

CYCLO® Drive for Precision Control Maintenance Manual

Safety and Other Precautions

- Carefully read this maintenance manual and all accompanying documents before use (installation, operation, maintenance, inspection, etc.). Thoroughly understand the machine, information about safety, and all precautions for correct operation. Maintain this manual for future reference.
- Pay particular attention to the "DANGER" and "CAUTION" warnings regarding safety and proper use.

**DANGER** : Improper handling may result in physical damage, serious personal injury and/or death.

**CAUTION** : Improper handling may result in physical damage and/or personal injury.

Matters described in **DANGER** may lead to serious danger depending on the situation.

Be sure to observe important matters described herein.

**DANGER**

- Transport, installation, plumbing, wiring, operation, maintenance, and inspections should be handled by properly trained technicians; otherwise, electric shock, injury, fire, or damage to the equipment may result.
- When the unit is to be used in a system for transport of human beings, a protective device should be installed to minimize chances of accidents resulting in injury, death, or damage to the equipment.
- When the unit is to be used for an elevator, install a protective device on the elevator side to prevent it from falling; otherwise, personal injury, death, or damage to the equipment may result.

1. Inspection Upon Delivery

**CAUTION**

- Unpack the unit after verifying that it is positioned right side up; otherwise, injury may result.
- Verify that the unit received is in fact the one you ordered. When a different unit is installed, injury or damage to the equipment may result.
- Do not remove the name plate.

Upon delivery and receipt of the reducer check the following. If a nonconformity or problem is found, contact our nearest agent, distributor, or sales office.

- Do the items on the name plate conform to what you ordered?
- Was there any part broken during transport?
- Are all bolts and nuts tightened firmly?

1-1) How to Refer to the Nameplate



When making an inquiry, advise us of ① Nomenclature of reducer ② Serial No.

1-2) Lubrication Method

Since all CYCLO Drive for Precision Control adopt grease lubrication. Refer to "5-2.Recommended Grease and amount"

4-1) Place of Installation

Ambient temperature: -10 ~ 40 °C  
(There is a possibility of the motor failing to start depending upon its capacity and rotational speed. For this reason, if it is necessary to use the motor near 0 °C, please consult us.)  
Ambient humidity: 90% max. No condensation  
Altitude: 1000m max.  
Ambient atmosphere there should be no corrosive gas, explosive gas, or steam.  
The place should be well ventilated without dust.  
Location of installation: Indoors, with minimum dust and no water splashing.

- Units made to special specifications are necessary for installation under conditions other than the above.
- Install the units where inspection, maintenance, and other such operations can be carried out easily.
- Install the unit on a base with sufficient rigidity.

5. Grease

**DANGER**

- Do not operate the delivered unit if it has not been filled with grease. This will cause internal damage, which may result in the reducer locking and the unit breaking down.
- Always use recommended grease. Using other grease may significantly reduce the performance and service life of the unit. In the worst case, the unit may become locked due to damage.

**CAUTION**

- Do not add grease to a unit that has been delivered with grease. This may cause heat build-up and grease leakage.
- Do not add excess grease. It may cause heat build-up and grease leakage.
- Add sufficient amount of grease. Lack of grease may cause insufficient lubrication and may damage parts.

5-1) Greased/not greased (The actual condition may differ from the following table depending upon the customer's specification.)

Series	Qty of grease	Change
FC-A, F1C-A F2C, F2CF-A F2C, F2CF-C F4C, F4CF-C	Grease supply at the time of assembly is not necessary. CYCLO DRIVE is filled with grease before shipment to customer.	<ul style="list-style-type: none"> <li>Change grease every 20,000 hours or every 3-5 years. Overhaul recommended when reducer runs for total 20000 hours or 3-5 years after purchase.</li> <li>Align the position of the filler and drain port on the output side of the F2C or F2CF-T with the eccentric planetary shaft bearing (refer to the diagram in sub-section 5-3).</li> <li>When supplying with grease for the first time, fill from lower drain port to ensure grease circulation.</li> </ul>
F4C,F4CF-D F2C,F2CF-T	<ul style="list-style-type: none"> <li>T series units are shipped without grease. For this reason, the customer must obtain the recommended grease indicated in sub-section 5-2, and fill the correct amount of grease.</li> <li>When greasing the unit, fill grease to the level shown in 5-3, using the quantity indicated in sub-section 5-2 as a rough guide. Note that the amount of grease to be filled will differ depending upon the construction in the vicinity of the reducer.</li> </ul>	

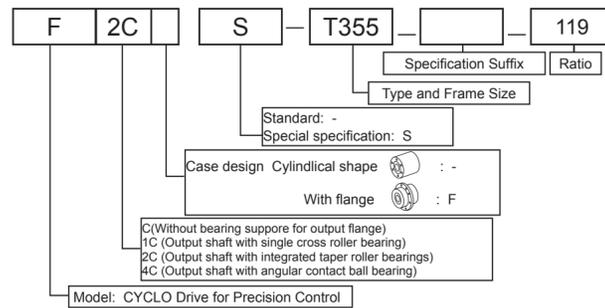
Read the delivery specifications which were prepared when you placed your order, to see whether or not any of the contents differ from the above due to the items that you specified.

5-2) Recommended grease and amount (rough guide)

Series	Frame Size	Amount of grease (rough guide) (g)						Recommended Grease
		A15	A25	A35	A45	A65	A75	
FC-A, F1C-A	20	40	70	120	180	270	-	Kyodo Yushi/Citrox FA No.2
F1C-A	20	40	70	-	-	-	-	
F2C,F2CF-A	30	80	160	240	-	-	-	
F2C,F2CF-C	30	80	160	240	-	-	-	
Series	Frame Size	C15	C25	C35	C45	C55	C65	Kyodo Yushi/Multemp FZ No.00
F2C,F2CF-F4C,F4CF-C	45	75	110	140	200	300	-	
Series	Mounting direction	D15	D25	D30	D35	D45	-	
F4C, F4CF-D	Vertical ①	55	100	220	190	320	-	
	Vertical ②	40	45	85	150	260	-	
	Horizontal	50	95	200	160	270	-	
Series	Mounting direction	T155	T255	T355	T455	T555	T755	Showa Shell Sekiyu/Shell Alvania EP Grease R0 Kyodo Yushi/Multemp FZ No.00
F2C, F2CF-T	Vertical	80	120	230	300	400	700	
	Horizontal	60	100	180	240	320	560	
	Horizontal	60	100	180	240	320	560	

Vertical ① : Output flange is downward. Vertical ② : Output flange is upward.

1-3) Nomenclature of Reducer



2. Storage

When storing reducers for any extended period of time, consider the following important points.

2-1) Storage Location

- Store the unit in a clean, dry place indoors.
- Avoid storage outdoors or in places with humidity, dust, sudden temperature change, or corrosive gas.

2-2) Storage Period

- Storage period should be less than 1 year.
- Export models need export rust prevention. Consult the factory for details.

3. Transportation

**DANGER**

- Do not stand directly under a unit suspended by a crane or other lifting mechanism; otherwise, injury or death may result.

**CAUTION**

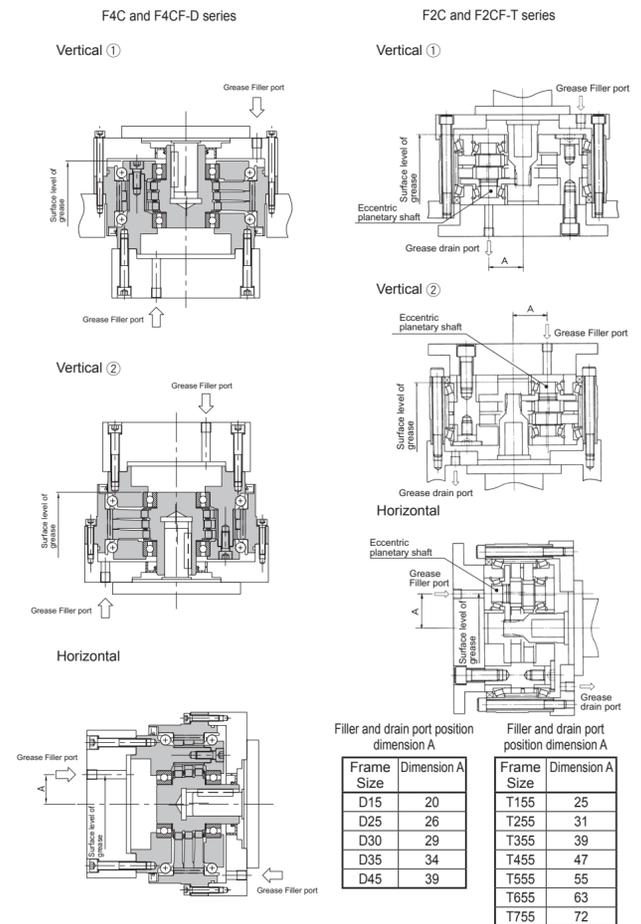
- Exercise ample care so as not to drop the reducer.
- When eye bolts are used in the threaded holes provided on the main unit: Do not lift the reducer with mass larger than the rated load of the eye bolts. Refer to the nameplate, package, outline drawing, catalog, and other sources to confirm the weight of the reducer before lifting. Otherwise, the falling/tumbling of the unit or damage to the lifting devices may cause personal injury or equipment damage.

4. Installation

**CAUTION**

- Do not use the reducer for purpose other than those shown on the rating plate or in the manufacturing specification; otherwise, electric shock, injury, or damage to the equipment may result.
- Do not place any object that will hinder ventilation around the reducer; otherwise, the cooling effect is reduced, possibly leading to fire or burns due to excessive heat build-up.
- Do not step on or hang from the reducer; otherwise, injury may result.
- Do not touch the shaft end of the reducer, inside keyways, or the edge of the motor cooling fan with bare hands; otherwise, injury may result.
- Provide an oil pan or similar device when installing the unit for applications which should avoid oil contaminations (such as food processing device, in a clean room, etc.) Otherwise, oil leakage may contaminate products if the unit fails or comes to the end of its service life.

5-3) Greasing method and supplementary explanatory diagram



6. Coupling with Other Machines

**CAUTION**

- Confirm the direction of rotation before coupling the unit with the driven machine. Difference in the direction of rotation may cause injury or damage to the equipment.
- Cover the rotating parts; otherwise, injury may result.
- When coupling the reducer with load, check that the centering, the belt tension and parallelism of the pulleys are within the specified limits. When the unit is directly coupled with another machine, check that the direct coupling accuracy is within the specified limits.
- When a belt is used for coupling the unit with another machine, check the belt tension. Correctly tighten bolts on the pulley and coupling before operation; otherwise, injury may result because of misalignment.
- Make sure to use the designated number of bolts and tightening torque, when fixing the ring gear housing to the output flange. Reducer may not function optimally when fixed with with improper number of bolts or tightening torque.

Use the unit within the allowable load shown in the catalog, when the radial or axial load is applied on the output flange.

6-1) Coupling Installation

- When installing a coupling, do not impact or apply excessive thrust load to the shaft; otherwise, the bearing may be damaged.
- When chain sprockets, gears or pullers are coupled with the reducer, please use within the range of the allowable radial axial load, or shaft and bearing may be damaged.

6-2) Mounting bolts

Tighten the mounting bolts carefully. Follow the size, used numbers, and tightening torque in the following table.

Frame size	Output flange bolts			Ring gear housing bolts			Eccentric high-speed shaft		
	Number of bolts-size	Tightening torque N·m	kgf·cm	Number of bolts-size	Tightening torque N·m	kgf·cm	Number of bolts-size	Tightening torque N·m	
FC	A15	12-M5	9.32	95	8-M5	9.32	95	-	-
	A25	12-M6	15.7	160	8-M6	15.7	160	-	-
	A35	12-M8	38.3	390	8-M8	38.3	390	-	-
	A45	12-M10	76.5	780	12-M8	38.3	390	-	-
	A65	12-M12	133	1360	12-M10	76.5	780	-	-
	A75	12-M12	133	1360	12-M10	76.5	780	-	-
F1C	A15	12-M6	15.7	160	12-M6	15.7	160	-	-
	A25	12-M8	38.3	390	12-M8	38.3	390	-	-
	A35	12-M10	76.5	780	12-M10	76.5	780	-	-
F2C F2CF	A15	12-M6	15.7	160	16-M6	12.8	130	-	-
	A25	12-M8	38.3	390	12-M8	31.4	320	-	-
	A35	12-M10	76.5	780	16-M8	31.4	320	-	-
F2C F4CF	A45	12-M14	206	2100	12-M12	107	1090	-	-
	C15	16-M6	13.6	139	12-M6	13.6	139	6-M3	1.67
	C25	12-M8	33.4	340	12-M8	33.4	340	6-M3	1.67
F2CF	C35	12-M10	65.7	670	8-M10	65.7	670	6-M4	3.92
	C45	12-M12	114	1160	8-M12	114	1160	6-M4	3.92
	C55	12-M14	181	1850	12-M12	114	1160	6-M5	8.04
F4C F4CF	C65	12-M16	284	2890	16-M12	114	1160	12-M5	8.04
	D15	12-M8	38.3	390	12-M6	15.7	160	-	-
	D25	12-M8	38.3	390	16-M6	15.7	160	-	-
	D30	16-M8	38.3	390	16-M6	15.7	160	-	-
	D35	12-M10	76.5	780	16-M8	38.3	390	-	-
D45	16-M12	133	1360	16-M10	76.5	780	-	-	

7. Operation

**DANGER**

- Do not approach or touch rotating parts during operation; otherwise, loose clothing caught in these rotating parts may result in serious injury.

**CAUTION**

- Do not put fingers or foreign object into the opening of the reducer; otherwise, injury or damage to the equipment may result.
- The reducer will become very hot during operation. Do not touch or come in contact with the unit; otherwise, burns may result.
- If anomaly occurs during operation, stop operation immediately; otherwise, injury may result.
- Do not operate the unit in excess of the rating; otherwise, injury or damage to the equipment may result.

8. Daily Inspection and Maintenance

**DANGER**

- Do not approach or touch any rotating parts during maintenance or inspection of the unit; otherwise, loose clothing caught in these rotating parts may result in injury or death.

**CAUTION**

- Do not put fingers or foreign objects into the opening of the reducer; otherwise, injury or damage to the equipment may result.
- The reducer will become very hot during operation. Do not touch the unit with bare hands; otherwise, burns may result.
- Identify and provide appropriate corrective action in a timely fashion and according to this maintenance manual if any abnormal operating characteristics are observed. Do not operate the unit corrective action has been taken.
- Do not use damaged reducers; otherwise, injury or damage to the equipment may result.
- We can not assume any responsibility for damage or injury as a result of an unauthorized modification by a customer.
- Dispose of the reducer as general industrial waste.

8-1) Daily Inspection

To ensure proper and continued optimum operation, use table 1 to perform daily inspections. All of the answers should be "No."

Inspection item	Details of inspection
Noise	Is there abnormal sound? Is there sudden change in sound?
Vibration	Is there vibration abnormally large? Does vibration change suddenly?
Surface temperature	Is the surface temperature abnormally high? Does the surface temperature rise suddenly?
Mounting bolts	Whether the mounting bolts have come loose
Grease leakage	Is there any grease leakage from mounting surfaces or oil seal part?
Lost motion	Is the backlash becoming larger?

Disassembly, inspection, repair and overhaul should be conducted at our factory. It requires special tools and experienced repair personnel with expert knowledge, especially for unit that is likely to have a problem.

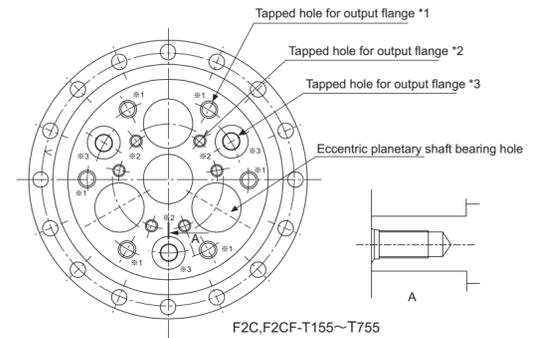
Sumitomo Heavy Industries, Ltd.

Power Transmission & Controls Group

Headquarter ThinkPark Tower, 1-1 Osaki 2-chome, Shinagawa-ku, Tokyo 141-6025, Japan

Frame size	Code	Output flange bolts			Ring gear housing bolts					
		Bolt PCD mm	Number of bolts-size	Bolt mm	Tightening torque N·m	kgf·cm	Number of bolts-size	Tightening torque N·m	kgf·cm	
T155	*1	72	6-M8	72	31.4	320	16-M6	12.8	130	
	*3	66	3-M8	66	31.4	320				
	*2	45	6-M6	45	12.8	130				
	T255	*1	84	6-M12	84	107	1090	12-M8	31.4	320
		*3	82	3-M8	82	31.4	320			
		*2	50	6-M8	50	31.4	320			
T355	*1	104	6-M14	104	172	1750	16-M8	31.4	320	
	*3	102	3-M12	102	107	1090				
	*2	63	6-M12	63	107	1090				
F2C F2CF	*1	135	6-M16	135	265	2700	12-M12	107	1090	
	*3	129	3-M12	129	107	1090				
	*2	93	6-M12	93	107	1090				
T555	*1	165	6-M18	165	363	3700	16-M12	107	1090	
	*3	150	3-M14	150	172	1750				
	*2	115	6-M14	115	172	1750				
T655	*1	180	6-M22	180	706	7200	16-M14	172	1750	
	*3	170	3-M16	170	265	2700				
	*2	115	6-M16	115	265	2700				
T755	*1	200	6-M24	200	903	9200	16-M16	265	2700	
	*3	190	3-M18	190	363	3700				
	*2	130	6-M18	130	363	3700				

- Bolt: Use metric hexagon socket head cap screw based on JIS B1176. Strength grade: Frame size FC-A, F1C-A, F2C, F2CF-A, F4C, F4CF-D: Strength grade 12.9. Frame size F2C, F2CF-C, F4C, F4CF-C, F2C, F2CF-T: Strength grade 10.9
- Countermeasure for bolts loosening: Use adhesives (Loctite262, etc.) or spring washer (based on JIS B1252, class 2). For F4C and F4CF-D, use a conical spring washer (based on JIS B 1252 Type 2) to prevent damage to the flange.
- When tightening the output side flange of F2C or F2CF-T, be sure to also tighten the mounting bolt marked \*3 to the specified torque. (If not, reducer may disassemble.)
- Refer to the figure below for the location of numbers (\*1, \*2, and \*3) on the output flange.



9. Warranty

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

Warranty (period and contents)

Warranty Period	The warranty period for the Products shall be 18 months after the commencement of delivery or 18 months after the shipment of the Products from the seller's works or 12 months from the Products coming into operation, whichever comes first.
Warranty Condition	In case that any problems, troubles or damages on the Products arise due to the defects in the Products during the above "Warranty Period", although the Products are appropriately and properly installed in, connected or combined to the equipment or machines, or maintained in accordance with the maintenance manual and are properly operated under the conditions as described in the catalogue or otherwise as agreed upon in writing between the Seller and the Buyer or its customers, the Seller will Provide, at its sole discretion, appropriate repair or replacement on the Products free of charge, except as stipulated in the "Exception for Warranty" as described below. However, in the event that the Products is installed in, connected or combined to or integrated into the equipment or machines, the Seller shall not reimburse the costs for removal or re-installation of the Products or other incidental costs related thereto and any lost opportunity, loss of profit or any other incidental or consequential losses or damages incurred by the Buyer or its customers.
Exception for Warranty	Notwithstanding the above warranty, the warranty as set forth herein shall not be applied to the problems, troubles or damages on the Products which are caused by: <ol style="list-style-type: none"> <li>installations, connections, combinations or integration of the Products in or to the other equipment or machines, which are rendered by any person or entity other than the Seller,</li> <li>the insufficient maintenance or improper operation by the Buyer or its customers, such that the Product is not appropriately maintained in accordance with the maintenance manual provided or designated by the Seller,</li> <li>the improper use or operation of the Products by the Buyer or its customers which are not informed to the Seller, including, without limitation,</li></ol>