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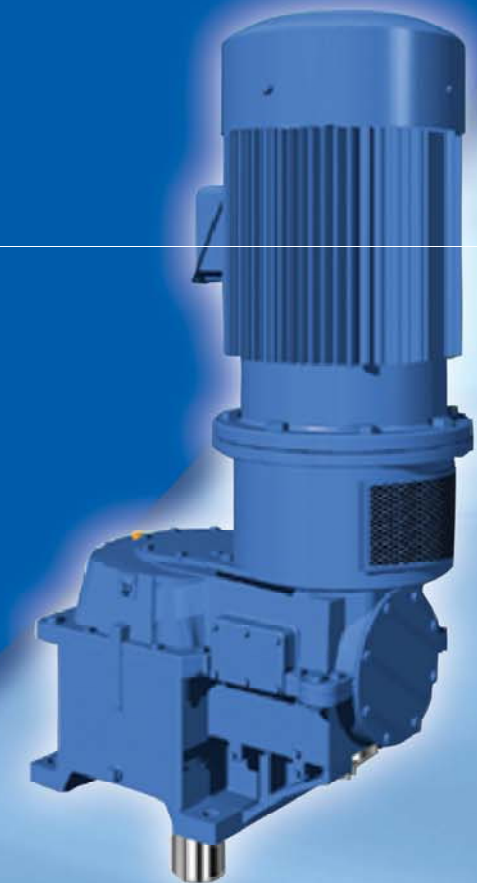
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Sumitomo Drive Technologies

Always on the Move

PARAMAX[®] SFC Series

The Air Cooled Condenser Drives



Features

Optimized for air cooled condenser use

1. Selection Criteria

- The SFC Series is specifically designed for the air cooled condenser drive.
- Use the chart to find the correct size based on motor power and fan diameter.

Motor power vs. Fan diameter

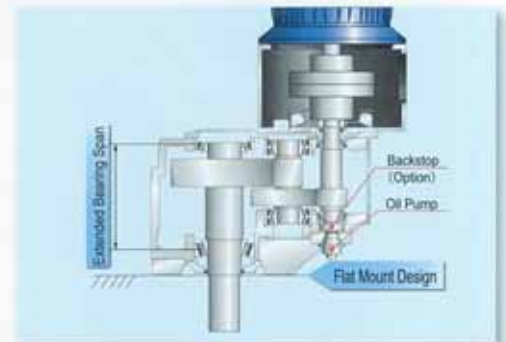
Fan Dia (ft)	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	52
55																	
75																	
90																	
110																	
132																	
160																	
200																	
250																	
280																	

Gearbox Size SFC060 SFC065 SFC070 SFC075

※ Refer to the selection table on page 5 for details.

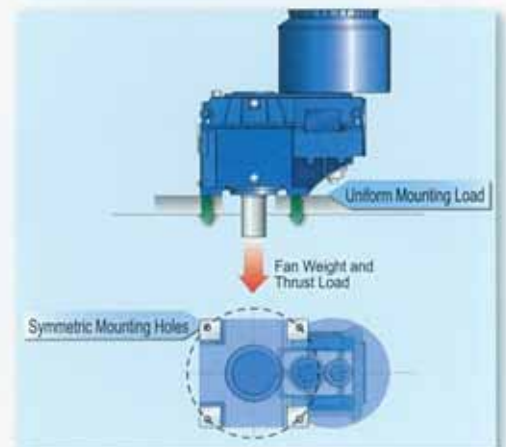
2. Low Vibration Design

- **Extended Bearing Span**
Even if the cooling fan is balanced, excess vibration can occur during operation. Using an extended fan drive shaft (gearbox low speed shaft), run-out due to fan operation is significantly reduced.
- **Balanced Mounting Load**
By arranging the mounting bolt holes uniformly about the fan drive shaft, the load to the gearbox mounting base is transmitted uniformly.



3. Flat Mount Design

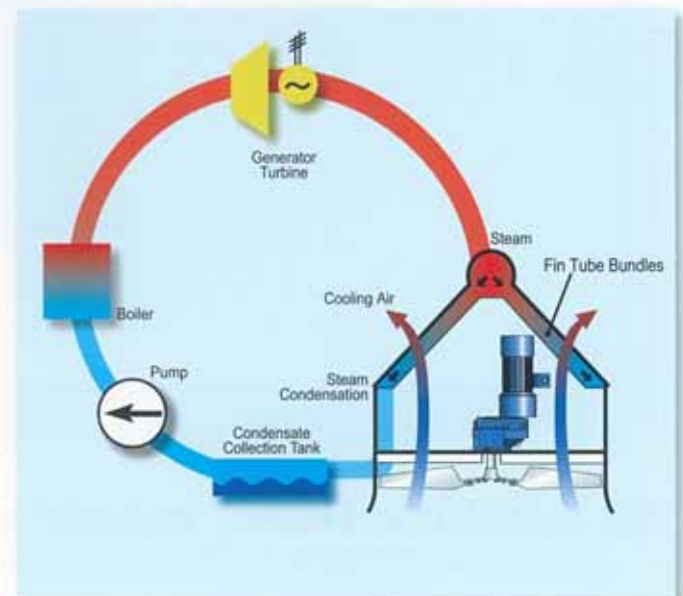
The SFC gearbox is designed without protrusions beneath the mounting surface, leading to simple mounting base design and construction. The design also takes into account the use of an optional backstop and pump to be added without protruding beneath the mounting surface.



4. Thermally Efficient Design

Due to the gearbox location in a cooling tower, minimal airflow from the cooling tower fan reaches it. The SFC gearbox is designed with maximum heat dissipation and with minimum heat generation in mind.

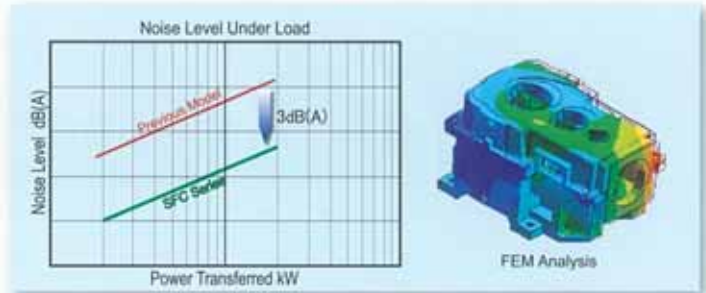
- Maximized housing surface area
- Lower oil level to reduce churning loss
- Large oil capacity



Low Noise

3dB(A) Noise Reduction From Previous Series

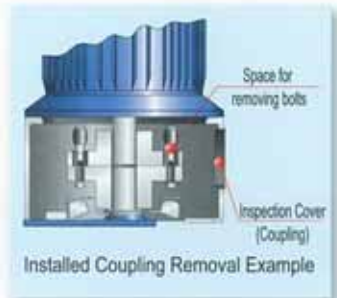
Shaft speed reduction achieved using optimized gear pairs, reducing gear noise.
Using FEM analysis, deflection under load is minimized and proper gear tooth contact is maintained.
FEM modal analysis is also performed to minimize natural frequency oscillation.



Ease of Maintenance

- 1 Year Maintenance free operation.*
- Oil fill, oil drain and oil gauge are located on the low speed shaft external wall for easy access.
- Internal gearbox inspection possible without draining oil due to inspection cover location above operating oil level.
- Motor rotation direction can be checked without removing the motor. This capability requires a specific coupling type. If this is a required capability, please inform us upon ordering the gearbox.

* Refer to the maintenance manual



Available Accessories

Air cooled condenser specific accessories are standard equipment.

Standard Equipment	Options	
Motor Adapter	Backstop*	Motor
Oil Pump	Oil Heater	Motor Coupling
Inspection Cover	Flow Switch	Fan Coupling
Air Breather	Oil Level Switch	Drain Valve
Oil Gauge	Vibration Sensor Seat	
Magnetic Plug	Integral Cooling Fan	
	Drywell	

* Use of a backstop (optional) is to prevent reverse rotation of the cooling fan. Backstop uses the internal gear oil for lubrication. Grease lubrication type is also available.



Inverter Controlled Motors

Due to the recent application of inverter controlled motors, SFC series is designed for continuous lubrication in variable speed environments.

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Nomenclature

Series	Size	Output Torque (kNm)	Gear Stages	Shaft Arrangement	Accessories	Nominal Ratio
SFC	060	(21.7)	P2 Parallel Double Reduction	RJL Motor Adapter (Standard)	N : No Additional Cooling (Standard)	10
	065	(27.5)		RML Motor	NB : No Cooling Fan With Backstop	11.2
	070	(35.5)			F : With Cooling Fan	12.5
	075	(44.0)			FB : With Cooling Fan & Backstop	14
					16	
	18					
	20					
	22.4					

Standard Specifications

SFC Series is designed to CTI standard specifications.

Item		Standard Specification
Gearbox	Gear	Material Spec : Alloy Steel Heat Treatment : Case Hardening Processing : Precision Finish
	Bearing	Type : Roller Bearing Rated Life (L10) : Low Speed Shaft Bearing100,000 Hours or Longer High Speed Shaft / Intermediate Shaft Bearings ...50,000 Hours or Longer
	Shaft	Material Spec : Alloy Steel
	Housing	Material Spec : Cast Iron
	Seal	Housing and Cover Mating surfaces : Fluid Gasket Low Speed Shaft : Dust-lip Oil Seal High Speed Shaft : Dust-lip Oil Seal
	Lubrication	Shaft Driven Oil Pump Lubrication
	Paint	P4 Reference
	Rotation Speed	High Speed Shaft input speed : 100~1800 r/min
External Conditions	Outside Temperature	0°C~40°C Temperatures within the -15°C~40°C range requires the use of synthetic oil.
	Environment	Not designed for corrosive or explosive gas environments.
	Altitude	Designed for altitudes of 1000m or less.

Lubricant Specifications

Ambient Temperature	Lubricant	Viscosity Grade	BP	CASTROL			CHEVRON TEXACO		EXXON MOBIL		SHELL	TOTAL
				ALPHA SP320	OPTIGEAR BM350	TRIBOL 1100/320	GEAR COMPOUNDS EP320	MEROPA WM320	SPARTAN EP320	MOBILGEAR 632		
0~40°C	Mineral Oil	ISO VG320 AGMA 6EP	ENERGOL GR-XP-320	ALPHA SP320	OPTIGEAR BM350	TRIBOL 1100/320	GEAR COMPOUNDS EP320	MEROPA WM320	SPARTAN EP320	MOBILGEAR 632	OMALA 320	CARTER EP320
-15~40°C	Synthetic Oil	ISO VG320 AGMA 6S	—	—	—	—	—	—	MOBILGEAR SHC XMP 320	MOBILGEAR SHC 320	—	—

Painting Specifications

Painting Area	Kind of painting	Paint Specification		
	Paint of finish coat	Type	Thickness μm	Quality
Outside Paint	Denatured epoxy	Under Coating	40~80	Denatured alkyde resin
		Finish Coating	15~30	Vinyl denatured epoxy paint
Inside Paint	—	—	20~40	Denatured alkyde resin

Mechanical Rating Table (Service Factor 2.0)

※ Selection Condition : Ambient Temperature is 40°C. Service factor is larger than 2.0 .
The numbers in the table represent the gearbox size (ie.) 060 ... SFC060, 060F ... SFC060 with cooling fan.

• Input Shaft Speed 1750r/min

Fan Speed (r/min)	175	155	140	125	110	97	88	78	
Reduction Ratio	10	11	13	14	16	18	20	22	
Motor (kW)	55	—	—	—	—	—	—	—	
	75	—	—	—	—	060	060	060	
	90	—	—	—	—	060	060	060	
	110	—	—	—	060F	060F	060F	065	065
	132	—	060F	060F	060F	060F	065F	065F	070F
	160	060F	060F	060F	065F	065F	070F	070F	075F
200	*	*	*	070F	070F	075F	075F	—	

• Input Shaft Speed 1450r/min

Fan Speed (r/min)	145	130	115	105	91	81	73	65	
Reduction Ratio	10	11	13	14	16	18	20	22	
Motor (kW)	55	—	—	—	—	—	—	—	
	75	—	—	—	—	—	060	060	
	90	—	—	—	060	060	060	065	065
	110	—	060F	060F	060F	060F	065	065	070
	132	060F	060F	060F	065F	065F	070F	070F	075
	160	060F	065F	065F	070F	070F	075F	075F	075F
200	*	070F	070F	075F	075F	075F	—	—	

• Input Shaft Speed 1160r/min

Fan Speed (r/min)	115	105	93	83	73	64	58	52	
Reduction Ratio	10	11	13	14	16	18	20	22	
Motor (kW)	55	—	—	—	—	060	060	060	
	75	—	—	—	060	060	060	065	065
	90	—	060	060	060	060	065	065	070
	110	060F	060F	060F	065F	065	070	070	075
	132	060F	065F	065F	070F	070F	075	075	—
	160	065F	065F	070F	075F	075F	075	—	—
200	*	*	075F	075F	—	—	—	—	

• Input Shaft Speed 970r/min

Fan Speed (r/min)	97	87	78	69	61	54	49	43	
Reduction Ratio	10	11	13	14	16	18	20	22	
Motor (kW)	55	—	—	—	060	060	060	065	065
	75	—	060	060	060	060	065	065	070
	90	060F	060F	060F	065	065	070	070	075
	110	060F	065F	065F	070	070	075	075	075
	132	065F	065F	070F	075	075	075	—	—
	160	070F	070F	075F	075F	075F	—	—	—
200	*	075F	075F	—	—	—	—	—	

Attention

- * symbol indicates a non-standard application. Consult Sumitomo for details
- For more specific details please use the following selection method.

Selection Procedure

• Selection Order

Item	Selection Method	Reference Page
Determine Reduction Ratio	$\text{Reduction Ratio} = \frac{\text{Motor Speed}}{\text{Fan Speed}}$	—
Determine the Service Factor (SF)	SF = 2.0	—
Determine the Reducer Size	$\text{Motor Power} \leq \text{Mechanical Rating (Service Factor 2.0)}$	P.6 Mechanical Power Rating Table
Thrust Load	$\text{Actual Thrust Load} \leq \text{Allowable Thrust Load on Slow Speed Shaft}$ Conservatively calculated, Actual Thrust Load = Fan Thrust Load + Fan Weight	P.6 Allowable Thrust Load on Slow Speed Shaft
Checking the Thermal Power	$\text{Thermal Power Rating} \times \text{Temperature Correction Factor } T_a \leq \text{Motor Power}$	P.6 Thermal Power Rating Table
Input Shaft Rotating Speed	Standard Input Shaft operating range 100~1800r/min	—

Attention

- Thrust load is the downward thrust load due to the weight and rotation of the cooling fan in the clockwise direction.
- Allowable thrust load is based on a bearing life of 100,000 hours. Please inquire about cases above the 100,000 hour limit.
- Consult Sumitomo when operating ambient temperature exceeds the 0~40°C range.
- Consult Sumitomo when input shaft speeds lower the 100 r/min or higher than 1800 r/min.

• Selection Example

Required Specifications	Selection
Use : Air-Cooled Condenser	1. Determine Reduction Ratio
Motor Power : 132kW × 150/1500r/min (Decelerating Torque)	Motor Speed / Fan Speed = 16
Cooling Fan Speed : 91 r/min	2. Determine the Service Factor SF=2.0
Actual Thrust Load : 26kN	3. Determine the Size
Rotation Direction : Counterclockwise rotation	Transfer Capacity (Motor Rating) ≤ Mechanical Rating@SF2.0
Ambient Temperature : -5~40°C	From Rating Table SFC065P2-16 Ratio 16
Backstop : Yes	132<139kW (Mechanical Rating@SF2.0) OK
	4. Check Thrust Load
	Low Speed Shaft Allowable Thrust Load
	26kN < 28kN OK
	5. Check Ambient Temperature
	Without Cooling Fan (Ambient Temperature 0~40°C)
	160kW × 0.7 = 112kW < 132kW (Motor Rating) NG
	With Cooling Fan (Ambient Temperature 0~40°C)
	272kW × 0.73 = 198kW < 132kW (Motor Rating) OK
	6. Check Input Shaft Operating Range
	1500r/min Fixed Speed is within the 100~1800r/min operating limits OK
	7. With Backstop
	Based on the selection criteria above, SFC065P2-RJLBF-16 is selected

Mechanical Rating Table (Service Factor 2.0)

Unit : kW

Nominal Ratio	Input Speed r/min	Output Speed r/min	Size			
			060	065	070	075
10	Exact Ratio		9.750	9.963	9.665	9.945
	1750	175	226	268	345	391
	1450	145	191	224	297	344
	1160	115	154	181	239	294
	970	97	129	151	200	253
11.2	Exact Ratio		11.361	10.739	10.829	11.160
	1750	155	180	237	296	376
	1450	130	151	198	248	315
	1160	105	121	160	200	254
	970	87	101	134	167	212
12.5	Exact Ratio		12.206	12.988	12.600	11.966
	1750	140	183	207	274	345
	1450	115	154	173	229	304
	1160	93	123	139	184	252
	970	78	103	117	154	211
14	Exact Ratio		14.224	14.000	14.118	13.428
	1750	125	145	183	229	314
	1450	105	121	153	192	263
	1160	83	97	123	154	212
	970	69	81	103	129	177

Nominal Ratio	Input Speed r/min	Output Speed r/min	Size			
			060	065	070	075
16	Exact Ratio		15.996	16.235	15.750	15.600
	1750	110	141	167	220	283
	1450	91	118	139	184	242
	1160	73	95	112	148	195
	970	61	79	94	124	163
18	Exact Ratio		18.640	17.500	17.647	17.506
	1750	97	111	147	184	243
	1450	81	93	123	154	203
	1160	64	75	99	124	163
	970	54	62	83	104	137
20	Exact Ratio		19.195	20.040	19.441	19.500
	1750	88	95	136	179	233
	1450	73	79	113	149	195
	1160	58	63	91	119	157
	970	49	53	76	99	131
22.4	Exact Ratio		22.368	21.602	21.783	21.882
	1750	78	93	124	150	195
	1450	65	77	104	125	163
	1160	52	62	83	100	131
	970	43	51	70	83	110

Attention

- When the desired input speed is not shown, use interpolation to determine the appropriate values.
- When input speed (N) is below 970 r/min, use the following formula to determine the mechanical power rating (PN)

$$P_N = P_{970} \times \frac{N}{970}$$

- Please inquire with us when input shaft speed exceeds 1800r/min.

Thermal Power Rating

Unit : kW

Nominal Ratio	Input Speed r/min	Number of Cooling Fans	Size			
			060	065	070	075
10	1750	—	136	158	182	220
		1	230	269	309	374
	1450	1	225	265	307	366
14	1160	—	128	153	177	213
		1	192	230	265	320
	970	1	185	222	257	312
16	1750	—	137	162	185	205
		1	232	275	315	348
	1450	1	229	272	313	345
22.4	1160	—	129	157	180	197
		1	194	236	270	295
	970	1	187	226	259	285

Ambient Temperature °C	Temperature Correction Factor Ta	
	Without Fan	With Fan
20	1.00	1.00
30	0.85	0.87
40	0.70	0.73
50	0.55	0.60

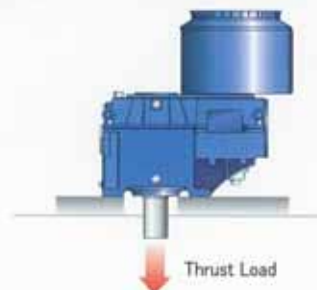
Attention

- Shown in the table are the ratings for models without a cooling fan and with a cooling fan. (-:none fan,1:with a fan)
- The values are applicable to continuous operation at ambient temperature of 20 °C or less. When the temperature is out of the range, refer to the temperature correction factor shown above.
- When the high speed shaft speed is not shown in the table, find it by interpolation method.

Allowable Thrust Load on Slow Speed Shaft


Unit : kN

Output Shaft Speed (r/min)	Size			
	060	065	070	075
≤200	22	28	31	50
≤150	27	28	31	50
≤100	30	34	39	50



Application Data Sheet

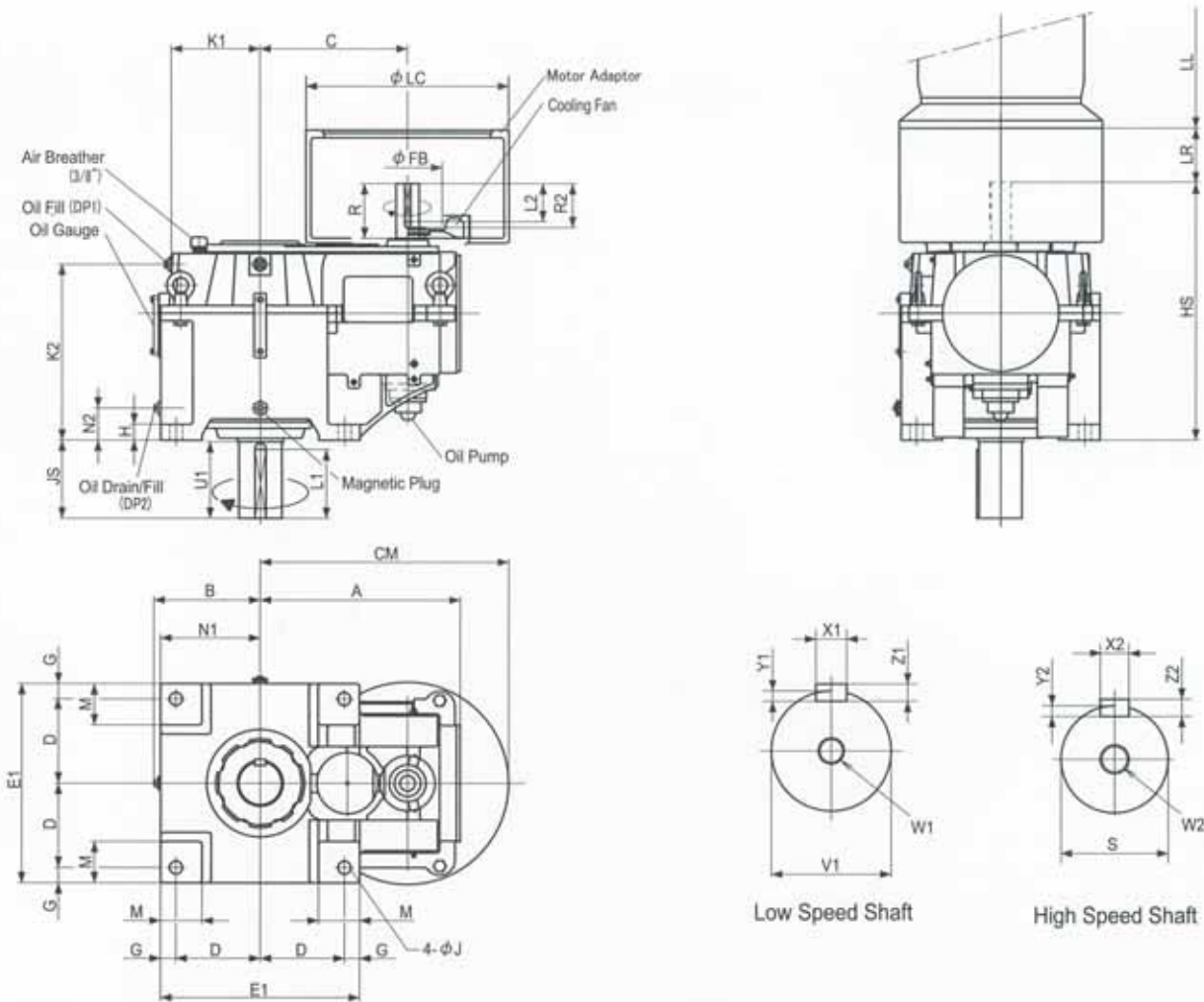
Enter the required specifications below when inquiring about SFC series reducers.

1. Load Conditions			
Motor Type	AC · Pole Change* · Inverter		
Motor Power	kW · HP		r/min
Maximum Start-up Power			kW
Actual Power			kW
Input Shaft Speed (Min·Max)	Min	r/min, Max	r/min
Output Shaft Speed (Min·Max)	Min	r/min, Max	r/min
Thrust Load (Fan Thrust+Fan Weight)	Down		N
Output Shaft Rotation Direction (As seen from the shaft end)			
Maximum Torque (Motor Rating Ratio)	%	Frequency	Times/Day
2. Installation Environment****			
Ambient Temperature Around the Gearbox			°C
Corrosive Gas (ex. Hydrogen Sulfide etc.)	None · Yes (^{Type of Gas})		
3. Backstop**			
Backstop	Yes · No		
4. Special Requests			
Noise Level	None · Yes (^{SPL***} 1m from the gearbox surface dB(A) ^{PWL***} dB(A))		
Paint	· Standard · Other ()		
Non-Permissible Materials (ex. Aluminum·Copper etc.)	None · Yes (^{Material})		

Attention

- * When using pole change motors to change from high speed to low speed, control the fan rotation speed so that regeneration braking torque does not act on the gearbox.
- ** When running cooling towers in close proximity to each other, exhaust air flow from an operational tower can cause the reverse rotation of fans that are not operating. Using a backstop to prevent this motion has the following advantages:
 1. Maintenance on the non-operational units is possible.
 2. Reduces the motor starting torque when the non-operating units are brought online.
 3. Prevents gearbox damage from excessive starting torque.
- *** SPL : sound pressure level
PWL : sound power level
- **** Consult us when using a sound proofing cover.

Dimensions



Units: mm

Size	A	B	C	D	E1	G	H	J (Installation Bolt)		M	HS	JS	Pipe Thread				N1	N2
								DP1	K1				K2	DP2				
060	583	312	414	240	560	40	45	35	(M30)	105	770	210	R 1 1/4	260	505	R 1 1/4	280	105
065	632	332	463	260	600	40	45	35	(M30)	105	820	250	R 1 1/4	280	555	R 1 1/4	300	105
070	661	357	482	275	650	50	52	42	(M36)	135	840	255	R 1 1/4	290	575	R 1 1/4	325	105
075	714	377	535	295	690	50	52	42	(M36)	135	875	255	R 1 1/4	310	610	R 1 1/4	345	105

Size	Low Speed Shaft							High Speed Shaft								Weight (kg)	Oil Q'ty (Liters)	
	V1	U1	L1	X1	Y1	Z1	W1/Depth	S	R	R2	L2	FB	X2	Y2	Z2			W2/Depth
060	120m6	210	180	32	11	18	M24/50	65m6	180	145	125	200	18	7	11	M20/42	650	55
065	130m6	250	225	32	11	18	M24/50	75m6	180	145	125	225	20	7.5	12	M20/42	820	70
070	140m6	250	225	36	12	20	M30/60	75m6	180	145	125	225	20	7.5	12	M20/42	900	90
075	150m6	250	225	36	12	20	M30/60	75m6	180	145	125	225	20	7.5	12	M20/42	1190	115

Motor						Size of Reducer							
Frame		Flange		LC	LL	SFC060		SFC065		SFC070		SFC075	
IEC	JEM	IEC	JEM			CM	LR	CM	LR	CM	LR	CM	LR
250	225	A550	FF500	550	835	689	145	—	—	—	—	—	—
280	250	A550	FF500	550	857	689	145	738	145	757	145	—	—
—	280	A660	FF600	660	983	744	175	793	175	812	175	865	175
315	315	A660	FF600	660	1393	744	175	793	175	812	175	865	175
355	355	A800	FF740	800	1680	—	—	—	—	882	215	935	215

Attention

- (1) Keys and keyways for both high speed and low speed shafts conform to ISO/R773-1969 close key. (JIS B 1301-1996 Parallel Key in Fastening Type)
- (2) The oil quantity shown is approximate. Fill to the appropriate level using the oil level gauge.
- (3) The installation bolts should be rated JIS Class 8.8.
- (4) To maintain coupling alignment, stop plates or knock pins should be installed to prevent gearbox twisting on its base due to fan operation.

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REPORT ON THE PROGRESS OF THE WORK

The first part of the report deals with the general situation of the work. It is found that the work has been carried out in accordance with the programme of work approved by the Council of the League of Nations. The progress made during the year is reported in detail, and it is found that the work has been carried out in a most satisfactory manner. The results of the work are reported in detail, and it is found that the work has been carried out in a most satisfactory manner.

The second part of the report deals with the work done during the year. It is found that the work has been carried out in accordance with the programme of work approved by the Council of the League of Nations. The progress made during the year is reported in detail, and it is found that the work has been carried out in a most satisfactory manner. The results of the work are reported in detail, and it is found that the work has been carried out in a most satisfactory manner.

The third part of the report deals with the work done during the year. It is found that the work has been carried out in accordance with the programme of work approved by the Council of the League of Nations. The progress made during the year is reported in detail, and it is found that the work has been carried out in a most satisfactory manner. The results of the work are reported in detail, and it is found that the work has been carried out in a most satisfactory manner.

The fourth part of the report deals with the work done during the year. It is found that the work has been carried out in accordance with the programme of work approved by the Council of the League of Nations. The progress made during the year is reported in detail, and it is found that the work has been carried out in a most satisfactory manner. The results of the work are reported in detail, and it is found that the work has been carried out in a most satisfactory manner.

The fifth part of the report deals with the work done during the year. It is found that the work has been carried out in accordance with the programme of work approved by the Council of the League of Nations. The progress made during the year is reported in detail, and it is found that the work has been carried out in a most satisfactory manner. The results of the work are reported in detail, and it is found that the work has been carried out in a most satisfactory manner.



SAFETY PRECAUTIONS

Strictly observe the safety rules necessary for the place of installation and equipment used. (Industrial Safety and Health Regulations, Electric Facility Technical Standards, Extension Rules, Plant Explosion-Proof Guidelines, Building Standards Law, etc.)

Carefully read the maintenance manual for correct use before operation. If the manual is not on hand, ask the dealer where you purchased the product or our Sales Division. A copy of the manual should be sent to the actual user.

Select appropriate products suitable for the operating environment and usage.

When the product is to be used in a system for transport of human beings, a secondary safety device should be installed to minimize chances of accidents.

When the product is used for food processing applications vulnerable to oil contamination, install an oil pan or other devices to cope with oil leakage due to failure or limited service life.

Warranty

The scope of our warranty for our products is limited to the range of our manufacture.

Warranty (period and contents)

Warranty Period	The warranty period for the Products shall be 18 months after the commencement of delivery or 18 months after the shipment of the Products from the seller's works or 12 months from the Products coming into operation, whichever comes first.
Warranty Condition	<p>In case any problems, troubles or damages on the Products arise due to defects in the Products during the above "Warranty Period", although the Products are appropriately and properly installed in, connected or combined to the equipment or machines, or maintained in accordance with the maintenance manual and are properly operated under the conditions as described in the catalogue or otherwise as agreed upon in writing between the Seller and the Buyer or its customers, the Seller will Provide, at its sole discretion, appropriate repair or replacement on the Products free of charge, except as stipulated in the "Exception for Warranty" as described below.</p> <p>However, in the event that the Products is installed in, connected or combined to or integrated into the equipment or machines, the Seller shall not reimburse the costs for removal or re-installation of the Products or other incidental costs related thereto and any lost opportunity, loss of profit or any other incidental or consequential losses or damages incurred by the Buyer or its customers.</p>
Exception for Warranty	<p>Notwithstanding the above warranty, the warranty as set forth herein shall not be applied to the problems, troubles or damages on the Products which are caused by:</p> <ol style="list-style-type: none">1. installations, connections, combinations or integration of the Products in or to other equipment or machines, which are supplied by any person or entity other than the Seller,2. insufficient maintenance or improper operation by the Buyer or its customers, such that the Product is not appropriately maintained in accordance with the maintenance manual provided or designated by the Seller,3. improper use or operation of the Products by the Buyer or its customers which are not informed to the Seller, including, without limitation, the Buyer's or its customers' operation of the Products not in conformity with the specifications, or use of the lubrication oil in the Products which is not recommended by the Seller,4. troubles, problems or damages on any equipment or machines in or to which the Products are installed, connected or combined or installed, or any specifications particular to the Buyer or its customers, or5. any changes, modifications, improvements or alterations on the Products or those functions which are rendered on the Products by any person or entity other than the Seller,6. any parts in the Products which are supplied or designated by the Buyer or its customers,7. earthquake, fire, flood, sea-breeze, gas, thunder, acts of God or any other reasons beyond the control of the Seller,8. waste, exhaustion, normal wear and tear, or deterioration on the parts of the Products, such as bearing, oil-seal.9. any other troubles, problems or damages on the Products which are not attributable to the Seller.