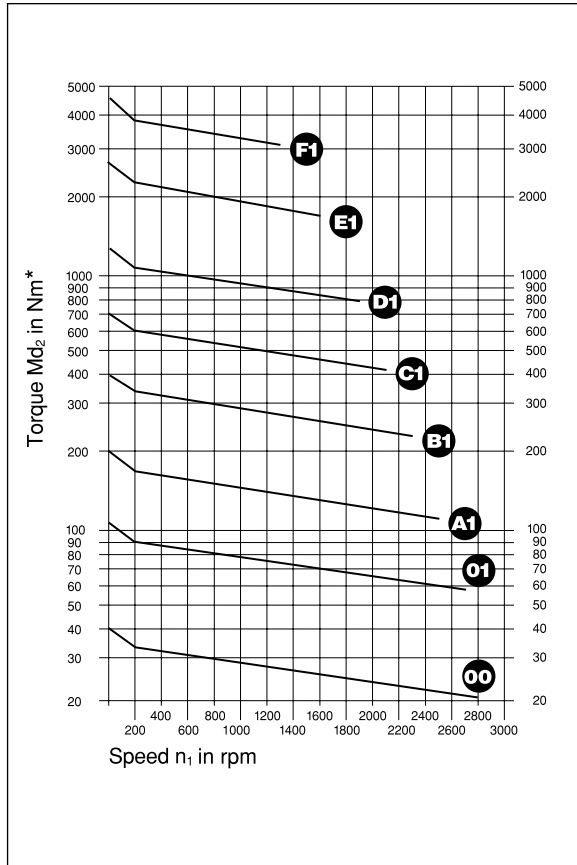
#### Gear Ratios of 1.25:1 and 1.5:1



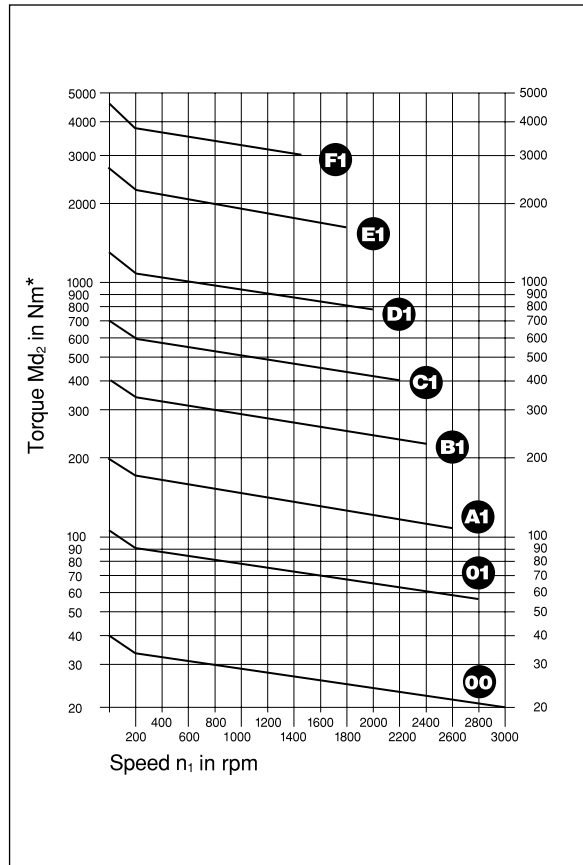
\*1Nm = 8.85 in. lbs.

**Selection note:** Lines represent the maximum capacity of each size.

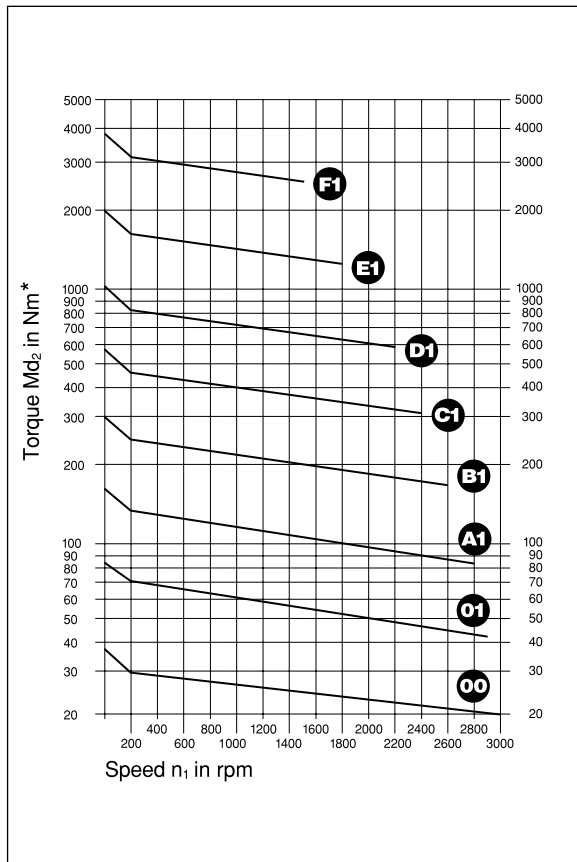
**Gear Ratios of 1.75:1 and 2:1**



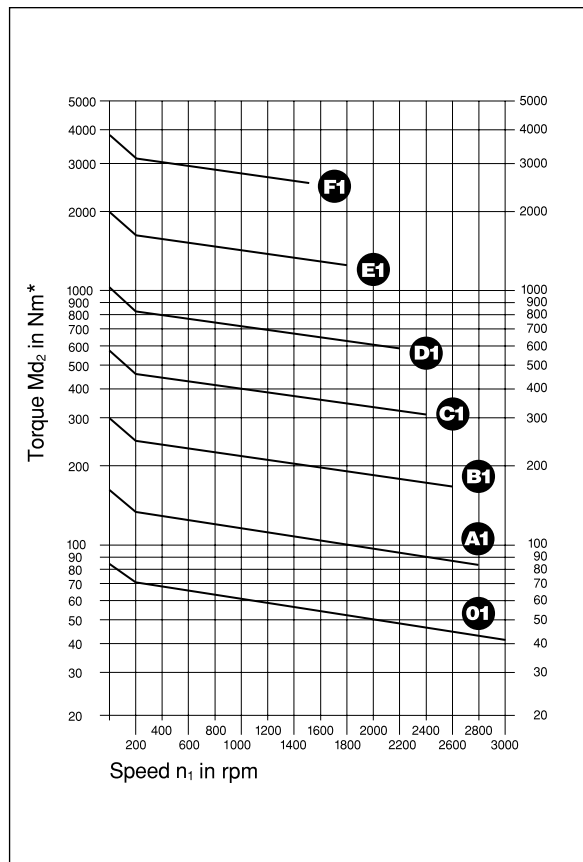
**Gear Ratios of 2.5:1 and 3:1**



**Gear Ratio of 3.5:1 and 4:1**



**Gear Ratio of 5:1 and 6:1**



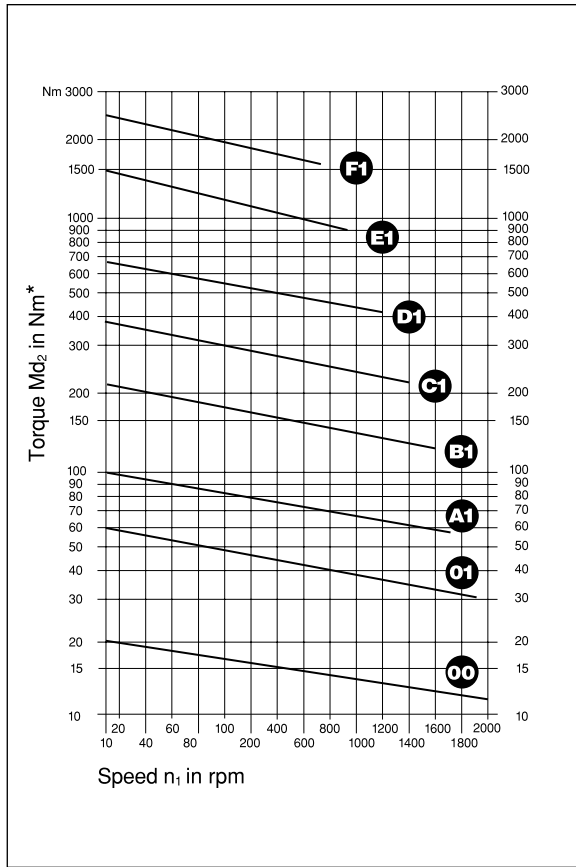
\*1Nm = 8.85 in. lbs.

# Sizing Charts

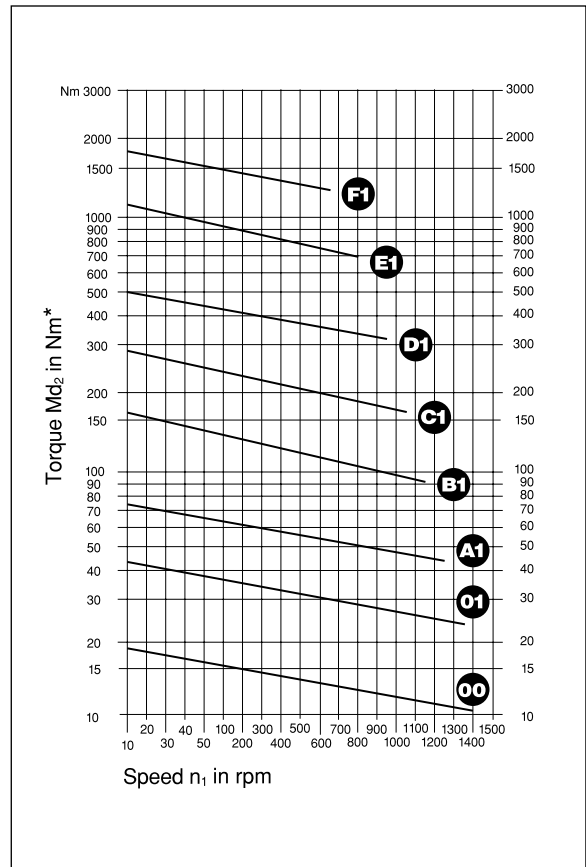
Spiral Bevel Gearboxes

## Speed-increasing

Gear Ratios of 1:1.25 and 1:1.5



Gear Ratios of 1:1.75 and 1:2



\*1Nm = 8.85 in. lbs.

Selection note: Lines represent the maximum capacity of each size.



# Operational Factors



Spiral Bevel Gearboxes

OPERATIONAL FACTORS

In order to properly size a gearbox for any application, it is important to consider the environment in which the gearbox must operate. The sizing charts shown on the previous pages contain the characteristic output torque limit lines for 00 through F1 size gearboxes. These values were created by

extensive computations and test stand operations in a controlled environment. Actual applications require that the following factors be taken into consideration, especially when approaching the torque limits for any given gearbox.

## Operational Factors

Degree of shock of the driven machine	Driving machine											
	Electric motor – running time in hours per day				Piston engine, hydraulic motor – running time in hours per day				Single cylinder piston engine – running time in hours per day			
	0.5	3	8	24	0.5	3	8	24	0.5	3	8	24
I	0.5	0.8	1.0	1.25	0.8	1.0	1.25	1.5	1.0	1.25	1.5	1.75
II	0.8	1.0	1.25	1.5	1.0	1.25	1.5	1.75	1.25	1.5	1.75	2.0
III	1.25	1.5	1.75	2.0	1.5	1.75	2.0	2.25	1.75	2.0	2.25	2.5

I Almost shock-free, e.g., electric generators, conveyor screws, light elevators, electric trains, ventilators, stirrers.

II Moderate shocks, e.g., heavy elevators, crane turrets, piston pumps, mine ventilators, cable winches.

III Heavy shocks, e.g., punch presses, shears, steel rolling machines, mills, looms.

$N_1$  is the normal power produced by the drive motor in kW.

$Md_2$  is the calculated output torque in Nm

$c$  is the correction factor given in the table above

$$N_c = N_1 \times c \quad Md_c = Md_2 \times c$$

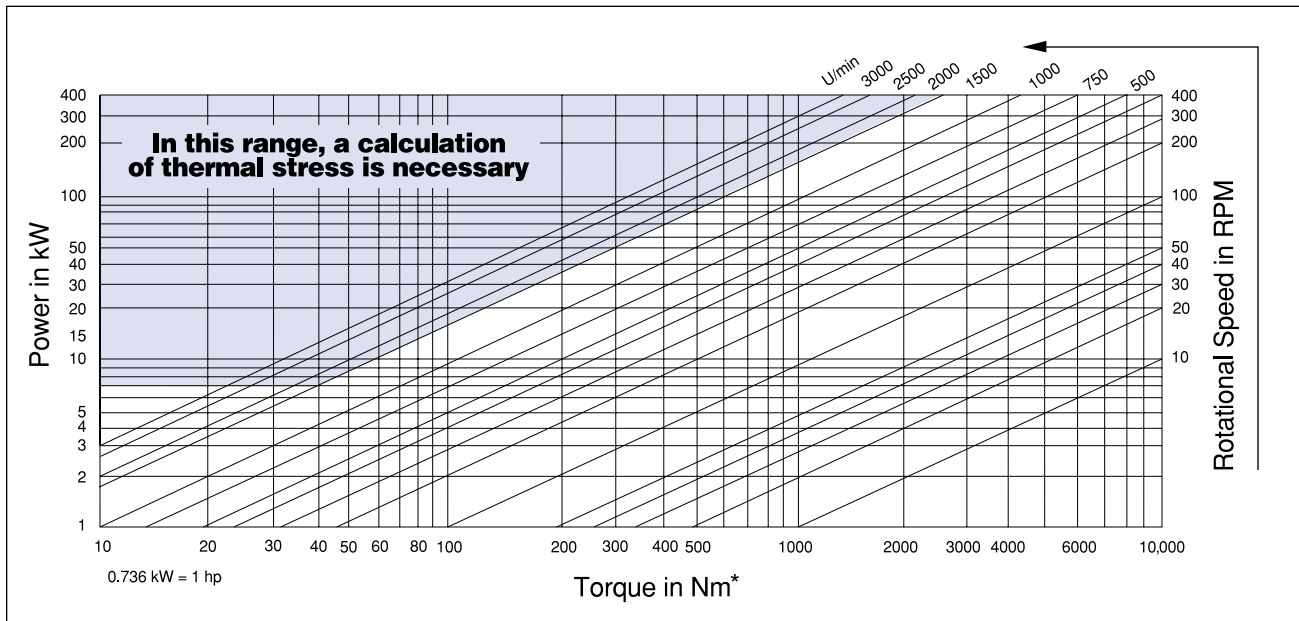
$N_c$  = corrected output power

$Md_c$  = corrected output torque

## Thermal Stress

Although a specific gearbox may have the mechanical capability to operate at high speeds, thermal considerations may reduce its actual capacity. The following chart shows where additional cooling options may be necessary. The parameters of this chart are based

on maximum speed, an ambient temperature of 20°C (68°F), continuous operation, all shafts mounted in a horizontal position, and a ratio of 1:1. See lubrication requirements in the Technical Data section, page 32. For other ratios, consult your DieQua Representative.

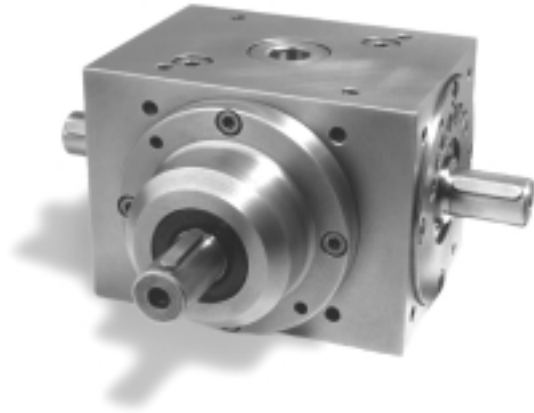


Note: Values for 1:1 ratios only.

\*1Nm = 8.85 in. lbs.

# Standard Right Angle

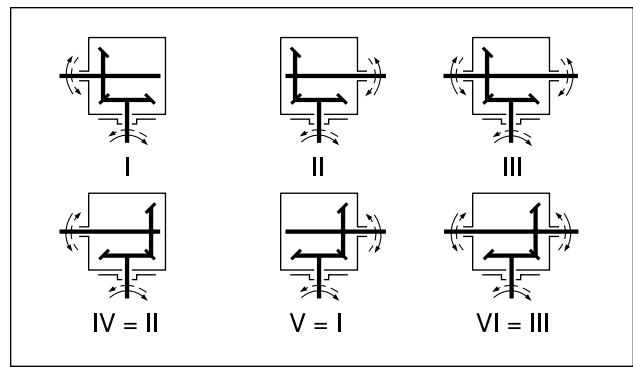
## Speed-Reducing Spiral Bevel Gearbox



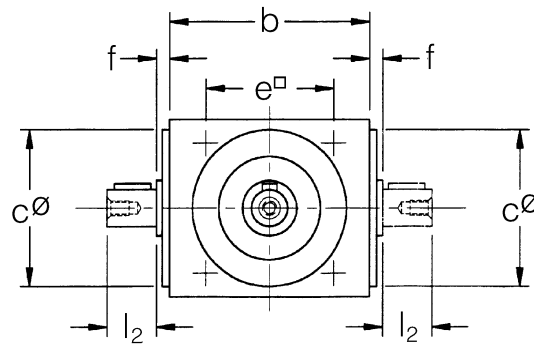
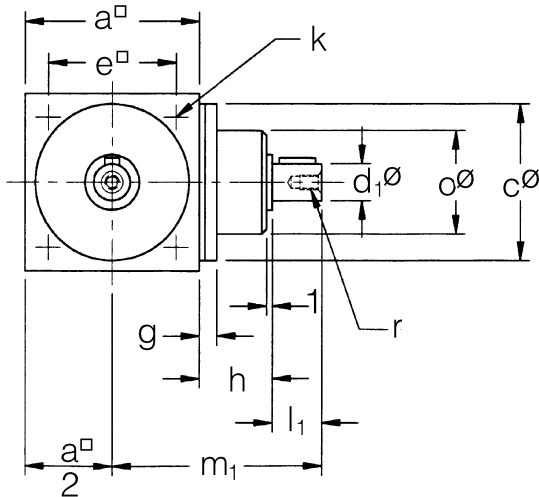
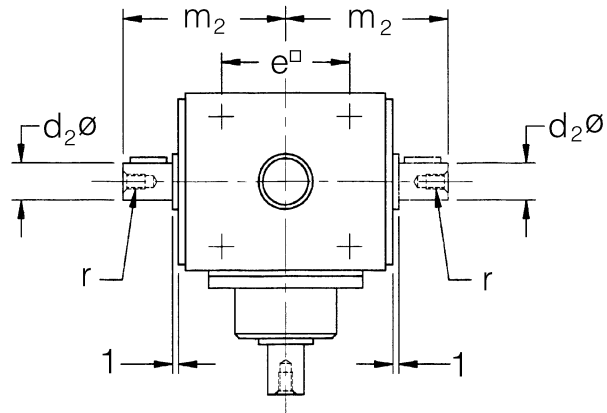
Right angle 1:1 or speed reduction from shaft  $d_1$  to  $d_2$   
Available in 8 sizes with 1:1 or 10 speed reducing ratios.

Available Ratios	
Standard gearbox is available in 1:1 and 10 speed-reducing ratios:	
1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

### Internal Gear Arrangements



Schematic:



## Dimensions

Size	General									d <sub>2</sub>	
	a <sup>□</sup>	b	c <sub>17</sub> <sup>o</sup>	d <sub>216</sub> <sup>o</sup>	e <sup>□</sup>	m <sub>2</sub>	f	h	k <sup>1)</sup>	r DIN 332	Key DIN 6885
STD 00*	80	110	74	14	60	88.5	3.5	40	M6	M6	5x5
STD 01*	110	145	102	22	82	111	3.5	45	M8	M8	6x6
STD A1*	140	175	130	32	105	137	4.5	50	M10	M10	10x8
STD B1*	170	215	160	42	130	172	4.5	65	M12	M12	12x8
STD C1*	210	260	195	55	160	220	5.0	85	M16	M16	16x10
STD D1	260	330	245	65	200	270	5.0	110	M16	M16	18x11
STD E1	330	430	310	75	260	340	5.0	150	M20	M20	20x12
STD F1	400	530	380	90	320	420	5.0	200	M24	M24	25x14

### Ratios i = 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1, and 2.5:1

Size	i = 1:1 to 2.5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	30	13	14	30	110	52	M6	5x5
STD 01*	35	14	22	35	135	70	M8	6x6
STD A1*	45	14	32	45	165	90	M10	10x8
STD B1*	60	18	42	60	210	110	M12	12x8
STD C1*	85	18	55	85	275	135	M16	16x10
STD D1	100	23	65	100	340	150	M16	18x11
STD E1	120	29	75	120	435	230	M20	20x12
STD F1	150	40	90	150	550	270	M24	25x14

### Ratios i = 3:1

Size	i = 3:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	30	13	12	25	105	52	M5	4x4
STD 01*	35	14	22	35	135	70	M8	6x6
STD A1*	45	14	32	45	165	90	M10	10x8
STD B1*	68	18	36	55	205	100	M12	10x8
STD C1*	85	18	38	65	255	135	M12	10x8
STD D1	95	32	55	85	325	135	M16	16x10
STD E1	120	29	55	85	400	190	M16	16x10
STD F1	150	40	75	120	520	270	M20	20x12

### Ratios i = 3.5:1

Size	i = 3.5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	30	13	12	25	105	52	M5	4x4
STD 01*	35	14	16	30	130	70	M6	5x5
STD A1*	45	14	20	32	152	80	M8	6x6
STD B1*	68	23	26	45	200	80	M8	8x7
STD C1*	85	18	32	45	235	105	M10	10x8
STD D1	95	28	42	70	310	110	M12	12x8
STD E1	120	29	50	75	390	190	M16	14x9
STD F1	150	40	60	95	495	200	M16	18x11

### Ratios i = 4:1

Size	i = 4:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	30	13	9	20	100	47	M4	3x3
STD 01*	35	14	16	30	130	70	M6	5x5
STD A1*	45	14	20	32	152	80	M8	6x6
STD B1*	68	23	26	45	200	80	M8	8x7
STD C1*	85	18	32	45	235	105	M10	10x8
STD D1	95	28	42	70	310	110	M12	12x8
STD E1	120	29	50	75	390	190	M16	14x9
STD F1	150	40	60	95	495	200	M16	18x11

### Ratios i = 5:1

Size	i = 5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	--	--	--	--	--	--	--	--
STD 01*	35	14	12	22	122	55	M5	4x4
STD A1*	45	14	16	30	150	65	M6	5x5
STD B1*	68	24	22	40	195	70	M8	6x6
STD C1*	85	18	26	45	235	95	M8	8x7
STD D1	95	23	32	58	298	105	M10	10x8
STD E1	120	29	42	70	385	190	M12	12x8
STD F1	150	40	55	85	485	200	M16	16x10

### Ratios i = 6:1

Size	i = 6:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>o</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>o</sup>	r DIN 332	Key DIN 6885
STD 00*	--	--	--	--	--	--	--	--
STD 01*	35	14	10	22	122	50	M4	3x3
STD A1*	45	14	12	30	150	55	M5	4x4
STD B1*	68	24	16	30	185	70	M6	5x5
STD C1*	85	18	20	40	230	95	M8	6x6
STD D1	95	23	26	45	285	105	M8	8x7
STD E1	120	29	40	70	385	190	M10	12x8
STD F1	--	--	--	--	--	--	--	--

Dimensions in mm

Ratio i = d<sub>1</sub>:d<sub>2</sub> = n<sub>1</sub>:n<sub>2</sub>

1) Screwed-in length = k • 1.5

\* Available in Meehanite and aluminum version  
Subject to changes

## Radial Load Capacities

Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1		Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1	
	d <sub>1</sub>	d <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>		d <sub>1</sub>	d <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>
STD 00	300 N	320 N	--	--	STD C1	3000 N	4500 N	2000 N	4500 N
STD 01	500 N	1000 N	450 N	1000 N	STD D1	3500 N	7000 N	2400 N	7000 N
STD A1	1200 N	2500 N	1000 N	2500 N	STD E1	4000 N	8500 N	2800 N	8500 N
STD B1	1750 N	3500 N	1500 N	3500 N	STD F1	6000 N	10,000 N	3500 N	10,000 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value.

Please consult your DieQua representative.

N = .22 lbs.

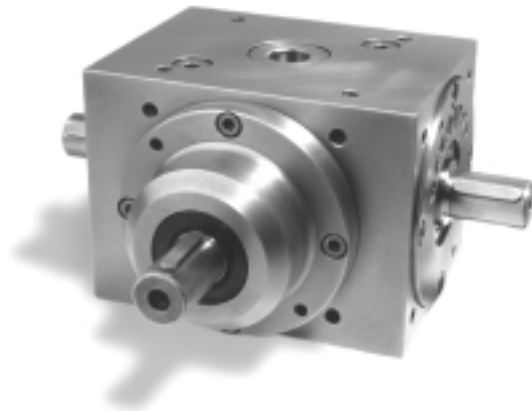
Values are higher with tapered bearing option

## Ordering Example

<b>STD A1</b>	<b>2:1</b>	<b>III</b>		
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Standard Right Angle

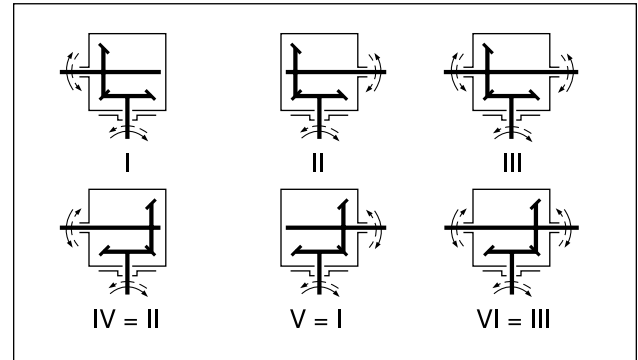
## Speed-Increasing Spiral Bevel Gearbox



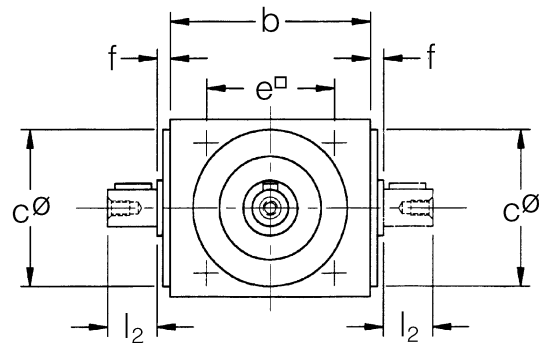
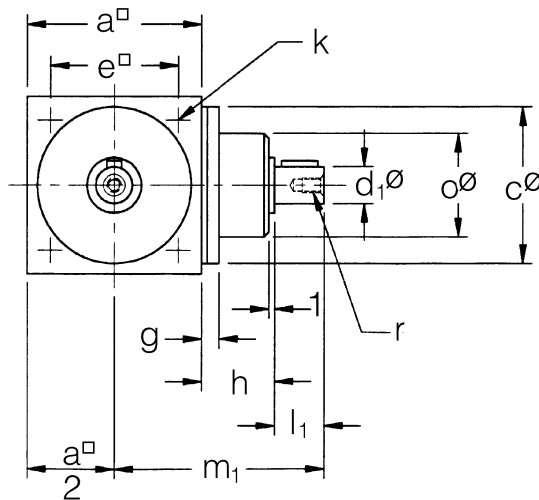
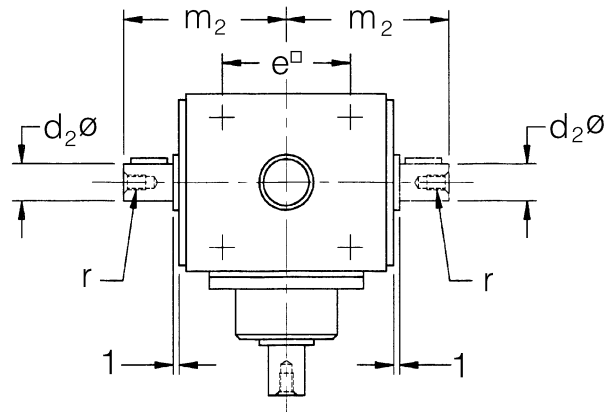
Right angle speed increasing from shaft  $d_1$  to  $d_2$   
Available in 8 sizes with 4 speed increasing ratios.

Available Ratios	
Standard gearbox is available in 4 speed-increasing ratios:	
1:1.25	1:1.75
1:1.5	1:2

### Internal Gear Arrangements



### Schematic:



# Dimensions

 Ratios  $i = 1:1.25, 1:1.5, 1:1.75, 1:2$ 

Type	General													$i = 1:1.25$ and $1:1.5$			$i = 1:1.75$ and $1:2$						
														$d_1$			$d_2$			$d_2$			
	$a^□$	b	$c_{17}^○$	$d_{116}^○$	$e^□$	$m_1$	$l_1$	f	g	h	k <sup>1)</sup>	$o^○$	$r_{\text{thread}}$	key DIN 6885	$d_{216}^○$	$l_2$	$m_2$	$r_{\text{thread}}$	key DIN 6885	$d_{216}^○$	$l_2$	$m_2$	$r_{\text{thread}}$
STD 00	80	110	74	14	60	110	30	3.5	13	40	M 6	52	M 6 5 x 5	14	30	88.5	M 6 5 x 5		12	25	83.5	M 5 4 x 4	
STD 01	110	145	102	22	82	135	35	3.5	14	45	M 8	70	M 8 6 x 6	22	35	111	M 8 6 x 6		16	30	106	M 6 5 x 5	
STD A1	140	175	130	32	105	165	45	4.5	14	50	M10	90	M10 10 x 8	32	45	137	M10 10 x 8		24	42	134	M 8 8 x 7	
STD B1	170	215	160	42	130	210	60	4.5	18	65	M12	110	M12 12 x 8	42	60	172	M12 12 x 8		28	50	162	M 8 8 x 7	
STD C1	210	260	195	55	160	275	85	5.0	18	85	M16	135	M16 16 x 10	55	85	220	M16 16 x 10		38	60	195	M12 10 x 8	
STD D1	260	330	245	65	200	340	100	5.0	23	110	M16	150	M16 18 x 11	65	100	270	M16 18 x 11		50	80	250	M16 14 x 9	
STD E1	330	430	310	75	260	435	120	5.0	29	150	M20	230	M20 20 x 12	75	120	340	M20 20 x 12		50	90	310	M16 14 x 9	
STD F1	400	530	380	90	320	550	150	5.0	40	200	M24	270	M24 25 x 14	90	150	420	M24 25 x 14		65	130	400	M16 18 x 11	

Dimensions in mm

 Ratio  $i = d_1:d_2 = n_1:n_2$ 

 1) Screwed-in length =  $k \cdot 1.5$ 

Subject to changes

## Engineering note:

 For ratios 1:1.75 and 1:2, the  $d_2$  shaft diameter decreases in size.

## Radial Load Capacities

Size	$i = 1:2$ to $1:1$		Size	$i = 1:2$ to $1:1$	
	$d_1$	$d_2$		$d_1$	$d_2$
STD 00	300 N	320 N	STD C1	3000 N	4500 N
STD 01	500 N	1000 N	STD D1	3500 N	7000 N
STD A1	1200 N	2500 N	STD E1	4000 N	8500 N
STD B1	1750 N	3500 N	STD F1	6000 N	10,000 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value.

Please consult your DieQua representative.

N = .22 lbs.

Values are higher with tapered bearing option

## Ordering Example

<b>STD</b>	<b>A1</b>	<b>1:2</b>	<b>III</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Auxiliary

## Type EA One-way Auxiliary Branch-off Spiral Bevel Gearbox



### Available Ratios

Type EA gearbox is available in 1:1 and 10 speed-reducing ratios:

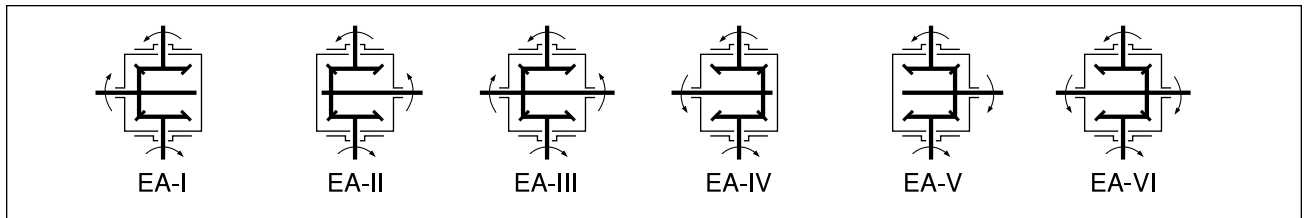
1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

and 4 speed-increasing ratios:

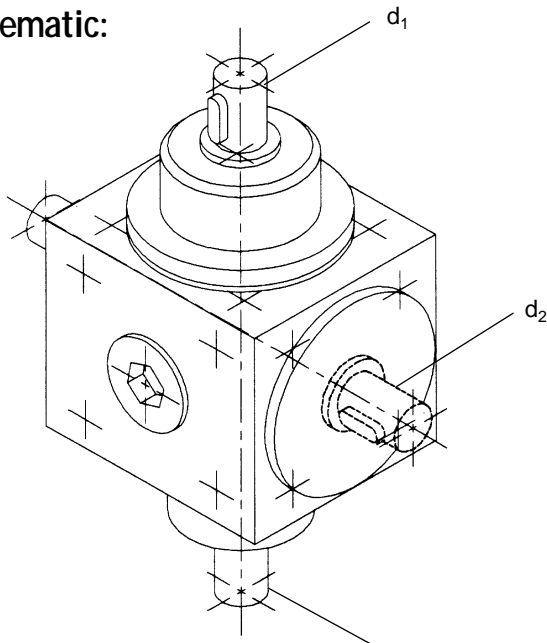
1:1.25	1:1.75
1:1.5	1:2

One input and up to three output shafts in one plane.  
Engineering note:  $d_1$  and  $d_5$  operate at the same speed.

### Internal Gear Arrangements



### Schematic:



### Dimensions

The dimensions for the 8 sizes of speed-reducing ratios are the same as those for STANDARD speed-reducing gearboxes. See the table on page 11.

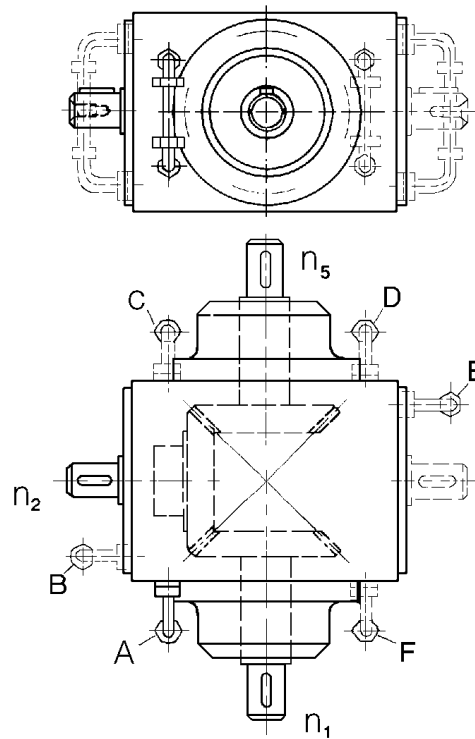
The dimensions for 8 sizes of speed-increasing ratios are the same as those for STANDARD speed-increasing gearboxes. See the table on page 13.

## Monitoring the Oil Level

Auxiliary pinion EA style gearboxes may require special oil level monitoring. When a one-way EA auxiliary gearbox is mounted vertically, the normal oil level sight-glass is used to monitor the oil level. When the gearbox is mounted horizontally, the normal sight-glass can no longer be used. An external sight-glass must be installed. The schematic at right indicates the various positions available. This is Tandler special design S-545. When ordering a gearbox with this feature, please specify this special design number and position of the sight-glass:

(example: A1 EA-III 1:1 S-545-A).

Also see page 32 for additional lubrication information, or consult your DieQua representative.



## Vertical Shaft Applications

Gearboxes mounted with a shaft in a vertical position will require special lubrication options. The bearings supporting the upper portion of the vertical shaft generally do not receive sufficient quantities of oil for proper lubrication and cooling. Several options exist:

### 1. For vertical pinions S515 d1:

The pinion is supported by two preloaded angular contact ball bearings. The lower bearing is replaced by a sealed bearing, and the pinion cavity is filled with grease.

### 2. For vertical shafts S515 d2:

The ball bearing supporting the upper portion of the vertical shaft is replaced with a permanently lubricated sealed ball bearing.

## Radial Load Capacities

Size	i = 1:2 to 3:1		i = 3.5:1 to 6:1		Size	i = 1:2 to 3:1		i = 3.5:1 to 6:1	
	d <sub>1</sub> = d <sub>5</sub>	d <sub>2</sub>	d <sub>1</sub> = d <sub>5</sub>	d <sub>2</sub>		d <sub>1</sub> = d <sub>5</sub>	d <sub>2</sub>	d <sub>1</sub> = d <sub>5</sub>	d <sub>2</sub>
STD 00	300 N	320 N	--	--	STD C1	3000 N	4500 N	2000 N	4500 N
STD 01	500 N	1000 N	450 N	1000 N	STD D1	3500 N	7000 N	2400 N	7000 N
STD A1	1200 N	2500 N	1000 N	2500 N	STD E1	4000 N	8500 N	2800 N	8500 N
STD B1	1750 N	3500 N	1500 N	3500 N	STD F1	6000 N	10,000 N	3500 N	10,000 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value. Please consult your DieQua representative.

Note: d<sub>1</sub> = d<sub>5</sub>

N = .22 lbs.

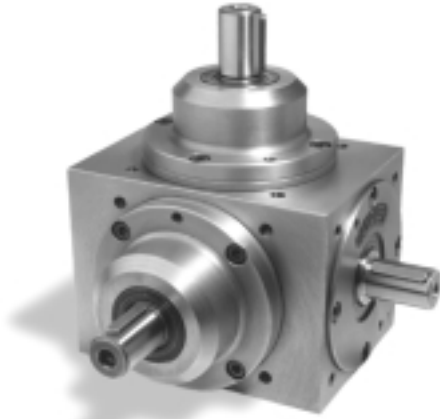
Values are higher with tapered bearing option

## Ordering Example

STD	A1	2:1	EAIII	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

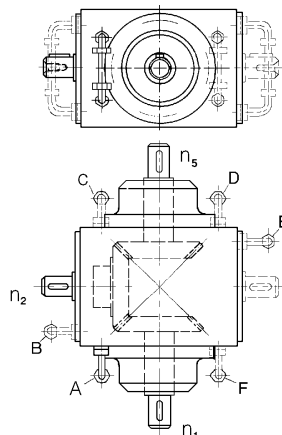
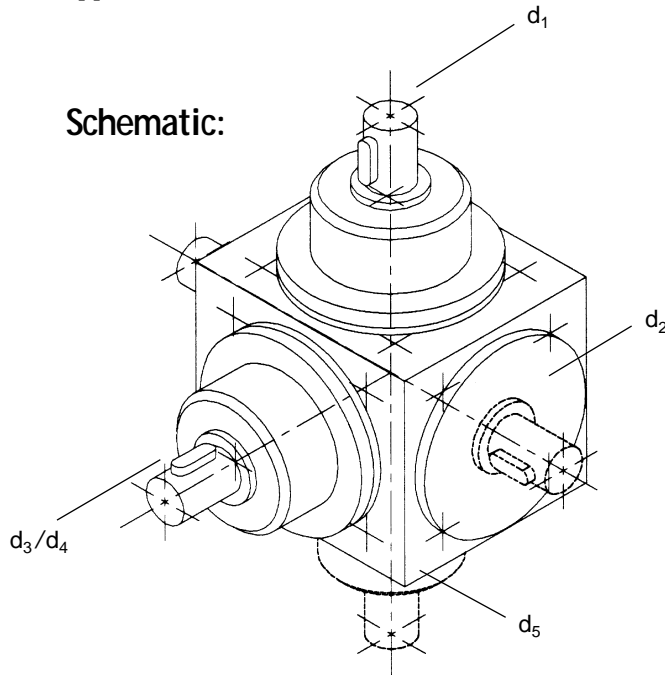
# Auxiliary

Type ZA Two- and Three-way Auxiliary  
Branch-off Spiral Bevel Gearboxes



One input and up to five output shafts make this gearbox an extremely versatile option for custom applications.

Schematic:



## Available Ratios

Type ZA gearbox is available in  
10 speed-reducing ratios:

1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

and 4 speed-increasing ratios:

1:1.25	1:1.75
1:1.5	1:2

(Note: 1:1 ratio not available).

## Dimensions

The dimensions for the 8 sizes of speed-reducing ratios are the same as those for STANDARD speed-reducing gearboxes. See the table on page 11.

The dimensions for 8 sizes of speed-increasing ratios are the same as those for STANDARD speed-increasing gearboxes. See the table on page 13.

## Monitoring the Oil Level

Auxiliary pinion ZA style gearboxes may require special oil level monitoring. For a two-way ZA auxiliary gearbox, the normal oil level sight-glass may be used only if the face of the gearbox with the sight-glass is mounted horizontal and is visible. For all three-way ZA auxiliary gearboxes, an external oil level sight-glass must be used. The schematic below left indicates the various positions available. This is Tandler special design S-545. When ordering a gearbox with this feature, please specify this special design number and position of the sight glass:

(example: A1 ZA-III 2:1 S-545-A).

Also see page 32 for additional lubrication information, or consult your DieQua representative.

## Vertical Shaft Applications

Gearboxes mounted with a shaft in a vertical position will require special lubrication options. The bearings supporting the upper portion of the vertical shaft generally do not receive sufficient quantities of oil for proper lubrication and cooling. Several options exist:

### 1. For vertical pinions S515 d1:

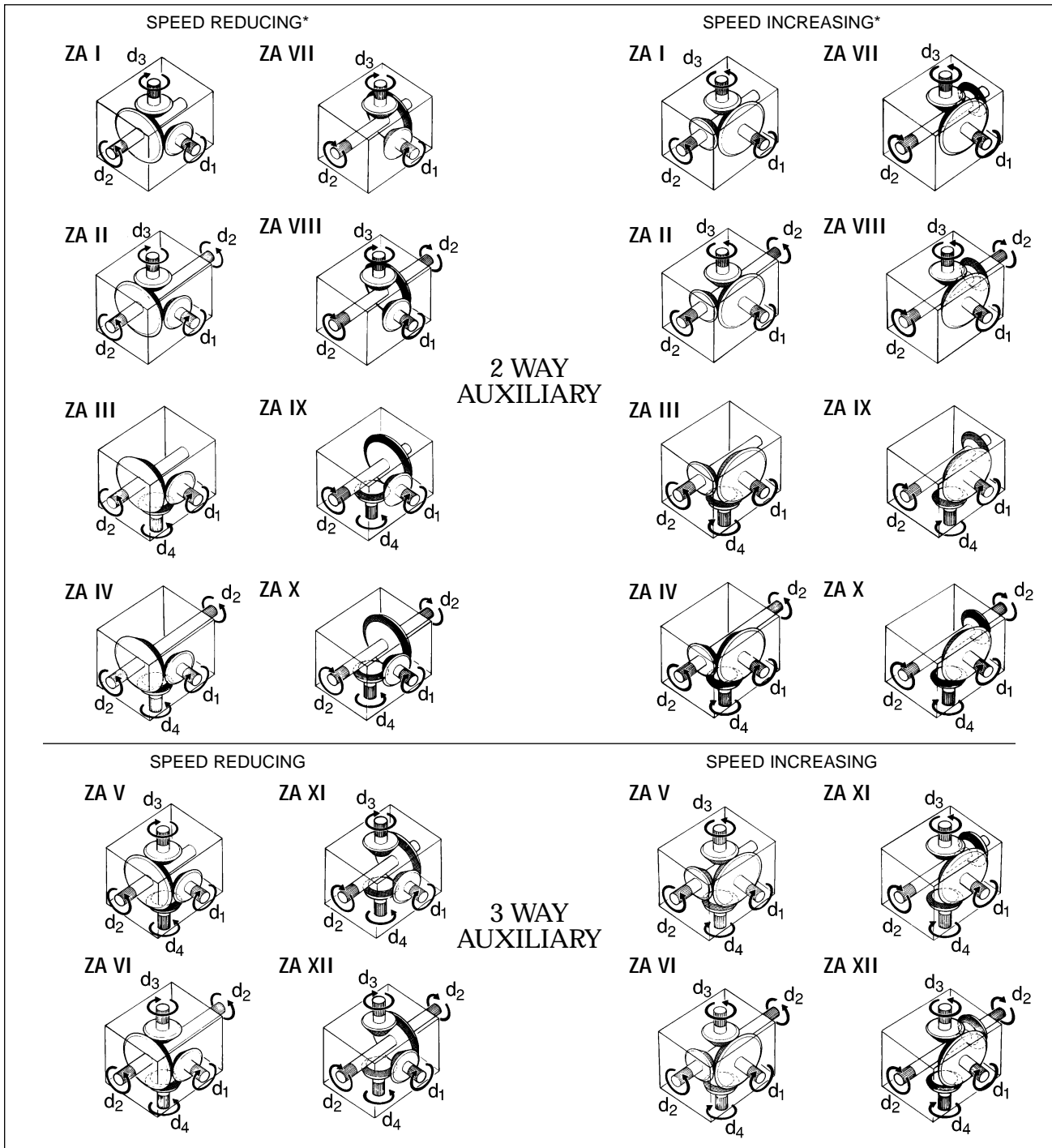
The pinion is supported by two preloaded angular contact ball bearings. The lower bearing is replaced by a sealed bearing, and the pinion cavity is filled with grease.

### 2. For vertical shafts S515 d2:

The ball bearing supporting the upper portion of the vertical shaft is replaced with a permanently lubricated sealed ball bearing.



# Internal Gear Arrangements



\* Note: 1 shaft runs slower. All other shafts run faster and at the same speed

## Radial Load Capacities

Size	i = 1:2 to 3:1		i = 3.5:1 to 6:1		Size	i = 1:2 to 3:1		i = 3.5:1 to 6:1	
	d <sub>1</sub> = d <sub>3</sub> = d <sub>4</sub>	d <sub>2</sub>	d <sub>1</sub> = d <sub>3</sub> = d <sub>4</sub>	d <sub>2</sub>		d <sub>1</sub> = d <sub>3</sub> = d <sub>4</sub>	d <sub>2</sub>	d <sub>1</sub> = d <sub>3</sub> = d <sub>4</sub>	d <sub>2</sub>
STD 00	300 N	320 N	--	--	STD C1	3000 N	4500 N	2000 N	4500 N
STD 01	500 N	1000 N	450 N	1000 N	STD D1	3500 N	7000 N	2400 N	7000 N
STD A1	1200 N	2500 N	1000 N	2500 N	STD E1	4000 N	8500 N	2800 N	8500 N
STD B1	1750 N	3500 N	1500 N	3500 N	STD F1	6000 N	10,000 N	3500 N	10,000 N

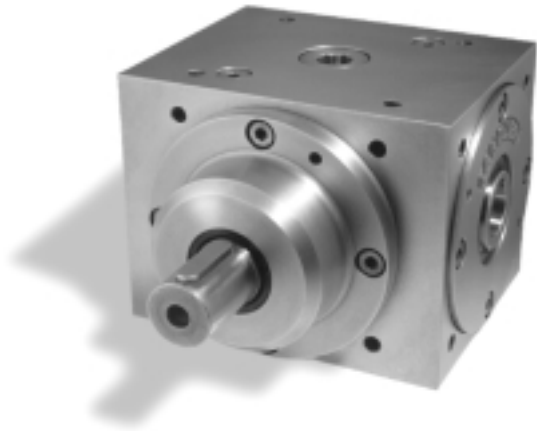
The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value. Please consult your DieQua representative. Note: d<sub>1</sub> = d<sub>3</sub> = d<sub>4</sub> N = .22 lbs. Values are higher with tapered bearing option

## Ordering Example

<b>STD</b>	<b>A1</b>	<b>2:1</b>	<b>ZAIII</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Hollow Shaft

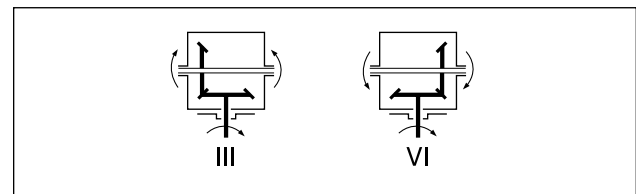
Type HW Hollow Shaft Spiral Bevel Gearbox



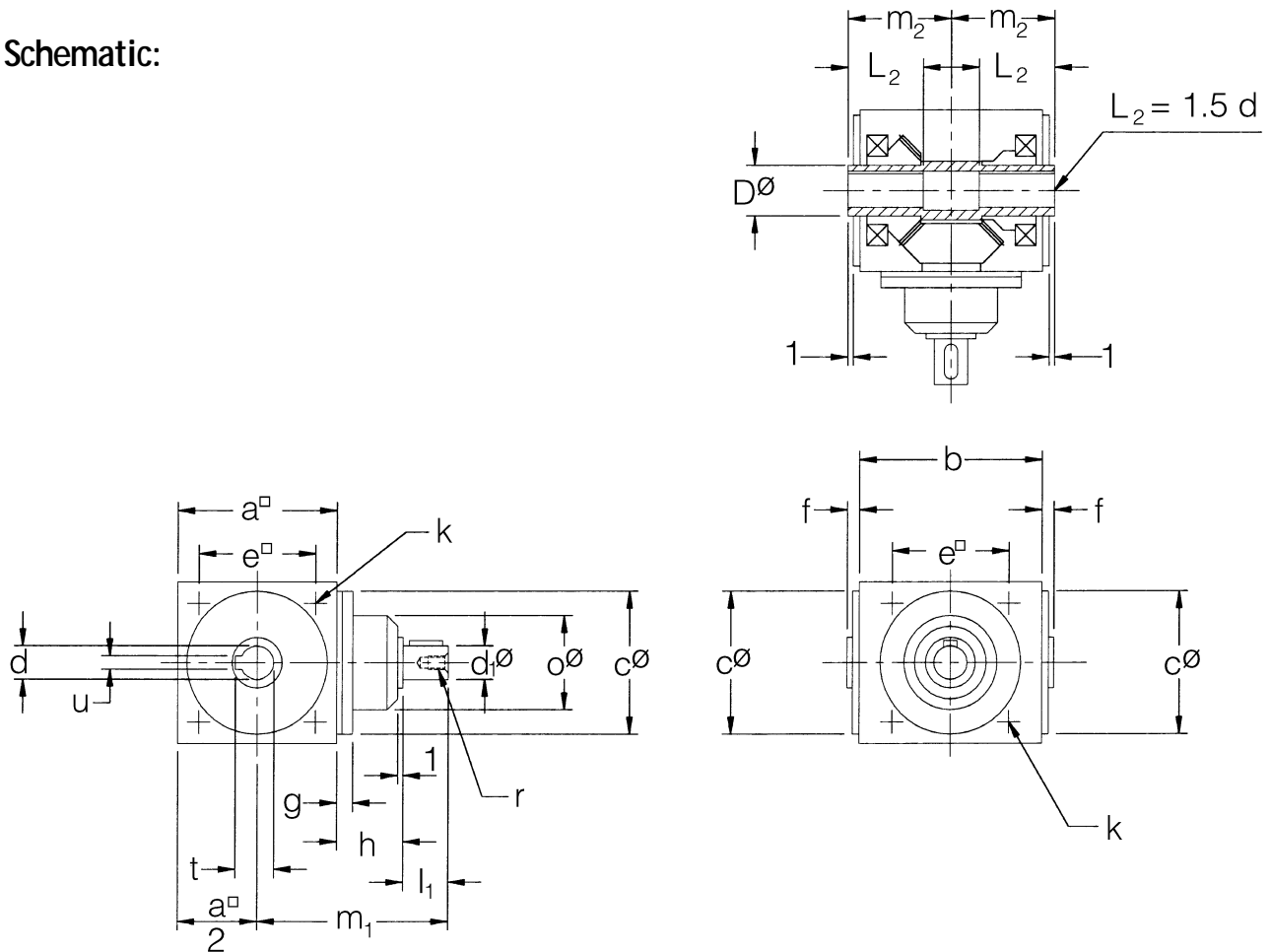
Available Ratios	
Type HW gearbox is available in 1:1 and 10 speed-reducing ratios:	
1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

A popular design because it eliminates the need for coupling intersecting shafts or allows for custom shafts to be inserted. Three hollow shaft designs offer increased connection flexibility: key, spline shaft profile, or involute spline profile. The torque, speed, and radial load capacity for type HW gearboxes are equivalent to STANDARD version gearboxes.

## Internal Gear Arrangements



## Schematic:





# Dimensions

Size	General								Hollow Shaft $d_2$							
	$a^{\square}$	b	$c_{17}^{\circ}$	$e^{\square}$	$m_2$	f	h	k <sup>1)</sup>	$d_{H7}^{\circ}$	D	t	$u^{99}$	for Key DIN 6885 Sh.3	straight sided spline type HWK	splines	involute spline type HWZ
HW 00*	80	110	74	60	58.5	3.5	40	M6	14	22	15.2	5	5x3	--	--	--
HW 01*	110	145	102	82	76	3.5	45	M8	22	38	23.6	6	6x4	21 x 25 x 5 (5463)	6	A25 x 22
HW A1*	140	175	130	105	92	4.5	50	M10	28	42	30	8	8x5	28 x 32 x 7 (5462)	6	A30 x 27
HW B1*	170	215	160	130	112	4.5	65	M12	35	55	37.4	10	10x6	36 x 42 x 8 (5472)	6	A40 x 36
HW C1*	210	260	195	160	135	5.0	85	M16	45	65	47.1	14	14x6	42 x 48 x 10 (5472)	6	A50 x 45
HW D1	260	330	245	200	170	5.0	110	M16	55	80	57.4	16	16x7	46 x 54 x 9 (5463)	8	A60 x 55
HW E1	330	430	310	260	220	5.0	150	M20	60	100	64.4	18	18x11	58 x 65 x 14 (5472)	6	A65 x 60
HW F1	400	530	380	320	270	5.0	200	M24	70	120	74.7	20	20x12	68 x 78 x 16 (5472)	6	A75 x 69

### Ratios i = 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1, and 2.5:1

Size	i = 1:1 to 2.5:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	13	14	30	110	52	M6	5x5
HW 01*	14	22	35	135	70	M8	6x6
HW A1*	14	32	45	165	90	M10	10x8
HW B1*	18	42	60	210	110	M12	12x8
HW C1*	18	55	85	275	135	M16	16x10
HW D1	23	65	100	340	150	M16	18x11
HW E1	29	75	120	435	230	M20	20x12
HW F1	40	90	150	550	270	M24	25x14

### Ratios i = 3:1

Size	i = 3:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	13	12	25	105	52	M5	4x4
HW 01*	14	22	35	135	70	M8	6x6
HW A1*	14	32	45	165	90	M10	10x8
HW B1*	18	36	55	205	100	M12	10x8
HW C1*	18	38	65	255	135	M12	10x8
HW D1	32	55	85	325	135	M16	16x10
HW E1	29	55	85	400	190	M16	16x10
HW F1	40	75	120	520	270	M20	20x12

### Ratios i = 3.5:1

Size	i = 3.5:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	13	12	25	105	52	M5	4x4
HW 01*	14	16	30	130	70	M6	5x5
HW A1*	14	20	32	152	80	M8	6x6
HW B1*	23	26	45	200	80	M8	8x7
HW C1*	18	32	45	235	105	M10	10x8
HW D1	28	42	70	310	110	M12	12x8
HW E1	29	50	75	390	190	M16	14x9
HW F1	40	60	95	495	200	M16	18x11

### Ratios i = 4:1

Size	i = 4:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	13	9	20	100	47	M4	3x3
HW 01*	14	16	30	130	70	M6	5x5
HW A1*	14	20	32	152	80	M8	6x6
HW B1*	23	26	45	200	80	M8	8x7
HW C1*	18	32	45	235	105	M10	10x8
HW D1	28	42	70	310	110	M12	12x8
HW E1	29	50	75	390	190	M16	14x9
HW F1	40	60	95	495	200	M16	18x11

### Ratios i = 5:1

Size	i = 5:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	--	--	--	--	--	--	--
HW 01*	14	12	22	122	55	M5	4x4
HW A1*	14	16	30	150	65	M6	5x5
HW B1*	24	22	40	195	70	M8	6x6
HW C1*	18	26	45	235	95	M8	8x7
HW D1	23	32	58	298	105	M10	10x8
HW E1	29	42	70	385	190	M12	12x8
HW F1	40	55	85	485	200	M16	16x10

### Ratios i = 6:1

Size	i = 6:1					$d_1$	
	g	$d_{1j6}^{\circ}$	$l_1$	$m_1$	$\alpha^{\circ}$	r DIN 332	Key DIN 6885
HW 00*	--	--	--	--	--	--	--
HW 01*	14	10	22	122	50	M4	3x3
HW A1*	14	12	30	150	55	M5	4x4
HW B1*	24	16	30	185	70	M6	5x5
HW C1*	18	20	40	230	95	M8	6x6
HW D1	23	26	45	285	105	M8	8x7
HW E1	29	40	70	385	190	M10	12x8
HW F1	--	--	--	--	--	--	--

Dimensions in mm  
 Ratio  $i = d_1:d_2 = n_1:n_2$   
 1) Screwed-in length =  $k \cdot 1.5$   
 \* Available in Meehanite and aluminum version  
 Subject to changes

# Radial Load Capacities

Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1		Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1	
	$d_1$	$d_2$	$d_1$	$d_2$		$d_1$	$d_2$	$d_1$	$d_2$
HW 00	300 N	320 N	--	--	HW C1	3000 N	4500 N	2000 N	4500 N
HW 01	500 N	1000 N	450 N	1000 N	HW D1	3500 N	7000 N	2400 N	7000 N
HW A1	1200 N	2500 N	1000 N	2500 N	HW E1	4000 N	8500 N	2800 N	8500 N
HW B1	1750 N	3500 N	1500 N	3500 N	HW F1	6000 N	10,000 N	3500 N	10,000 N

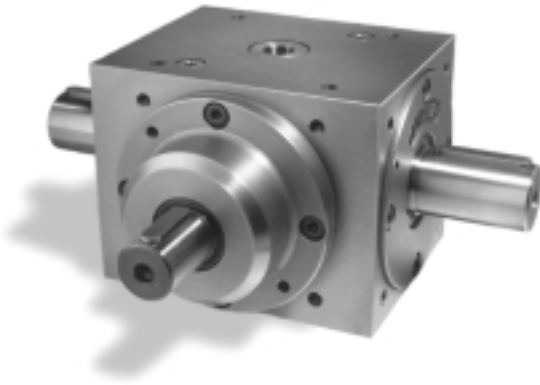
The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value.  
 Please consult your DieQua representative.  
 N = .22 lbs.  
 Values are higher with tapered bearing option

# Ordering Example

<b>HW</b>	<b>A1</b>	<b>2:1</b>	<b>III</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Reinforced Shaft

## Type WV Reinforced Shaft Spiral Bevel Gearbox



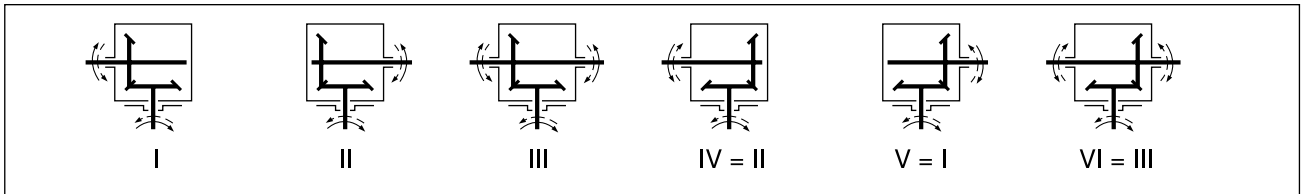
Larger, heavier cross shaft. A cost-effective alternative where partial torques fork off a main line shaft. The torque, speed, and radial load capacity for type WV gearboxes are equivalent to STANDARD version gearboxes.

Available Ratios	
Type WV gearbox is available in 1:1 and 10 speed-reducing ratios:	
1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

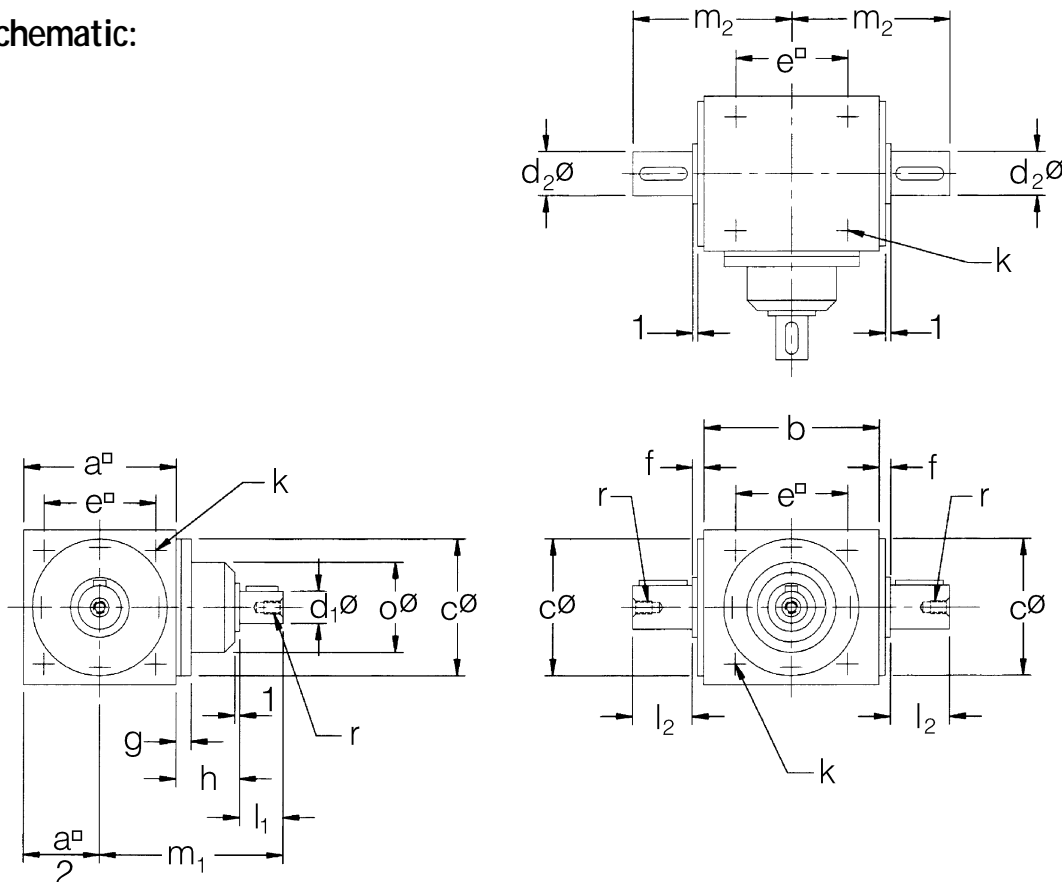
### Application Example

A web style printing press with multiple print stations is an excellent application example for a type WV gearbox. In a web press, one main drive motor is used to drive numerous print stations at right angles to the main drive shaft. The larger through shaft can transmit the entire machine torque, while the gears drive only the individual print stations. The result is a smaller gearbox size and increased line-shaft rigidity.

### Internal Gear Arrangements



### Schematic:





# Dimensions

Size	General								d <sub>2</sub>		
	a <sup>□</sup>	b	c <sub>17</sub> <sup>○</sup>	e <sup>□</sup>	m <sub>2</sub>	f	h	k <sup>1)</sup>	d <sub>216</sub> <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	80	110	74	60	93.5	3.5	40	M6	20	M8	6x6
WV 01*	110	145	102	82	131	3.5	45	M8	35	M10	10x8
WV A1*	140	175	130	105	157	4.5	50	M10	40	M12	12x8
WV B1*	170	215	160	130	192	4.5	65	M12	50	M16	14x9
WV C1*	210	260	195	160	230	5.0	85	M16	60	M16	18x11
WV D1	260	330	245	200	285	5.0	110	M16	75	M20	20x12
WV E1	330	430	310	260	350	5.0	150	M20	85	M20	22x14
WV F1	400	530	380	320	430	5.0	200	M24	100	M24	28x16

## Ratios i = 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1, and 2.5:1

Size	i = 1:1 to 2.5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	35	13	14	30	110	52	M6	5x5
WV 01*	55	14	22	35	135	70	M8	6x6
WV A1*	65	14	32	45	165	90	M10	10x8
WV B1*	80	18	42	60	210	110	M12	12x8
WV C1*	95	18	55	85	275	135	M16	16x10
WV D1	115	23	65	100	340	150	M16	18x11
WV E1	130	29	75	120	435	230	M20	20x12
WV F1	160	40	90	150	550	270	M24	25x14

## Ratios i = 3:1

Size	i = 3:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	35	13	12	25	105	52	M5	4x4
WV 01*	55	14	22	35	135	70	M8	6x6
WV A1*	65	14	32	45	165	90	M10	10x8
WV B1*	80	18	36	55	205	100	M12	10x8
WV C1*	95	18	38	65	255	135	M12	10x8
WV D1	115	23	55	85	325	135	M16	16x10
WV E1	130	29	55	85	400	190	M16	16x10
WV F1	160	40	75	120	520	270	M20	20x12

## Ratios i = 3.5:1

Size	i = 3.5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	35	13	12	25	105	52	M5	4x4
WV 01*	55	14	16	30	130	70	M6	5x5
WV A1*	65	14	20	32	152	80	M8	6x6
WV B1*	80	23	26	45	200	80	M8	8x7
WV C1*	95	18	32	45	235	105	M10	10x8
WV D1	115	28	42	70	310	110	M12	12x8
WV E1	130	29	50	75	390	190	M16	14x9
WV F1	160	40	60	95	495	200	M16	18x11

## Ratios i = 4:1

Size	i = 4:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	35	13	9	20	100	47	M4	3x3
WV 01*	55	14	16	30	130	70	M6	5x5
WV A1*	65	14	20	32	152	80	M8	6x6
WV B1*	80	23	26	45	200	80	M8	8x7
WV C1*	95	18	32	45	235	105	M10	10x8
WV D1	115	28	42	70	310	110	M12	12x8
WV E1	130	29	50	75	390	190	M16	14x9
WV F1	160	40	60	95	495	200	M16	18x11

## Ratios i = 5:1

Size	i = 5:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	--	--	--	--	--	--	--	--
WV 01*	55	14	12	22	122	55	M5	4x4
WV A1*	65	14	16	30	150	65	M6	5x5
WV B1*	80	24	22	40	195	70	M8	6x6
WV C1*	95	18	26	45	235	95	M8	8x7
WV D1	115	23	32	58	298	105	M10	10x8
WV E1	130	29	42	70	385	190	M12	12x8
WV F1	160	40	55	85	485	200	M16	16x10

## Ratios i = 6:1

Size	i = 6:1						d <sub>1</sub>	
	l <sub>2</sub>	g	d <sub>116</sub> <sup>○</sup>	l <sub>1</sub>	m <sub>1</sub>	o <sup>○</sup>	r DIN 332	Key DIN 6885
WV 00*	--	--	--	--	--	--	--	--
WV 01*	55	14	10	22	122	50	M4	3x3
WV A1*	65	14	12	30	150	55	M5	4x4
WV B1*	80	24	16	30	185	70	M6	5x5
WV C1*	95	18	20	40	230	95	M8	6x6
WV D1	115	23	26	45	285	105	M8	8x7
WV E1	130	29	40	70	385	190	M10	12x8
WV F1	--	--	--	--	--	--	--	--

Dimensions in mm Subject to changes

Ratio i = d<sub>1</sub>:d<sub>2</sub> = n<sub>1</sub>:n<sub>2</sub>

1) Screwed-in length = k • 1.5

\* Available in Meehanite and aluminum version

# Shaft Torque Capacities

Gearbox type	WV 00	WV 01	WV A1	WV B1	WV C1	WV D1	WV E1	WV F1
Shaft diameter (mm)	20	35	40	50	60	75	85	100
Torque capacity (Nm)	80	380	580	1150	1950	3900	5800	9000

# Radial Load Capacities

Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1		Size	i = 1:1 to 3:1		i = 3.5:1 to 6:1	
	d <sub>1</sub>	d <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>		d <sub>1</sub>	d <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>
WV 00	300 N	320 N	--	--	WV C1	3000 N	4500 N	2000 N	4500 N
WV 01	500 N	1000 N	450 N	1000 N	WV D1	3500 N	7000 N	2400 N	7000 N
WV A1	1200 N	2500 N	1000 N	2500 N	WV E1	4000 N	8500 N	2800 N	8500 N
WV B1	1750 N	3500 N	1500 N	3500 N	WV F1	6000 N	10,000 N	3500 N	10,000 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value.

Please consult your DieQua representative.

N = .22 lbs.

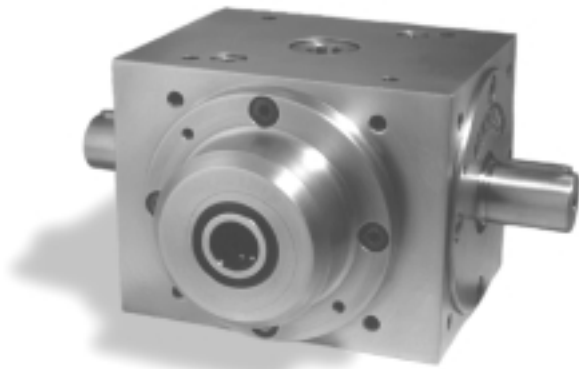
Values are higher with tapered bearing option

# Ordering Example

<b>WV</b>	<b>A1</b>	<b>2:1</b>	<b>III</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

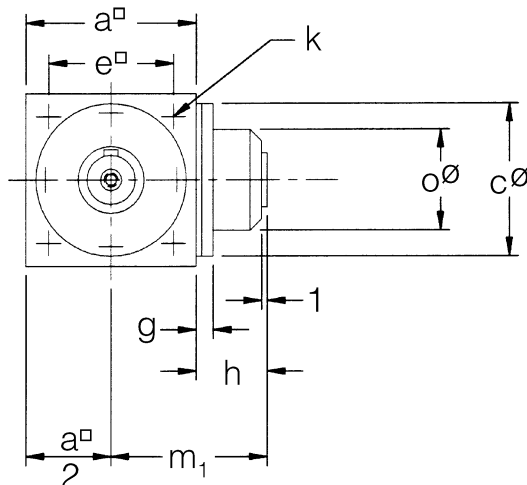
# Hollow Pinion

Types HR and HRZ Hollow Pinion Spiral Bevel Gearboxes



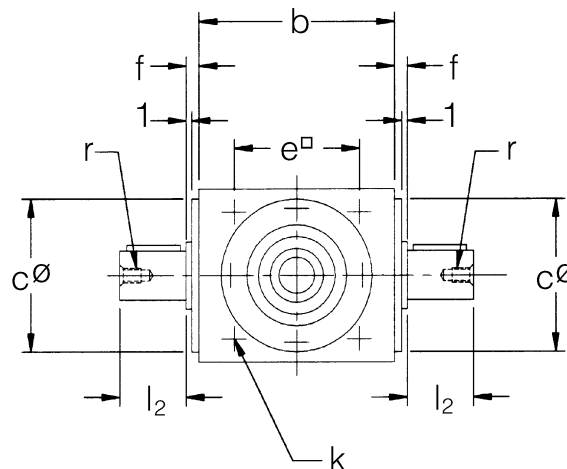
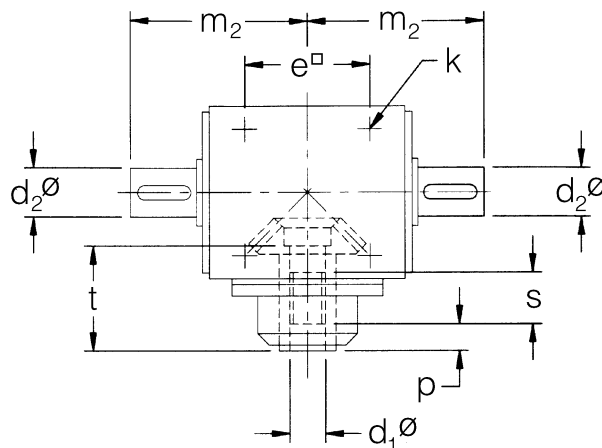
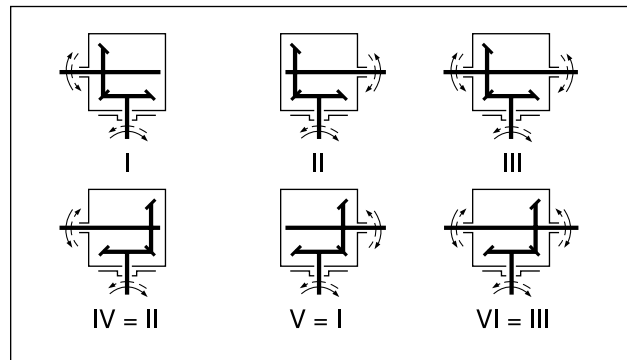
The hollow pinion in the Type HR gearbox contains a keyway, and the hollow pinion in the Type HRZ gearbox contains an involute spline, to facilitate installation directly onto a drive shaft. The torque, speed, and radial load capacity for gearbox types HR and HRZ are equivalent to STANDARD version gearboxes.

Schematic:



Available Ratios	
Type HR and Type HRZ gearboxes are available in 4 ratios:	
1:1.5	1.5:1
1:1	2:1

## Internal Gear Arrangements





# Dimensions

Ratios  $i = 1:1.5, 1:1, 1.5:1, 2:1$

Type	General																	$d_2$	
	$a^{\square}$	b	$d_1^{H12}$	t	$m_1$	$\phi^{\circ}$	p	s	$c_{17}^{\circ}$	$d_{26}^{\circ}$	$e^{\square}$	$m_2$	$l_2$	f	g	h	$k^1)$	$r_{\text{thread}}$	key DIN 6885
HR & HRZ 01	110	145	20	60	100	70	20	30	102	22	82	111	35	3.5	14	45	M 8	M 8	6 x 6
HR & HRZ A1	140	175	25	70	120	90	15	48	130	32	105	137	45	4.5	14	50	M10	M10	10 x 8
HR & HRZ B1	170	215	30	95	150	110	15	48	160	42	130	172	60	4.5	18	65	M12	M12	12 x 8
HR & HRZ C1	210	260	40	120	190	135	26	48	195	55	160	220	85	5.0	18	85	M16	M16	16 x 10
HR & HRZ D1	260	330	45	150	240	150	30	48	245	65	200	270	100	5.0	23	110	M16	M16	18 x 11
HR & HRZ E1	330	430	49	220	315	230	40	48	310	75	260	340	120	5.0	29	150	M20	M20	120 x 12
HR & HRZ F1	(upon request)																		

Dimensions in mm  
 Ratio  $i = d_1:d_2 = n_1:n_2$   
 1) Screwed-in length =  $k \cdot 1.5$   
 \* Available in Meehanite and aluminum version  
 Subject to changes  
 Note: The  $d_1^{H12}$  dimension is for Type HRZ only.

## Type HR Keyway Dimensions

Ratio	$i = 1:1.5, 1:1, 1.5:1, 2:1$						
Gearbox type	HR 01	HR A1	HR B1	HR C1	HR D1	HR E1	HR F1
Keyway per DIN 6885	A 6 x 6	A 8 x 5	A 10 x 6	A 14 x 6	Upon Request	Upon Request	Upon Request
Input Bore diameter (mm)	19	25	35	45			

## Type HRZ Involute Spline Dimensions

Ratio	$i = 1:1.5, 1:1, 1.5:1, 2:1$						
Gearbox type	HRZ 01	HRZ A1	HRZ B1	HRZ C1	HRZ D1	HRZ E1	HRZ F1
Input Involute spline DIN 5482	A 20 x 17	A 25 x 22	A 30 x 27	A 40 x 36	A 45 x 41	A 48 x 44	Upon Request
Length of involute spline (mm)	30	48	48	48	48	48	

## Radial Load Capacities

Size	$i = 1:1 \text{ to } 2:1$		Size	$i = 1:1 \text{ to } 2:1$	
	$d_1$	$d_2$		$d_1$	$d_2$
HR & HRZ 01	500 N	1000 N	HR & HRZ C1	3000 N	4500 N
HR & HRZ A1	1200 N	2500 N	HR & HRZ D1	3500 N	7000 N
HR & HRZ B1	1750 N	3500 N	HR & HRZ E1	4000 N	8500 N
			HR & HRZ F1	6000 N	10,000 N

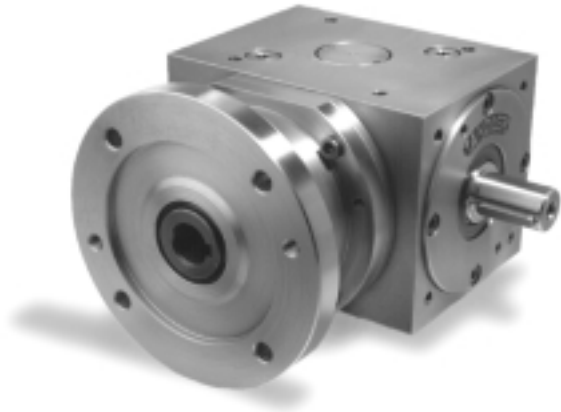
The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value. Please consult your DieQua representative.  
 N = .22 lbs.  
 Values are higher with tapered bearing option

## Ordering Example

<b>HRZ</b>	<b>A1</b>	<b>2:1</b>	<b>III</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Flange-Mount

Type F Flange-mount Spiral Bevel Gearbox

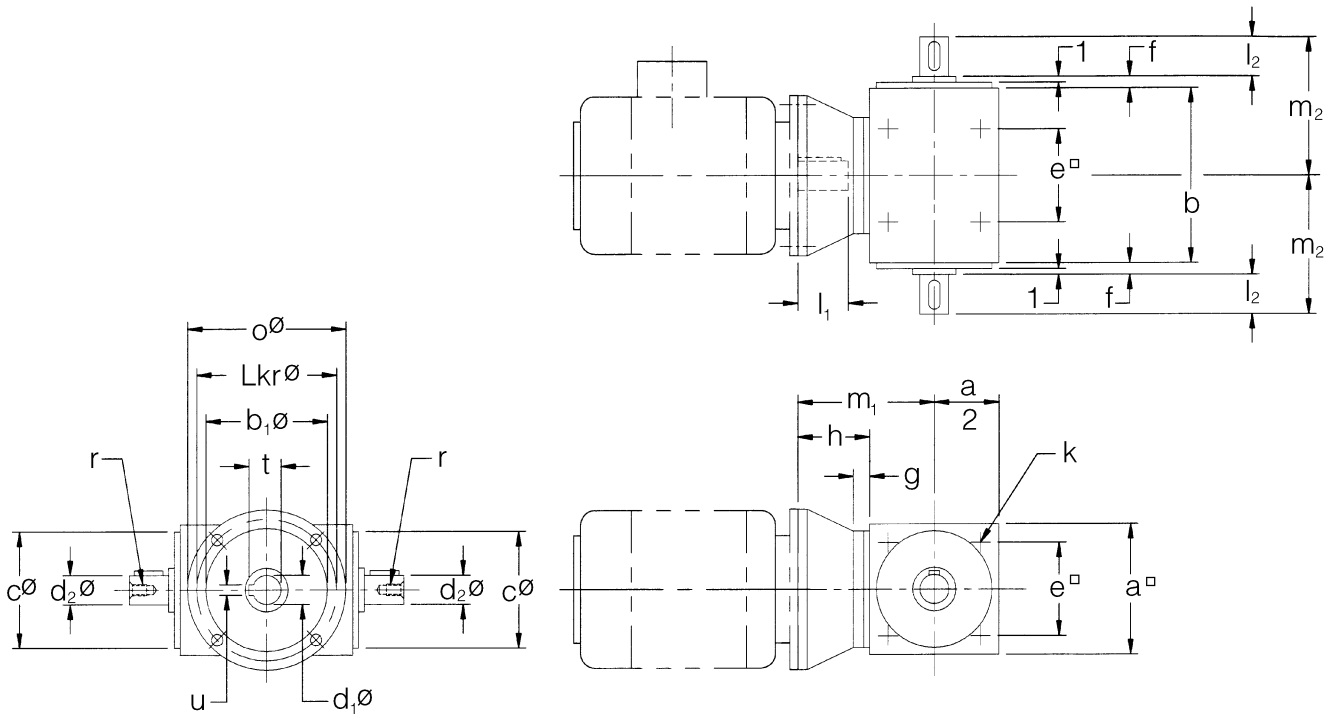
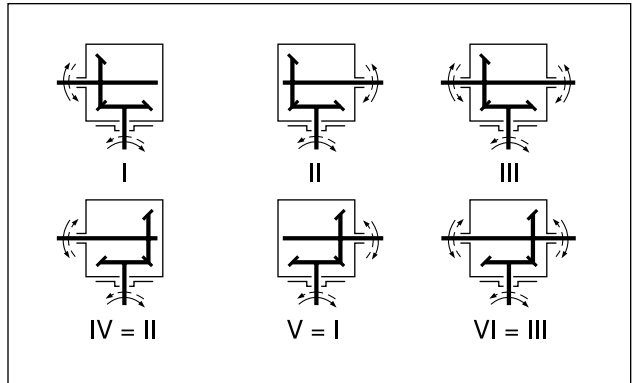


The flange mount version offers a variety of IEC, NEMA, and servo motor compatible flange adapters and bore dimensions.

Schematic:

Available Ratios	
Standard gearbox is available in 1:1 and 10 speed-reducing ratios:	
1.25:1	3:1
1.5:1	3.5:1
1.75:1	4:1
2:1	5:1
2.5:1	6:1

### Internal Gear Arrangements



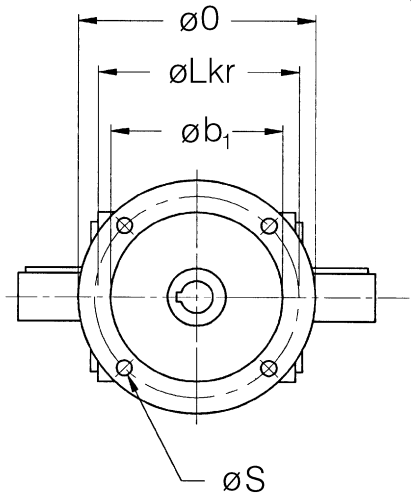


# Dimensions

Ratios i = 1:1 to 6:1<sup>(1)</sup>

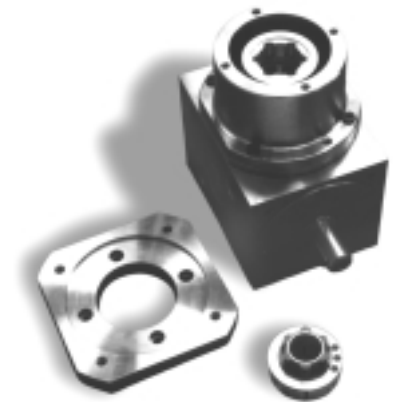
Type	Gear										d <sub>2</sub>	
	a <sup>□</sup>	b	$\frac{a}{c_{17}}$	$\frac{a}{d_{2j6}}$	e <sup>□</sup>	m <sub>2</sub>	l <sub>2</sub>	f	g	k <sup>2</sup>	r thread	key DIN 6885
F 00	80	110	74	14	60	88.5	30	3.5	10	M 6	M 6	5 x 5
F 01	110	145	102	22	82	111	35	3.5	18	M 8	M 8	6 x 6
F A1	140	175	130	32	105	137	45	4.5	19	M10	M10	10 x 8
F B1	170	215	160	42	130	172	60	4.5	24	M12	M12	12 x 8
F C1	210	260	195	55	160	220	85	5.0	22	M16	M16	16 x 10
F D1	260	330	245	65	200	270	100	5.0	25	M16	M16	18 x 11
F E1	(upon request)											

Dimensions in mm  
 Dimensions for d<sub>1</sub>, l<sub>1</sub>, m, and h vary per motor and adapter selected  
 Ratio i = d<sub>1</sub>:d<sub>2</sub> = n<sub>1</sub>:n<sub>2</sub>  
 1) Size 00 to 4:1. Size 01 to 5:1  
 2) Screwed-in length = k • 1.5  
 Subject to changes



## Motor Flange Dimensions

Size	IEC					NEMA	Servo
	Ø0	ØLkr	Øb <sub>1</sub> H7	Bolt hole Size ØS	Number of Bolt holes	Frame Size	Flange
F 00	160	130	110	9	4	145	Per Motor Flange Specs.
F 01	140	115	95	9	4	56	
	160	130	110	9	4	145	
	200	165	130	11	4	184	
	250	215	180	13	4	215	
F A1	160	130	110	9	4	184	
	200	165	130	11	4	215	
	250	215	180	13	4	256	
F B1	160	130	110	9	4	215	
	200	165	130	11	4	256	
	250	215	180	13	4	284	
F C1	250	215	180	13	4	256	
	300	265	230	13.5	4	284	
	350	300	250	18	4	326	
F D1	300	265	230	13.5	4	286	
	350	300	250	17.5	4	365	
F E1	450	400	350	18	8	405	



Other flanges available upon special request, NEMA and servo adapters include a coupling.  
 Subject to changes.

## Radial Load Capacities

Size	i = 1:1 to 3:1	i = 3.5:1 to 6:1	Size	i = 1:1 to 3:1	i = 3.5:1 to 6:1
	d <sub>2</sub>	d <sub>2</sub>		d <sub>2</sub>	d <sub>2</sub>
F 00	320 N	--	F C1	4500 N	4500 N
F 01	1000 N	1000 N	F D1	7000 N	7000 N
F A1	2500 N	2500 N	F E1	8500 N	8500 N
F B1	3500 N	3500 N			

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value.  
 Please consult your DieQua representative.  
 N = .22 lbs.  
 Values are higher with tapered bearing option.

## Ordering Example

<b>250</b>	<b>F</b>	<b>A1</b>	<b>2:1</b>	<b>III</b>	_____
Flange Size	Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

For servo flange ordering procedure, please consult your DieQua representative.

# Switch

## Type S and Type AS Switch Spiral Bevel Gearboxes



### Available Ratios

Type S and Type AS gearboxes are available in 1:1 and 4 speed-reducing ratios:

1.25:1	1.75:1
1.5:1	2:1

#### Note:

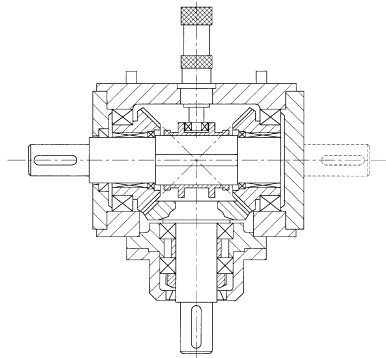
Gearbox can only be shifted after all shafts come to a complete stop.

Allows for right-angle disengaging or reversal of output direction. Manual or pneumatic actuation available.

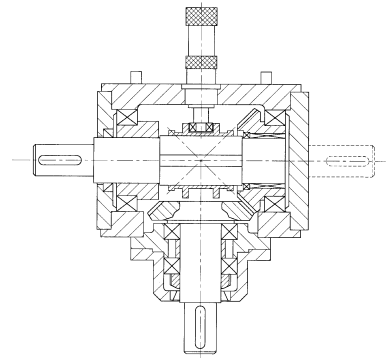
### Two Different Switching Capabilities Available

The Type S Switching gearbox is used in applications where the output rotation can be shifted from clockwise to neutral to counter-clockwise relative to the input rotation.

The Type AS Engage-Disengage gearbox is used in applications where the output shaft can either be engaged or disengaged to the input shaft. In both cases, the  $d_2$  shaft is a solid shaft.



TYPE S - REVERSE OUTPUT DIRECTION



TYPE AS - ENGAGE-DISENGAGE

### Radial Load Capacities

#### Type S - All Ratios

Size	$d_1$	$d_2$
S 01	500 N	600 N
S A1	1200 N	1600 N
S B1	1750 N	2200 N
S C1	3000 N	2600 N
S D1	3500 N	4500 N

#### Type AS - All Ratios

Size	$d_1$	$d_2$ gearside	$d_2$ opposite gear
AS 01	500 N	700 N	1100 N
AS A1	1200 N	1700 N	2700 N
AS B1	1750 N	2300 N	3700 N
AS C1	3000 N	3200 N	5000 N
AS D1	3500 N	4700 N	7500 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value. Please consult your DieQua representative.

N = .22 lbs.

### Dimensions

Ratios  $i = 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1$

Type	a <sup>□</sup>	b	c <sup>○</sup> <sub>17</sub>	d <sup>○</sup> <sub>1/6</sub> d <sup>○</sup> <sub>2/6</sub>	e <sup>□</sup>	f	g	h	k <sup>1)</sup>	l <sub>1</sub> l <sub>2</sub>	m <sub>1</sub>	m <sub>2</sub>	n	o <sup>○</sup>	p	q	r thread	key DIN 6885	switch A <sup>2)</sup>
S or AS 01	110	145	102	22	82	3.5	14	45	M 8	35	135	111	65	70	255	41	M 8	6 x 6	70° up to 80°
S or AS A1	140	175	130	32	105	4.5	14	50	M10	45	165	137	65	90	300	41	M10	10 x 8	
S or AS B1	170	215	160	42	130	4.5	18	65	M12	60	210	172	80	110	375	75	M12	12 x 8	
S or AS C1	210	260	195	55	160	5.0	18	85	M16	85	275	220	80	135	460	75	M16	16 x 10	
S or AS D1	260	330	245	65	200	5.0	23	110	M16	100	340	270	80	150	550	90	M16	18 x 11	

Dimensions in mm  
Subject to changes

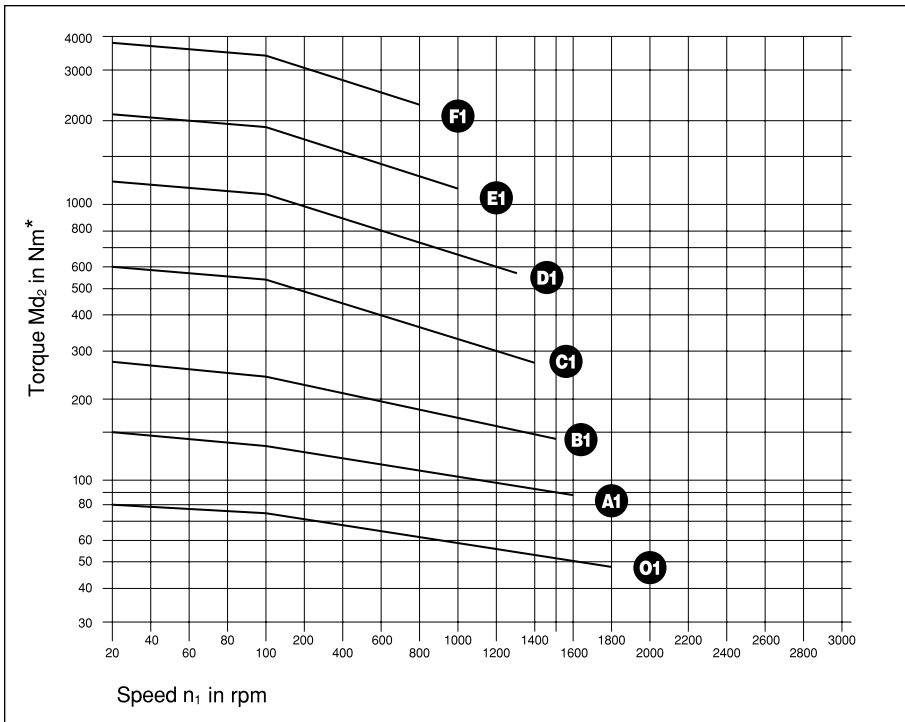
Ratio  $i = d_1:d_2 = n_1:n_2$

Dimensions for sizes E1 and F1 are available upon request

1) Screwed-in length =  $k \cdot 1.5$   
2) from 0 position

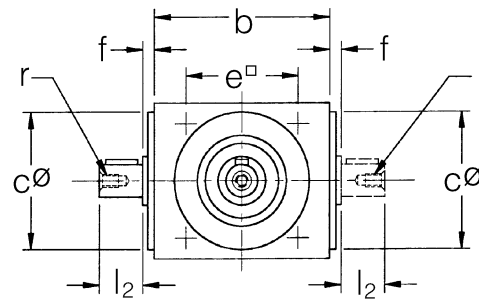
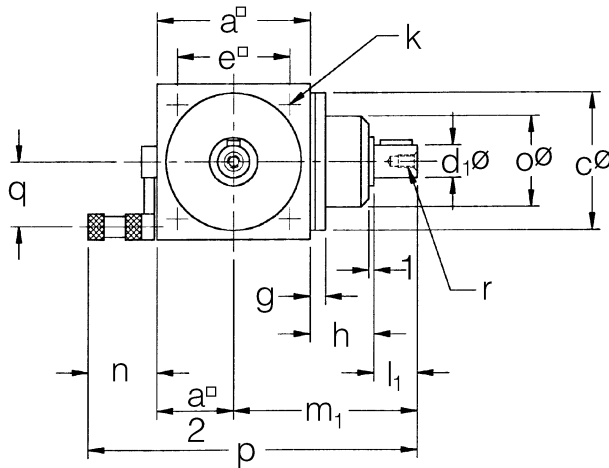
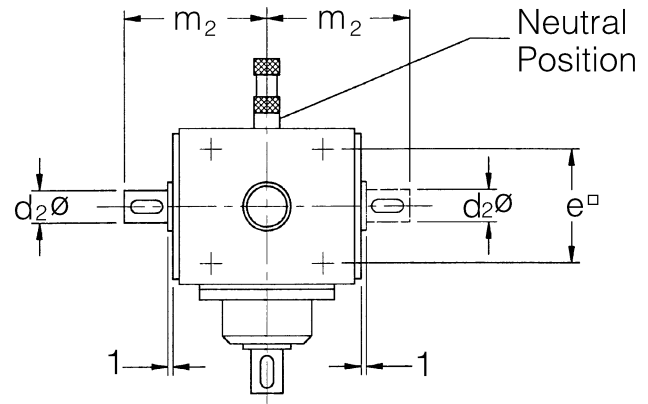
# Sizing for Types S and AS Gearboxes

Gear Ratios of 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1



\*1Nm = 8.85 in. lbs.

## Schematic:

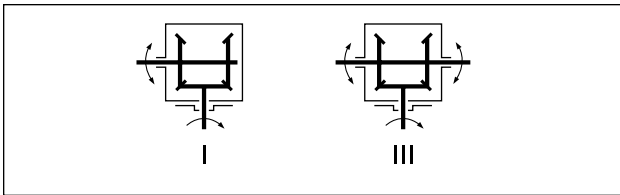


Note: Available internal gear arrangements and switch handle positions are shown on the following pages.

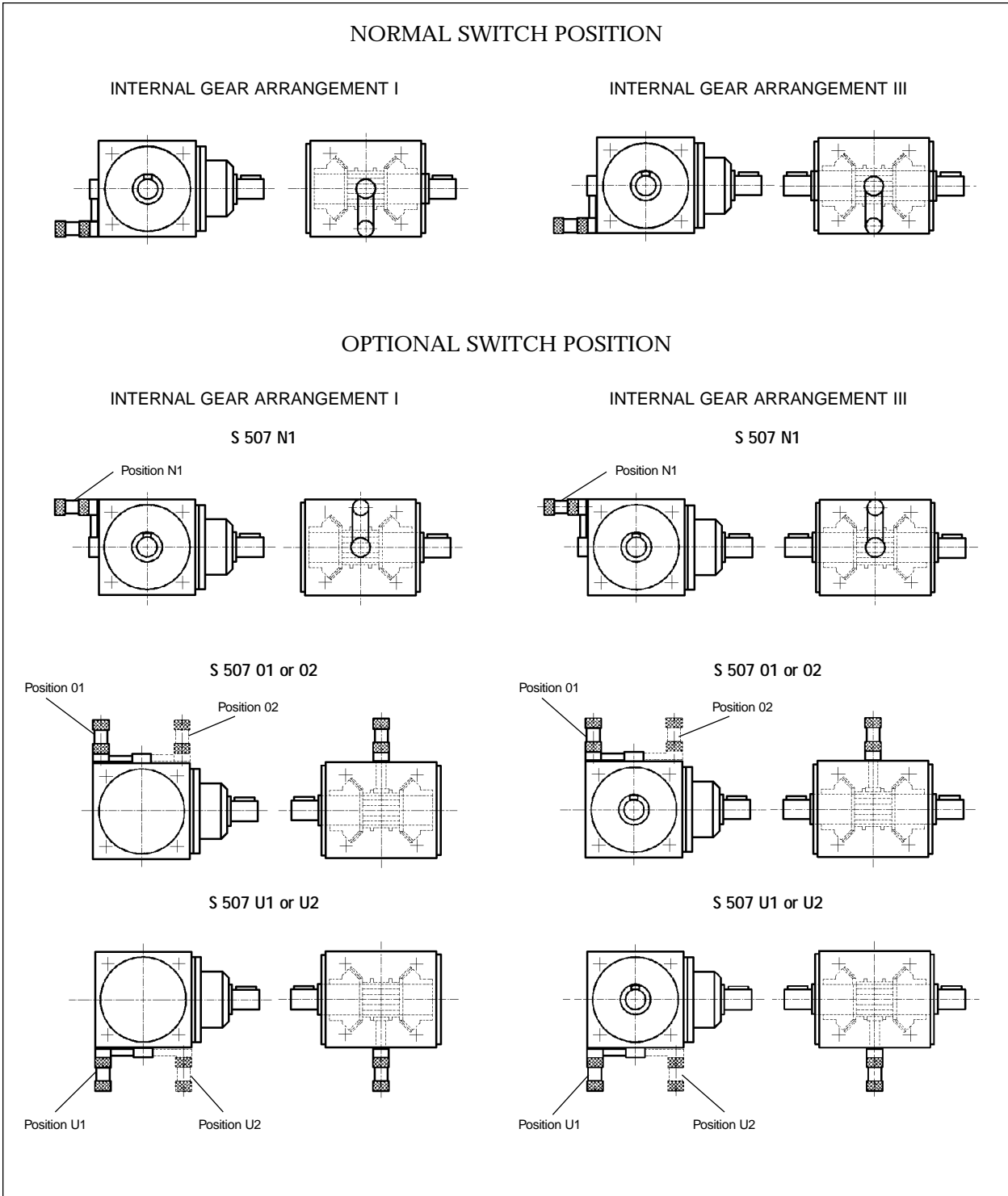
## Ordering Example

AS	A1	2:1	III	S-507 01
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

## Internal Gear Arrangements - Type S

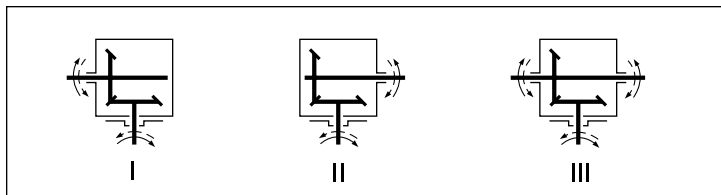


## Switch Handle Positions - Type S

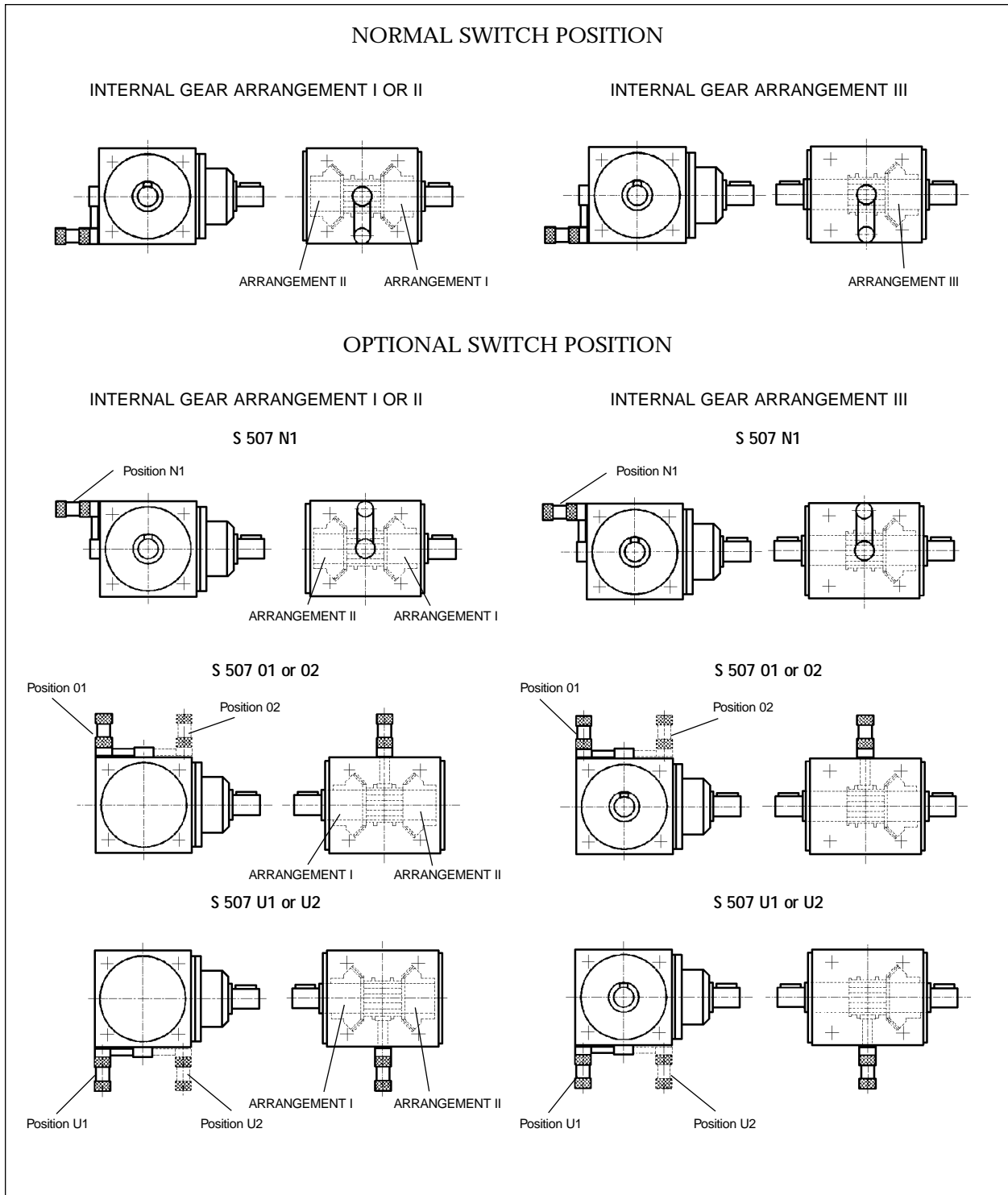


Special site glass positions available

### Gear arrangements - Type AS



### Switch Handle Positions - Type AS



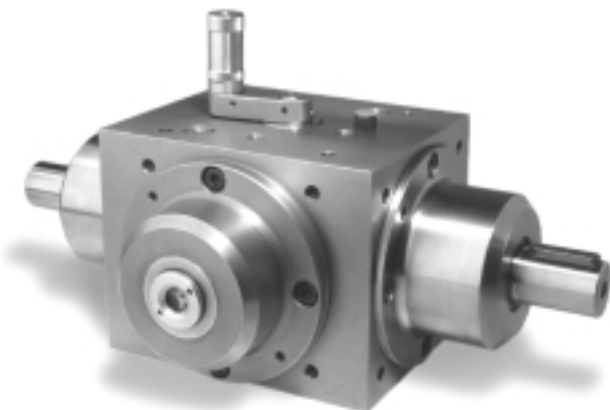
Special site glass positions available



# Reverse

## Type W Reverse Spiral Bevel Gearbox

I N - L I N E R E V E R S I N G

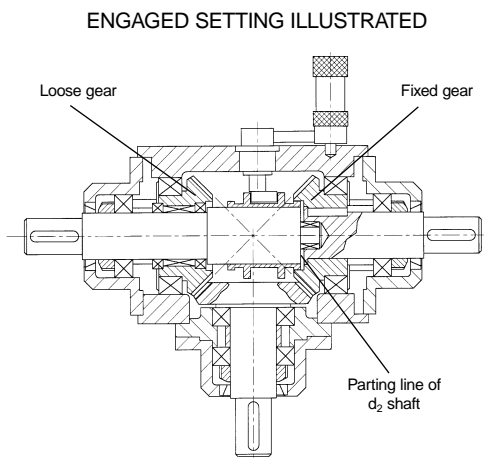


Available Ratios
Type W gearboxes are available in 1 ratio:
1:1

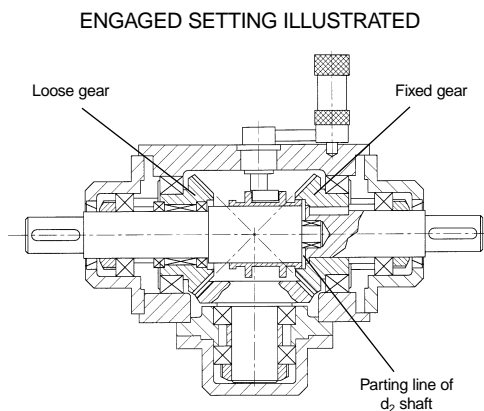
**Note:**  
Gearbox can only be shifted after all shafts come to a complete stop.

Allows for in-line disengaging or reversal of output direction.  
Manual or pneumatic actuation available.

### Two Different Switching Capabilities Available



WITH PINION-SHAFT JOURNAL ARRANGEMENT **WMR**



WITHOUT PINION-SHAFT JOURNAL ARRANGEMENT **WOR**

### Radial Load Capacities

Size	d <sub>1</sub>	d <sub>2</sub>
W 01	500 N	1200 N
W A1	1200 N	3000 N
W B1	1750 N	4000 N
W C1	3000 N	5500 N
W D1	3500 N	8000 N

The figures in the table above are provided for reference only. Speed, torque, direction of rotation, and direction of applied force will affect the true radial load capacity value. Please consult your DieQua representative. N = .22 lbs.

### Dimensions

Ratios  $i = 1:1$

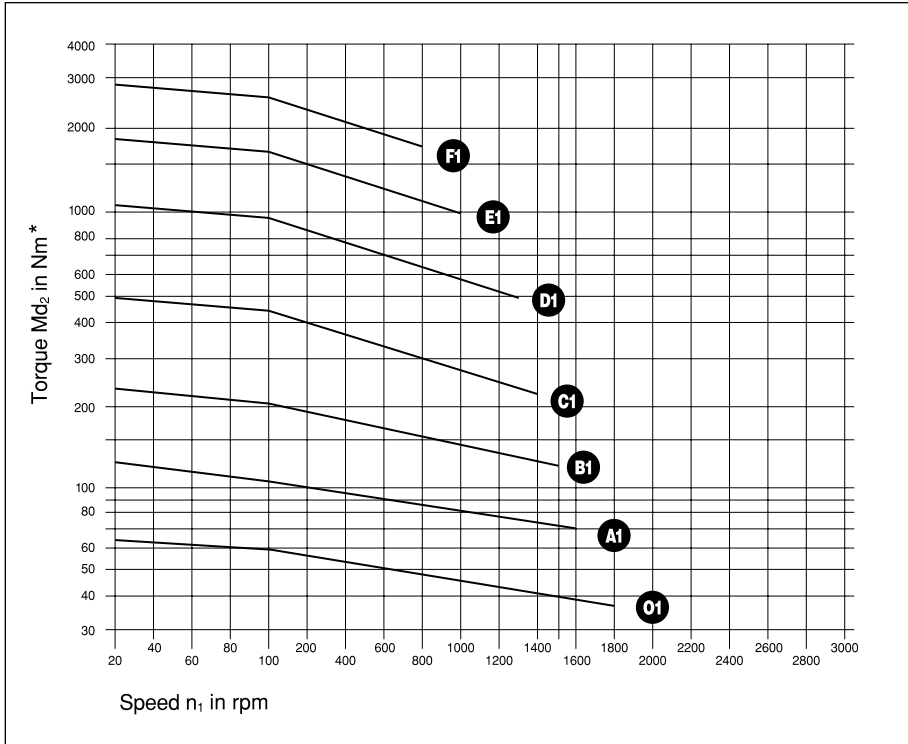
Type	a <sup>□</sup>	b	c <sup>○</sup> <sub>17</sub>	d <sup>○</sup> <sub>1/16</sub> d <sup>○</sup> <sub>2/16</sub>	e <sup>□</sup>	f	g	h <sub>1</sub>	h <sub>2</sub>	k <sup>1)</sup>	l <sub>1</sub> l <sub>2</sub>	m <sub>1</sub>	m <sub>2</sub>	n	o <sup>○</sup>	p	q	r thread	key DIN 6885	switch DIN 6885 ↔ <sup>2)</sup>
W 01	110	145	102	22	82	8.0	14	45	47.5	M 8	35	135	155	65	70	255	41	M 8	6 x 6	70°
W A1	140	175	130	32	105	8.0	14	50	60.5	M10	45	165	193	65	90	300	41	M10	10 x 8	up to
W B1	170	215	160	42	130	6.5	18	65	69.5	M12	60	210	237	80	110	375	75	M12	12 x 8	80°
W C1	210	260	195	50	160	6.0	18	85	73.0	M16	85	275	288	80	135	460	75	M16	14 x 9	
W D1	260	330	245	60	200	7.0	23	110	94.0	M16	95	335	354	80	150	545	90	M16	18 x 11	

Dimensions in mm  
Subject to changes  
Ratio  $i = d_1:d_2 = n_1:n_2$   
Dimensions for sizes E1 and F1 are available upon request

1) Screwed-in length =  $k \cdot 1.5$   
2) from 0 position

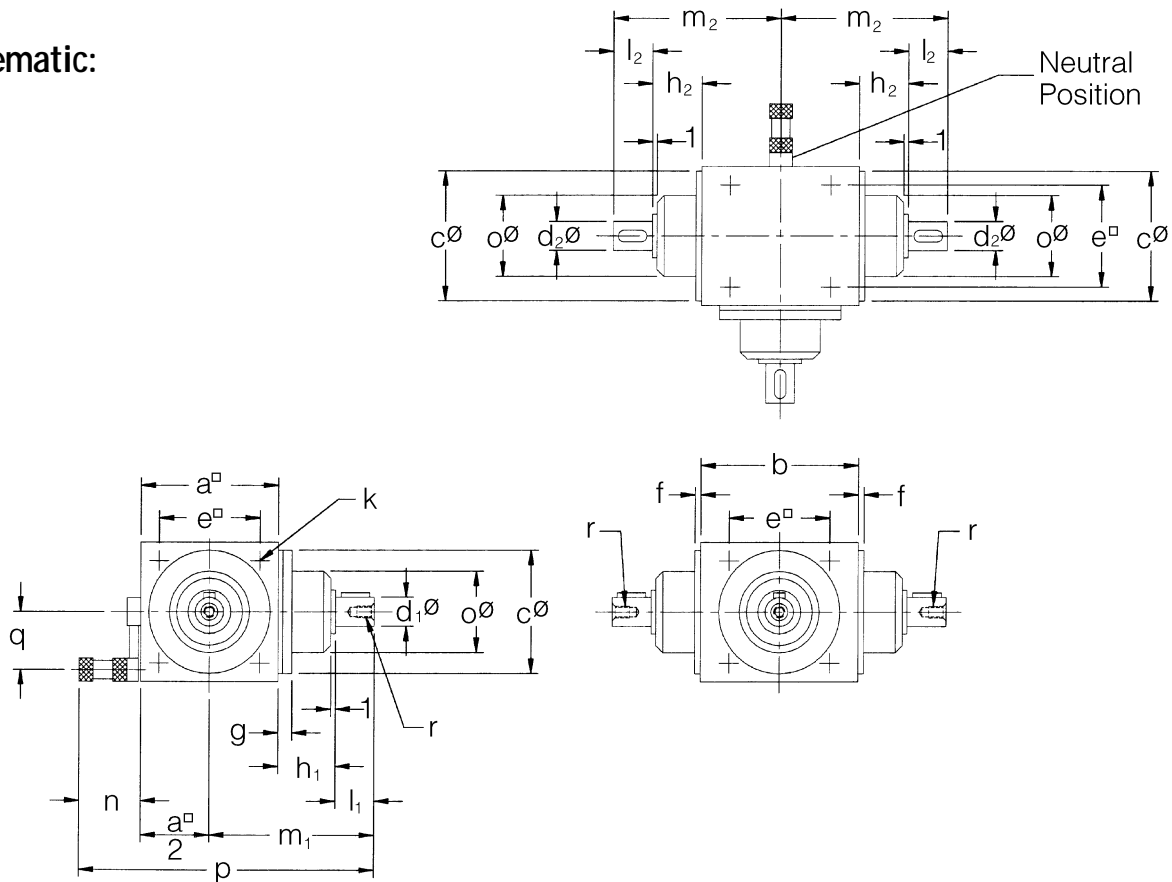
# Sizing Type W Gearboxes

Gear Ratio of 1:1



\*1Nm = 8.85 in. lbs.

## Schematic:



## Ordering Example

<b>W</b>	<b>A1</b>	<b>1:1</b>	<b>WOR</b>	_____
Type	Size	Total Ratio	Gear Arrangement	Special Design (Optional)

# Technical Data

## Spiral Bevel Gearboxes

### Gearbox Weights

Gearbox Size	Weight	Gearbox Size	Weight	Gearbox Size	Weight	Gearbox Size	Weight	Gearbox Size	Weight
00	4.50 kg	HW 00	5.00 kg	WV 00	5.00 kg	S 01	12.00 kg	W 01	15.00 kg
01	11.00 kg	HW 01	12.00 kg	WV 01	12.70 kg	S A1	22.00 kg	W A1	26.00 kg
A1	20.50 kg	HW A1	20.00 kg	WV A1	21.50 kg	S B1	42.00 kg	W B1	50.00 kg
B1	36.50 kg	HW B1	35.00 kg	WV B1	38.40 kg	S C1	75.00 kg	W C1	88.00 kg
C1	66.00 kg	HW C1	64.50 kg	WV C1	68.30 kg	S D1	145.00 kg	W D1	172.00 kg
D1	127.00 kg	HW D1	125.00 kg	WV D1	132.60 kg	S E1	291.00 kg	W E1	350.00 kg
E1	250.00 kg	HW E1	245.00 kg	WV E1	286.00 kg	S F1	535.00 kg	W F1	630.00 kg
F1	454.50 kg	HW F1	445.00 kg	WV F1	524.00 kg				

Gearbox weights are approximate. 1 kg = 2.2 lbs.  
For other gearbox weights not listed, please contact your DieQua representative.

### Backlash Values in Minutes

Model	Standard	Reduced
STD	5 - 6	2 - 4
S	6 - 7	3 - 5
W	8 - 9	5 - 7

### Transmission Error Values in Minutes - 1:1 ratio

Size	G1	G2	Standard
00	< 2.5	2.5 - 4.5	5.0 - 7.0
01	< 2.3	2.3 - 4.0	5.0 - 7.0
A1	< 2.3	2.3 - 4.0	5.0 - 7.0
B1	< 2.1	2.1 - 4.0	5.0 - 7.0
C1	< 2.1	2.1 - 3.8	4.5 - 6.5
D1	< 2.0	2.0 - 3.5	4.5 - 6.5
E1	< 2.0	2.0 - 3.5	4.5 - 6.5

Other ratios and disengage/reversing models may have up to 1.5 times these values.

### Thermal Stress

Although a specific gearbox may have the mechanical capability to operate at high speeds, thermal considerations may reduce its actual capacity. The Thermal Stress chart on page 9 shows where additional cooling options may be necessary. The parameters of the chart are based on maximum speed, an ambient temperature of 20°C (68°F), continuous operation, all shafts mounted in a horizontal position, and a ratio of 1:1. For other ratios, please contact your DieQua representative.

### Ventilation

It is extremely important that the gearbox have sufficient airflow over it. The gearbox dissipates most of its excess heat by convection. If the gearbox is built into an enclosure without sufficient airflow, overheating may occur, substantially reducing the life of the unit.

### External Cooling Options

If your gearbox is running at high speeds, or it is in an environment where it cannot dissipate enough excess heat, additional cooling devices will need to be installed. Several cooling options are listed below. Please consult your DieQua representative for the appropriate special design number and pricing.

**External Cooling Ribs.** Extruded aluminum cooling ribs can be made to fit onto any exposed side of a gearbox. These ribs are designed to provide additional surface area to increase the convection cooling properties of the gearbox.

**Oil Circulation.** The gearbox can include oil circulation fittings. These fittings allow the heated oil to be drained from the box, while filtered, cooled oil is re-injected into the gearbox over the gears and bearings.

**Liquid Cooled Heat Sinks.** In some applications, heat sinks can be attached to an exposed side of a gearbox through which a cooled liquid (e.g. water) is pumped. These heat sinks draw the excess heat out of the gearbox, providing an economical, often cleaner heat dissipation solution.



### Lubrication Requirements

The operational life of any Tandler gearbox depends greatly on proper lubrication. The correct lubricant applied to the gears and bearings acts both as a lubricant and as a coolant. The main heat source in a gearbox is friction generated by meshing gear teeth, bearing friction, radial shaft seal friction, and the turbulent activity of the oil as the gear teeth plunge into it. The heat generated by friction must be dissipated by the outer surfaces of the gearbox. In most cases, where the gearbox is running below its maximum rated speed, adequate lubrication and cooling is provided by the amount and type of oil in the oil reservoir. Tandler gearboxes are designed to operate at temperatures up to 90°C (200°F).

However, in some high speed and/or heavy load applications, excessive temperature must be carefully monitored. If your application falls into the shaded area of the Thermal Stress chart on page 9, or exceeds the maximum temperatures noted above, additional cooling with the attachment of cooling ribs, or an oil circulation system, or a water cooled heat sink will be required. Contact your DieQua representative for all technical data regarding external cooling systems.

In some very low speed applications, the use of liquid grease for virtual lifetime lubrication is possible. Consult your DieQua representative for conditions where this may apply.

### Change Intervals and Oil Capacities

For optimum performance, the first oil change should take place after an initial 500 hours of operation. Subsequent oil changes should be performed every 2000 hours for maximum gearbox life. If the gearbox is constantly running at high speed, or under heavy loads, a shorter interval may be required.

The recommended lubricants and viscosity have been selected, taking into account the wide variety of designs and applications where these gearboxes are used. Considering backlash, rotational speed and operating temperatures, other oils may perform better or worse under these conditions. Tandler gearboxes are filled at the factory with an ISO VG 46 oil. Approved suppliers and their products are listed at the right.

**IMPORTANT: DO NOT USE HEAVY WEIGHT GEAR OIL!** This type of oil may cause excessive heat and gear tooth wear. Use only one of the recommended oils or contact DieQua for lubrication options. To ensure proper operation, the oil level must be maintained as indicated by the oil level sight glass. Too little oil will result in insufficient cooling and lubrication. Too much oil will cause overheating and thermal breakdown of the oil.

The chart at right indicates the approximate oil quantities for each size gearbox.

### Vertical Shaft Applications

Gearboxes mounted with a shaft in a vertical position will require special lubrication options. The bearings supporting the upper portion of the vertical shaft generally do not receive sufficient quantities of oil for proper lubrication and cooling. Several options exist:

1. S515 d1 – for vertical pinions: The pinion is supported by two preloaded angular contact ball bearings. The lower bearing is replaced by a sealed bearing, and the pinion cavity is filled with grease.
2. S515 d2 – for vertical shafts: The ball bearing supporting the upper portion of the vertical shaft is replaced with a permanently lubricated sealed ball bearing.

### Approved Gearbox Oils and Grease

Producer	Oil	Grease
Aral BP Castrol Esso Kluber Mobil Shell Texaco	Degol BG 46 GR-XP 46 (ISO) HYSPIN AWS 46 NUTO H 46 LAMORA 46 D.T.E. 25 Tellus Oil 46 Rando Oil HD B-46	Shell Special Gear Grease H Shell Grease S 3655 Mobilplex 44

### Oil and Grease Capacities

Gearbox Size	i = 1:1	i ≥ 1:1	Grease kg
	Ltr.	Ltr.	
00	0.10	0.10	0.20
01	0.25	0.25	0.45
A1	0.60	0.60	1.00
B1	0.75	1.10	1.60
C1	1.50	2.25	3.00
D1	3.00	4.50	6.00
E1	8.00	11.00	15.00
F1	13.00	15.00	19.00

Oil capacities are approximate. 1 liter = 1.06 qts. 1 kg = 2.2 lbs.

### Monitoring the Oil Level

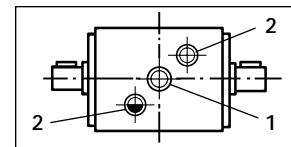
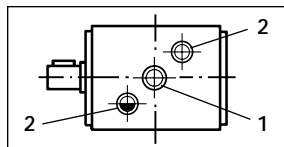
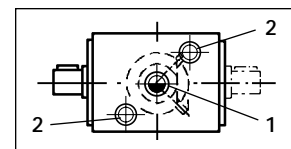
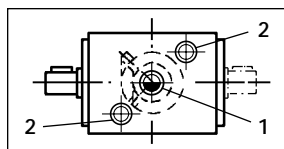
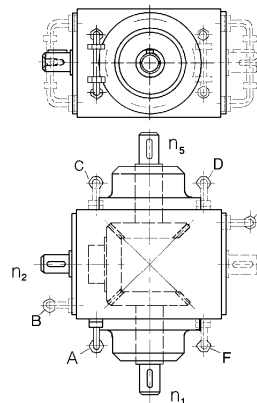
Auxiliary pinion style gearboxes may require special oil level monitoring. When an auxiliary gearbox is mounted vertically, the normal oil level sight-glass is used to monitor the oil level. When the gearbox is mounted horizontally, the normal sight-glass can no longer be used. An external sight-glass must be installed. The schematic at right indicates the various positions available. This is Tandler special design S-545. When ordering a gearbox with this feature, please specify this special design number and position of the sight-glass:

(example: A1 EA-III 1:1 S-545-A).

Consult your DieQua representative for additional lubrication information.

For most gearbox sizes, the oil sight-glass is located in the middle of the housing, position 1, directly opposite of pinion  $d_1$ .

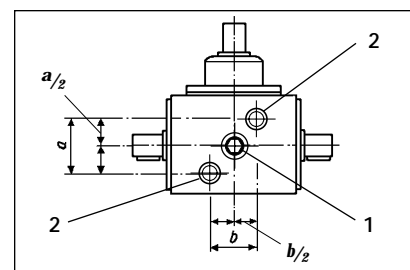
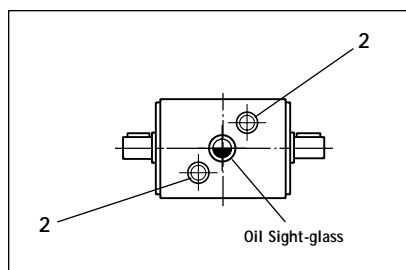
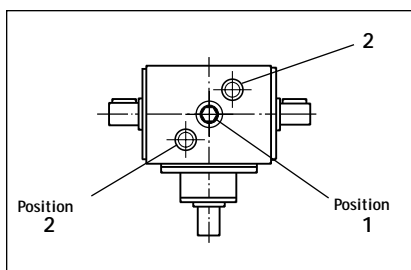
For gearbox sizes B1, C1, D1, E1, and F1 with ratio of  $i=1:1$ , the oil sight-glass is located at the lower corner of the housing, position 2, directly opposite pinion  $d_1$ .



### Oil Fill/Drain Plug and Sight Glass Positions

Gearbox Size	Fill/Drain Plug per DIN 908				Dimensions (mm)	
	*	Position 1	*	Position 2	a	b
00*	2	R 3/4" *	6	M12 x 1.5	39.6	39.6
01	2	M30 x 1.5	6	M12 x 1.5	58	67
A1	2	M30 x 1.5	6	M12 x 1.5	90	70
B1	2	M30 x 1.5	6	M30 x 1.5	100	68
C1	2	M30 x 1.5	6	M30 x 1.5	110	98
D1	2	M30 x 1.5	6	M30 x 1.5	146	134
E1	2	M42 x 1.5	6	M42 x 1.5	180	168
F1	2	M48 x 1.5	6	M48 x 1.5	120	230

\* Number of locations - Refer to diagrams below.



Oil Sight-glass



Fill/Drain Plug

# Special Design Options

Spiral Bevel Gearboxes

TANDLER

SPECIAL DESIGN OPTIONS

## Upgraded Performance

1. **Reduced Backlash:** All gearboxes are available with a reduced backlash option.
2. **Reduced Transmission Error:** Tandler offers two additional improved gear classifications: a G2 and a higher G1 classification. These two classifications refer to improved transmission error.

## Increased Radial Load Capacity

### Bearings

The radial load capacity of any shaft or bearing can be increased by substituting tapered roller bearings for the existing bearings. For technical data and pricing, please consult your DieQua representative.

### Special Shafts

Custom shaft designs are available to meet many shafting requirements. Shafts can be lengthened, shortened, increased or decreased in diameter, stepped, or have special key configuration machined into them.

### Special Ratios

Tandler has complete design and fabrication facilities to produce custom gear sets for many whole or fractional ratios. All standard and custom gear sets are hardened and lapped together to produce matched sets.

## Special Housings

1. **Aluminum housing:** Tandler offers aluminum housings for gearbox sizes 00 through C1. These housings are used primarily to reduce the overall weight of the gearbox.
2. **Corrosion-resistant plating:** All of the external components can be plated for corrosion resistance. A variety of plating options are available.
3. **Dimension modifications:** Tandler will custom design gearbox housings to meet any special design criteria. For larger production runs, Tandler will also have custom castings produced to minimize costs.

## Remote Switching Actuators

For types S, AS, and W gearboxes, DieQua offers pneumatic actuators for remote switching applications. A 3-position actuator is used for S and W gearboxes, and a 2-position actuator is used for the AS gearbox. Simple control mechanisms can also be supplied. Consult your DieQua representative for complete details.

## Complete Repair Service

DieQua Corporation is a certified factory service center for all Tandler gearboxes. DieQua maintains a staff of highly skilled technicians along with a large inventory of spare parts. Should a Tandler gearbox experience any type of failure in the field, simply contact your DieQua representative to obtain a Return Material Authorization (RMA) number and return instructions. Return the gearbox to our factory, and our technicians will inspect and evaluate the unit free of charge. A repair or replacement quote will be generated and immediately sent to your attention. Upon completion of the repair, the gearbox is inspected to ensure that it meets or exceeds original factory specifications. It is then refilled with oil and returned.

# The Benefits of Choosing Tandler

## Low Backlash

Low standard backlash and a reduced backlash option optimize and enhance positioning accuracies while providing smooth, quiet, and efficient torque transmission.

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## Low Transmission Error

Precision matched set gearing, reduced tolerance component manufacturing, and custom assembly result in the ultimate in rotary motion control.

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## Specialty Models

The widest range of shaft configurations and connection options provide unmatched design versatility.

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## More Ratios

The greatest number of ratios offered anywhere in a spiral bevel program assures that the required output speed is achieved.

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## Mounting Features

Centering pilots, machined housings with tapped holes on all sides, shaft shoulders, and tapped shaft ends guarantee precise and trouble-free installation.

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## Custom Designs

Modification of all standard dimensions and complete special designs are available to allow the best possible design solutions.

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## Worldwide Support

A global network of sales partners and technical centers assures the highest levels of customer service.

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# Spiral Bevel Gearboxes

**DIEQUA**  
Corporation

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