Innovation in Motion
TSUBAKI

TSUBAKI
Helical Power Drive

FOR ALL APPLICATIONS

Expanded Lineup + More Options

Powerful and compact Helical Power Drives deliver advanced performance to all drive components.

Powerful Drive

- 30% more drive capacity than existing models

- Smallest footprint in its class
  (Thin-profile design based on the hollow shaft type)

Wide Selection & Variation

- Standard line of right angle shaft and parallel shaft models, including motor-equipped models.
- Modular housing for any mount position
- Complete line of options meets various demands

High Reliance

- Features a heavy-duty housing with reinforcement ribs
  (large sizes are made of ductile cast iron housings)
- Apply double oil seals to output shaft for greater reliability

Easier to use

Greater Power

INDEX

Applications ····· P3
Special Applications ···· P5
Models ····· P7
Standard Package ····· P9
Internal Construction ··· P10
Model Numbers ····· P13
Sizing ····· P15

Right Angle Shaft Type

Sizing Table ····· P19
Transfer Capacity Table ··· P23
Technical Data ····· P27
Dimension Drawings ·· P29

Parallel Shaft Type

Sizing Table ····· P45
Transfer Capacity Table ··· P47
Technical Data ····· P49
Dimension Drawings ·· P51

Common Information

Technical Data ····· P59
Option ····· P65
Handling Instructions ··· P71
Sizing Inquiry Form ··· P80

Right Angle Type

Parallel Shaft Type

Motor-equipped Type

Applications

The Helical Power Drive at work in these applications.

POWER

High Power **Rubber Extruder**

RELIANCE

Reliability **Overhead Container Carrier**

SPEED

High Speed

Stacker Crane (Traverse and Lifting)

DURABILITY

Durability

Sludge Scraper

Special Specifications

Solutions from Tsubaki that give form to your ideas.

High-ratio Integrated Gear Reducers (TERUS)

These high-reduction ratio specs combine various gear units for high reduction application or special layouts.

HDR0303AL + GMTA150

HDR0903BH + HDM0102-11kW

HDR0702CL + SWM175-7.5kW
(Worm)

Value-added Units

Backstop device

This device, based on an intermediate shaft with a one-way cam clutch, prevents rollback on inclined conveyors and blowers.

Overload Protection Device Package

Features our mechanical overload protection device.

2 Double Input Shafts

The input shaft can be ordered with two input shafts for (1) synchronizing multiple reducers (2) mounting a brake (3) mounting an encoder (4) providing a 2-speed drive.
(Models with an extended intermediate shaft can also be manufactured)

Forced Lubrication

Forced lubrication can be provided for mounting positions with restricted bearing lubrication, or where forced cooling is required due to high ambient temperatures.

Servo Driven Models

Servo motor-ready models are available for applications requiring high precision, high speed positioning, and speed control.
(Various connection methods are available for various motor shafts or supporting operation patterns.)

Note: Contact us for other special specifications.

Models

1. Right Angle Shaft Type

Output shaft \ Size		000	010	020	030	040	050	060	070	080	090
2-stage	Solid single shaft, double shaft	○	○	○	○	○	○	○	*	*	*
	Hollow shaft	○	○	○	○	○	○	○	*	*	*
	Hollow Power-Lock	△	△	△	△	△	△	△	*	*	*
3-stage	Solid single shaft, double shaft	○	○	○	○	○	○	○	○	○	○
	Hollow shaft	○	○	○	○	○	○	○	○	○	○
	Hollow Power-Lock	△	△	△	△	△	△	△	△	△	△
4-stage	Solid single shaft, double shaft	*	△	△	△	△	△	△	△	△	△
	Hollow shaft	*	△	△	△	△	△	△	△	△	△
	Hollow Power-Lock	*	△	△	△	△	△	△	△	△	△

Note) 1. ○: Standard package 2. △: Semi-standard package 3. *: Design in stock
Note) 4-stage reduction models are only available with input shaft position A.

2. Parallel Shaft Type

Output shaft \ Size		000	010	020	030	040	050	060	070	080	090
2-stage	Solid single shaft, double shaft	*	○	○	○	○	○	○	○	○	○
	Hollow shaft	*	○	○	○	○	○	○	○	○	○
	Hollow Power-Lock	*	△	△	△	△	△	△	△	△	△
3-stage	Solid single shaft, double shaft	*	○	○	○	○	○	○	○	○	○
	Hollow shaft	*	○	○	○	○	○	○	○	○	○
	Hollow Power-Lock	*	△	△	△	△	△	△	△	△	△

Note) 1. ○: Standard package 2. △: Semi-standard package 3. *: Design in stock

3. Motor Compatibility (Straight Shaft Type)

■2-, 3-stage reduction (input shaft position A□ or B□) ■ 4-stage reduction (input shaft position A□)

Size		000		010			020			030			040			050			060			070		080	
Motor kW	Brake	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	2-stage	4-stage	3-stage	4-stage	3-stage
2.2	Without	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–	–	–	–
	With	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–	–	–	–
3.7	Without	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–	–	–	–
	With	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–	–	–	–
5.5	Without	○	○	△	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–
	With	○	○	△	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–
7.5	Without	○	○	△	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–	–	–	–	–	–	–
11	Without	–	○	–	○	○	–	○	○	△	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–
15	Without	–	○	–	○	○	–	○	○	△	○	○	△	○	○	△	○	–	△	–	–	△	–	–	–
18.5	Without	–	–	–	–	–	–	–	○	–	○	○	–	○	○	△	○	○	△	○	○	△	–	△	–
22	Without	–	–	–	–	–	–	–	○	–	○	○	–	○	○	△	○	○	△	○	○	△	–	△	–
30	Without	–	–	–	–	–	–	–	–	–	○	○	–	○	○	△	○	○	△	○	○	△	○	△	○
37	Without	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	○	○	△	○	○	△	○	△	○

Note) 1. ○: Standard package 2. △: Semi-standard package

4. Reduction Ratios

4-1. Right Angle Shaft Type

	Nominal reduction ratio \ Size	000	010	020	030	040	050	060	070	080	090
2-stage	12	○	○	○	○	○	○	○	–	–	–
	15	○	○	○	○	○	○	○	–	–	–
	18	○	○	○	○	○	○	○	–	–	–
3-stage	22	○	○	○	○	○	○	○	○	○	○
	27	○	○	○	○	○	○	○	○	○	○
	33	○	○	○	○	○	○	○	○	○	○
	41	○	○	○	○	○	○	○	○	○	○
	50	○	○	○	○	○	○	○	○	○	○
	60	○	○	○	○	○	○	○	○	○	○
	75	○	○	○	○	○	○	○	○	○	○
	95	○	○	○	○	○	○	○	○	○	○
4-stage	120	–	○	○	○	○	○	○	○	○	○
	150	–	○	○	○	○	○	○	○	○	○
	180	–	○	○	○	○	○	○	○	○	○
	230	–	○	○	○	○	○	○	○	○	○
	280	–	○	○	○	○	○	○	○	○	○
	350	–	○	○	○	○	○	○	○	○	○

Note) Refer to Page 28 for actual reduction ratios.

4–2. Parallel Shaft Type

	Nominal reduction ratio \ Size	000	010	020	030	040	050	060	070	080	090
2-stage	12	–	○	○	○	○	○	○	○	○	○
	15	–	○	○	○	○	○	○	○	○	○
	20	–	○	○	○	○	○	○	○	○	○
	25	–	○	○	○	○	○	○	○	○	○
3-stage	22	–	○	○	○	○	○	○	○	○	○
	27	–	○	○	○	○	○	○	○	○	○
	33	–	○	○	○	○	○	○	○	○	○
	41	–	○	○	○	○	○	○	○	○	○
	50	–	○	○	○	○	○	○	○	○	○
	60	–	○	○	○	○	○	○	○	○	○
	75	–	○	○	○	○	○	○	○	○	○
	95	–	○	○	○	○	○	○	○	○	○

Note) Refer to Page 50 for actual reduction ratios.

Standard Package

1. Reducer Specifications

Item			Standard package
Reducer	Reduction method	Right Angle Shaft Type	[2-stage] Spiral bevel gear x helical gear [3-stage] Spiral bevel gear x helical gear x helical gear [4-stage] Spiral bevel gear x helical gear x helical gear x helical gear
		Parallel Shaft Type	[2-stage] Helical gear x helical gear [3-stage] Helical gear x helical gear x helical gear
	Lubrication method		Oil bath
	Housing material		Sizes 000 to 030: FC200 (optional FCD450 also possible) 040 to 090: FCD450
	Keyway		JIS normal grade, JIS B1301-1976 (key supplied with solid shaft models)
	Seal design		Input shaft: Right angle type = single oil seal (double oil seals on sizes 070 or larger) Parallel shaft type = single oil seal (double oil seals on sizes 0502 to 0902 and 0603 to 0903) Output shaft: double oil seals
	Paint specifications		Paint color: Munsell 2.5G6/3 Primer: lacquer primer Finish coat: acrylic lacquer-based paint
	Rust proofing specifications		Rust proofing: Effective for 6 months when stored indoors (after shipping). Outside: rust-proofing oil Inside: sealed after filling with lubrication oil
Ambient conditions	Installation		Indoors
	Ambient temperature		HDR Series: 0°C to 50°C, HDM Series: 0°C to 40°C
	Ambient humidity		95% or less
	Altitude		No more than 1,000 m above sea level
	Atmosphere		Area must be free of corrosive and explosive gases, steam, condensation, and have little or no dust.
Installation direction			Horizontal or vertical

2. Motor Specifications

Item			Standard package	
Motor	Output		Without brake	With brake
			2.2, 3.7, 5.5, 7.5, 11, 15, 18.5, 22, 30, 37kW	2.2, 3.7, 5.5kW
	Source		3-phase 200/200/220V 50/60/60Hz	
	Poles		4	
	Protection		Totally enclosed fan-cooled (IP44)	
	Rating		Continuous (S1)	
	Insulation		E	
	Brake unit	Source	DC 90 to 99V	
		Braking system	Engaged when denergized	
		Braking torque	150% or more of motor rating	
		Protection	IP20	
		Insulation	Class B	

Note) Contact us for detailed motor specifications.

Internal Construction

■Right Angle Shaft Type

HDR Series (2-stage reduction)

HDR Series (3-stage reduction)

Internal Construction

HDR Series (4-stage reduction)

HDM Series (2-stage reduction)

■Parallel Shaft Type

HDR Series (2-stage reduction)

HDR Series (3-stage reduction)

Model Numbers

Right Angle Shaft Type	HDR	030	4	A	L	280	N			-1
	HDM	060	3	B	H	41	O	220	S	-1
Parallel Shaft Type	HDR	010	2	C	KL	12	N			-3
	HDR	090	3	D	R	95	N			-1

Series	Size	Gear stages	Input position	Shaft arrangement	Reduction ratio	Respect to rotation	Motor kW	Motor Instructions	Mounting code
Right-angle HDR	000 010 020 030 040 050 060 070 080 090	Right angle 2-stage . 3-stage . 4-stage	Right angle A B See Shaft arrangements	Hollow shaft H See Shaft arrangements	Right angle 12 75 15 95 18 120 22 150 27 180 33 230 41 280 50 350 60	Relative input/output rotation details N or O See Output shaft rotation details	022 -2.2kW ~ 370 -37kW	S Ship with brake-less motor installed SB Ship with brake motor installed SX Ship with customer-supplied motor installed Y Customer to install motor	NO.1 ~ NO.4 See Mounting directions
Parallel HDR				Solid shaft L, R (single) T (double) See Shaft arrangements					
With motor HDM		Parallel 2-stage . 3-stage	Parallel C D See Shaft arrangements	Hollow Power-Lock KL KR See Shaft arrangements	Parallel 12 15 20 22 25 27 33 41 50 60 75 95				

Note) Refer to page 62 for model numbers and dimensions for models with a cooling fan.

Shaft arrangements, Rotation details

Input shaft positions, Arrangements

	Output shaft type					
	Single output shaft		Double output shaft	Hollow output shaft	Output shaft with Power-Lock	
Right angle shaft type	AL	AR	AT	AH	AKL	AKR
	BL	BR	BT	BH	BKL	BKR
Parallel shaft type	CL	CR	CT	CH	CKL	CKR
	DL	DR	DT	DH	DKL	DKR

Output shaft rotation details

Right angle shaft type	N	O

Note) (1) These examples are based on a double output shaft.
(2) A and B each represent the corresponding input shaft position.

Parallel shaft type	2-stage reduction	3-stage reduction

Note) (1) Parallel shaft type only available with rotation N.
(2) For the parallel shaft type, the rotating direction differs depending on the number of reduction stages.
(3) C and D each represent the corresponding input shaft position.

Mounting direction

← As viewed in the direction of the arrow.

Mounting code	Shaft arrangement / Mounting direction	A□			B□			C□, D□		
		Hollow	Solid	Power-Lock	Hollow	Solid	Power-Lock	Hollow	Solid	Power-Lock
1	Standard (Top ↑ ↓ Bottom)									
2	L side on top (Top ↑ ↓ Bottom)									
3	R side on top (Top ↑ ↓ Bottom)									
4	Other	Contact us.								

Note) (1) The solid shaft columns are shown for a double output shaft.
(2) Sizes 060 to 090 with installation codes 2 or 3 have a different mounting style. Refer to the external dimension diagrams.

Sizing

Reducers can be sized roughly based on the motor power (kW), or more accurately by specifying each condition. Follow the method best suited for the application.

[Quick Sizing]

Steps

1. Determine service factor

The service factor (Sf) must be determined based on the type of load, operating time, and start/stop frequency. Use the table below to determine the service factor (Sf).

Refer to page 17, Load Categories by Machine Type, for various load types. If your machine is not listed, find one that is similar or contact us for assistance.

Load type \ Operating hours (per day)	2	10	24
U: Uniform load	1.00(1.25)	1.00(1.25)	1.25(1.50)
M: Loads with moderate shock	1.00(1.25)	1.25(1.50)	1.50(1.75)
H: Loads with heavy shock	1.25(1.50)	1.50(1.75)	1.75(2.00)

Note) Use the figure in ( ) for start/stop frequencies between 10 and 30, inclusive, per hour. Contact us for start/stop frequencies greater than 30.

2. Determine package

Determine the required motor kW, motor speed, and reduction ratio.

3. Determine size

Use the service factor Sf (determined in step 1) to select a frame size that meets the motor kW, motor speed, and reduction ratio from the Sizing Tables on pages 19 to 22, and 45 to 46.

Next, multiply the peak torque by the service factor and check whether it is within 200% of the transfer capacity.

Note, make sure the selected size does not exceed the thermal rating capacity. If it does, contact us. For all sizes, contact us if the ambient temperature is 40ºC or higher. Next, check that the radial load on the input shaft, and the radial and axial loads on the output shaft are within the Allowable Loads listed on pages 27 and 50.

4. Determine series, type, shaft arrangement, and speed

Determine the series, type, shaft arrangement, and rotation details based on the Model Numbers on pages 13 and 14.

[Detailed Sizing]

Steps

1. Determine service factor

2. Determine compensation kW and compensation torque

Determine the compensation kW and compensation torque with formula 1.

Compensation kW = load kW x Sf ·····(formula 1)
Compensation torque = load torque x Sf ·····(formula 1)

3. Determine reduction ratio

Determine the reduction ratio based on the operating input and output speed. Contact us if the input speed exceeds 1750 r/min.

Note) Refer to pages 28 and 50 for actual reduction ratios.

4. Determine size

Determine the frame size with the operating input speed and reduction ratio that satisfies the factors explained below: transfer capacity, thermal rating, input and output shaft radial load.

(Check the transfer capacity)

- Tentatively select a size from the Transfer Capacity Table with the operating input speed and reduction ratio that satisfies the compensation kW and compensation torque. If the reducer is to be driven slower than 950 r/min, select from the output torque column for 950 r/min.

(Check the peak torque)

-Next, multiply the peak torque by the service factor and check whether it is within 200% of the transfer capacity.

(Check the thermal rating)

-If the tentatively selected size is to be run continuously for 2 or more hours in an ambient temperature of 20ºC or higher, multiply the thermal rating kW by the temperature compensation factor and see if the result is greater than the actual load kW. If it does not satisfy the thermal rating kW, select the next higher size, or contact us for assistance. Note, for all sizes, if the ambient temperature exceeds 50ºC, contact us for other important information.

Temperature Compensation factors

20°C	30°C	40°C	50°C
1.00	0.85	0.70	0.55

Thermal rating capacity kW x temperature compensation factor ≥ actual load kW or motor kW

(Check radial load on input and output shafts)

-For the tentatively selected size, use formula 2 to verify that the radial load on the input shaft and the radial and axial load on the output shaft satisfies the allowable radial load (on pages 27 and 50).

$$\text{Allowable radial load} \geq \frac{T \times f \times Lf}{R} \quad \cdots\cdots\cdots \text{ formula 2}$$

T : Compensation input/output torque N·m (kgf·m)
f : OHL factor (see table below),
Lf : point of load factor (see table below)
R : Pitch radius (m) of sprockets, and pulleys

Note) Contact us if radial and axial loads occur simultaneously.

OHL factor (f)

Chain	1.0
Gears, toothed belt	1.25
V belt, heavy duty toothed belt	1.5

Point of load factor (Lf)

r≤W(U)	Lf=1
r>W(U)	Lf=r/W(U)

5. Determine series

Consider the usage conditions to determine the series: HDR for separately mounted motor, HDM for direct-mounted motor.

6. Determine the motor kW (HDM Series)

Determine the motor kW using formula 3 that satisfies the compensation kW and compensation torque determined in step 2. Then, check the Motor Compatibility table (on page 7) to verify the motor kW is capable of driving the selected size.

$$\text{Motor kW} \geq \frac{\text{compensation kW}}{\eta} \text{ or } \frac{\text{compensation torque x output speed}}{974 \times \eta} \quad \ldots\text{formula 3}$$

Reducer efficiency

Gear stages	Efficiency (%)
2-stage	94
3-stage	91
4-stage	88

η: $\frac{\text{Reducer efficiency}}{100}$

7. Determine the type

Determine the type, solid or hollow output shaft, based on the usage conditions.

8. Determine shaft arrangement and rotation details

Determine the shaft arrangement and rotation details by referring to the Shaft arrangements, Rotation details table on page 14.

Table 2 Load Type (Load Categories by Machine Type)

Driven machine		Load category
Cranes	Stacker cranes, container cranes, mechanical parking lifts, hoists	*
Constant load conveyors	Belt, bucket, chain, flow, flight, screw, assembly	U
Heavy load conveyors	Belt, bucket, chain, flow, flight, screw, assembly	M
Elevators, Escalators	Escalators, elevators, centrifugal, belt, bucket (constant load)	U
	Gravity lifts, flight, chain bucket (constant load), belt bucket (heavy load)	M
	Chain bucket (heavy load)	H
Feeders	Disk, stocker	U
	Belt, apron, cold, screw, dust	M
	Reciprocating	H
Agitators	Pure liquids	U
	Liquids and solids, varying densities	M
Mixers	Uniform granularity	U
	Varying granularity, mortar mixers, kneaders, ribbon mixers, concrete mixers (constant load)	M
Plastic extruders	Mixing (low viscosity), films, sheets, coatings	U
	Mixing (high viscosity)	M
Rubber extruders	Sheets	M
	Mixing	H

Driven machine		Load category
Pulverizers	Kilns, cement mills, ball mills, rod mills, crushers (for granulating sugar), sand mullers, scum breakers	M
	Crushers (minerals, rubble, used paper, plastic, rubber), tumbler mills, hammer mills	H
Environmental sanitation equipment	Sludge scrapers, sediment pumps clarifiers, bar screens	U
	Thickeners, classifiers, flocculators, flash mixers, vacuum filters, belt presses	M
	Aerators	*
Machine tools	Tapping machines	U
	Bending rolls	M
	Geared punching press, tumblers, tapping machines, planers	H
Steel, non-ferrites	Wire drawing, rolling machines, wire winders, slitters	M
	Forming machines, draw bench (carriage drive)	H
	Pinch rolls, dryers, scrubber rolls, roller tables	*
Pulp mills, paper making	Concentrate screw conveyor, conveyors, bleachers, suction rolls, presses	U
	Barkers (mechanical, hydraulic), beaters, pulpers, reels (for pulpers), washers, thickeners, agitators, calendars, couch rollers, dryers	M
	Drum barkers, conveyors (for lumber), cutters platers, super calendars	H

Driven machine		Load category
Textiles	Spinning machines, weaving machines, dying machines, washing machines	M
Foods	Rice mills, canning machines	U
	Bottle washers, noodle making machines, meat grinders	M
Brewing	Distillers (constant load), cookers (constant load) bottling machines	U
	Scale hoppers	M
Sugar making	Cane knives, crystal can mixers	M
	Mills	H
Sorters	Screens (air, water type), classifiers	U
	Screens (rotary, gravel, stones)	M
Pumps	Centrifugal, rotary (gear driven)	U
	Variable stroke pumps, reciprocating pump	M
Pottery	General pottery machines, mixing machines, pug mills	M
	Brick forming machines, briquette making machines	H
Others	Line shafts (light loads), centrifugal fans, centrifugal blowers	U
	Line shafts (heavy loads), winches, cable reels, washing machines, fans, blowers	M
	Printing machines, woodworking machines	*

* These load categories assume the use of a normal motor. Contact us if a special motor or engine is to be used.
The * denotes various load possibilities depending on operating conditions. Contact us for further details.

Right Angle Type

CONTENTS

Sizing Table ..... P19 to 22

Transfer Capacity Table ..... P23 to 28

- 2-stage
- 3-stage
- 4-stage
- Thermal rating
- Allowable loads on shafts
- Actual reduction ratio

Dimension Drawings ..... P29 to 43

- 2-stage (hollow, solid, Power-Lock output shafts)
- 3-stage (hollow, solid, Power-Lock output shafts)
- 4-stage (hollow, solid, Power-Lock output shafts)
- With motor (hollow, solid, Power-Lock output shafts)

Sizes for input speed of 1750 r/min

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.00	12	—	—	—	—	000	000	000	010	020	020	030	030	040	050	050	050	050	060	060	060	—	—	—
	15	—	—	—	—	000	000	010	020	020	030	030	040	050	050	050	050	060	—	—	—	—	—	—
	18	—	—	—	000	000	020	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—
	22	—	—	—	000	000	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	080	090
	27	—	—	000	000	010	010	020	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	090
	33	—	—	000	000	010	020	020	020	030	030	040	050	050	060	060	070	070	080	080	080	080	090	090
	41	—	000	000	010	010	020	030	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	090
	50	—	000	000	010	020	030	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	090	—
	60	000	000	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	75	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	95	000	010	010	020	030	030	040	050	050	060	060	060	070	080	080	080	090	—	—	—	—	—	—
	120	010	010	020	030	040	050	050	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—
	150	010	020	020	030	040	050	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	180	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	230	010	030	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—
	280	020	030	040	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	350	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
Sf=1.25	12	—	—	—	—	000	000	010	020	020	030	030	040	050	050	050	050	060	060	—	—	—	—	—
	15	—	—	—	000	000	010	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—
	18	—	—	—	000	010	020	020	030	030	040	040	050	060	060	060	—	—	—	—	—	—	—	—
	22	—	—	000	000	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	090
	27	—	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—
	33	—	000	000	010	010	020	030	030	030	040	050	050	060	060	070	070	080	080	080	090	090	090	—
	41	—	000	000	010	020	030	030	030	040	050	050	050	060	070	070	070	080	080	090	090	090	—	—
	50	000	000	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	090	—	—	—
	60	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	75	000	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	95	000	010	020	030	030	040	050	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—
	120	010	020	030	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	150	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	180	010	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—
	230	020	030	040	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	280	020	030	040	050	060	070	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	040	050	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
Sf=1.50	12	—	—	—	000	000	010	020	020	030	030	040	040	050	050	050	060	060	—	—	—	—	—	—
	15	—	—	—	000	010	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—
	18	—	—	000	000	020	020	030	030	040	040	050	060	060	060	—	—	—	—	—	—	—	—	—
	22	—	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	—	—
	27	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	33	—	000	000	010	020	030	030	030	040	050	050	060	060	070	070	070	080	080	090	090	090	—	—
	41	000	000	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	—	—	—	—
	50	000	000	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	—	—	—	—	—
	60	000	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	75	000	010	020	030	030	040	050	050	060	060	070	080	080	080	090	090	—	—	—	—	—	—	—
	95	010	020	020	030	040	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	120	010	020	030	040	050	050	060	060	070	080	080	080	090	—	—	—	—	—	—	—	—	—	—
	150	010	020	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—
	180	020	030	040	040	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	230	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	040	030	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	040	050	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.75	12	—	—	—	000	000	010	020	020	030	040	040	050	050	050	060	060	—	—	—	—	—	—	—
	15	—	—	000	000	010	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—	—
	18	—	—	000	010	020	030	030	030	040	050	050	060	060	—	—	—	—	—	—	—	—	—	—
	22	—	000	000	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	27	000	000	010	010	020	030	040	040	050	050	060	060	070	070	070	080	090	090	—	—	—	—	—
	33	000	000	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	—	—	—	—
	41	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	50	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	60	000	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	75	000	010	020	030	040	050	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	95	010	020	030	030	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—
	120	020	030	030	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—
	150	020	030	040	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—
	180	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	230	030	040	050	050	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	040	050	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	050	060	060	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sf=2.00	12	—	—	000	000	010	020	020	030	040	040	050	050	050	060	060	060	—	—	—	—	—	—	—
	15	—	—	000	000	020	020	030	030	040	050	050	050	060	060	—	—	—	—	—	—	—	—	—
	18	—	—	000	020	020	030	030	040	050	050	050	060	—	—	—	—	—	—	—	—	—	—	—
	22	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	27	000	000	010	010	030	030	040	040	050	060	060	060	070	070	080	080	090	—	—	—	—	—	—
	33	000	000	010	020	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	41	000	010	010	020	030	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—
	50	000	010	020	030	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—
	60	000	010	020	030	040	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—
	75	010	020	030	030	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—
	95	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
	120	020	030	040	050	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	150	020	030	040	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	180	020	030	040	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	230	030	040	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	040	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	040	050	060	060	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sizes for input speed of 1450 r/min

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.00	12	—	—	—	—	000	000	010	010	020	030	030	040	040	050	050	050	060	060	060	—	—	—	—
	15	—	—	—	000	000	010	020	020	030	030	040	040	050	050	060	060	060	—	—	—	—	—	—
	18	—	—	000	000	010	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—
	22	—	—	000	000	010	010	020	020	030	040	040	050	050	060	060	060	070	080	080	080	080	090	090
	27	—	000	000	000	010	020	030	030	040	040	050	050	060	060	070	070	070	080	080	090	090	090	—
	33	—	000	000	010	010	020	020	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	090
	41	—	000	000	010	020	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	090	—
	50	000	000	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	60	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—	—
	75	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	95	000	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	120	010	020	030	030	040	050	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	150	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	180	010	020	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—
	230	020	030	040	040	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	280	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	040	050	050	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
Sf=1.25	12	—	—	—	000	000	010	020	020	030	030	040	040	050	050	050	060	—	—	—	—	—	—	—
	15	—	—	000	000	010	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—
	18	—	—	000	000	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—	—
	22	—	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	090	—
	27	—	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	33	—	000	000	010	020	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—
	41	000	000	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	090	—	—	—
	50	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	60	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	75	000	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	95	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	120	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
	150	010	020	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—
	180	020	030	040	040	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	230	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	040	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	040	050	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sf=1.50	12	—	—	—	000	000	010	020	020	030	040	040	050	050	060	060	060	—	—	—	—	—	—	—
	15	—	—	000	000	020	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—	—
	18	—	000	000	010	020	030	030	030	040	050	050	060	060	—	—	—	—	—	—	—	—	—	—
	22	—	000	000	010	010	020	030	030	040	050	050	050	060	070	070	070	080	090	090	090	—	—	—
	27	—	000	000	010	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	33	000	000	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	41	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	50	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	60	000	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	75	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	95	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	120	020	030	030	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—
	150	020	030	040	040	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	180	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	230	030	040	050	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	040	050	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	030	050	060	060	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.75	12	—	—	000	000	010	020	020	030	040	040	050	050	050	060	060	—	—	—	—	—	—	—	—
	15	—	000	000	010	020	030	030	030	040	050	050	050	060	060	—	—	—	—	—	—	—	—	—
	18	—	000	000	020	020	030	030	040	050	050	060	060	—	—	—	—	—	—	—	—	—	—	—
	22	000	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	27	000	000	010	020	030	040	040	040	050	060	060	060	070	070	080	080	090	—	—	—	—	—	—
	33	000	000	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	41	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	50	000	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	60	000	010	020	030	040	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—
	75	010	020	030	030	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—
	95	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
	120	020	030	040	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	150	020	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—
	180	030	040	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	230	030	040	050	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	280	030	050	060	060	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	040	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sf=2.00	12	—	—	000	000	010	020	030	030	040	040	050	050	060	060	060	—	—	—	—	—	—	—	—
	15	—	000	000	010	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—	—	—
	18	—	000	010	020	030	030	040	040	050	050	060	060	—	—	—	—	—	—	—	—	—	—	—
	22	000	000	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—
	27	000	000	010	020	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—
	33	000	010	010	020	030	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—
	41	000	010	020	020	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—
	50	000	010	020	030	040	040	050	050	060	060	070	070	080	090	090	090	—	—	—	—	—	—	—
	60	010	020	030	030	040	050	050	060	060	070	070	080	090	090	090	—	—	—	—	—	—	—	—
	75	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
	95	010	030	030	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—
	120	020	030	040	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	150	020	030	040	050	060	070	070	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—
	180	030	040	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—
	230	030	040	050	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	280	040	050	060	060	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	350	040	050	060	070	080	090	090	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Transfer Capacity Table 2-stage and 3-stage Reduction (Reduction ratio 1/12 to 1/95)

Size			000		010		020		030		040	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
2-stage	12	1750	21.2	1314 {134}	26.9	1676 {171}	42.8	2656 {271}	57.6	3577 {365}	88.6	5508 {562}
		1450	18.0	1343 {137}	22.6	1695 {173}	35.9	2695 {275}	50.5	3783 {386}	77.7	5831 {595}
		1150	14.5	1372 {140}	18.2	1715 {175}	28.9	2735 {279}	42.9	4058 {414}	66.0	6253 {638}
		950	12.1	1392 {142}	15.2	1735 {177}	24.2	2764 {282}	37.5	4293 {438}	55.6	6380 {651}
	15	1750	15.5	1206 {123}	19.4	1519 {155}	30.6	2391 {244}	49.7	3881 {396}	71.4	5586 {570}
		1450	13.0	1225 {125}	16.3	1539 {157}	25.7	2421 {247}	41.7	3940 {402}	59.9	5664 {578}
		1150	10.4	1235 {126}	13.1	1559 {159}	20.7	2460 {251}	33.6	3999 {408}	48.3	5753 {587}
		950	8.68	1255 {128}	10.9	1568 {160}	17.2	2480 {253}	28.1	4038 {412}	40.4	5822 {594}
	18	1750	12.7	1216 {124}	14.9	1421 {145}	24.3	2323 {237}	41.2	3940 {402}	57.4	5488 {560}
		1450	10.6	1216 {124}	12.4	1421 {145}	20.2	2332 {238}	34.2	3940 {402}	47.7	5508 {562}
		1150	8.40	1225 {125}	9.82	1431 {146}	16.1	2333 {238}	27.2	3960 {404}	37.9	5528 {564}
		950	6.95	1225 {125}	8.13	1431 {146}	13.3	2343 {239}	22.5	3969 {405}	31.4	5537 {565}
3-stage	22	1750	11.7	1274 {130}	20.7	2274 {232}	26.9	2950 {301}	42.8	4694 {479}	61.2	6723 {686}
		1450	10.2	1352 {138}	17.9	2362 {241}	22.6	2989 {305}	35.9	4753 {485}	53.7	7125 {727}
		1150	8.55	1431 {146}	14.4	2401 {245}	18.2	3038 {310}	28.9	4303 {493}	45.6	7625 {778}
		950	7.16	1450 {148}	12.0	2431 {248}	15.2	3068 {313}	24.2	4891 {499}	39.2	7938 {810}
	27	1750	9.50	1313 {134}	15.5	2136 {218}	19.4	2675 {273}	30.6	4224 {431}	48.7	6733 {687}
		1450	8.33	1392 {142}	13.0	2156 {220}	16.3	2715 {277}	25.7	4283 {437}	41.7	6958 {710}
		1150	6.90	1450 {148}	10.4	2186 {223}	13.1	2744 {280}	20.7	4342 {443}	33.6	7066 {721}
		950	5.77	1470 {150}	8.68	2205 {225}	10.9	2774 {283}	17.2	4391 {448}	28.1	7145 {729}
	33	1750	8.72	1431 {146}	14.7	2401 {245}	22.4	3665 {374}	37.7	6164 {629}	53.3	8732 {891}
		1450	7.32	1441 {147}	12.3	2430 {248}	18.8	3714 {379}	31.7	6252 {638}	46.8	9241 {943}
		1150	5.89	1470 {150}	9.91	2470 {252}	15.1	3764 {384}	25.5	6351 {648}	37.8	9428 {962}
		950	4.93	1490 {152}	8.29	2499 {255}	12.7	3813 {389}	21.3	6429 {656}	31.7	9555 {975}
	41	1750	7.04	1450 {148}	11.8	2440 {249}	18.1	3714 {379}	30.5	6272 {640}	45.2	9310 {950}
		1450	5.90	1470 {150}	9.93	2470 {252}	15.2	3763 {384}	25.6	6350 {648}	37.9	9428 {962}
		1150	4.75	1490 {152}	8.00	2509 {256}	12.2	3822 {390}	20.6	6449 {658}	30.6	9575 {977}
		950	3.97	1509 {154}	6.68	2529 {258}	10.2	3871 {395}	17.2	6527 {666}	25.6	9702 {990}
	50	1750	5.83	1470 {150}	9.82	2470 {252}	14.9	3744 {382}	24.3	6115 {624}	37.5	9437 {963}
		1450	4.89	1480 {151}	8.23	2499 {255}	12.4	3753 {383}	20.2	6125 {625}	31.5	9555 {975}
		1150	3.93	1499 {153}	6.62	2539 {259}	9.82	3764 {384}	16.1	6145 {627}	25.3	9702 {990}
		950	3.29	1529 {156}	5.54	2568 {262}	8.13	3764 {384}	13.3	6164 {629}	21.2	9830 {1003}
	60	1750	4.86	1490 {152}	8.17	2499 {255}	12.5	3822 {390}	21.0	6439 {657}	31.2	9565 {976}
		1450	4.07	1499 {153}	6.85	2528 {258}	10.5	3861 {394}	17.7	6517 {665}	26.2	9682 {988}
		1150	3.27	1519 {155}	5.51	2568 {262}	8.42	3920 {400}	14.2	6615 {675}	21.1	9830 {1003}
		950	2.73	1539 {157}	4.60	2597 {265}	7.04	3969 {405}	11.9	6694 {683}	17.6	9947 {1015}
	75	1750	3.91	1509 {154}	6.59	2538 {259}	10.1	3871 {395}	17.0	6537 {667}	25.2	9712 {991}
		1450	3.28	1519 {155}	5.52	2568 {262}	8.44	3920 {400}	14.2	6615 {675}	21.1	9820 {1002}
		1150	2.64	1548 {158}	4.44	2597 {265}	6.79	3979 {406}	11.5	6704 {684}	17.0	9967 {1017}
		950	2.20	1558 {159}	3.71	2627 {268}	5.67	4018 {410}	9.57	6782 {692}	14.2	10085 {1029}
	95	1750	3.24	1529 {156}	5.46	2568 {262}	8.34	3920 {400}	14.1	6615 {675}	20.9	9839 {1004}
		1450	2.72	1548 {158}	4.57	2597 {265}	6.99	3969 {405}	11.8	6693 {683}	17.5	9947 {1015}
		1150	2.18	1558 {159}	3.68	2637 {269}	5.62	4028 {411}	9.48	6792 {693}	14.1	10094 {1030}
		950	1.82	1578 {161}	3.07	2656 {271}	4.69	4067 {415}	7.92	6860 {700}	11.8	10202 {1041}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Size			050		060		070		080		090	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
2-stage	12	1750	166	10329 {1054}	273	16993 {1734}	—	—	—	—	—	—
		1450	146	11015 {1124}	227	17052 {1740}	—	—	—	—	—	—
		1150	116	11054 {1128}	181	17130 {1748}	—	—	—	—	—	—
		950	96.9	11103 {1133}	150	17189 {1754}	—	—	—	—	—	—
	15	1750	130	10182 {1039}	192	15063 {1537}	—	—	—	—	—	—
		1450	108	10221 {1043}	160	15112 {1542}	—	—	—	—	—	—
		1150	86.2	10270 {1048}	127	15170 {1548}	—	—	—	—	—	—
		950	71.4	10290 {1050}	105	15229 {1554}	—	—	—	—	—	—
	18	1750	92.3	8830 {901}	139	13308 {1358}	—	—	—	—	—	—
		1450	76.7	8859 {904}	115	13348 {1362}	—	—	—	—	—	—
		1150	61.1	8898 {908}	92.1	13406 {1368}	—	—	—	—	—	—
		950	50.6	8918 {910}	76.3	13446 {1372}	—	—	—	—	—	—
3-stage	22	1750	94.8	10417 {1063}	150	16591 {1693}	226	24598 {2510}	334	36358 {3710}	451	48980 {4998}
		1450	82.4	10927 {1115}	132	17552 {1791}	198	26048 {2658}	293	38475 {3926}	395	51832 {5289}
		1150	66.5	11114 {1134}	112	18797 {1918}	168	27823 {2839}	248	41072 {4191}	335	55429 {5656}
		950	55.6	11261 {1149}	96.9	19679 {2008}	147	29469 {3007}	217	43503 {4439}	293	58683 {5988}
	27	1750	71.4	9869 {1007}	130	18052 {1842}	192	26342 {2688}	268	36730 {3748}	361	49431 {5044}
		1450	59.9	9996 {1020}	108	18120 {1849}	160	26440 {2698}	235	38877 {3967}	317	52312 {5338}
		1150	48.3	10153 {1036}	86.2	18189 {1856}	128	26539 {2708}	200	41670 {4252}	269	55988 {5713}
		950	40.4	10281 {1049}	71.4	18248 {1862}	106	26637 {2718}	175	44140 {4504}	235	59212 {6042}
	33	1750	81.3	13318 {1359}	130	21374 {2181}	198	32183 {3284}	306	49735 {5075}	427	69384 {7080}
		1450	72.1	14259 {1455}	115	22765 {2323}	174	34055 {3475}	260	50950 {5199}	375	73578 {7508}
		1150	58.2	14504 {1480}	92.5	23158 {2363}	145	35663 {3639}	215	52999 {5408}	319	78832 {8044}
		950	48.7	14691 {1499}	77.4	23471 {2395}	121	36162 {3690}	180	53753 {5485}	268	80184 {8182}
	41	1750	69.4	14308 {1460}	110	22834 {2330}	165	33741 {3443}	255	52224 {5329}	361	73833 {7534}
		1450	58.3	14494 {1479}	92.7	23148 {2362}	145	35662 {3639}	215	52989 {5407}	317	78135 {7973}
		1150	47.0	14730 {1503}	74.7	23530 {2401}	117	36260 {3700}	174	53910 {5501}	258	80213 {8185}
		950	39.3	14926 {1523}	62.5	23844 {2433}	97.6	36750 {3750}	146	54655 {5577}	216	81291 {8295}
	50	1750	57.4	14455 {1475}	91.6	23177 {2365}	139	34770 {3548}	212	53038 {5412}	317	79086 {8070}
		1450	47.7	14494 {1479}	76.7	23432 {2391}	116	34868 {3558}	178	53782 {5488}	266	80233 {8187}
		1150	37.9	14544 {1484}	61.1	23520 {2400}	92.1	35026 {3574}	144	54684 {5580}	215	81615 {8328}
		950	31.4	14573 {1487}	50.6	23589 {2407}	76.3	35124 {3584}	121	55419 {5655}	180	82732 {8442}
	60	1750	48.0	14710 {1501}	77.8	23471 {2395}	118	36201 {3694}	176	53841 {5494}	263	80311 {8195}
		1450	40.3	14896 {1520}	65.3	23775 {2426}	99.4	36701 {3745}	148	54576 {5569}	221	81438 {8310}
		1150	32.4	15122 {1543}	52.6	24138 {2463}	80.1	37289 {3805}	120	55468 {5660}	178	82801 {8449}
		950	27.1	15308 {1562}	44.0	24442 {2494}	67.0	37770 {3854}	99.2	55929 {5707}	149	83663 {8537}
	75	1750	38.8	14935 {1524}	62.8	23834 {2432}	95.6	36809 {3756}	142	54733 {5585}	212	81683 {8335}
		1450	32.5	15121 {1543}	52.7	24137 {2463}	80.2	37279 {3804}	119	55448 {5658}	178	82790 {8448}
		1150	26.2	15347 {1566}	42.4	24500 {2500}	64.6	37858 {3863}	95.6	56007 {5715}	143	83790 {8550}
		950	21.9	15524 {1584}	35.5	24804 {2531}	53.8	38152 {3893}	79.5	56409 {5756}	120	84418 {8614}
	95	1750	32.1	15131 {1544}	52.1	24167 {2466}	79.3	37318 {3808}	118	55497 {5663}	176	82859 {8455}
		1450	26.9	15317 {1563}	43.7	24461 {2496}	66.5	37779 {3855}	98.5	55948 {5709}	148	83692 {8540}
		1150	21.7	15367 {1586}	35.2	24814 {2532}	53.3	38171 {3895}	78.8	56429 {5758}	118	84447 {8617}
		950	18.1	15720 {1604}	29.4	25108 {2562}	44.3	38397 {3918}	65.6	56821 {5798}	98.2	85045 {8678}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Transfer Capacity Table 4-stage Reduction (Reduction ratio 1/120 to 1/350)

Size			000		010		020		030		040	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
4-stage	120	1750	—	—	3.80	2254 {230}	5.84	3459 {353}	10.0	5929 {605}	14.7	8604 {878}
		1450	—	—	3.19	2283 {233}	4.89	3499 {357}	8.36	5968 {609}	12.4	8722 {890}
		1150	—	—	2.59	2332 {238}	3.92	3538 {361}	6.68	6017 {614}	9.93	8820 {900}
		950	—	—	2.16	2362 {241}	3.28	3577 {365}	5.56	6056 {618}	8.32	8938 {912}
	150	1750	—	—	3.68	2636 {269}	5.62	4028 {411}	9.51	6801 {694}	14.2	10172 {1038}
		1450	—	—	3.07	2656 {271}	4.70	4067 {415}	7.95	6860 {700}	11.8	10202 {1041}
		1150	—	—	2.44	2656 {271}	3.73	4067 {415}	6.30	6860 {700}	9.36	10202 {1041}
		950	—	—	2.01	2656 {271}	3.08	4067 {415}	5.21	6860 {700}	7.74	10202 {1041}
	180	1750	—	—	2.98	2656 {271}	4.56	4067 {415}	7.70	6860 {700}	11.4	10202 {1041}
		1450	—	—	2.47	2656 {271}	3.78	4067 {415}	6.38	6860 {700}	9.48	10202 {1041}
		1150	—	—	1.96	2656 {271}	3.00	4067 {415}	5.06	6860 {700}	7.52	10202 {1041}
		950	—	—	1.62	2656 {271}	2.48	4067 {415}	4.18	6860 {700}	6.21	10202 {1041}
	230	1750	—	—	2.37	2656 {271}	3.63	4067 {415}	6.12	6860 {700}	9.10	10202 {1041}
		1450	—	—	1.96	2656 {271}	3.01	4067 {415}	5.07	6860 {700}	7.54	10202 {1041}
		1150	—	—	1.56	2656 {271}	2.39	4067 {415}	4.02	6860 {700}	5.98	10202 {1041}
		950	—	—	1.29	2656 {271}	1.97	4067 {415}	3.32	6860 {700}	4.94	10202 {1041}
	280	1750	—	—	1.93	2656 {271}	2.95	4067 {415}	4.98	6860 {700}	7.40	10202 {1041}
		1450	—	—	1.60	2656 {271}	2.45	4067 {415}	4.13	6860 {700}	6.13	10202 {1041}
		1150	—	—	1.27	2656 {271}	1.94	4067 {415}	3.27	6860 {700}	4.86	10202 {1041}
		950	—	—	1.05	2656 {271}	1.60	4067 {415}	2.70	6860 {700}	4.02	10202 {1041}
	350	1750	—	—	1.57	2656 {271}	2.40	4067 {415}	4.08	6860 {700}	6.05	10202 {1041}
		1450	—	—	1.30	2656 {271}	1.99	4067 {415}	3.38	6860 {700}	5.02	10202 {1041}
		1150	—	—	1.03	2656 {271}	1.58	4067 {415}	2.68	6860 {700}	3.98	10202 {1041}
		950	—	—	0.85	2656 {271}	1.30	4067 {415}	2.21	6860 {700}	3.29	10202 {1041}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Thermal rating kW Mounting code 1

Nominal reduction ratio		Input speed r/min	Size 000	010	020	030	040	050	060	070	080	090
2-stage	12 to 18	1750	17 (27)	21 (34)	28 (45)	37 (59)	48 (77)	70 (115)	93 (150)	—	—	—
		1450	16 (24)	20 (30)	27 (41)	36 (54)	47 (71)	69 (105)	92 (140)			
		1150	15 (21)	19 (27)	26 (36)	35 (49)	46 (64)	68 (95)	91 (130)			
		950	14 (18)	18 (23)	25 (33)	34 (44)	45 (59)	67 (90)	90 (120)			
3-stage	22 to 27	1750	19 (27)	23 (32)	29 (41)	36 (50)	48 (67)	65 (91)	86 (120)	120 (165)	160 (210)	220 (280)
		1450	18 (24)	21 (28)	27 (36)	34 (46)	46 (62)	62 (84)	82 (110)	115 (155)	155 (195)	215 (270)
		1150	17 (22)	19 (25)	25 (33)	32 (42)	44 (57)	59 (77)	78 (100)	110 (145)	150 (180)	210 (250)
		950	16 (20)	18 (23)	23 (29)	30 (38)	42 (53)	56 (70)	74 (95)	105 (135)	145 (165)	205 (235)
	33 to 50	1750	18 (25)	20 (28)	25 (35)	32 (45)	44 (62)	59 (83)	80 (110)	110 (155)	150 (195)	210 (270)
		1450	17 (23)	18 (24)	23 (31)	30 (41)	42 (57)	56 (76)	76 (100)	105 (145)	145 (180)	205 (255)
		1150	15 (20)	16 (21)	21 (27)	28 (36)	40 (52)	53 (69)	72 (95)	100 (130)	140 (170)	200 (240)
		950	14 (18)	15 (19)	20 (25)	26 (33)	38 (48)	50 (63)	68 (85)	95 (120)	135 (155)	195 (225)
	60 to 95	1750	16 (22)	18 (25)	22 (31)	28 (39)	38 (53)	52 (73)	72 (100)	100 (140)	130 (170)	190 (245)
		1450	15 (20)	16 (22)	20 (27)	27 (36)	36 (49)	50 (68)	68 (92)	95 (130)	125 (155)	185 (230)
		1150	14 (18)	15 (20)	19 (25)	25 (33)	34 (44)	48 (62)	64 (83)	90 (120)	120 (145)	180 (215)
		950	13 (16)	14 (18)	18 (23)	24 (30)	33 (41)	46 (58)	60 (75)	85 (105)	115 (135)	175 (200)
4-stage	120 to 350	1750	—	On right-angle 4-stage reducers, the thermal capacity rating kW is much higher than the transfer capacity, so for ambient temperatures up to 50°C, select based on transfer capacity.								
		1450										
		1150										
		950										

1. These thermal ratings are for continuous operation at ambient temperatures of 20ºC or less. For higher ambient temperatures, refer to the compensation factor table on page 16.
2. Figures in ( ) represent the thermal rating when a cooling fan is used and must be specified when ordering. Refer to page 62 for dimensions that include the cooling fan.

Size			050		060		070		080		090	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
4-stage	120	1750	23.3	13426 {1370}	38.3	21678 {2212}	53.4	30576 {3120}	84.9	48618 {4961}	126.0	73039 {7453}
		1450	19.7	13661 {1394}	32.2	21981 {2243}	44.9	30997 {3163}	71.4	49314 {5032}	106.0	74137 {7565}
		1150	15.9	13936 {1422}	25.9	22344 {2280}	36.2	31517 {3216}	57.6	50156 {5118}	84.4	74451 {7597}
		950	13.4	14161 {1445}	21.7	22628 {2309}	30.3	31928 {3258}	48.2	50842 {5188}	71.6	76479 {7804}
	150	1750	22.0	15553 {1587}	35.7	24843 {2535}	53.4	37652 {3842}	80.1	56468 {5762}	118.3	84525 {8625}
		1450	18.5	15719 {1604}	29.9	25108 {2562}	44.9	38181 {3896}	66.8	56820 {5798}	98.6	85044 {8678}
		1150	14.6	15719 {1604}	23.7	25108 {2562}	35.8	38396 {3918}	53.0	56820 {5798}	78.2	85044 {8678}
		950	12.1	15719 {1604}	19.6	25108 {2562}	29.6	38396 {3918}	43.8	56820 {5798}	64.6	85044 {8678}
	180	1750	17.6	15719 {1604}	28.6	25108 {2562}	43.0	38298 {3908}	63.8	56820 {5798}	95.6	85044 {8678}
		1450	14.6	15719 {1604}	23.7	25108 {2562}	35.7	38396 {3918}	52.9	56820 {5798}	79.2	85044 {8678}
		1150	11.6	15719 {1604}	18.8	25108 {2562}	28.3	38396 {3918}	41.9	56820 {5798}	62.8	85044 {8678}
		950	9.57	15719 {1604}	15.5	25108 {2562}	23.4	38396 {3918}	34.6	56820 {5798}	51.9	85044 {8678}
	230	1750	14.0	15719 {1604}	22.7	25108 {2562}	34.3	38396 {3918}	50.7	56820 {5798}	76.0	85044 {8678}
		1450	11.6	15719 {1604}	18.8	25108 {2562}	28.4	38396 {3918}	42.0	56820 {5798}	63.0	85044 {8678}
		1150	9.21	15719 {1604}	14.9	25108 {2562}	22.5	38396 {3918}	33.3	56820 {5798}	49.9	85044 {8678}
		950	7.61	15719 {1604}	12.3	25108 {2562}	18.6	38396 {3918}	27.5	56820 {5798}	41.2	85044 {8678}
	280	1750	11.5	15719 {1604}	18.7	25108 {2562}	28.2	38396 {3918}	41.7	56820 {5798}	61.8	85044 {8678}
		1450	9.55	15719 {1604}	15.5	25108 {2562}	23.4	38396 {3918}	34.6	56820 {5798}	51.2	85044 {8678}
		1150	7.58	15719 {1604}	12.3	25108 {2562}	18.5	38396 {3918}	27.4	56820 {5798}	40.6	85044 {8678}
		950	6.26	15719 {1604}	10.2	25108 {2562}	15.3	38396 {3918}	22.6	56820 {5798}	33.6	85044 {8678}
	350	1750	9.43	15719 {1604}	15.3	25108 {2562}	23.1	38396 {3918}	34.1	56820 {5798}	50.6	85044 {8678}
		1450	7.82	15719 {1604}	12.7	25108 {2562}	19.1	38396 {3918}	28.3	56820 {5798}	41.9	85044 {8678}
		1150	6.20	15719 {1604}	10.1	25108 {2562}	15.2	38396 {3918}	22.4	56820 {5798}	33.2	85044 {8678}
		950	5.12	15719 {1604}	8.30	25108 {2562}	12.5	38396 {3918}	18.5	56820 {5798}	27.5	85044 {8678}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Thermal rating kW **Mounting code 2, 3**

Nominal reduction ratio		Input speed r/min	Size 000	010	020	030	040	050	060	070	080	090
2-stage	12 to 18	1750	15 (24)	19 (30)	25 (40)	33 (53)	43 (69)	63 (105)	82 (135)	—	—	—
		1450	14 (22)	18 (27)	24 (36)	32 (49)	42 (63)	62 (95)	80 (125)			
		1150	14 (19)	17 (24)	23 (33)	32 (44)	41 (58)	60 (86)	78 (115)			
		950	13 (16)	16 (21)	23 (29)	31 (40)	41 (53)	58 (81)	76 (110)			
3-stage	22 to 27	1750	17 (17)	21 (29)	26 (37)	32 (45)	43 (60)	59 (82)	77 (110)	110 (150)	145 (190)	200 (250)
		1450	16 (16)	19 (26)	24 (33)	31 (41)	41 (56)	56 (75)	74 (100)	105 (140)	140 (175)	195 (240)
		1150	14 (14)	17 (22)	23 (29)	29 (37)	40 (51)	53 (69)	70 (90)	100 (130)	135 (160)	190 (225)
		950	13 (13)	16 (20)	21 (26)	27 (34)	38 (47)	50 (63)	67 (86)	95 (120)	130 (150)	185 (210)
	33 to 50	1750	15 (15)	18 (25)	23 (32)	29 (40)	40 (55)	53 (74)	72 (99)	100 (140)	135 (175)	190 (245)
		1450	14 (14)	16 (22)	21 (28)	27 (36)	38 (51)	50 (68)	68 (90)	95 (130)	130 (160)	185 (230)
		1150	12 (12)	14 (19)	19 (25)	25 (33)	36 (47)	48 (62)	65 (86)	90 (120)	125 (150)	180 (215)
		950	11 (11)	14 (17)	18 (23)	23 (29)	34 (43)	45 (56)	61 (77)	86 (110)	120 (140)	175 (205)
	60 to 95	1750	14 (14)	16 (23)	20 (28)	25 (35)	34 (48)	47 (66)	65 (90)	90 (125)	120 (155)	170 (220)
		1450	13 (13)	14 (19)	18 (24)	24 (33)	32 (44)	45 (61)	61 (83)	86 (115)	115 (140)	165 (205)
		1150	12 (12)	14 (18)	17 (22)	23 (29)	31 (40)	43 (56)	58 (75)	81 (110)	110 (130)	160 (195)
		950	10 (10)	13 (16)	16 (20)	22 (27)	30 (37)	41 (52)	54 (68)	77 (95)	105 (120)	155 (180)
4-stage	120 to 350	1750	—	On right-angle 4-stage reducers, the thermal capacity rating kW is much higher than the transfer capacity, so for ambient temperatures up to 50°C, select based on transfer capacity.								
		1450										
		1150										
		950										

1. These thermal ratings are for continuous operation at ambient temperatures of 20ºC or less. For higher ambient temperatures, refer to the compensation factor table on page 16.
2. Figures in ( ) represent the thermal rating when a cooling fan is used and must be specified when ordering. Refer to page 62 for dimensions that include the cooling fan.

1. Allowable loads on shafts

1–1. Allowable Radial Load on Input Shaft

N{kgf}

Nominal reduction ratio \ Size		000	010	020	030	040	050	060	070	080	090
2-stage	12	1078{110}	980{100}	1078{110}	980{100}	2058{210}	2548{260}	5586{570}	–	–	–
	15	1666{170}	1274{130}	1764{180}	1372{140}	2058{210}	2548{260}	5586{570}	–	–	–
	18	1666{170}	1764{180}	2058{210}	2450{250}	2842{290}	2548{260}	5586{570}	–	–	–
3-stage	22 to 27	1470{150}	1274{130}	980{100}	1274{130}	1274{130}	1764{180}	1764{180}	3234{330}	3528{360}	3920{400}
	33 to 95	2156{220}	2156{220}	1960{200}	2058{210}	2352{240}	4508{460}	7350{750}	7840{800}	5390{550}	3920{400}
4-stage	120 to 350	–	2548{260}	2156{220}	2156{220}	1960{200}	2058{210}	2352{240}	4508{460}	7350{750}	7350{750}

1–2. Allowable Radial Load on Output Shaft

N{kgf}

Nominal reduction ratio \ Size		000	010	020	030	040	050	060	070	080	090
2-stage	12 to 18	10878{1110}	14798{1510}	15386{1570}	20580{2100}	29988{3060}	42140{4300}	5880{6000}	–	–	–
3-stage	22 to 27	12054{1230}	17346{1770}	23912{2440}	29204{2980}	35574{3630}	43708{4460}	61740{6300}	65268{6660}	92120{9400}	140140{14300}
	33 to 50	13622{1390}	19992{2040}	24206{2470}	30870{3150}	37240{3800}	45864{4680}	64680{6600}	66934{6830}	92904{9480}	142100{14500}
	60 to 95	17542{1790}	22540{2300}	27048{2760}	31850{3250}	42728{4360}	52430{5350}	73990{7550}	85064{8680}	120540{12300}	142100{14500}
4-stage	120 to 350	–	22540{2300}	27048{2760}	31850{3250}	42728{4360}	52430{5350}	73990{7550}	85064{8680}	120540{12300}	142100{14500}

1–3. Allowable Axial Load on Output Shaft

N{kgf}

Nominal reduction ratio \ Size		000	010	020	030	040	050	060	070	080	090
2-stage	12 to 18	10682{1090}	10976{1120}	19502{1990}	17640{1800}	27244{2780}	36064{3680}	4968.6{5070}	–	–	–
3-stage	22 to 27	10976{1120}	8820{900}	18816{1920}	16464{1680}	24500{2500}	35770{3650}	46746{4770}	69776{7120}	61936{6320}	117600{12000}
	33 to 50	10388{1060}	8526{870}	16954{1730}	13426{1370}	21658{2210}	31164{3180}	42336{4320}	63994{6530}	54488{5560}	106820{10900}
	60 to 95	10192{1040}	8232{840}	16562{1690}	12838{1310}	20972{2140}	30282{3090}	41160{4200}	62622{6390}	53018{5410}	104860{10700}
4-stage	120 to 350	–	8232{840}	16562{1690}	12838{1310}	20972{2140}	30282{3090}	41160{4200}	62622{6390}	53018{5410}	104860{10700}

2. Actual reduction ratio

	Nominal reduction ratio \ Size	000	010	020	030	040	050	060	070	080	090
2-stage	12	12.107	12.107	12.107	12.107	12.122	12.122	12.122	—	—	—
	15	15.231	15.231	15.231	15.231	15.250	15.250	15.250	—	—	—
	18	18.615	18.615	18.615	18.615	18.639	18.639	18.639	—	—	—
3-stage	22	22.051	22.051	22.051	22.051	22.079	22.079	22.154	21.861	21.861	21.841
	27	27.742	27.742	27.742	27.742	27.777	27.777	27.871	27.503	27.503	27.477
	33	32.861	32.861	32.861	32.861	32.902	32.902	33.059	32.652	32.652	32.622
	41	41.341	41.341	41.341	41.341	41.393	41.393	41.591	41.079	41.079	41.040
	50	50.527	50.527	50.527	50.527	50.591	50.591	50.833	50.207	50.207	50.160
	60	61.464	61.464	61.464	61.464	61.541	61.541	60.609	61.475	61.475	61.417
	75	77.325	77.325	77.325	77.325	77.423	77.423	76.250	77.339	77.339	77.267
	95	94.509	94.509	94.509	94.509	94.628	94.628	93.194	94.526	94.526	94.437
4-stage	120	—	122.715	122.715	122.496	120.829	119.119	117.315	118.544	118.544	120.055
	150	—	148.337	148.337	148.072	148.259	146.161	143.946	146.003	146.003	147.959
	180	—	184.722	184.722	184.391	184.624	184.624	181.827	184.424	184.424	184.251
	230	—	231.976	231.976	231.976	232.269	232.269	228.750	232.018	232.018	231.800
	280	—	285.138	285.138	285.138	285.498	282.367	278.088	282.061	282.061	284.921
	350	—	350.939	350.939	348.501	348.942	345.115	339.886	344.741	344.741	348.237

Note) Contact us for reduction ratios below 1/10, or greater than 1/350.

Right Angle Shaft Dimensions HDR0002 to 0502 (2-stage reduction)

Input shaft direction A□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0002	378	180	247	264	125	163	65	150	514	374	140	220	122	210	20	140	20	32	65	10×8×50	14
0102	446	200	287	308	145	193	75	162	591	426	165	263	143	246	22	156	22	38	75	10×8×60	18
0202	495	220	325	340	165	223	93	182	660	475	185	293	163	286	22	172	24	45	90	14×9×75	18
0302	555	250	365	404	185	249	99	206	763	558	205	329	180	318	26	198	26	50	100	14×9×80	22
0402	624	280	415	452	210	284	115	230	857	627	230	369	200	360	30	220	30	55	110	16×10×90	26
0502	726	310	465	525	235	356	145	260	1019	759	260	441	230	410	30	240	35	65	130	18×11×110	26

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Input shaft direction B□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0002	378	180	247	392	125	163	65	150	107	246	140	220	122	210	20	140	20	32	65	10×8×50	14
0102	446	200	287	445	145	193	75	162	126	289	165	263	143	246	22	156	22	38	75	10×8×60	18
0202	495	220	325	495	165	223	93	182	145	320	185	293	163	286	22	172	24	45	90	14×9×75	18
0302	555	250	365	579	185	249	99	206	164	383	205	329	180	318	26	198	26	50	100	14×9×80	22
0402	624	280	415	645	210	284	115	230	192	434	230	369	200	360	30	220	30	55	110	16×10×90	26
0502	726	310	465	768	235	356	145	260	226	516	260	441	230	410	30	240	35	65	130	18×11×110	26

Size	Hollow shaft						Solid shaft								Hollow Power-Lock				
	φW1	XW1	XH1	φY1	M1	Mass kg	φW2	X2	XW2	XH2	Y2	Key	M2	Mass kg	φW3	Y3	φY3	M3	Mass kg
0002	55	16	59.3	75	204	65	65	110	18	69	212	18×11×90	302	70	55	173	140	275	70
0102	65	18	69.4	85	210	95	75	130	20	79.5	235	20×12×110	335	105	65	190	145	295	105
0202	75	20	79.9	100	236	130	85	150	22	90	268	22×14×130	378	140	75	203	170	321	140
0302	85	22	90.4	120	272	190	95	170	25	100	306	25×14×145	431	210	85	262	205	398	205
0402	95	25	100.4	130	294	255	110	190	28	116	337	28×16×160	477	280	95	283	230	430	280
0502	110	28	116.4	150	336	380	125	220	32	132	388	32×18×180	543	420	110	317	250	485	420

Right Angle Shaft Dimensions HDR0602 (2-stage reduction)

Mounting code 1

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Mounting codes 2 and 3

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Right Angle Shaft Dimensions HDR0003 to 0503 (3-stage reduction)

Input shaft direction A□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0003	444	180	247	262	125	229	65	150	563	423	140	286	122	210	20	140	20	28	55	8×7×45	14
0103	508	200	287	302	145	255	75	162	643	478	165	325	143	246	22	156	22	32	65	10×8×50	18
0203	575	220	325	338	165	303	93	182	722	537	185	373	163	286	22	172	24	38	75	10×8×60	18
0303	642	250	365	381	185	336	99	206	806	601	205	416	180	318	26	198	26	45	90	14×9×75	22
0403	735	280	415	434	210	395	115	230	942	712	230	480	200	360	30	220	30	50	100	14×9×80	26
0503	831	310	465	484	235	461	145	260	1066	806	260	546	230	410	30	240	35	55	110	16×10×90	26

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Input shaft direction B□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0003	444	180	247	367	125	229	65	150	181	312	140	286	122	210	20	140	20	28	55	8×7×45	14
0103	508	200	287	412	145	255	75	162	211	351	165	325	143	246	22	156	22	32	65	10×8×50	18
0203	575	220	325	465	165	303	93	182	237	401	185	373	163	286	22	172	24	38	75	10×8×60	18
0303	642	250	365	515	185	336	99	206	271	467	205	416	180	318	26	198	26	45	90	14×9×75	22
0403	735	280	415	604	210	395	115	230	318	537	230	480	200	360	30	220	30	50	100	14×9×80	26
0503	831	310	465	670	235	461	145	260	371	613	260	546	230	410	30	240	35	55	110	16×10×90	26

Size	Hollow shaft						Solid shaft								Hollow Power-Lock				
	φW1	XW1	XH1	φY1	M1	Mass kg	φW2	X2	XW2	XH2	Y2	Key	M2	Mass kg	φW3	Y3	φY3	M3	Mass kg
0003	55	16	59.3	75	204	70	65	110	18	69	212	18×11×90	302	75	55	173	140	275	75
0103	65	18	69.4	85	210	100	75	130	20	79.5	235	20×12×110	335	110	65	190	145	295	110
0203	75	20	79.9	100	236	135	85	150	22	90	268	22×14×130	378	145	75	203	170	321	145
0303	85	22	90.4	120	272	195	95	170	25	100	306	25×14×145	431	215	85	262	205	398	210
0403	95	25	100.4	130	294	280	110	190	28	116	337	28×16×160	477	310	95	283	230	430	305
0503	110	28	116.4	150	336	410	125	220	32	132	388	32×18×180	543	450	110	317	250	485	450

Right Angle Shaft Dimensions HDR0603 to 0903 (3-stage reduction)

Input shaft direction A□ (Mounting code 1)

mm

Size	A	B	C	D	F	G	GA	H	I	J	K	L	LB	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0603	931	400	502	550	260	601	—	180	330	1272	967	305	255	636	215	202	320	40	65	130	18×11×110	33
0703	1050	440	568	613	295	660	—	190	364	1477	1132	345	290	725	245	225	350	45	75	150	20×12×130	39
0803	1180	490	639	663	335	740	260	220	404	1606	1221	385	330	806	286	250	390	50	75	150	20×12×130	39
0903	1350	570	720	792	400	833	283	267	484	1804	1344	460	392	938	352	280	470	50	75	150	20×12×130	39

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Input shaft direction B□ (Mounting code 1)

mm

Size	A	B	C	D	F	G	GA	H	I	J	K	L	LB	N	P	Q	S	T	Input shaft			Z
																			ϕU	V	Key	
0603	931	400	502	793	260	601	—	180	330	434	724	305	255	636	215	202	320	40	65	130	18×11×110	33
0703	1050	440	568	925	295	660	—	190	364	497	815	345	290	725	245	225	350	45	75	150	20×12×130	39
0803	1180	490	639	980	335	740	260	220	404	576	904	385	330	806	286	250	390	50	75	150	20×12×130	39
0903	1350	570	720	1065	400	833	283	267	484	679	1027	460	392	938	352	280	470	50	75	150	20×12×130	39

Size	Hollow shaft						Solid shaft								Hollow Power-Lock				
	ϕW1	XW1	XH1	ϕY1	M1	Mass kg	ϕW2	X2	XW2	XH2	Y2	Key	M2	Mass kg	ϕW3	Y3	ϕY3	M3	Mass kg
0603	125	32	132.4	170	396	670	140	250	36	148	455	36×20×210	655	730	125	366	290	564	730
0703	140	36	148.4	180	432	950	170	280	40	179	505	40×22×240	725	1040	140	394	305	610	1020
0803	170	40	179.4	220	480	1380	200	340	45	210	590	45×25×300	835	1540	170	420	350	660	1470
0903	200	45	210.4	260	630	2070	240	400	56	252	720	56×32×350	1005	2350	200	495	405	810	2190

Right Angle Shaft Dimensions HDR0603 to 0903 (3-stage reduction)

Input shaft direction A□ (mounting codes 2 and 3)

mm

Size	A	B	C	D	F	G	H	J	K	L	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0603	931	400	484	510	255	676	255	1272	967	305	636	215	404	320	40	65	130	18×11×110	33
0703	1060	440	546	580	290	770	290	1477	1132	345	725	245	450	350	45	75	150	20×12×130	39
0803	1180	490	608	660	330	850	330	1606	1221	385	806	286	500	390	50	75	150	20×12×130	39
0903	1370	570	640	784	392	978	392	1804	1344	460	938	352	560	470	50	75	150	20×12×130	39

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Input shaft direction B□ (mounting codes 2 and 3)

mm

Size	A	B	C	D	D1	F	F1	G	H	J	K	L	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0603	931	400	484	510	788	290	533	676	255	434	724	305	636	215	404	320	40	65	130	18×11×110	33
0703	1060	440	546	580	920	318	630	770	290	497	815	345	725	245	450	350	45	75	150	20×12×130	39
0803	1180	490	608	660	973	328	645	850	330	576	904	385	806	286	500	390	50	75	150	20×12×130	39
0903	1370	570	640	784	1057	348	665	978	392	679	1027	460	938	352	560	470	50	75	150	20×12×130	39

Size	Hollow shaft						Solid shaft								Hollow Power-Lock				
	φW1	XW1	XH1	φY1	M1	Mass kg	φW2	X2	XW2	XH2	Y2	Key	M2	Mass kg	φW3	Y3	φY3	M3	Mass kg
0603	125	32	132.4	170	396	670	140	250	36	148	455	36×20×210	655	730	125	366	290	564	730
0703	140	36	148.4	180	432	950	170	280	40	179	505	40×22×240	725	1040	140	394	305	610	1020
0803	170	40	179.4	220	480	1380	200	340	45	210	590	45×25×300	835	1540	170	420	350	660	1470
0903	200	45	210.4	260	630	2070	240	400	56	252	720	56×32×350	1005	2350	200	495	405	810	2190

Right Angle Shaft Dimensions HDR0104 to 0504 (4-stage reduction)

Input shaft direction A□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	Z
0104	508	200	287	302	145	255	75	162	660	495	165	325	143	246	22	156	22	22	45	6×6×38	18
0204	575	220	325	338	165	303	93	182	738	553	185	373	163	286	22	172	24	28	55	8×7×45	18
0304	642	250	365	381	185	336	99	206	828	623	205	416	180	318	26	198	26	32	65	10×8×50	22
0404	735	280	415	434	210	395	115	230	940	710	230	480	200	360	30	220	30	38	75	10×8×60	26
0504	831	310	465	484	235	461	145	260	1068	808	260	546	230	410	30	240	35	45	90	14×9×75	26

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Size	Hollow shaft φW1	XW1	XH1	φY1	M1	Mass kg	Solid shaft φW2	X2	XW2	XH2	Y2	Key	M2	Mass kg	Hollow Power-Lock φW3	Y3	φY3	M3	Mass kg
0104	65	18	69.4	85	210	100	75	130	20	79.5	235	20×12×110	335	110	65	190	145	295	110
0204	75	20	79.9	100	236	140	85	150	22	90	268	22×14×130	378	150	75	203	170	321	150
0304	85	22	90.4	120	272	200	95	170	25	100	306	25×14×145	431	220	85	262	205	398	215
0404	95	25	100.4	130	294	300	110	190	28	116	337	28×16×160	477	330	95	283	230	430	325
0504	110	28	116.4	150	336	440	125	220	32	132	388	32×18×180	543	480	110	317	250	485	480
0604	125	32	132.4	170	396	700	140	250	36	148	455	36×20×210	655	760	125	366	290	564	760
0704	140	36	148.4	180	432	1000	170	280	40	179	505	40×22×240	725	1090	140	394	305	610	1070
0804	170	40	179.4	220	480	1450	200	340	45	210	590	45×25×300	835	1610	170	420	350	660	1540
0904	200	45	210.4	260	630	2140	240	400	56	252	720	56×32×350	1005	2420	200	495	405	810	2260

Right Angle Shaft Dimensions HDR0604 to 0904 (4-stage reduction)

Input shaft direction A□ (Mounting code 1)

mm

Size	A	B	C	D	F	G	GA	H	I	J	K	L	LB	N	P	Q	S	T	Input shaft ϕU	Input shaft V	Input shaft Key	Z
0604	931	400	502	550	260	601	—	180	330	1259	954	305	255	636	215	202	320	40	50	100	14×9×80	33
0704	1050	440	568	613	295	660	—	190	364	1422	1077	345	290	725	245	225	350	45	55	110	16×10×90	39
0804	1180	490	639	663	335	740	260	220	404	1664	1279	385	330	806	286	250	390	50	65	130	18×11×110	39
0904	1350	570	720	792	400	833	283	267	484	1852	1392	460	392	938	352	280	470	50	65	130	18×11×110	39

Input shaft direction A□ (mounting codes 2 and 3)

mm

Size	A	B	C	D	F	G	H	J	K	L	N	P	Q	S	T	Input shaft ϕU	Input shaft V	Input shaft Key	Z
0604	931	400	484	510	255	676	255	1259	954	305	636	215	404	320	40	50	100	14×9×80	33
0704	1060	440	546	580	290	770	290	1422	1077	345	725	245	450	350	45	55	110	16×10×90	39
0804	1180	490	608	660	330	850	330	1664	1279	385	806	286	500	390	50	65	130	18×11×110	39
0904	1370	570	640	784	392	978	392	1852	1392	460	938	352	560	470	50	65	130	18×11×110	39

Right Angle Shaft Motor Dimensions HDM0002 to 0602 (2-stage reduction)

Motor dimensions and specifications are subject to change. Contact us for updated information.

Sizes: 0002 to 0502
(common to all mounting codes)

Input shaft direction A□

Input shaft direction B□

Sizes: 0602
(Mounting code 1)

Input shaft direction A□

Input shaft direction B□

mm

kW	Motor dimensions										Reducer dimensions													
	Flange diameter	Shaft diameter	Without brake				With brake				A□Type Dimension K							B□Type Dimension E						
	φMD	φMS	φMA	φMB	KL	Mass kg	φMA	φMB	KL	Mass kg	0002	0102	0202	0302	0402	0502	0602	0002	0102	0202	0302	0402	0502	0602
2.2	250	28	290	198	143	29	354	196	143	39	315	361	—	—	—	—	—	333	380	—	—	—	—	—
3.7	250	28	290	198	143	41	354	196	143	54	315	361	—	—	—	—	—	333	380	—	—	—	—	—
5.5	300	38	350	220	148	57	455	249	188	106	315	361	395	—	—	—	—	333	380	415	—	—	—	—
7.5	300	38	387	264	182	56	—	—	—	—	315	361	395	—	—	—	—	333	380	415	—	—	—	—
11	350	42	495	316	242	80	—	—	—	—	341	371	407	474	523	—	—	359	390	427	495	541	—	—
15	350	42	495	316	242	97	—	—	—	—	341	371	407	474	523	—	—	359	390	427	495	541	—	—
18.5	400	48	495	316	275	113	—	—	—	—	—	—	407	474	523	641	699	—	—	427	495	541	650	695
22	400	48	510	316	275	135	—	—	—	—	—	—	407	474	523	641	699	—	—	427	495	541	650	695
30	400	55	593	350	290	170	—	—	—	—	—	—	—	474	523	641	699	—	—	—	495	541	650	695
37	450	60	619	390	305	210	—	—	—	—	—	—	—	—	523	641	699	—	—	—	—	541	650	695

Output shaft	Hollow shaft							Solid shaft							Hollow Power-Lock						
Reducer	0002	0102	0202	0302	0402	0502	0602	0002	0102	0202	0302	0402	0502	0602	0002	0102	0202	0302	0402	0502	0602
mass kg	75	110	150	215	285	420	670	80	120	160	235	310	460	730	80	120	160	230	310	460	730

Right Angle Shaft Motor Dimensions HDM0003 to 0803 (3-stage reduction)

Motor dimensions and specifications are subject to change. Contact us for updated information.

Sizes: 0003 to 0503
(common to all mounting codes)

Input shaft direction A□

Input shaft direction B□

Sizes: 0603 to 0803
(Mounting code 1)

Input shaft direction A□

Input shaft direction B□

mm

kW	Motor dimensions										Reducer dimensions																	
	Flange diameter	Shaft diameter	Without brake				With brake				A□Type Dimension K									B□Type Dimension E								
	φMD	φMS	φMA	φMB	KL	Mass kg	φMA	φMB	KL	Mass kg	0003	0103	0203	0303	0403	0503	0603	0703	0803	0003	0103	0203	0303	0403	0503	0603	0703	0803
2.2	250	28	290	198	143	29	354	196	143	39	376	419	472	—	—	—	—	—	—	320	353	400	—	—	—	—	—	—
3.7	250	28	290	198	143	41	354	196	143	54	376	419	472	—	—	—	—	—	—	320	353	400	—	—	—	—	—	—
5.5	300	38	350	220	148	57	455	249	188	106	376	419	472	521	—	—	—	—	—	320	353	400	435	—	—	—	—	—
7.5	300	38	387	264	182	56	—	—	—	—	376	419	472	521	—	—	—	—	—	320	353	400	435	—	—	—	—	—
11	350	42	495	316	242	80	—	—	—	—	—	445	482	533	628	702	—	—	—	—	379	410	447	520	566	—	—	—
15	350	42	495	316	242	97	—	—	—	—	—	445	482	533	628	702	—	—	—	—	379	410	447	520	566	—	—	—
18.5	400	48	495	316	275	113	—	—	—	—	—	—	—	533	628	702	849	—	—	—	—	—	447	520	566	675	—	—
22	400	48	510	316	275	135	—	—	—	—	—	—	—	533	628	702	849	—	—	—	—	—	447	520	566	675	—	—
30	400	55	593	350	290	170	—	—	—	—	—	—	—	—	628	702	849	997	1086	—	—	—	—	520	566	675	795	845
37	450	60	619	390	305	210	—	—	—	—	—	—	—	—	—	702	849	997	1086	—	—	—	—	—	566	675	795	845

Output shaft	Hollow shaft									Solid shaft									Hollow Power-Lock								
Reducer	0003	0103	0203	0303	0403	0503	0603	0703	0803	0003	0103	0203	0303	0403	0503	0603	0703	0803	0003	0103	0203	0303	0403	0503	0603	0703	0803
mass kg	80	110	150	215	305	440	710	990	1430	85	120	160	235	335	480	770	1080	1590	85	120	160	230	330	480	770	1060	1520

Right Angle Shaft Motor Dimensions HDM0104 to 0804 (4-stage reduction)

Motor dimensions and specifications are subject to change. Contact us for updated information.

Sizes: 0104 to 0504
(common to all mounting codes)

Input shaft direction A□

Sizes: 0604 to 0804
(Mounting code 1)

Input shaft direction A□

mm

kW	Motor dimensions										Reducer dimensions							
	Flange diameter φMD	Shaft diameter φMS	Without brake				With brake				A□Type Dimension K							
			φMA	φMB	KL	Mass kg	φMA	φMB	KL	Mass kg	0104	0204	0304	0404	0504	0604	0704	0804
2.2	250	28	290	198	143	29	354	196	143	39	456	506	564	—	—	—	—	—
3.7	250	28	290	198	143	41	354	196	143	54	456	506	564	—	—	—	—	—
5.5	300	38	350	220	148	57	455	249	188	106	466	506	564	645	729	—	—	—
7.5	300	38	387	264	182	56	—	—	—	—	466	506	564	645	729	—	—	—
11	350	42	495	316	242	80	—	—	—	—	—	—	590	655	741	871	974	—
15	350	42	495	316	242	97	—	—	—	—	—	—	590	655	741	871	974	—
18.5	400	48	495	316	275	113	—	—	—	—	—	—	—	655	741	871	974	1161
22	400	48	510	316	275	135	—	—	—	—	—	—	—	655	741	871	974	1161
30	400	55	593	350	290	170	—	—	—	—	—	—	—	—	741	871	974	1161
37	450	60	619	390	305	210	—	—	—	—	—	—	—	—	—	871	974	1161

Output shaft	Hollow shaft								Solid shaft								Hollow Power-Lock							
Reducer	0104	0204	0304	0404	0504	0604	0704	0804	0104	0204	0304	0404	0504	0604	0704	0804	0104	0204	0304	0404	0504	0604	0704	0804
mass kg	105	145	210	320	460	730	1040	1490	115	155	230	350	500	790	1130	1650	115	155	225	345	560	790	1110	1580

Parallel Shaft Type

CONTENTS

Sizing Table P45, 46

Transfer Capacity Table ..... P47 to 50

- 2-stage
- 3-stage
- Thermal rating
- Allowable loads on shafts
- Actual reduction ratio

Dimension Drawings ..... P51 to 56

- 2-stage (hollow, solid, Power-Lock output shafts)
- 3-stage (hollow, solid, Power-Lock output shafts)

Sizes for input speed of 1750 r/min

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.00	12	—	—	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	060	060	060	070	070
	15	—	—	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	060	070	070	070	070
	20	—	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	060	070	070	080	080	080	080
	25	—	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	060	070	070	080	080	080	090
	22	—	—	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	070	080	080	080	090
	27	—	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	—
	33	—	—	—	010	010	020	020	020	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090
	41	—	—	—	010	010	020	030	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	—
	50	—	—	010	010	020	030	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—
	60	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	75	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	95	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
Sf=1.25	12	—	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	060	060	070	070	070	080
	15	—	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	070	070	070	070	070	080
	20	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	060	070	080	080	080	080	090	090
	25	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	090
	22	—	—	—	—	010	010	030	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	—
	27	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	070	080	090	090	090	—	—
	33	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	070	080	080	090	090	090	—
	41	—	—	010	010	020	030	030	030	040	050	050	050	060	070	070	070	070	080	090	090	090	—	—
	50	—	—	010	010	020	030	030	040	050	050	050	060	070	070	070	080	080	090	090	—	—	—	—
	60	—	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	75	010	010	020	020	030	040	040	050	050	060	060	070	080	080	080	090	090	—	—	—	—	—	—
	95	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
Sf=1.50	12	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	060	070	070	070	070	080	080
	15	—	—	—	—	—	010	010	020	030	030	040	040	050	050	050	060	060	070	070	070	080	080	090
	20	—	—	—	010	010	020	030	030	040	040	050	050	060	060	060	070	070	080	080	080	090	090	090
	25	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	070	080	080	090	090	090	—
	22	—	—	—	010	010	030	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—
	27	—	—	—	010	010	030	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	33	—	—	010	010	020	030	030	030	040	050	050	050	060	060	070	080	080	090	090	090	—	—	—
	41	—	—	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	—	—	—	—
	50	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—
	60	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	75	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	95	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
Sf=1.75	12	—	—	—	—	010	010	020	020	030	040	040	040	050	050	060	060	060	070	070	080	080	080	080
	15	—	—	—	—	010	010	020	020	030	040	040	040	050	050	060	060	070	070	070	080	080	090	090
	20	—	—	010	010	020	020	030	030	040	050	050	050	060	060	070	070	080	080	090	090	090	090	—
	25	—	—	010	010	020	020	030	030	040	050	050	050	060	060	070	070	080	090	090	090	090	—	—
	22	—	—	—	010	010	030	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	27	—	—	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	33	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	41	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	50	—	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	60	010	010	020	030	030	040	050	050	050	060	060	070	080	080	090	090	—	—	—	—	—	—	—
	75	010	010	020	030	040	050	050	050	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	95	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
Sf=2.00	12	—	—	—	—	010	010	020	020	030	040	040	050	050	050	060	060	070	070	080	080	080	090	090
	15	—	—	—	—	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	080	090	090	090
	20	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	090	—	—
	25	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	22	—	—	010	010	020	030	030	040	050	050	050	060	070	070	070	080	080	090	—	—	—	—	—
	27	—	—	010	010	030	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—
	33	—	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	41	—	010	010	020	030	030	040	040	050	050	060	060	070	080	080	090	090	—	—	—	—	—	—
	50	010	010	020	030	030	040	050	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—
	60	010	010	020	030	040	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—
	75	010	020	030	030	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—
	95	010	020	030	040	050	050	060	060	060	070	080	080	090	—	—	—	—	—	—	—	—	—	—

Sizes for input speed of 1450 r/min

Service factor	Reduction ratio	Motor kW																						
		2.2	3.7	5.5	7.5	11	15	19	22	30	37	45	55	75	90	110	132	160	200	220	250	280	315	355
Sf=1.00	12	—	—	—	—	—	—	010	010	020	020	030	040	040	050	050	050	050	060	060	060	070	070	070
	15	—	—	—	—	—	—	010	010	020	020	030	040	040	050	050	050	060	060	070	070	070	070	080
	20	—	—	—	010	010	020	020	020	030	040	040	040	050	060	060	060	070	070	080	080	080	080	090
	25	—	—	—	010	010	020	020	020	030	040	040	040	050	060	060	060	070	070	080	080	080	090	090
	22	—	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	080	090	090
	27	—	—	—	010	010	020	030	030	030	040	050	050	060	060	070	070	070	080	080	090	090	—	—
	33	—	—	—	010	010	020	030	030	030	040	040	050	060	060	060	070	070	080	080	080	090	090	090
	41	—	—	010	010	020	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—
	50	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	60	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	75	—	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	95	010	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
Sf=1.25	12	—	—	—	—	—	—	010	010	020	030	040	040	050	050	050	060	060	060	070	070	070	080	080
	15	—	—	—	—	—	010	010	020	020	030	040	050	050	050	050	060	060	070	070	070	070	080	080
	20	—	—	—	010	010	020	030	030	040	040	050	050	060	060	060	070	070	080	080	080	090	090	090
	25	—	—	—	010	010	020	030	030	040	040	050	050	060	060	060	070	070	080	080	090	090	090	—
	22	—	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	080	090	090	—	—
	27	—	—	—	010	010	030	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	33	—	—	010	010	020	030	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—
	41	—	—	010	010	020	030	030	040	040	050	050	060	070	070	070	080	080	090	090	—	—	—	—
	50	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	60	—	010	010	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	75	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	95	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	
Sf=1.50	12	—	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	060	070	070	070	080	080	080
	15	—	—	—	—	010	010	020	020	030	030	040	040	050	050	060	060	070	070	070	080	080	090	090
	20	—	—	010	010	020	030	030	030	040	050	050	050	060	060	070	070	080	080	090	090	090	090	—
	25	—	—	010	010	020	030	030	030	040	050	050	050	060	060	070	070	080	090	090	090	090	—	—
	22	—	—	—	010	010	030	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	27	—	—	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	33	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	41	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	50	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	60	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	75	010	020	020	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—
	95	010	020	030	030	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—	—	—
Sf=1.75	12	—	—	—	—	010	010	020	020	030	040	040	050	050	050	060	060	070	070	080	080	080	080	090
	15	—	—	—	—	010	010	020	020	030	040	040	050	050	060	060	070	070	070	080	080	090	090	090
	20	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	090	—	—	—
	25	—	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—
	22	—	—	010	010	020	030	030	040	050	050	050	060	070	070	070	080	080	090	—	—	—	—	—
	27	—	—	010	010	030	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—
	33	—	010	010	020	030	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	41	—	010	010	020	030	040	040	040	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—
	50	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—	—	—
	60	010	010	020	030	040	050	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—
	75	010	020	020	030	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—	—	—	—
	95	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
Sf=2.00	12	—	—	—	010	010	020	020	030	040	040	050	050	050	060	060	070	070	080	080	080	090	090	090
	15	—	—	—	010	010	020	020	030	040	040	050	050	060	060	070	070	070	080	080	090	090	090	—
	20	—	010	010	020	020	030	040	040	050	050	050	060	060	070	080	080	080	090	090	—	—	—	—
	25	—	010	010	020	020	030	040	040	050	050	060	060	070	070	080	080	090	090	—	—	—	—	—
	22	—	—	010	010	030	030	040	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—
	27	—	010	010	020	030	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—
	33	—	010	010	020	030	030	040	040	050	060	060	060	070	080	080	090	090	—	—	—	—	—	—
	41	010	010	020	020	030	040	040	050	050	060	060	060	070	080	090	090	—	—	—	—	—	—	—
	50	010	010	020	030	030	040	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—
	60	010	020	030	030	040	050	050	060	060	070	070	080	090	090	—	—	—	—	—	—	—	—	—
	75	010	020	030	040	050	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—
	95	020	030	030	040	050	060	060	070	070	080	080	090	—	—	—	—	—	—	—	—	—	—	—

Transfer Capacity Table 2-stage and 3-stage Reduction (Reduction ratio 1/12 to 1/95)

Size			010		020		030		040		050	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
2-stage	12	1750	32.8	1921 {196}	44.2	2586 {264}	61.3	3586 {366}	98.6	5690 {581}	187	10792 {1101}
		1450	27.9	1970 {201}	38.7	2733 {279}	53.8	3799 {388}	86.5	6025 {615}	162	11283 {1151}
		1150	22.8	2030 {207}	32.9	2929 {299}	45.7	4069 {415}	73.5	6455 {659}	132	11592 {1183}
		950	19.3	2078 {212}	28.8	3104 {317}	40.0	4311 {440}	64.3	6836 {698}	112	11906 {1215}
	15	1750	31.8	2250 {230}	44.2	3126 {319}	61.3	4335 {442}	98.6	6982 {712}	170	12038 {1228}
		1450	26.8	2284 {233}	38.7	3303 {337}	53.8	4592 {469}	86.5	7392 {754}	149	12734 {1299}
		1150	21.6	2325 {237}	32.9	3544 {362}	45.7	4918 {502}	73.5	7920 {808}	126	13577 {1385}
		950	18.1	2357 {240}	27.6	3594 {367}	40.0	5211 {532}	64.3	8387 {856}	106	13787 {1407}
	20	1750	17.3	1890 {193}	26.4	2892 {295}	39.9	4366 {446}	62.8	6779 {692}	102	11010 {1123}
		1450	14.6	1932 {197}	22.4	2960 {302}	35.0	4623 {472}	55.0	7165 {731}	86.7	11295 {1153}
		1150	11.9	1985 {203}	18.3	3041 {310}	29.8	4962 {506}	45.6	7489 {764}	70.9	11646 {1188}
		950	10.1	2026 {207}	15.4	3104 {317}	26.0	5241 {535}	38.5	7661 {782}	60.0	11930 {1217}
	25	1750	17.3	2284 {233}	26.4	3496 {357}	39.9	5278 {539}	62.8	8318 {849}	102	13510 {1379}
		1450	14.6	2336 {238}	22.4	3578 {365}	35.0	5588 {570}	55.0	8792 {897}	86.7	13859 {1414}
		1150	11.9	2399 {245}	18.3	3676 {375}	29.8	5999 {612}	45.6	9189 {938}	70.7	14249 {1454}
		950	10.1	2449 {250}	15.4	3753 {383}	26.0	6328 {646}	38.5	9398 {959}	59.2	14444 {1474}
3-stage	22	1750	21.1	2334 {238}	22.3	2473 {252}	40.6	4503 {459}	57.9	6429 {656}	91.9	10060 {1027}
		1450	17.7	2366 {241}	19.6	2623 {268}	35.6	4765 {486}	50.8	6808 {695}	80.5	10635 {1085}
		1150	14.3	2405 {245}	16.6	2801 {286}	30.3	5113 {522}	43.2	7300 {745}	68.5	11411 {1164}
		950	11.9	2435 {248}	14.5	2962 {302}	26.5	5414 {552}	37.8	7732 {789}	59.9	12079 {1233}
	27	1750	17.2	2371 {242}	19.3	2665 {272}	35.1	4847 {495}	50.1	6928 {707}	76.6	10592 {1081}
		1450	14.4	2402 {245}	16.9	2817 {287}	30.8	5134 {524}	43.9	7326 {748}	67.2	11215 {1144}
		1150	11.6	2440 {249}	14.4	3026 {309}	26.2	5506 {562}	37.3	7849 {801}	57.1	12015 {1226}
		950	9.71	2470 {252}	12.6	3205 {327}	22.3	5660 {578}	32.6	8304 {847}	50.0	12736 {1300}
	33	1750	14.5	2401 {245}	22.2	3664 {374}	37.4	6181 {631}	55.4	9167 {935}	86.2	14062 {1435}
		1450	12.2	2431 {248}	18.6	3712 {379}	31.4	6255 {638}	46.5	9286 {948}	72.4	14258 {1455}
		1150	9.82	2470 {252}	15.0	3770 {385}	25.3	6355 {648}	37.5	9438 {963}	58.4	14497 {1479}
		950	8.21	2499 {255}	12.5	3818 {390}	21.1	6436 {657}	31.4	9559 {975}	48.9	14688 {1499}
	41	1750	11.8	2437 {249}	18.1	3719 {379}	30.5	6277 {640}	45.2	9314 {950}	69.4	14300 {1459}
		1450	9.93	2466 {252}	15.2	3765 {384}	25.6	6348 {648}	39.7	9873 {1007}	58.3	14499 {1479}
		1150	8.00	2505 {256}	12.2	3824 {390}	20.6	6448 {658}	30.6	9579 {977}	47.0	14731 {1503}
		950	6.68	2532 {258}	10.2	3871 {395}	17.2	6528 {666}	25.6	9698 {990}	39.3	14921 {1523}
	50	1750	9.77	2471 {252}	14.9	3772 {385}	25.1	6349 {648}	37.3	9447 {964}	57.9	14504 {1480}
		1450	8.19	2500 {255}	12.5	3816 {389}	21.1	6436 {657}	31.3	9562 {976}	48.6	14696 {1500}
		1150	6.59	2537 {259}	10.1	3872 {395}	17.0	6532 {667}	25.2	9709 {991}	39.2	14928 {1523}
		950	5.51	2568 {262}	8.41	3919 {400}	14.2	6612 {675}	21.1	9826 {1003}	32.8	15112 {1542}
	60	1750	8.09	2501 {255}	12.4	3821 {390}	20.8	6430 {656}	30.9	9564 {976}	48.2	14707 {1501}
		1450	6.79	2533 {258}	10.4	3865 {394}	17.5	6521 {665}	25.9	9690 {989}	40.4	14892 {1520}
		1150	5.46	2568 {262}	8.34	3923 {400}	14.1	6618 {675}	20.9	9834 {1003}	32.6	15123 {1543}
		950	4.56	2597 {265}	6.97	3969 {405}	11.8	6696 {683}	17.5	9955 {1016}	27.2	15305 {1562}
	75	1750	6.59	2537 {259}	10.1	3872 {395}	17.0	6544 {668}	25.2	9713 {991}	38.8	14954 {1526}
		1450	5.52	2564 {262}	8.44	3921 {400}	14.1	6541 {667}	21.1	9824 {1002}	32.5	15122 {1543}
		1150	4.44	2601 {265}	6.79	3977 {406}	11.5	6707 {684}	17.0	9971 {1017}	26.2	15349 {1566}
		950	3.71	2631 {268}	5.67	4021 {410}	9.57	6786 {692}	14.2	10089 {1029}	21.9	15527 {1584}
	95	1750	5.43	2569 {262}	8.29	3922 {400}	14.0	6624 {676}	20.8	9854 {1005}	32.3	15134 {1544}
		1450	4.55	2598 {265}	6.95	3969 {405}	11.7	6693 {683}	17.4	9954 {1016}	27.1	15313 {1563}
		1150	3.66	2635 {269}	5.59	4025 {411}	9.43	6790 {693}	14.0	10093 {1030}	21.8	15536 {1585}
		950	3.05	2658 {271}	4.67	4070 {415}	7.88	6868 {701}	11.7	10210 {1042}	18.2	15717 {1604}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Size			060		070		080		090	
Nominal reduction ratio		Input speed r/min	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque	Input kW	Output torque
			kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}	kW	N·m {kgf·m}
2-stage	12	1750	286	16584 {1692}	430	24534 {2503}	629	35888 {3662}	895	50984 {5202}
		1450	251	17566 {1792}	377	25961 {2649}	552	38011 {3879}	785	53970 {5507}
		1150	213	18795 {1918}	320	27784 {2835}	469	40721 {4155}	667	57820 {5900}
		950	187	19974 {2038}	280	29429 {3003}	410	43092 {4397}	584	61283 {6253}
	15	1750	247	17574 {1793}	399	28039 {2861}	531	37315 {3808}	765	53708 {5480}
		1450	217	18634 {1901}	350	29684 {3029}	465	39437 {4024}	671	56855 {5802}
		1150	184	19922 {2033}	300	32081 {3274}	395	42240 {4310}	570	60896 {6214}
		950	161	21101 {2153}	261	33786 {3448}	346	44789 {4570}	499	64534 {6585}
	20	1750	175	18604 {1898}	244	26211 {2675}	378	40605 {4143}	578	61991 {6326}
		1450	153	19604 {2000}	206	26707 {2725}	327	42394 {4326}	489	63296 {6459}
		1150	124	20043 {2045}	167	27364 {2792}	265	43319 {4420}	397	64793 {6612}
		950	104	20405 {2082}	141	27862 {2843}	223	44127 {4503}	334	65987 {6733}
	25	1750	162	21131 {2156}	244	32282 {3294}	340	44983 {4590}	497	65693 {6703}
		1450	142	22307 {2276}	206	32893 {3356}	298	47583 {4855}	436	69553 {7097}
		1150	114	22708 {2317}	167	33703 {3439}	253	50937 {5198}	370	74422 {7594}
		950	95.9	23043 {2351}	141	34315 {3502}	216	52643 {5372}	323	78646 {8025}
3-stage	22	1750	145	15926 {1625}	220	23845 {2433}	326	35334 {3606}	405	44485 {4539}
		1450	128	16902 {1725}	193	25247 {2576}	285	37282 {3804}	355	47061 {4802}
		1150	108	18118 {1849}	164	27050 {2760}	243	40080 {4090}	302	50479 {5151}
		950	94.8	19181 {1957}	143	28552 {2913}	212	42328 {4319}	264	53417 {5451}
	27	1750	121	16788 {1713}	183	25055 {2557}	272	37240 {3800}	350	47874 {4885}
		1450	106	17800 {1816}	161	26603 {2715}	238	39326 {4013}	307	50680 {5171}
		1150	90.4	19086 {1948}	137	28543 {2913}	202	42085 {4294}	261	54326 {5544}
		950	79.1	20216 {2063}	120	30265 {3088}	177	44640 {4555}	228	57449 {5862}
	33	1750	137	22456 {2291}	213	34483 {3519}	299	48405 {4939}	405	66444 {6780}
		1450	115	22749 {2321}	179	35032 {3575}	262	51191 {5224}	355	70291 {7173}
		1150	92.8	23147 {2362}	145	35647 {3637}	215	52966 {5405}	302	75396 {7693}
		950	77.7	23461 {2394}	121	36144 {3688}	180	53679 {5477}	264	79785 {8141}
	41	1750	110	22775 {2324}	172	35173 {3589}	255	52146 {5321}	350	71505 {7296}
		1450	92.6	23139 {2361}	145	35663 {3639}	214	52815 {5389}	307	75697 {7724}
		1150	74.7	23535 {2402}	117	36253 {3699}	173	53835 {5493}	259	80397 {8204}
		950	62.5	23837 {2432}	97.5	36728 {3748}	145	54621 {5574}	217	81554 {8322}
	50	1750	92.0	23156 {2363}	143	35550 {3628}	213	52952 {5403}	295	74080 {7559}
		1450	77.3	23482 {2396}	121	36154 {3689}	179	53706 {5480}	258	78193 {7979}
		1150	62.3	23862 {2435}	97.2	36771 {3752}	145	54665 {5578}	214	81625 {8329}
		950	52.1	24157 {2465}	81.3	37231 {3799}	121	55411 {5654}	179	82757 {8445}
	60	1750	78.1	23469 {2395}	115	35051 {3577}	176	53644 {5474}	260	80308 {8195}
		1450	65.5	23755 {2424}	97.0	35682 {3641}	148	54553 {5567}	218	81267 {8293}
		1150	52.8	24145 {2464}	78.4	36363 {3711}	120	55426 {5656}	176	82866 {8456}
		950	44.2	24439 {2494}	65.7	36888 {3764}	99.6	55921 {5706}	147	83698 {8541}
	75	1750	62.8	23838 {2432}	93.0	35805 {3654}	142	54670 {5579}	212	81544 {8321}
		1450	52.7	24143 {2464}	78.3	36383 {3713}	119	55434 {5656}	178	82631 {8432}
		1150	42.4	24491 {2499}	63.2	37027 {3778}	95.6	56009 {5715}	143	83760 {8547}
		950	35.5	24801 {2531}	53.0	37588 {3836}	79.5	56382 {5753}	119	84388 {8611}
	95	1750	52.3	24134 {2463}	77.7	36367 {3711}	118	55229 {5636}	175	82738 {8443}
		1450	43.9	24449 {2495}	65.4	36943 {3770}	99.0	55923 {5706}	147	83708 {8542}
		1150	35.3	24788 {2529}	52.8	37606 {3837}	79.2	56409 {5756}	117	84464 {8619}
		950	29.5	25102 {2561}	44.2	38108 {3889}	65.9	56818 {5798}	97.7	85089 {8683}

Note) (1) Keep the input speed at 1750 r/min or less.
(2) If the motor runs between the listed input speeds, calculate using the compensation method.
(3) For motors that run below 950 r/min, use the output torque rated for 950 r/min.

Thermal Rating

■Mounting code 1

Nominal reduction ratio		Input speed r/min	Size								
			010	020	030	040	050	060	070	080	090
2-stage	12~15	1750	35 (53)	48 (72)	58 (87)	75 (110)	100 (150)	130 (195)	180 (270)	240 (335)	330 (460)
		1450	33 (46)	46 (64)	56 (78)	73 (100)	98 (135)	125 (175)	175 (245)	235 (310)	320 (415)
		1150	32 (42)	44 (57)	54 (70)	70 (90)	95 (125)	120 (155)	170 (220)	230 (275)	310 (370)
		950	30 (36)	42 (50)	52 (62)	67 (80)	92 (110)	115 (140)	165 (200)	225 (260)	300 (345)
	20~25	1750	32 (48)	44 (66)	54 (81)	70 (105)	95 (140)	120 (180)	170 (255)	230 (320)	310 (435)
		1450	30 (42)	42 (59)	52 (73)	67 (94)	92 (130)	115 (160)	165 (230)	225 (290)	300 (390)
		1150	28 (36)	40 (52)	50 (65)	65 (85)	90 (115)	110 (145)	160 (210)	220 (260)	290 (350)
		950	27 (32)	39 (47)	49 (59)	63 (76)	88 (105)	105 (125)	155 (185)	215 (245)	280 (320)
3-stage	22~27	1750	23 (30)	33 (43)	40 (52)	51 (66)	70 (91)	86 (110)	130 (170)	165 (205)	230 (290)
		1450	22 (28)	32 (40)	39 (49)	50 (63)	69 (86)	85 (105)	125 (155)	160 (190)	225 (270)
		1150	21 (25)	31 (37)	38 (46)	48 (58)	67 (80)	83 (100)	120 (145)	155 (180)	220 (250)
		950	20 (23)	30 (35)	37 (43)	47 (54)	66 (76)	81 (93)	115 (130)	150 (165)	215 (235)
	33~50	1750	20 (26)	29 (38)	36 (47)	47 (61)	65 (85)	80 (105)	115 (150)	150 (190)	215 (270)
		1450	19 (24)	28 (35)	35 (44)	45 (56)	63 (79)	78 (98)	110 (140)	145 (175)	210 (250)
		1150	18 (22)	27 (32)	33 (40)	44 (53)	61 (73)	76 (91)	105 (125)	140 (160)	205 (235)
		950	17 (20)	26 (30)	32 (37)	42 (48)	60 (69)	75 (86)	100 (115)	135 (150)	200 (220)
	60~95	1750	16 (21)	25 (33)	31 (40)	42 (55)	58 (75)	72 (94)	105 (135)	140 (175)	200 (250)
		1450	15 (19)	24 (30)	29 (36)	40 (50)	55 (69)	69 (86)	100 (125)	135 (160)	190 (225)
		1150	14 (17)	23 (28)	27 (32)	38 (46)	52 (62)	66 (79)	97 (115)	130 (150)	185 (210)
		950	13 (15)	22 (25)	26 (30)	36 (41)	50 (58)	63 (72)	94 (105)	125 (140)	180 (200)

1. These thermal ratings are for continuous operation at ambient temperatures of 20ºC or less. For higher ambient temperatures, refer to the correction factor table on page 16.
2. Figures in ( ) represent the thermal rating when a cooling fan is used and must be specified when ordering. Refer to page 62 for dimensions that include the cooling fan.

■Mounting codes 2 and 3

Nominal reduction ratio		Input speed r/min	Size								
			010	020	030	040	050	060	070	080	090
2-stage	12~15	1750	32 (47)	43 (65)	52 (78)	68 (99)	90 (135)	115 (175)	160 (245)	215 (300)	300 (410)
		1450	30 (42)	41 (58)	50 (71)	66 (90)	88 (120)	110 (160)	155 (220)	210 (280)	290 (370)
		1150	29 (37)	40 (51)	49 (63)	63 (81)	86 (110)	105 (140)	150 (200)	205 (250)	280 (330)
		950	27 (32)	38 (45)	47 (56)	60 (72)	83 (100)	105 (125)	150 (180)	200 (230)	270 (310)
	20~25	1750	29 (43)	40 (59)	49 (73)	63 (95)	86 (125)	110 (160)	155 (230)	205 (290)	280 (390)
		1450	27 (38)	38 (53)	47 (66)	60 (84)	83 (115)	105 (145)	150 (210)	200 (260)	270 (350)
		1150	25 (33)	36 (47)	45 (59)	59 (76)	81 (105)	100 (130)	145 (190)	195 (235)	260 (310)
		950	24 (29)	35 (42)	44 (53)	57 (68)	79 (95)	95 (110)	140 (170)	195 (220)	250 (290)
3-stage	22~27	1750	21 (27)	30 (39)	36 (47)	46 (60)	63 (82)	77 (100)	115 (150)	149 (185)	210 (260)
		1450	20 (25)	29 (36)	35 (44)	45 (56)	62 (78)	77 (95)	110 (140)	144 (170)	205 (245)
		1150	19 (23)	28 (33)	34 (41)	43 (52)	60 (72)	75 (90)	105 (130)	140 (160)	200 (225)
		950	18 (21)	27 (31)	33 (38)	42 (49)	59 (68)	73 (84)	105 (115)	135 (150)	195 (210)
	33~50	1750	18 (23)	26 (34)	32 (42)	42 (55)	59 (76)	72 (95)	105 (135)	135 (170)	195 (245)
		1450	17 (21)	25 (32)	32 (39)	41 (51)	57 (71)	70 (88)	100 (125)	131 (160)	190 (225)
		1150	16 (19)	24 (29)	30 (36)	40 (48)	55 (66)	68 (82)	95 (110)	126 (145)	185 (210)
		950	15 (18)	23 (27)	29 (33)	38 (43)	54 (62)	68 (78)	90 (105)	122 (135)	180 (200)
	60~95	1750	14 (19)	23 (29)	28 (36)	38 (49)	52 (68)	65 (84)	95 (120)	126 (160)	180 (225)
		1450	14 (17)	22 (27)	26 (33)	36 (45)	50 (62)	62 (78)	90 (115)	122 (145)	170 (205)
		1150	13 (15)	21 (25)	24 (29)	34 (41)	47 (56)	59 (71)	87 (105)	117 (135)	165 (190)
		950	12 (13)	20 (23)	23 (27)	32 (37)	45 (52)	57 (65)	85 (95)	113 (125)	160 (180)

1. These thermal ratings are for continuous operation at ambient temperatures of 20ºC or less. For higher ambient temperatures, refer to the correction factor table on page 16.
2. Figures in ( ) represent the thermal rating when a cooling fan is used and must be specified when ordering. Refer to page 62 for dimensions that include the cooling fan.

1. Allowable loads on shafts

1–1. Allowable Radial Load on Input Shaft

N{kgf}

Nominal reduction ratio \ Size		010	020	030	040	050	060	070	080	090
2-stage	12 ~ 25	686{70}	686{70}	686{70}	882{90}	1568{160}	2254{230}	2058{210}	2352{240}	8820{900}
3-stage	22 ~ 27	686{70}	686{70}	686{70}	784{80}	1078{110}	1470{150}	1666{170}	2254{230}	2548{260}
	33 ~ 50	1176{120}	686{70}	882{90}	1274{130}	1176{120}	1470{150}	2548{260}	4606{470}	2548{260}
	60 ~ 95	2842{290}	1666{170}	3626{370}	4312{440}	6174{630}	7938{810}	9996{1020}	12054{1230}	9604{980}

1–2. Allowable Radial Load on Output Shaft

N{kgf}

Nominal reduction ratio \ Size		010	020	030	040	050	060	070	080	090
2-stage	12 ~ 25	14798{1510}	15386{1570}	20580{2100}	29988{3060}	40180{4100}	55860{5700}	60760{6200}	83300{8500}	129360{13200}
3-stage	22 ~ 27	16660{1700}	23912{2440}	29204{2980}	35574{3630}	43708{4460}	61740{6300}	65268{6660}	92120{9400}	140140{14300}
	33 ~ 50	19600{2000}	24206{2470}	30870{3150}	37240{3800}	45864{4680}	64680{6600}	66934{6830}	92904{9480}	142100{14500}
	60 ~ 95	22540{2300}	27048{2760}	31850{3250}	42728{4360}	52430{5350}	73990{7550}	85064{8680}	120540{12300}	142100{14500}

1–3. Allowable Axial Load on Output Shaft

N{kgf}

Nominal reduction ratio \ Size		010	020	030	040	050	060	070	080	090
2-stage	12 ~ 25	10976{1120}	19502{1990}	17640{1800}	27244{2780}	36064{3680}	49686{5070}	67326{6870}	61250{6250}	113680{11600}
3-stage	22 ~ 27	8820{900}	18816{1920}	16464{1680}	24500{2500}	35770{3650}	46746{4770}	69776{7120}	61936{6320}	117600{12000}
	33 ~ 50	8526{870}	16954{1730}	13426{1370}	21658{2210}	31164{3180}	42336{4320}	63994{6530}	54488{5560}	106820{10900}
	60 ~ 95	8232{840}	16562{1690}	12838{1310}	20972{2140}	30282{3090}	41160{4200}	62622{6390}	53018{5410}	104860{10700}

2. Actual reduction ratio

Nominal reduction ratio \ Size		010	020	030	040	050	060	070	080	090
2-stage	12	11.400	11.400	11.400	11.245	11.245	11.299	11.118	11.118	11.100
	15	13.780	13.780	13.780	13.798	13.798	13.864	13.693	13.693	13.680
	20	21.323	21.323	21.323	21.033	21.033	20.714	20.931	20.931	20.898
	25	25.775	25.775	25.775	25.808	25.808	25.417	25.780	25.780	25.756
3-stage	22	22.277	22.277	22.277	22.306	21.990	22.064	21.773	21.773	22.065
	27	27.742	27.742	27.742	27.777	27.777	27.871	27.503	27.503	27.477
	33	33.198	33.198	33.198	33.240	32.769	32.926	32.521	32.521	32.956
	41	41.341	41.341	41.341	41.393	41.393	41.591	41.079	41.079	41.040
	50	50.815	50.815	50.815	50.879	50.321	50.561	49.939	49.939	50.445
	60	62.095	62.095	62.095	62.173	61.293	60.365	61.227	61.227	62.047
	75	77.325	77.325	77.325	77.423	77.423	76.250	77.339	77.339	77.267
	95	95.046	95.046	95.046	95.166	94.122	92.696	94.020	94.020	94.974

Note) Contact us for reduction ratios below 1/10, or greater than 1/350.

Parallel Shaft Dimensions HDR0102 to 0502 (2-stage reduction)

Input shaft direction C□, D□(common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J2	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0102	508	200	287	302	145	255	75	162	211	351	165	325	143	246	22	156	22	32	65	10×8×50	170	270	18
0202	575	220	325	338	165	303	93	182	237	401	185	373	163	286	22	172	24	38	75	10×8×60	190	300	18
0302	642	250	365	381	185	336	99	206	271	467	205	416	180	318	26	198	26	42	85	12×8×70	215	340	22
0402	735	280	415	434	210	395	115	230	318	537	230	480	200	360	30	220	30	48	95	14×9×80	240	380	26
0502	831	310	465	484	235	461	145	260	371	613	260	546	230	410	30	240	35	50	100	14×9×80	260	415	26

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Parallel Shaft Dimensions HDR0602 to 0902 (2-stage reduction)

Input shaft direction C□, D□ (Mounting code 1)

mm

Size	A	B	C	D	F	G	GA	H	I	J2	K	L	LB	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0602	931	400	502	550	260	601	—	180	330	434	724	305	255	636	215	202	320	40	55	110	16×10×90	315	515	33
0702	1050	440	568	613	295	660	—	190	364	497	815	345	290	725	245	225	350	45	65	130	18×11×110	355	575	39
0802	1180	490	639	663	335	740	260	220	404	576	904	385	330	806	286	250	390	50	75	150	20×12×130	400	645	39
0902	1350	570	720	792	400	833	283	267	484	679	1027	460	392	938	352	280	470	50	85	170	22×14×150	460	745	39

Size	Hollow shaft φW1	Hollow shaft XW1	Hollow shaft XH1	Hollow shaft φY1	Hollow shaft M1	Hollow shaft Mass kg	Solid shaft φW2	Solid shaft X2	Solid shaft XW2	Solid shaft XH2	Solid shaft Y2	Solid shaft M2	Solid shaft Key	Solid shaft Mass kg	Hollow Power-Lock φW3	Hollow Power-Lock Y3	Hollow Power-Lock φY3	Hollow Power-Lock M3	Hollow Power-Lock Mass kg
0102	65	18	69.4	85	210	85	75	130	20	79.5	235	335	20×12×110	95	65	190	145	295	95
0202	75	20	79.9	100	236	120	85	150	22	90	268	378	22×14×130	130	75	203	170	321	130
0302	85	22	90.4	120	272	175	95	170	25	100	306	431	25×14×145	195	85	262	205	398	190
0402	95	25	100.4	130	294	245	110	190	28	116	337	477	28×16×160	275	95	283	230	430	270
0502	110	28	116.4	150	336	370	125	220	32	132	388	543	32×18×180	410	110	317	250	485	410
0602	125	32	132.4	170	396	640	140	250	36	148	455	655	36×20×210	700	125	366	290	564	700
0702	140	36	148.4	180	432	830	170	280	40	179	505	725	40×22×240	920	140	394	305	610	900
0802	170	40	179.4	220	480	1240	200	340	45	210	590	835	45×25×300	1400	170	420	350	660	1330
0902	200	45	210.4	260	630	1890	240	400	56	252	720	1005	56×32×350	2170	200	495	405	810	2010

Parallel Shaft Dimensions HDR0103 to 0503 (3-stage reduction)

Input shaft direction C□, D□ (common to all mounting codes)

mm

Size	A	B	C	D	F	G	H	I	J3	K	L	N	P	Q	R	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0103	508	200	287	302	145	255	75	162	285	351	165	325	143	246	22	156	22	28	55	8×7×45	160	260	18
0203	575	220	325	338	165	303	93	182	311	401	185	373	163	286	22	172	24	32	65	10×8×50	180	290	18
0303	642	250	365	381	185	336	99	206	356	467	205	416	180	318	26	198	26	38	75	10×8×60	205	330	22
0403	735	280	415	434	210	395	115	230	410	537	230	480	200	360	30	220	30	42	85	12×8×70	230	370	26
0503	831	310	465	484	235	461	145	260	478	613	260	546	230	410	30	240	35	48	95	14×9×80	255	410	26

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Parallel Shaft Dimensions HDR0603 to 0903 (3-stage reduction)

Input shaft direction C□, D□ (mounting code 1)

mm

Size	A	B	C	D	F	G	GA	H	I	J3	K	L	LB	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0603	931	400	502	550	260	601	—	180	330	560	724	305	255	636	215	202	320	40	50	100	14×9×80	305	505	33
0703	1050	440	568	613	295	660	—	190	364	642	815	345	290	725	245	225	350	45	55	110	16×10×90	335	555	39
0803	1180	490	639	663	335	740	260	220	404	746	904	385	330	806	286	250	390	50	65	130	18×11×110	380	625	39
0903	1350	570	720	792	400	833	283	267	484	859	1027	460	392	938	352	280	470	50	70	140	20×12×120	430	715	39

Size	Hollow shaft φW1	Hollow shaft XW1	Hollow shaft XH1	Hollow shaft φY1	Hollow shaft M1	Hollow shaft Mass kg	Solid shaft φW2	Solid shaft X2	Solid shaft XW2	Solid shaft XH2	Solid shaft Y2	Solid shaft M2	Solid shaft Key	Solid shaft Mass kg	Hollow Power-Lock φW3	Hollow Power-Lock Y3	Hollow Power-Lock φY3	Hollow Power-Lock M3	Hollow Power-Lock Mass kg
0103	65	18	69.4	85	210	90	75	130	20	79.5	235	335	20×12×110	100	65	190	145	295	100
0203	75	20	79.9	100	236	120	85	150	22	90	268	378	22×14×130	130	75	203	170	321	130
0303	85	22	90.4	120	272	185	95	170	25	100	306	431	25×14×145	205	85	262	205	398	200
0403	95	25	100.4	130	294	250	110	190	28	116	337	477	28×16×160	280	95	283	230	430	275
0503	110	28	116.4	150	336	380	125	220	32	132	388	543	32×18×180	420	110	317	250	485	420
0603	125	32	132.4	170	396	620	140	250	36	148	455	655	36×20×210	680	125	366	290	564	680
0703	140	36	148.4	180	432	850	170	280	40	179	505	725	40×22×240	940	140	394	305	610	920
0803	170	40	179.4	220	480	1280	200	340	45	210	590	835	45×25×300	1440	170	420	350	660	1370
0903	200	45	210.4	260	630	1950	240	400	56	252	720	1005	56×32×350	2230	200	495	405	810	2070

Parallel Shaft Dimensions HDR0602 to 0902 (2-stage reduction)

Input shaft direction C□, D□ (mounting codes 2 and 3)

mm

Size	A	B	C	D	G	H	J2	K	L	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0602	931	400	484	510	676	255	434	724	305	636	215	404	320	40	55	110	16×10×90	315	515	33
0702	1060	440	546	580	770	290	497	815	345	725	245	450	350	45	65	130	18×11×110	355	575	39
0802	1180	490	608	660	850	330	576	904	385	806	286	500	390	50	75	150	20×12×130	400	645	39
0902	1370	570	640	784	978	392	679	1027	460	938	352	560	470	50	85	170	22×14×150	460	745	39

Output shaft dimensions

Hollow shaft	Solid shaft	Hollow Power-Lock

Size	Hollow shaft φW1	Hollow shaft XW1	Hollow shaft XH1	Hollow shaft φY1	Hollow shaft M1	Hollow shaft Mass kg	Solid shaft φW2	Solid shaft X2	Solid shaft XW2	Solid shaft XH2	Solid shaft Y2	Solid shaft M2	Solid shaft Key	Solid shaft Mass kg	Hollow Power-Lock φW3	Hollow Power-Lock Y3	Hollow Power-Lock φY3	Hollow Power-Lock M3	Hollow Power-Lock Mass kg
0602	125	32	132.4	170	396	640	140	250	36	148	455	655	36×20×210	700	125	366	290	564	700
0702	140	36	148.4	180	432	830	170	280	40	179	505	725	40×22×240	920	140	394	305	610	900
0802	170	40	179.4	220	480	1240	200	340	45	210	590	835	45×25×300	1400	170	420	350	660	1330
0902	200	45	210.4	260	630	1890	240	400	56	252	720	1005	56×32×350	2170	200	495	405	810	2010

Input shaft direction C□, D□ (mounting codes 2 and 3)

mm

Size	A	B	C	D	G	H	J3	K	L	N	P	Q	S	T	Input shaft φU	Input shaft V	Input shaft Key	VA	VB	Z
0603	931	400	484	510	676	255	560	724	305	636	215	404	320	40	50	100	14×9×80	305	505	33
0703	1060	440	546	580	770	290	642	815	345	725	245	450	350	45	55	110	16×10×90	335	555	39
0803	1180	490	608	660	850	330	746	904	385	806	286	500	390	50	65	130	18×11×110	380	625	39
0903	1370	570	640	784	978	392	859	1027	460	938	352	560	470	50	70	140	20×12×120	430	715	39

Parallel Shaft Type

Hollow shaft	Solid shaft	Hollow Power-Lock

Size	Hollow shaft φW1	XW1	XH1	φY1	M1	Mass kg	Solid shaft φW2	X2	XW2	XH2	Y2	M2	Key	Mass kg	Hollow Power-Lock φW3	Y3	φY3	M3	Mass kg
0603	125	32	132.4	170	396	620	140	250	36	148	455	655	36×20×210	680	125	366	290	564	680
0703	140	36	148.4	180	432	850	170	280	40	179	505	725	40×22×240	940	140	394	305	610	920
0803	170	40	179.4	220	480	1280	200	340	45	210	590	835	45×25×300	1440	170	420	350	660	1370
0903	200	45	210.4	260	630	1950	240	400	56	252	720	1005	56×32×350	2230	200	495	405	810	2070

MEMO

Common Information

CONTENTS

Technical Data ..... P59 to 64

▮ Moment of inertia ▮ Shaft end tapping ▮ Motor flange details

▮ Hollow shaft details ▮ Hollow Power-Lock details ▮ Cooling fan details

▮ Foot mount details ▮ Tie rod mounting details

Option ..... P65 to 70

▮ Housing material ▮ Shaft end tapping ▮ Various oil gauges

▮ Drain valve ▮ Clear inspection cap ▮ Upper and lower housing feet

▮ Housing upright mount package ▮ Hollow shaft cover

▮ Hollow Power-Lock shaft end cover ▮ Special painting ▮ Special rust-proofing specifications

Handling Instructions ..... P71 to 79

Sizing Inquiry Form P80

1.Moment of inertia on input shaft (GD²)

1–1. Right angle shaft type

kg·m²{kgf·m²}

	Nominal reduction ratio \ Size	000	010	020	030	040	050	060	070	080	090
2-stage	12	0.0041{0.0162}	0.0074{0.0294}	0.0113 {0.0452}	0.0205{0.0821}	0.0379 {0.152 }	0.0850{0.3400}	0.1335{0.5340}	—	—	—
	15	0.0037{0.0147}	0.0068{0.0271}	0.0102 {0.0407}	0.0181{0.0723}	0.0334 {0.134 }	0.0693{0.2770}	0.1065{0.4260}	—	—	—
	18	0.0034{0.0137}	0.0064{0.0256}	0.0095 {0.0378}	0.0165{0.0662}	0.0306 {0.122 }	0.0605{0.2420}	0.0903{0.3610}	—	—	—
3-stage	22	0.0028{0.0110}	0.0042{0.0170}	0.0075 {0.0301}	0.0119{0.0478}	0.0215 {0.0860}	0.0405 {0.162}	0.0884{0.354 }	0.142 {0.567 }	0.232 {0.930 }	0.494 {1.977 }
	27	0.0024{0.0094}	0.0038{0.0152}	0.0069 {0.0275}	0.0106{0.0423}	0.0187 {0.0748}	0.0351 {0.140}	0.0715{0.286 }	0.113 {0.453 }	0.175 {0.702 }	0.360 {1.439 }
	33	0.0026{0.0105}	0.0040{0.0161}	0.0071 {0.0285}	0.0111{0.0442}	0.0197 {0.0789}	0.0368 {0.147}	0.0804{0.321 }	0.125 {0.499 }	0.199 {0.798 }	0.417 {1.668 }
	41	0.0023{0.0091}	0.0036{0.0146}	0.0066 {0.0265}	0.0100{0.0400}	0.0176 {0.0703}	0.0327 {0.131}	0.0664{0.266 }	0.103 {0.410 }	0.155 {0.619 }	0.311 {1.243 }
	50	0.0021{0.0085}	0.0034{0.0137}	0.0063 {0.0252}	0.0094{0.0374}	0.0162 {0.0648}	0.0301 {0.120}	0.0586{0.234 }	0.089 {0.355 }	0.126 {0.504 }	0.248 {0.990 }
	60	0.0026{0.0102}	0.0039{0.0154}	0.0068 {0.0273}	0.0104{0.0416}	0.0184 {0.0737}	0.0341 {0.137}	0.0748{0.299 }	0.113 {0.451 }	0.175 {0.701 }	0.360 {1.441 }
	75	0.0022{0.0089}	0.0035{0.0142}	0.0064 {0.0257}	0.0096{0.0384}	0.0168 {0.0671}	0.0310 {0.124}	0.0629{0.251 }	0.095 {0.380 }	0.139 {0.557 }	0.275 {1.100 }
	95	0.0021{0.0084}	0.0033{0.0134}	0.0062 {0.0247}	0.0091{0.0363}	0.0157 {0.0626}	0.0290 {0.116}	0.0562{0.225 }	0.084 {0.335 }	0.116 {0.463 }	0.224 {0.894 }
4-stage	120	—	0.0021{0.0084}	0.0027 {0.0106}	0.0042{0.0169}	0.0074 {0.0295}	0.0114{0.0457}	0.0205{0.0819}	0.0380 {0.1520}	0.0843 {0.3370}	0.0950 {0.3800}
	150	—	0.0021{0.0084}	0.0027 {0.0106}	0.0042{0.0169}	0.0074 {0.0295}	0.0114{0.0457}	0.0205{0.0819}	0.0380 {0.1520}	0.0843 {0.3370}	0.0950 {0.3800}
	180	—	0.0021{0.0083}	0.0026 {0.0105}	0.0041{0.0165}	0.0072 {0.0289}	0.0111{0.0442}	0.0198{0.0792}	0.0365 {0.1460}	0.0810 {0.3240}	0.0883 {0.3530}
	230	—	0.0018{0.0072}	0.0023 {0.0091}	0.0037{0.0149}	0.0067 {0.0267}	0.0100{0.0401}	0.0176{0.0705}	0.0325 {0.1300}	0.0668 {0.2670}	0.0715 {0.2860}
	280	—	0.0018{0.0072}	0.0023 {0.0090}	0.0037{0.0148}	0.0066 {0.0265}	0.0099{0.0395}	0.0173{0.0693}	0.0318 {0.1270}	0.0655 {0.2620}	0.0688 {0.2750}
	350	—	0.0017{0.0066}	0.0021 {0.0084}	0.0035{0.0138}	0.0063 {0.0252}	0.0093{0.0371}	0.0160{0.0641}	0.0295 {0.1180}	0.0580 {0.2320}	0.0603 {0.2410}

1–2. Parallel shaft type

kg·m²{kgf·m²}

	Nominal reduction ratio \ Size	010	020	030	040	050	060	070	080	090
2-stage	12	0.0022{0.0086}	0.0036{0.0144}	0.0087{0.0346}	0.0167{0.0668}	0.0348{0.1392}	0.0703{0.2813}	0.145{0.5780}	0.296{1.1840}	0.713{2.8510}
	15	0.0019{0.0077}	0.0033{0.0130}	0.0079{0.0316}	0.0151{0.0603}	0.0314{0.1255}	0.0628{0.2513}	0.130{0.5190}	0.267{1.0680}	0.643{2.5710}
	20	0.0011{0.0043}	0.0016{0.0064}	0.0041{0.0162}	0.0076{0.0302}	0.0160{0.0641}	0.0307{0.1227}	0.062{0.2470}	0.125{0.4980}	0.317{1.2660}
	25	0.0010{0.0041}	0.001{0.0060}	0.0039{0.0154}	0.0071{0.0283}	0.0151{0.0602}	0.0285{0.1138}	0.058{0.2300}	0.116{0.4650}	0.297{1.1870}
3-stage	22	0.0014{0.0057}	0.0018{0.0071}	0.0039{0.0156}	0.0076{0.0302}	0.0156{0.0624}	0.0314{0.1255}	0.066{0.2630}	0.136{0.5440}	0.268{1.0710}
	27	0.0011{0.0045}	0.0014{0.0054}	0.0030{0.0121}	0.0057{0.0226}	0.0110{0.0441}	0.0225{0.0900}	0.046{0.1820}	0.097{0.3880}	0.185{0.7380}
	33	0.0012{0.0049}	0.0015{0.0058}	0.0033{0.0131}	0.0058{0.0233}	0.0119{0.0476}	0.0234{0.0934}	0.049{0.1950}	0.103{0.4130}	0.193{0.7710}
	41	0.0010{0.0039}	0.0012{0.0046}	0.0026{0.0104}	0.0045{0.0181}	0.0087{0.0348}	0.0175{0.0699}	0.035{0.1390}	0.077{0.3060}	0.136{0.5450}
	50	0.0008{0.0033}	0.0010{0.0038}	0.0022{0.0088}	0.0037{0.0147}	0.0070{0.0278}	0.0135{0.0541}	0.027{0.1070}	0.059{0.2350}	0.101{0.4020}
	60	0.0011{0.0042}	0.0012{0.0048}	0.0028{0.0111}	0.0046{0.0182}	0.0092{0.0366}	0.0178{0.0712}	0.037{0.1460}	0.079{0.3150}	0.140{0.5610}
	75	0.0009{0.0035}	0.0010{0.0039}	0.0023{0.0091}	0.0037{0.0148}	0.0070{0.0280}	0.0140{0.0559}	0.027{0.1090}	0.061{0.2440}	0.102{0.4090}
	95	0.0008{0.0031}	0.0009{0.0034}	0.0020{0.0080}	0.0032{0.0126}	0.0058{0.0232}	0.0112{0.0447}	0.022{0.0860}	0.049{0.1940}	0.078{0.3130}

2. Moment of inertia of standard motors (GD²)

kg·m²{kgf·m²}

Motor kW	Without brake	With brake
2.2	0.00925{0.037}	0.0110{0.044}
3.7	0.0175 {0.070}	0.0195{0.078}
5.5	0.0375 {0.150}	0.0530{0.212}
7.5	0.0335 {0.134}	—
11	0.0540 {0.216}	
15	0.0730 {0.292}	
18.5	0.0890 {0.356}	
22	0.122 {0.488}	
30	0.151 {0.604}	
37	0.230 {0.920}	

Note) Motor specifications are subject to change. Contact us for updated information.

3. Shaft end tapping

3–1. Input shaft tap (right angle shaft)

Right angle shaft models have a standard tapped hole on the input shaft end.
(Tapping is optional on parallel shafts.)

mm

	Size	000	010	020	030	040	050	060	070	080	090
2-stage	Tapped	M12	M12	M12	M12	M12	M16	M16	—	—	—
	Depth (L)	20	20	20	20	20	32	32	—	—	—
3-stage	Tapped	M10	M12	M12	M12	M12	M16	M16	M16	M16	M16
	Depth (L)	20	20	20	20	20	32	32	32	32	32
4-stage	Tapped	—	M8	M10	M12	M12	M12	M12	M12	M16	M16
	Depth (L)	—	16	20	20	20	20	20	20	32	32

Tap on input shaft end

Taps on output shaft end

3–2. Output shaft tap (right angle shaft, parallel shaft)

Sizes 040 to 090 have standard tapped holes on the output shaft end.
(Tapping is optional on sizes 000 to 030.)

mm

Size	000	010	020	030	040	050	060	070	080	090
Tapped	—	—	—	—	M16	M16	M20	M20	M20	M20
Depth (L)	—	—	—	—	32	32	40	40	40	40
Pitch (P)	—	—	—	—	60	70	80	90	100	120

4. Motor flange details

mm

Motor kW	A	LB	C	D	E	φMS	H	I	LZ	LA	Mounting bolts
2.2 3.7	250	180	63	14	6	28	31.1	8	4-M12	215	M12x30
5.5 7.5	300	230	83	16	6	38	41.1	10	4-M12	265	M12x35
11 15	350	250	113	19	7	42	45.1	12	4-M16	300	M16x40
18.5 22	400	300	113	19	7	48	51.6	14	4-M16	350	M16x40
30	400	300	113	19	7	55	59.1	16	4-M16	350	M16x40
37	450	350	143	19	7(8)	60	64.1	18	8-M16	400	M16x40

Motor kW	F							
	0002 0103	0102 0203	0202 0303	0302 0403	0402 0503	0603	0703	0803
2.2 3.7	13	20	–	–	–	–	–	–
5.5 7.5	13	20	19	22	–	–	–	–
11 15	39	30	31	22	18	–	–	–
18.5 22 30	–	–	31	22	18	12	15	15
37	–	–	–	–	18	12	15	15

5. Hollow shaft details

mm

Size	A	B	C	DH8	E	F	G	H	J	K
000	204	55	94	55	56	2.2	6	58	3	178
010	210	65	80	65	66	2.7	7	68	3	182
020	236	70	96	75	76	2.7	7	78	3	208
030	272	80	112	85	86	3.2	9	88.5	4	238
040	294	90	114	95	96	3.2	9	98.5	4	260

Size	A	B	C	DH8	E	F	G	H	J	K
050	336	100	136	110	112	4.2	12	114	4	294
060	396	120	156	125	127	4.2	12	129	5	354
070	432	140	152	140	142	4.2	12	144	5	386
080	480	160	160	170	172	4.2	15	175	6	430
090	630	200	230	200	202	4.2	15	205	6	580

6. Hollow Power-Lock details

* The recommended length for the driven shaft is dimension LS.

mm

Size	Power-Lock SL				Hollow shaft dimensions											
	φd	φD	L3	N-ZS	φS	LS	M	N	LV	LA	LB	LC	C	φY1	N-ZY	DZ
000	68	140	61	6-M10	55	275	173	102	2	101	144	30	3	75	—	—
010	80	145	72.5	6-M12	65	295	190	105	2	115	150	30	3	85	—	—
020	90	170	72.5	8-M12	75	321	203	118	2	109	176	30	3	100	—	—
030	110	205	114	8-M16	85	398	262	136	2	138	212	30	4	120	8-M6	97.5
040	125	230	122	6-M20	95	430	283	147	2	176	214	40	4	130	8-M8	110

Size	Power-Lock SL				Hollow shaft dimensions											
	φd	φD	L3	N-ZS	φS	LS	M	N	LV	LA	LB	LC	C	φY1	N-ZY	DZ
050	140	250	133	6-M20	110	485	317	168	2	189	256	40	4	150	8-M10	125
060	165	290	147	9-M20	125	564	366	198	5	218	296	50	5	170	8-M10	145
070	175	305	155	10-M20	140	610	394	216	5	228	332	50	5	180	8-M10	157.5
080	200	350	155	12-M20	170	660	420	240	5	240	360	60	6	220	8-M10	190
090	250	405	155	15-M20	200	810	495	315	5	260	470	80	6	260	8-M12	225

7. Cooling fan details

7–1. Right angle type

Model Number: **HDR0402AL12N-I-F**

with cooling fan

mm

	Size	K	L	φU	V	D	□KF
2-stage	HDR0002	344	30	32	36	68	190
	HDR0102	391	35	38	40	115	260
	HDR0202	425	50	45	55	115	260
	HDR0302	508	50	50	55	120	280
	HDR0402	567	60	55	64	120	348
	HDR0502	706	53	65	80	150	448
	HDR0602	764	53	65	80	150	448
3-stage	HDR0003	403	20	28	26	68	190
	HDR0103	448	30	32	36	68	190
	HDR0203	502	35	38	40	115	260
	HDR0303	551	50	45	55	115	260
	HDR0403	662	50	50	55	120	280
	HDR0503	746	60	55	64	120	348
	HDR0603	914	53	65	80	150	448
	HDR0703	1059	73	75	100	190	448
	HDR0803	1148	73	75	100	190	448
	HDR0903	1271	73	75	100	190	448

7–2. Parallel shaft type

mm

	Size	K	□KF
2-stage	HDR0102	175	162
	HDR0202	200	190
	HDR0302	229	226
	HDR0402	237	260
	HDR0502	287	280
	HDR0602	317	280
	HDR0702	371	348
	HDR0802	399	348
	HDR0902	515	448
3-stage	HDR0103	173	162
	HDR0203	177	162
	HDR0303	230	226
	HDR0403	241	226
	HDR0503	259	260
	HDR0603	317	280
	HDR0703	360	348
	HDR0803	385	348
	HDR0903	438	348

8. Foot mount details

Sizes: 000 to 050 feet shape

Sizes: 060 to 070 feet shape

Sizes: 080 to 090 feet shape

■Right angle shaft type

2-stage reducer dimensions

mm

Size	A	B	C	D	E	F	G	H
000	180	43	101	39	137	101	20	60
010	200	53	119	46	164	119	22	72
020	220	55	121	64	194	116	24	72
030	250	60	142	63	213	137	26	82
040	280	70	156	74	243	152	30	92
050	310	72	156	104	315	152	35	95
060	400	—	150	105	306	200	—	—

3- and 4-stage reducer dimensions

mm

Size	A	B	C	D	E	F	G	H
000	180	43	101	39	203	101	20	60
010	200	53	119	46	226	119	22	72
020	220	55	121	64	274	116	24	72
030	250	60	142	63	300	137	26	82
040	280	70	156	74	354	152	30	92
050	310	72	156	104	420	152	35	95
060	400	—	150	105	526	150	—	—
070	440	—	200	90	560	200	—	—
080	490	—	220	110	150	220	260	220
090	570	—	250	142	158	250	300	250

■Parallel shaft type

2- and 3-stage reducer dimensions

mm

Size	A	B	C	D	E	F	G	H
010	200	53	119	46	226	119	22	72
020	220	55	121	64	274	116	24	72
030	250	60	142	63	300	137	26	82
040	280	70	156	74	354	152	30	92
050	310	72	156	104	420	152	35	95
060	400	—	150	105	526	150	—	—
070	440	—	200	90	560	200	—	—
080	490	—	220	110	150	220	260	220
090	570	—	250	142	158	250	300	250

9. Tie rod mounting details

If a hollow output shaft type is to be shaft mounted, secure the reducer with a tie rod or similar means to keep it from turning by reactive force. The tie rod will be subject to compression and tensile loads during operation. Take impact loads into consideration when determining the shape of the tie rod.
Note, impact loads should be of primary concern when determining the shape of the feet on the tie rod side.
Note) Consider furnishing a separate stopper or similar preventive measure to minimize risks if the tie rod breaks.
Note) The recommended direction of rotation for the drive input is to compress the tie rod as in the usage examples.

Usage examples

To connect reducer-to-reducer
Install the tie rod in a mounting hole (➡ portion) near the driven machine.
Note) Specify FCD for housings for sizes 000 to 030.

To connect on a common base plate
Install the tie rod as far from the output shaft as possible.

Recommended tie rod dimensions

Details of tie rod collar

mm

Size	A	L	M Bolt, nut	PR max	TR	S (Belleville springs) DIN2093 (nominal)	Stack	Load kg
000	16.1	170	M16	40	22	A50	2×3	2,195
010								
020					24			
030	18.9	200	M20	50	26	A63	2×3	3,015
040	21.7	240	M24	60	30	A80	2×2	4,273
050		250			35			
060	32.2	310	M30	85	40	A100	2×3	9,690
070	38.2	370	M36	95	45	A100	2×4	12,920
080					50			
090					50			

Note) Adjust dimension A to within A(0 to -0.2).
(Weak dish springs may result in bolt breakage.)

mm

Size	Tie rod collar dimensions φC	φD	φE	l	B
000	16.5	35	24.5	6.6	8
010					
020					
030	20.5	45	30	7.7	9
040	24.5	55	40	10.9	9
050					
060	30.5	65	50	13.1	17
070	36.5	65	50	13.1	23
080					
090					

1. Ductile cast iron housings (FCD)

Housings for sizes 000 to 030 can be manufactured from ductile cast iron (FCD) instead of the standard cast iron (FC) to meet special usage conditions.
(The transfer capacity, dimensions, and shape are the same as the standard model.)
Note) FCD is standard for sizes 040 to 090.

2. Shaft end tapping

2–1. Tapping on end of input shaft (parallel shaft type)

Taps can be machined in the end of the input shaft to prevent mounted sprockets and gears from falling off.
(Taps are provided standard on right angle models.)

mm

	Size	010	020	030	040	050	060	070	080	090
2-stage	TYPE	I	II	II	II	II	II	II	II	II
	Tapped	M10	M8	M10	M10	M10	M10	M12	M12	M12
	Depth (L)	20	16	20	20	20	20	24	24	24
	Pitch (P)	—	20	22	26	28	30	36	45	54
3-stage	TYPE	I	I	II	II	II	II	II	II	II
	Tapped	M10	M10	M8	M10	M10	M10	M10	M12	M12
	Depth (L)	20	20	16	20	20	20	20	24	24
	Pitch (P)	—	—	20	22	26	28	30	36	40

TYPE I

TYPE II

2–2. Output shaft tap (right angle, parallel shaft)

Tapped holes are optional on the output shaft of sizes 000 to 030.

mm

Size	000	010	020	030	040	050	060	070	080	090
TYPE	II	II	II	II	—	—	—	—	—	—
Tapped	M12	M12	M12	M16	—	—	—	—	—	—
Depth (L)	24	24	24	32	—	—	—	—	—	—
Pitch (P)	36	45	54	58	—	—	—	—	—	—

3. Various oil gauges

3–1. Metal gauges

The standard plastic oil gauge can be replaced with a metal oil gauge.

3–2. Clamp oil gauge

The clamp type oil gauge offers better visibility of the oil level and can be furnished upon request.

Clamp oil gauge

4. Drain valve

A drain valve can be furnished to make draining oil easier during oil replacements and when installing piping.

mm

Size	000	010	020	030	040	050	060	070	080	090
A	91	91	93	93	96	96	96	106	106	106
B	3/8″	3/8″	1/2″	1/2″	3/4″	3/4″	3/4″	1″	1″	1″

5. Clear inspection cap

A clear plastic inspection cap can be made to facilitate maintenance and inspection work.

6. Housing upright mount package

The housing can be machined with mounting holes on the lower feet with the input shaft pointing upward. Available for sizes 000 to 050.

mm

Size	I	J	T	Z
000	150	110	20	14
010	162	124	22	18
020	182	154	24	18
030	206	162	26	22
040	230	190	30	26
050	260	240	35	26

■Characteristics against external loads

If the input shaft is subject to radial loads, the mounting feet on the top of the housing should also be reinforced with bolts.
(Do not subject the housing to excessive force during installation.)

7. Upper and lower housing feet

Sizes 060 to 090 can be furnished with additional mounting feet at the top of the housing for right angle input shaft type A□, parallel shaft type C□ and D□.

■Right angle shaft type input shaft direction A□

mm

Size	A	B	C	F	GA	G	H	I	LB	Z
060	931	400	520	260	—	601	180	330	255	4–33
070	1050	440	590	295	—	660	190	364	290	4–39
080	1180	490	670	335	260	740	220	404	330	6–39
090	1350	570	800	400	283	833	267	484	392	6–39

■Parallel type input shaft direction C□, D□

mm

Size	A	B	C	F	GA	G	H	I	LB	Z
060	931	400	520	260	—	601	180	330	255	4–33
070	1050	440	590	295	—	660	190	364	290	4–39
080	1180	490	670	335	260	740	220	404	330	6–39
090	1350	570	800	400	283	833	267	484	392	6–39

8. Hollow shaft cover

A protective cover is available to protect hollow output shafts. As special machining is required on the reducer to mount the cover, please specify when ordering.

TYPE I (Size 000 to 020)

TYPE II (Size 030 to 090)

mm

Size	Safety cover dimensions													Mounting dimensions		
	TYPE	A	B	C	D	E	G	H	I	J	K	L	M	X	X1	X2
000	I	116	112	148	4	42	40.5	5.5	46	130	5.5	64	14	90	36	20
010	I	135	130	170	5	41	40	6	46	150	7	75	14	100	34	24
020	I	152	146	190	5	46	43	8	51	170	7	87	17.5	110	35	22
030	II	145	131	175	7	29	28	8	36	160	6.6	—	—	125	43	25
040	II	160	146	194	6	32	30	8	38	180	6.6	—	—	140	41	28
050	II	175	159	220	8	42	40	10	50	200	9	—	—	155	58	37
060	II	230	214	264	8	42	40	10	50	246	9	—	—	200	43	37
070	II	230	214	264	8	42	40	10	50	246	9	—	—	220	42	38
080	II	260	244	320	8	48	40	16	56	290	11	—	—	245	41	38
090	II	320	304	380	8	52	45	15	60	350	14	—	—	285	83	45

9. Hollow Power-Lock shaft end cover

This protective cover is for hollow output shafts with a Power-Lock. As special machining is required on the reducer to mount the cover, please specify when ordering.

mm

Size	A	E	X	X1
000	165.2	173	90	93
010	165.2	190	100	100
020	190.7	203	110	109
030	232	262	125	153
040	267.4	283	140	159
050	280	317	155	178
060	318.5	366	200	182
070	355.6	394	220	190
080	406.4	420	245	199
090	457.2	495	285	234

10. Special painting

Special painting for special environments is available upon request.

Paint types		Paint specifications		Weather resistant	Water resistant	Acid resistant	Alkali resistant	Application
Classification	Paint		Generic name					
Standard	Indoor standard	Primer	Soluble nitrocellulose	–	–	△	△	Standard paint specification
		Top coat	Acrylic lacquer					
Semi-standard	Outdoor standard	Primer	Soluble nitrocellulose	△	△	△	△	Outdoor standard paint specification
		Top coat	Phthalic acid (alkyd) resin					
	Waterproof standard	Primer	Special modified epoxy	○	⦿	○	⦿	Waterproof standard paint specification
		Top coat	Two-component urethane resin					
Special painting	Long-oil phthalic acid resin	Primer	Long-oil alkyd resin rust prevention	○	○	△	△	Ships, bridges, coastal areas, outdoor humid environments
		Top coat	Long-oil alkyd resin top coat					
	Phenolic resin	Primer	Rust prevention JIS-K-5623 (2 grade)	○	○	⦿	△	Factory indoor/outdoor areas where acid is used, chemical plant sites, on-water areas
		Top coat	Phenolic resin acid-resistant					
	Chlorinated rubber	Primer	Epoxide resin for prime coat	⦿	○	○	○	Ships, bridges, coastal areas, outdoor humid environments corrosive gases
		Middle coat	Chlorinated rubber for middle coat					
		Top coat	Chlorinated rubber for top coat					
	Heat-resistant	Primer	Special alkyd for heat-resistant prime coat	○	×	×	×	Normally withstands 100°C, momentarily withstands 150°C
		Top coat	Special alkyd for heat-resistant top coat					
	Epoxide resin	Primer	Epoxide resin for prime coat	○	⦿	○	⦿	Good resistance against seawater and chemicals
		Top coat	Epoxide resin for top coat					
	Tar epoxide	Primer	Organic zinc rich primer	×	⦿	⦿	⦿	Good resistance against chemicals, oil, seawater, and water
		Top coat	Tar epoxide resin JIS-K-5664 (1 grade)					

Note) Contact us for application details. ⦿:-- Most suitable ○: Suitable △: Contact TEM before making your selection x: Unsuitable

11. Special rust-proofing specifications

Upon request, we can provide export-grade rust prevention or a longer lasting treatment than the standard rust-prevention. Contact us for more information.
(Standard rust prevention lasts six months after shipment from our factory when stored indoors.)

MEMO

Handling

This section contains general information regarding the handling of your reducer. For details, refer to the manual supplied with your reducer.

1. Upon receipt of your reducer

1). Verify that the specifications on the nameplate match your order.
Note) If the shaft arrangement does not match your order, the reducer will have a different amount of lubrication oil, and the oil gauge and plugs will also be in different positions.
2). Make sure pressure vents and all other accessories are included.
3). Check for any scratches or cosmetic defects caused during transport. If found, notify your dealer.

■Name Plate

(1) TYPE (model number)
(2) RATIO (reduction ratio)
(3) MFG.NO. (serial number)

2. Mounting

2–1. Ambient conditions

Install the HDR Series in an ambient temperature range from 0 to 50ºC, or 0 to 40ºC for the HDM Series. Make sure the location is well-ventilated and low in humidity. Avoid use in areas with corrosive, explosive, or flammable liquids and gases. If the reducer is to be used outdoors, furnish a cover or similar protection to avoid direct exposure to rain.

2–2. Transporting

Be sure to use the eye-nut on the top surface of the housing (fastened with a hex bolt) when transporting the reducer. Never hook wires or slings to the input/output shafts. Doing so may make the shaft eccentric or cause other problems which will shorten the life of the reducer or cause it to fail.

2–3.Mounting the Motor (applies to motor handling code Y for the HDM Series)

These procedures describe the motor mounting procedures for customer mounting. Note, the reducer ships with bolts for mounting the motor flange.
Note) Do not run or leave the reducer idle in any position other than its intended mounting position for prolonged periods of time. Doing so may allow the factory-supplied grease to flow out.

Motor installation procedures

Step	Installation procedure	Notes	Step	Installation procedure	Notes
1	Place the reducer so that the motor can be mounted easily.	Take all necessary safety precautions during transportation.	3	Gently insert the motor output shaft into the reducer input shaft.	Apply grease and other lubricants to the motor output shaft and the reducer input shaft bore. Grease brand: Unimax White (Kyodo Yushi) Molybdenum Special (COSMO OIL)
2	Align the position of the key on the motor output shaft to the keyway on the reducer input shaft.	Take all necessary safety precautions when transporting the motor.	4	Fully tighten the supplied hex bolts to the motor flange using the spring washers.	Make sure the motor has entered the reducer properly, then tighten the bolts. Torque the bolts according to their size and strength grade.

Motor flange mounting bolts

mm

Motor kW	0.75	1.5	2.2·3.7	5.5·7.5	11·15	18.5·22	30	37 (45)
Mounting bolts	M10×30	M10×30	M12×30	M12×35	M16×40	M16×40	M16×40	M16×40

2–4. Installation

■Solid output shaft type

-Install on a smooth flat installation surface that can easily withstand the weight of the equipment.
The installation angle should be within ±1°.
-Use bolts compliant to JIS strength class 10.9T for installation.

Recommended bolts for mounting

mm

Size	000	010	020	030	040	050	060	070	080	090
Recommended bolts	M12x45	M16x55	M16x55	M20x60	M24x70	M24x80	M30x90	M36x100	M36x110	M36x110

Note) (1) Failure to install the reducer correctly may result in vibration, noise, and reduced life.
(2) If the reducer is installed at an angle of above ±1°, the oil level and the location of the oil gauge and each plug will no longer apply.

■Hollow output shaft type

The normal practice is to mount the hollow output shaft type reducer to the driven machine, and then fix it in place with a torque arm or tie rod to keep it from turning by reaction force.

1). Mounting to the driven shaft

The shaft to which the reducer is to be mounted should be held to a g7 tolerance. The hollow shaft bore is finished to an H8 tolerance.
- Mount as outlined here.

Step	Mounting procedure
1	Install the key on the driven shaft. Note) Use a bar key only. Do not use a tapered or gib headed key. Doing so may make the output shaft eccentric or cause other problems which will shorten the life of the reducer or cause it to fail.
2	Hoist the reducer using the eye-nut on the top of the housing and slowly insert it onto the driven shaft. Align the phase of the key before inserting it. For large size reducers, use a fixture fashioned as shown below to make the insertion go smoothly. Note) If the shaft fits too tightly, help the hollow output shaft slide smoothly by lightly tapping the edge with a plastic hammer. (Apply grease (Unimax White (Kyodo Yushi) or Molybdenum Special (COSMO OIL)) to the driven shaft.) Be careful not to damage the oil seal during the procedure.
3	Use an end plate to fix the reducer and driven shaft in the thrust direction. The end plate can be fixed on the driven shaft with a stop ring in the stop ring groove of the hollow output shaft, or by fixing it to the end of the shaft. The preferred fixing method is to use a stop ring and end plate to allow easy removal. However, if the reducer is to be reversed frequently, fix the end plate to the end of the shaft. Place a stop ring in the stop ring groove on the hollow output shaft and mount the end plate on the reducer output shaft side of the stop ring. Then fix the end plate to the driven shaft with hex bolts.

Mounting example

Fixing example

Recommended End Plate Dimensions (also used as draw plate)

mm

Size	Plate						Bolt for plate (with spring washer)	Stop ring size
	ϕD	T	H	Z	2-ϕY	P		
000	54.6	14	48	M16	11	32	2-M10x 55	C 55
010	64.6	14	57	M24	14	40	2-M12x 60	C 65
020	74.6	14	67	M24	14	48	2-M12x 60	C 75
030	84.6	17	75	M30	14	55	2-M12x 65	C 85
040	94.6	17	85	M30	18	60	2-M16x 75	C 95
050	109.6	20	99	M30	18	60	2-M16x 85	C110
060	124.4	20	113	M30	18	70	2-M16x 85	C125
070	139.4	24	127	M36	22	80	2-M20x100	C140
080	169.4	24	156	M36	22	90	2-M20x100	C170
090	199.4	24	184	M36	22	120	2-M20x100	C200

- If the driven shaft is vertical and points down, use the stop ring and bolts to prevent the reducer from falling off, and take all safety precautions necessary.

Note) Always apply Loctite or similar locking agent to the bolts.

- If the driven shaft faces up, machine a shoulder on the driven shaft to prevent movement in the thrust direction.

2). Fixing (Torque arm)

-Mount as outlined here.

Step	Mounting procedure
1	Mount the torque arm to the reducer. Select the proper mounting bolts by referring to the recommended installation bolts for the S type. Note) The torque arm is subject to reaction force from the reducer. Make the torque arm robust enough by considering the bending moment under maximum torque, such as when starting and stopping. Note) The load that acts upon the point of support on the torque arm can be reduced by making dimension L (from the output shaft to the point of support) as long as possible. Note) Ideally, the point of support for the torque arm should be within the width of the reducer housing. However, if it must be located closer to the equipment, make dimension M as small as possible, as shown in the good example for torque arm mounting case A. If dimension M is too large, the reducer could be damaged from unnecessary bending moment on the reducer housing and output shaft bearings.
2	Mount the reducer on the driven shaft, then mount the torque arm to the frame of the machine. When mounting the torque arm to the machine frame, leave clearance between the reducer and driven shaft to avoid causing eccentric loads. Note) If the torque arm is fixed to the machine frame, the reducer output shaft bearings and the driven shaft could break due to excessive radial and thrust loads. Note) To reduce shock, use rubber bushings or tie rods (dish springs) between the torque arm and mounting bolts on the machine frame side.

(Tie rod)

Refer to Technical Data from page 64 for details.

(Flange and base mounting notes)

- Install on a smooth flat installation surface that can easily withstand the weight of the equipment.
- Select mounting bolts recommended for the solid output shaft type reducer. Torque the bolts according to their size and strength grade.
- Mount as outlined here.

Step	Mounting procedure
1	Free the driven shaft in the thrust direction.
2	Insert the reducer into the driven shaft, then mount to the flange surface and base surface.
3	Fix the reducer in the thrust direction of the driven shaft.
4	Fix the driven shaft in the thrust direction.

Note) If the reducer is mounted on its flange surface and base surface after it is fixed to the driven shaft in the thrust direction, the bearings on the reducer or the driven shaft will be subject to thrust force which could result in reduced life or machine failure.

■Hollow output shaft with Power-Lock

The normal practice is to mount the hollow output shaft type reducer to the driven machine, and then fix it in place with a torque arm or tie rod to keep it from turning by reaction force. Since the reducer will be fastened to the driven shaft with a Tsubaki Power-Lock SL Series, you should also read the "Tsubaki Power-Lock SL Series Instruction Manual".

1). Mounting to the driven shaft

The shaft to which the reducer is to be mounted should be held to an h6 tolerance. The hollow shaft bore is finished to an H7 tolerance.
-Mount as outlined here.

Step	Mounting procedure
1	Make sure there are no scratches or foreign particles on the driven shaft and inside the output shaft on the reducer.
2	Hoist the reducer using the eye-nut on the top of the housing and slowly insert it onto the driven shaft. Use a fixture fashioned as shown below for smooth insertion. Note) If the shaft fits too tightly, help the output shaft slide smoothly by lightly tapping the edge with a plastic hammer. Be careful not to damage the oil seal during the procedure. Refer to the drawing below for grease points between the driven shaft and output shaft. (Grease brands: Unimax White (Kyodo Yushi) or Molybdenum Special (COSMO OIL))
3	Wipe foreign particles and oil from the outer surface of the reducer's output shaft (mounting surface for the Power-Lock). Gently push the Power-Lock onto the outer surface of the reducer's output shaft. Note) If the Power-lock is too heavy, disassemble it and reassemble it on the output shaft. Note) The tightening bolts and main unit of the Power-lock SL Series are coated with a special lubricant and require no further lubrication.
4	Determine the relative position of the driven shaft and reducer output shaft (along the periphery, along a line), and tighten the Power-Lock using a torque wrench. Note) Refer to the "Tsubaki Power-Lock SL Series Instruction Manual" for further details on this procedure.

Mounting example

Fixing

Grease and oil removal

2).Fixing

Refer to the section for hollow shafts on page 73.

2–5. Connection (input shaft of the HDR Series, solid output shaft type)

-The input and output shaft diameters are finished to h7.

-When using a coupling or similar element to connect the input and output shaft to another shaft, check the allowable eccentricity and declination. Align and fix in place so that the center of the mating shaft is aligned accurately. Any eccentricity in the shafts will shorten the life of the gears, bearings, and shaft, resulting in vibration and noise. Center alignment is also important when using flexible couplings to prevent from transmitting radial loads from the coupling. We recommend our Flexible Couplings.

-When mounting couplings, pulleys, and sprockets on the shaft, do not force them on. Also be careful not to scratch the bearings and oil seals.

2–6. Wiring (HDM Series)

Refer to the separate instruction manual for details on motor wiring.

2–7. Removal (hollow shaft, hollow Power-Lock)

-To remove the reducer from the driven shaft, use a customer-supplied jack bolt and locking bolt, as illustrated in the figures below, with an end/draw plate (explained earlier) and a stop ring.

- Remove as outlined here.

Step	Removal
1	Loosen the hex bolt used to fix the end plate, and remove the end plate.
2	Mount the end/draw plate and locking bolt on the driven shift side.
3	Insert the jack bolt in the tap on the draw plate and pull the reducer from the driven shaft.

Removal example

Recommended jack bolt

mm

Size	000	010	020	030	040	050	060	070	080	090
Jack bolt (threaded full length)	M16x100	M24x150	M24x150	M30x180	M30x180	M30x180	M30x180	M36x250	M36x250	M36x250

3. Lubrication

3–1. Introduction

The HDR and HDM Series are filled with lubrication oil (Shell Omala Oil S2 G150, Showa Shell) as part of the standard package before shipping, are used as is upon delivery.
However, you should still check the oil level in the oil gauge after completing the installation. If the oil level does not appear in the oil gauge, supply oil until it is visible.

Note) For non-standard packages (page 9), check the separately issued drawings to verify temperature conditions, oil type, volume, and whether the oil is filled.

Note) Contact us if the ambient temperature is less than 0ºC or greater than 50ºC.

Note) For best results in ambient temperatures between 35ºC and 50ºC, or for input speeds slower than 500 r/min, switch to an oil recommended in the following table.

- After completing the installation, be sure to replace the plug on the oil filling port with the supplied pressure vent.

3–2. Oil replacement

First change: 500 hours after starting operation. Subsequent changes: 2500 hours or 6 months, whichever comes first.

Step	Mounting procedure
1	Perform the oil replacement when the machine is stopped. Note) The housing and oil are very hot immediately after stopping. Wait for the housing surface to be cool before replacing the oil.
2	Have a drip pan ready and place it under the reducer's drain plug.
3	Remove the drain plug with an Allen key wrench to drain the oil. Remove the pressure vent to allow the oil to drain quickly. Note) Do not loosen the drain plug all at once. Otherwise, oil may splash out.
4	Apply sealant to the drain plug and fully tighten it in place. Note) TEM recommends POS seal sealer by CEMEDINE.
5	Check the mounting direction examples and refer to the following tables to determine the proper oil volume. Pour the recommended oil into the oil inlet until visible in the oil gauge. Note) If the reducer is mounted at a more inclined angle than shown in the mounting examples, fill with a little more than indicated below.
6	After filling, attach the pressure vent.

Drain plug size (common for right angle shaft and parallel shaft types)

Size	000	010	020	030	040	050	060	070	080	090
Plug sizes	PF3/8"	PF3/8"	PF1/2"	PF1/2"	PF3/4"	PF3/4"	PF3/4"	PF1"	PF1"	PF1"

Oil volume (common for right angle shaft and parallel shaft types)

ℓ

Shaft arrangement \ Size	000	010	020	030	040	050	060	070	080	090
Mounting code 1	3(3)	6(5)	8(7)	12(11)	18(15)	27(24)	30(27)	48	70	120
Mounting codes 2 and 3	4(4)	6(6)	8(8)	12(13)	20(18)	29(26)	34(31)	50	75	130

Note) (1) Figures in ( ) for sizes 000 to 060 indicate the oil volume for a right angle type 2-stage housing.
(2) The oil volume differs for mounting codes not listed above. Contact us for proper oil volume.

Recommended oil

Input speed	1750 to 500r/min		Slower than 500r/min	
Ambient temperature	0 to 35°C	35 to 50°C	0 to 35°C	35 to 50°C
Brand	2 Industrial gear oils			
Manufacturer	ISO VG 150	ISO VG 220	ISO VG 220	ISO VG 320
Showa Shell	Shell Omala Oil S2 G150	Shell Omala Oil S2 G220	Shell Omala Oil S2 G220	Shell Omala Oil S2 G320
Idemitsu	Daphne Super Gear Oil 150	Daphne Super Gear Oil 220	Daphne Super Gear Oil 220	Daphne Super Gear Oil 320
Exxon Mobile	Mobile Gear 600XP 150	Mobile Gear 600XP 220	Mobile Gear 600XP 220	Mobile Gear 600XP 320
COSMO Oil	COSMO Gear SE150	COSMO Gear SE220	COSMO Gear SE220	COSMO Gear SE320

3–3. Supplying grease

Follow the procedures outlined below to supply grease about every 1000 hours of operation.

Step	Replacement procedure
1	Add grease when the machine is stopped.
2	Supply grease through the grease nipples listed in the table below. Use only the recommended grease. Note) Do not over grease. Doing so may cause the reducer to heat up.

Grease volume

(1) Right angle shaft type: Input section for shaft arrangement B, and middle and output sections for mounting codes 2 and 3. g

Size	0002	0102	0202	0302	0402	0502	0602
Input section	20	30	30	40	60	150	200
Middle section 1	—	—	—	—	—	—	—
Middle section 2	5	10	10	20	20	40	50
Output section	10	15	20	30	50	60	130

Size	0003	0103	0203	0303	0403	0503	0603	0703	0803	0903
Input section	20	20	30	30	40	60	150	200	200	300
Middle section 1	5	5	5	10	20	20	20	40	50	100
Middle section 2	5	10	10	20	20	40	50	70	100	200
Output section	10	15	20	30	50	60	130	150	300	400

(2) Parallel shaft type: Input, middle, and output sections for mounting codes 2 and 3. g

Size	0102	0202	0302	0402	0502	0602	0702	0802	0902
Input section	5	5	10	20	20	20	40	50	100
Middle section 1	—	—	—	—	—	—	—	—	—
Middle section 2	10	10	20	20	40	50	70	100	200
Output section	15	20	30	50	60	130	150	300	400

Size	0103	0203	0303	0403	0503	0603	0703	0803	0903
Input section	5	5	5	5	10	10	20	20	20
Middle section 1	5	5	10	20	20	20	40	50	100
Middle section 2	10	10	20	20	40	50	70	100	200
Output section	15	20	30	50	60	130	150	300	400

Note) Reducers are shipped with approximately 3 times the amount (listed above) of Mobilux EP2. Do not over grease. Doing so may cause the reducer to heat up.

Recommended grease

Manufacturer	Brand (industrial all-purpose grease JIS grade 2)
Exxon Mobile	Mobilux EP2
Showa Shell	Alvania EP2
Idemitsu	Eponex EP2
COSMO Oil	COSMO Dynamax EP2
Shin Nihon	Epinoc grease AP2

Grease nipple size

Size	000 to 050	060 to 090
Nipple size	A-M6F	A-PT1/8

3–4. Inspection and replacement of the oil seal

-Worn oil seals can cause oil leakages. Inspect regularly and have it replaced if you discover oil leaks. Use the same model and material oil seal. Occasionally, the grease applied to the oil seal lip during the assembly process may look like an oil leak. Observe the condition for a while before making your conclusion.
-Do not use an oil seal made of a different material. Doing so may cause oil leakages.
-Contact us to have the oil seal replaced.

4. Operation

4–1. Inspecting prior to use

Upon completing the installation, check the following prior to operation:
- the direction of rotation is correct.
- the connection to the driven shaft is secure.
- no loose mountings or bolts.

Make sure the equipment incorporates failsafe measures to prevent accidents from occurring due to the use of the reducer, or in the event the reducer malfunctions.

4–2. Trial run

Before running in production, run the reducer without loading. Verify the rotating direction, and check for abnormalities such as vibration, noise, and heat. Gradually increase the load.

4–3. Production run

Verify the following after starting operation:
- there is no abnormal vibration, noise, heat, etc.
- the reducer is not subject to shock or overloads.

Note) Loading the reducer above the allowable capacity can shorten the life of the gears and other parts, resulting in damage to the reducer. Do not load the reducer above its allowable capacity.

Note) The reducer may generate heat during the first two or three days of operation. This is expected and does not indicate a problem. However, if the housing temperature exceeds 93ºC, it could indicate incorrect oil level or improper installation. Check each location. Note, do not touch the reducer with your bare hands when checking. Doing so may cause burns.

5. Daily inspection and maintenance

5–1. Maintenance

- When performing maintenance, wear suitable clothing and use protection including safety glasses, gloves, safety shoes, etc.
- To prevent secondary accidents, keep the surrounding area safe and tidy.
- Always turn the power off and wait for the machine to come to a full stop. Also, use lock-outs to prevent unintentional power supply.
- The Helical Power Drive reaches extremely high temperatures during operation. Do not touch with your bare hands.
- Read and follow labor safety codes and standards.

5–2. Daily inspection

Make daily inspections using appropriate measuring instruments for the following procedures. Take note of operating conditions when performing maintenance.
Be sure to inspect the following items daily. Failure to do so may result in problems.

Inspection item	Inspection details
Noise	Is the noise louder than usual? Are there any unusual noises?
Vibration	Is there any unusual vibration? Any rapid changes in vibration?
Temperature	Is the surface temperature of the reducer higher than usual? Any rapid temperature rises?
Oil level	Is the oil level correct when the machine is stopped?
Mounting bolts	Are any of the bolts loose?
Chain/belt	Are the chains/belts loose?
Lubricant condition	Has the lubricant blackened due to abrasion powder?
Oil leakage	Are there any leakages from the connection points on the reducer, oil seals, caps?
Pressure vent	Are the holes for air bleeding clogged?

If you discover any abnormalities during the daily inspection, take the appropriate measures by referring to "7. Troubleshooting". If the problem persists, contact your dealer.

6. Disassembly/assembly

- Never disassemble the reducer.
- Tooth contact and bearings have been adjusted for optimal performance.
- Contact us if the reducer needs to be disassembled.

7. Troubleshooting

If a problem occurs with the reducer, refer to the table below to troubleshoot the problem.

Problem	Possible cause	Action
Abnormal temperature rise	Overload operation	Check and apply the correct load.
	Insufficient or too much lubricant	Fill with the appropriate volume.
	Oil contamination or wrong oil	Replaced with new and correct oil.
	Bearings are overtightened	Contact TEM for adjustment.
Loud noise Strong vibration	Damaged bearings	Contact TEM for repair.
	Bad tooth contact	
	Bearings are overtightened	
	Damaged teeth	
	Insufficient oil	Contact TEM for repair and lubrication.
	Intrusion of foreign objects	Contact TEM for repair and oil replacement.
Oil leak	Wear and damage to the oil seal	Replace the oil seal.
	Damaged oil gauge	Replace the oil gauge.
	Clogged pressure vent	Replace the pressure vent.
	Bolts/plugs have become loose	Retighten loose bolts/plugs.
Output shaft does not rotate	Gear wear	Contact TEM for repair.
	Damaged shaft or gear	
	Damaged gear and output shaft key	
Both input and output shafts do not rotate	Intrusion of foreign objects	Contact TEM for repair.
	Damaged or broken bearings	
	Seized gear teeth	

8. Storage

If you will not be using the reducer immediately upon delivery, store it by observing these precautions.

8–1. Storage location

Store in a clean and dry indoor environment.

Note) Do not store outside where the reducer/motor may be exposed to humidity, dust, extreme temperature fluctuations, or corrosive gases.

8–2. Storage condition

The reducer is packed and shipped in its final mounting position. Store it as delivered, in the upright position. For reducers with special installation styles, if stored in the wrong position or direction, the bearing grease and lubrication may mix or even leak from the unit.

8–3. Storage period

(1) The maximum storage period is six months. Special anti-rust treatment is required for storage over six months.

(2) Anti-rust treatment for export models is special and must be done prior to export. Contact us for details.

8–4. Operating the reducer after storage

(1) Non-metallic parts like oil seals, oil gauges, and oil plugs wear easily from environmental conditions such as extreme temperatures and ultraviolet rays. Make sure to inspect these parts and replace them if damaged before operation.

(2) Make sure there is no abnormal noise, vibration, or overheating. Stop operation immediately if you notice any of these signs, and contact your distributor.

9. Others

9–1. Disposal

The HDR and HDM Series and its lubrication oil should be treated as general industrial waste.

9–2. Reducers with motors

Refer to the Instruction Manual for the motor for further disposal instructions.

9–3. Paint

If you are going to paint your reducer, mask the oil seals to prevent contact with paint. Otherwise, oil leakages may occur.

9–4. Special specifications

Refer to the drawings and this manual.

Sizing Inquiry Form

Provide us with the following information when asking for assistance in sizing a Helical Power Drive.

Machine or equipment used		
Application		
Motor	Type	- General purpose - Variable frequency controlled - Servo motor - Hydraulic motor - Other
	Capacity (kW)	
	Speed	
	Reduction ratio	
	Brake	With (torque =) Without
	Others	
Connection	Motor side	- Coupling - Belt - Other
	Driven side	- Coupling - Chain - Gear - Other
Operating conditions	Hours of use	( ) hours/day continuous or intermittent
	Intermittent	Frequency ( ) Running time ( ) - Idle time ( )
	Start frequency	( ) starts/hour
	Shock environment	Yes/No
	Load torque	
	Peak torque	Yes/No (%) of load Duration ( ) Frequency ( )
	Radial load	Yes/No (N) Point of load (mm from end of shaft)
	Thrust load	Yes/No (N)
Operating environment	Installation	Indoors / Outdoors (simple roof Yes/No, Subject to raindrops) Inside refrigerator Near oven
	Ambient temperature	Normal temperature (°C) Tropical areas (°C) Cold areas (°C)
	Atmosphere	Sea or salty air Dust/cement Acid/Alkali
Paint/ Rust-proofing	Paint specifications	Standard Outdoor grade Salt-resistant Chemical-resistant Other
	Color	Munsell ( )
Others	Accessories	Yes/No
	Spare parts	Yes/No
Outline of equipment		

MEMO

Limited Warranty

Tsubaki E&M Co.: hereinafter referred to as “Seller”
Customer: hereinafter referred to as “Buyer”
Goods sold or supplied by Seller to Buyer: hereinafter referred to as “Goods”

1. Warranty period without charge

18 months effective the date of shipment or 12 months effective the first use of Goods, including installation of Goods to Buyer’s equipment or machine - whichever comes first.

2. Warranty coverage

Should any damage or problem with the Goods arise within the warranty period, given that the Goods were operated and maintained according to the instructions provided in the manual, Seller will repair and replace at no charge once the Goods are returned to the Seller.
This warranty only covers individual Goods supplied by the Seller to the Buyer and therefore does not include the following:
(1) Any costs related to the removal or re-installation of Goods from the Buyer’s equipment or machine to repair or replace parts.
(2) Cost to transport Buyer’s equipment or machines to repair facility.
(3) Costs to reimburse any profit loss due to any repair or damage and consequential losses caused by the Buyer.

3. Warranty with charge

Seller will charge for any investigation and repair of Goods (even during the warranty period without charge) caused by:
(1) Improper installation by failing to follow the instruction manual.
(2) Insufficient maintenance or improper operation by the Buyer.
(3) Incorrect installation of Goods onto other equipment or machines.
(4) Structure change of the Goods by any modifications or alterations by the Buyer.
(5) Any repair by engineers other than the Seller or those designated by the Seller.
(6) Operation in an inappropriate environment not specified in the manual.
(7) Force Majeure or forces beyond the Seller’s control such as a natural disaster and injustices committed by a third party.
(8) Secondary damage or problems incurred by the Buyer’s equipment or machines.
(9) Defective parts supplied or specified by the Buyer.
(10) Wear, tear or deterioration of parts including bearings and oil seals.
(11) Loss or damage not liable to the Seller.

⚠ Safety precautions

(General)

- Comply with the required safety regulations where the reducer is set or used. (Ordinance on Labor Safety Law by government, electrical system technical standards, building standard laws, etc.)
- To ensure optimum performance is obtained from the Helical Power Drive, it is necessary to read and understand the instructions and safety precautions contained in the manual.
  If the instruction manual is not at hand, request one from the distributor where you purchased the product, or TEM with product name and model number.
  This manual should remain with the product at all times, including when redistributed.
  Make sure this manual is available to every person who operates the product.

(Selection)

- Select the products which are suitable for the usage environment and application.
- When using with equipment for transporting humans or an elevating device, install a suitable protection device on the equipment for safety purposes. Otherwise an accident resulting in death, injury or damage to the equipment may occur due to accidental falling.
- Use explosion-proof type motors in an explosive atmosphere. Use an explosion-proof type motor suitable for dangerous environments to prevent possible explosions, ignitions, electrical shock, injuries, fires and damage to the device.
- When driving an explosion-proof motor with an inverter, be sure to use a verified inverter with a motor because an inverter and a motor mate one-on-one. In addition, install an inverter in a non-explosive atomosphere because inverters have a non-explosive structure.
- When a 400V class inverter is used to drive the product, install a suppression filter or reactor to the inverter side or use reinforced insulation type motors.
- When the product is used for food processing machinery, install devices such as oil pans to prevent grease from leaking. Lubricant oil can damage food or other such products.

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