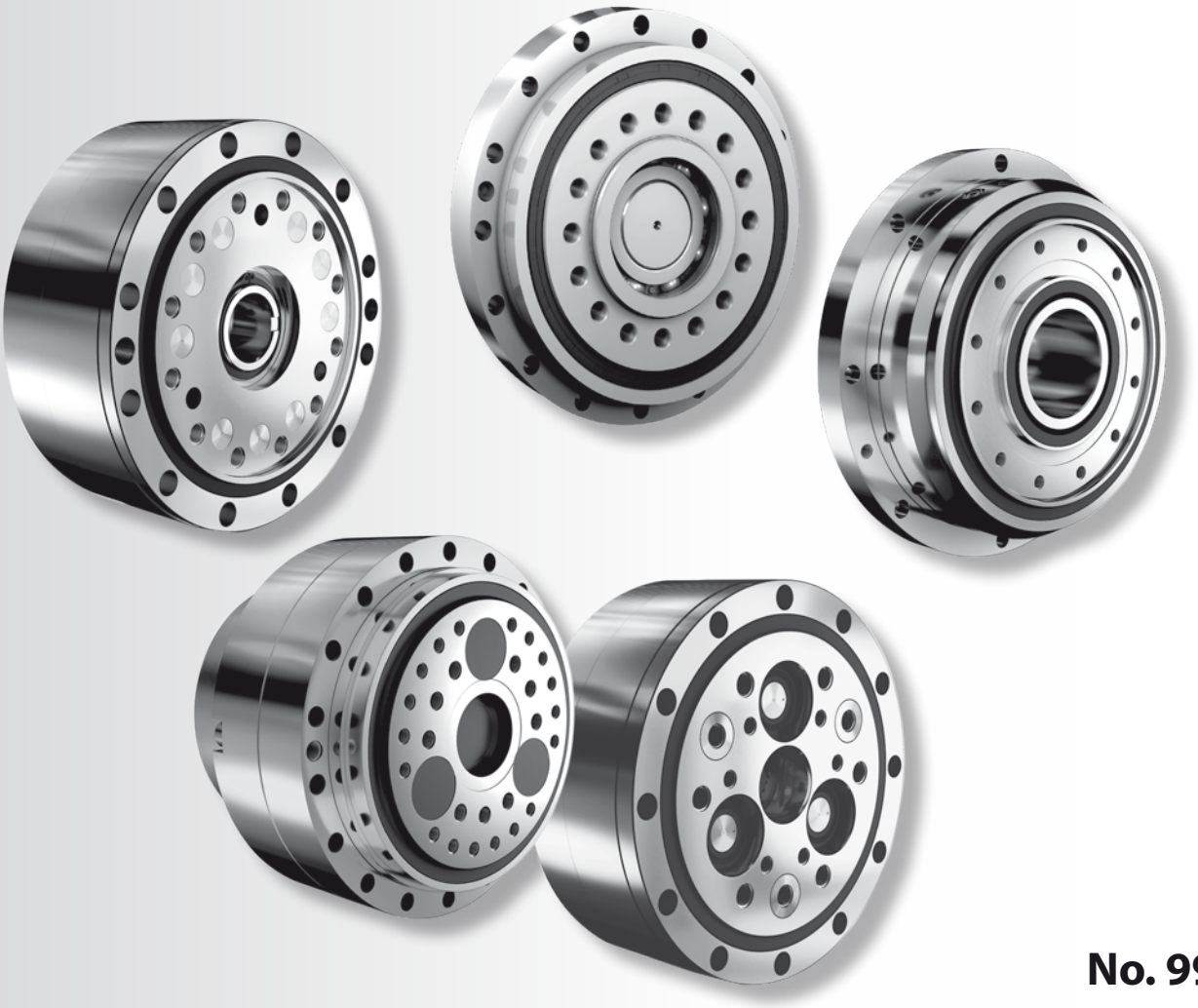
Sumitomo Drive Technologies

Fine Cyclo

No-backlash precision gearbox

Operating manual



No. 991464
04/2021

Manufacturer:
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Cyclostrasse 92
85229 Markt Indersdorf, Germany

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1 General instructions

1.1 How to use this operating manual

Before working with this gearbox (assembly, operation, maintenance, inspection, etc.), please read this operating manual carefully to obtain an overview of the correct way of handling the Fine Cyclo precision gearbox, the applicable safety regulations, and the warnings to be noted.
Keep this operation manual where you can access it at any time, as required.

1.2 Target group

This operating manual is intended for trained technical staff familiar with the transport, assembly, lubrication, operation, maintenance and inspection of the gearbox.

1.3 Text markers

This operating manual makes use of the following text markers:

Text	Presentation
Instructions	Starting with a box ☒
Lists	Starting with a dot ●
Text references to images	are provided in round brackets ( )

1.4 Activity-related safety instructions

An activity-related safety instruction is made up of several components:

- a pictogram,
- a signal word that indicates the degree of risk,
- a reference to the type of risk and
- one (or several) reference(s) to avoid this risk, starting with the symbol "☒".

Pictogram	Signal word	Danger	Consequences
	Danger	Indicates an immediate personal risk.	Death or serious injuries
	Warning	Indicates a possible risk of injury or material damage.	Damage to health or serious material damage
	Note	Indicates a possible risk of material damage.	Material damage

1.5 Additional notes

Pictogram	Meaning
	Further information
	Information about disposal
	Information about explosion protection

1.6 Basic safety instructions

Transport, assembly, lubrication, operation, maintenance and inspection may only be carried out by trained technical staff, otherwise there is a risk of injury or damage to the gearbox/machine.
The gearbox may only be used for its intended purpose, otherwise there is a risk of injury or damage to the gearbox/machine.

1.7 Designated use

Fine Cyclo precision gearboxes are motor-driven gearboxes for industrial and commercial systems. The permitted speeds and performances are to be observed in accordance with the technical data and nameplate. Where the gearbox load deviates from the permitted values or where the system is to be used for applications other than industrial and commercial systems, the gearbox may only be used in consultation with the manufacturer.
Their use in the Ex area is not permitted, unless specific provisions in this regard have been made. As per EC Machinery Directive 2006/42/EC, the precision gearbox components are intended for installation in machines and systems. The system may not be operated in areas where the EC Machine Directive 2006/42/EC applies until it has been ensured that the end product conforms to this EC Directive.

1.8 Technical data

Ambient temperature	-10 °C to +40 °C
Relative humidity	85 % (non-condensing)

Where your requirements deviate from the above, please consult Sumitomo Drive Technologies.

2 Transport

The delivery must be checked for possible damage incurred during transport as soon as it arrives. If any is found, the transport company must be advised immediately. If it must be presumed that the transport damage would restrict proper operation, commissioning may not be carried out.

3 Installation of transmission elements

Gearboxes with a hollow input shaft need to have MoS_2 paste or spray (e.g. Molykote) applied to the motor shaft/counterpart before the counterpart is fitted.
Caution! Clamp connections may not be treated with MoS_2 paste or spray (e.g. Molykote). Clamp connections must be cleaned free of oil and grease before assembly.

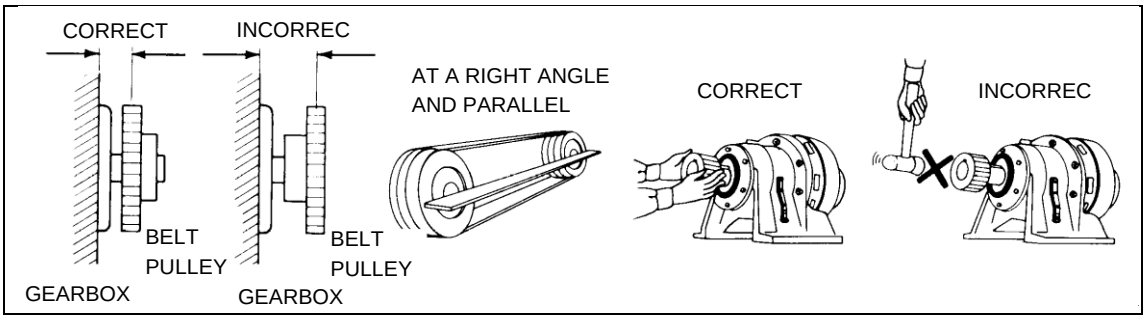


Fig. 1 *Correct assembly*

To avoid damage during storage or in the gear reduction area, couplings, discs, pinions, chains, etc. in contact with the gearbox shafts may not be pressed or hammered on.

4 Installation

4.1 Tools required

The following tools are required for installation:

- Set of spanners
- Torque wrench
- Pull-on device
- Compensation elements
- Corrosion protection (e.g. MoS_2 paste)

4.2 Checks before starting installation work

- The information on the nameplate must correspond with that in the existing documentation (drawings, parts lists, etc.).
- The input/output should not exhibit any damage.
- The intended lubricants must be selected in accordance with the environmental conditions and provided where necessary.

4.3 Preparatory tasks

NOTE!

Material damage!
Improper cleaning!
The corrosion protection should never be mechanically removed (e.g. with an abrasive).

☒ Only alkaline cleaning agents may be used for cleaning.
Care should be taken to ensure that the seals do not come into contact with the cleaning agent.

When handling lubricants and anti-corrosion agents, the personal and environmental safety regulations are to be observed in accordance with the corresponding safety regulations and DIN 52900 safety data sheets.

☒ The anti-corrosion agent (brand Valvoline Tectyl 846/K19) used on the shaft ends or hollow shafts and centerings for transport and storage purposes must be removed with an alkaline cleaning agent before commissioning.

4.4 Setup

☒ The gearbox should be set up in a way as to make it easily accessible for potential regreasing and maintenance work.

☒ Inputs set up outdoors or under very unfavourable environmental conditions such as dirt, dust, splashing water or heat should be protected with a cover.
This may not interfere with the air supply to the housing surface. Lubrication ports and lubricant drainage plugs must be freely accessible.

☒ Where there is a risk of electrochemical corrosion between the gearbox and the operating machine (contact between different metals such as cast iron/stainless steel), plastic spacers should be used.
The housing may need to be grounded.

4.5 Safety instructions for installation

Please observe the following during installation:

- Do not disassemble the gearbox and pre-assembled units.
  All components have been carefully checked and coordinated to ensure the highest possible precision.
  The function of the gearbox can no longer be guaranteed after disassembly and reassembly.
  The warranty expires if the gearbox has been disassembled.
- Protect the gearbox against contamination.
  Proceed very carefully to ensure that no foreign bodies enter the gearbox.
- Do not exchange individual parts.
  It is not permitted to exchange the individual components of various gearboxes.
  The individual parts have been paired with each other.
- Tightening torques must be observed.
  The permitted transmissible torque is also limited by the mounting bolts. The number of bolts, their size, the tightening torque, and the bolt quality are described in the corresponding product-specific chapter "Bolt tightening torques and permitted torques". It must be ensured that the tightening torques for the various gearbox sizes are adhered to. The bolts must be tightened with a torque wrench for this purpose.

The specified torque values allow for a tightening factor of 1.4 and a friction factor of 0.15. The values must be recalculated if the conditions differ. In case of doubt, contact Sumitomo Drive Technologies.
The contact surfaces of the slow-speed shaft flange and housing must be clean and dry. The gearbox connections and torques can be safety transmitted under these conditions. The equivalent stress, i.e. the degree to which the yield strength stress is used during tightening, amounts to 0.9. "Yield point controlled tightening" as per VDI 2230 increases the transmittable torque of bolts by approximately 25%. Higher torque peaks may occur in crash situations and are also transmitted by the gearbox without any lasting damage. In this event, however, the bolt should be checked. Any questions in this regard are to be addressed to Sumitomo Drive Technologies. The values specified in the corresponding product-specific chapter "Bolt tightening torques and permitted torques" apply for the maximum permitted gearbox torques in all cases.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

4.6 Safety instructions for use in areas at risk of explosions

Explosive gas mixtures or dust concentrations can result in severe or fatal injuries when combined with hot, conductive and moving gearbox parts.
Assembly, connection, commissioning and maintenance and repair work on the gearbox / geared motor, as well as the additional electrical equipment, may only be carried out by qualified staff. The following must be taken into account:

- These instructions
- The warning and information signs on the gearbox / geared motor
- All other project planning documentation and circuit diagrams for this input
- The system-specific regulations and requirements
- The national/regional applicable standards and regulations (explosion protection, safety, accident prevention)

In addition, sealing must take place as per IP65 at the following interfaces:

- towards the customer's housing
- towards the drive motor

☒ Oil seals to be checked for leaks every three months.
The seals must be exchanged when a leak develops.
☒ The gearboxes must be integrated into the equipotential bonding of the system to avoid static charging.
☒ Dust deposits thicker than 1 mm must be removed.
The connection on the customer's side may not interfere with convection and heat dissipation.
Heat may not enter the gearbox from the outside.
The maximum permitted temperature is 70 °C at the outer diameter of the housing (ring gear housing).

For gearboxes which are sealed by means of locking caps on the output (e.g. D series), axial securing of these caps by the customer connection design is recommended. For implementation questions (e.g. tolerances), please contact Sumitomo Drive Technologies.
The creation of a maintenance plan is strongly recommended. It is the customer's responsibility to evaluate critical control limits according to the environmental conditions of their application. Therefore, the following recommendations are only of limited use and may need to be amended or extended:

- Check oil seals for leaks.
- The seals must be exchanged when a leak develops.
- Dust deposits thicker than 1 mm must be removed.
- The equipotential bonding of the gearbox to the machine must be ensured.

4.7 Safety instructions for use with motor / inverter

A drive motor connected to the gearbox may only be operated once the measures described in 4.3 to 4.5 can be put into operation.
A motor connected to the gearbox may only be operated via an inverter when the information given on the gearbox nameplate has been observed.
The gearboxes are intended for commercial systems and may only be used in accordance with the information in the technical documentation and on the nameplate.
They correspond to the applicable standards and regulations.

4.8 Motor connection flange supplied loose

In special cases (e.g. motor connection flange dimension larger than the connecting bore pitch circle of the gearbox housing (ring gear housing)), the motor connection flange is supplied loose to facilitate assembly. In such cases, the dimensional drawing assigned to the specific product must be observed, in which the required tightening torque of the mounting bolts for connecting the motor mounting flange to the gearbox is specified. If no such dimensional drawing is available, please contact Sumitomo Drive Technologies for the necessary information.
Basically, make sure that the flat surfaces (parting lines of the bolts) of the elements to be connected between motor connection flange and gearbox are clean and free of oil and grease before they are connected.

4.9 Motor mounting via clamp ring connection

In principle, the connection between motor shaft and gearbox input shaft is possible for all gearbox types described in this manual. Please refer to 4.10 Installation instructions for clamp ring connections regarding the correct mounting between motor and gearbox.
The assembly procedure described there is valid for all other gearbox types described in these instructions.
With regard to the required bolt tightening torques for the clamp connections and the transmittable torques, the specific dimensional drawings assigned to the respective product must be observed. The tightening torques and transmittable torques in Tables 1 to 3 refer exclusively to gearboxes according to catalogue Standard design of series D, series DA and series UA (clamp ring design). If there is no dimensional drawing for your version or if your version is not a standard version of the D, DA or UA series (clamp ring design), the necessary information can be obtained from Sumitomo Drive Technologies.

Motor shaft diameter [mm]	Clamp ring for bolt	Bolt quality 8.8	Bolt quality 10.9	Bolt quality 8.8	Bolt quality 10.9
		Tightening torque for bolt [Nm]	Tightening torque for bolt [Nm]	Transmittable torque T1 [Nm] *	Transmittable torque T1 [Nm] *
Ø9	M4	2.8	4.1	4.4	6.5
Ø10	M4	2.8	4.1	4.9	7.2
Ø11	M5	2.8	8.1	8.7	12.8
Ø14	M5	5.5	8.1	11.1	16.4
Ø16	M5	5.5	8.1	12.7	18.7
Ø17	M5	5.5	8.1	13.5	19.9
Ø19	M6	9.5	14.0	21.5	31.3
Ø22	M8	23.0	34.0	45.6	66.2
Ø24	M8	23.0	34.0	49.7	72.2
Ø28	M8	23.0	34.0	58.0	84.3
Ø30	M10	46.0	68.0	99.3	144.5
Ø32	M10	46.0	68.0	106.0	154.1
Ø35	M10	46.0	68.0	115.9	168.6
Ø38	M12	-	117.0	-	269.9

Tab. 1 Bolt tightening torque and permitted input torque values for input shafts with direct clamp connections (applies for all gearboxes without bushing)

* The transmittable torques shown do not apply for gearboxes with a bushing. For gearboxes with a bushing, refer to the dimensional drawings assigned specifically to the product.

Motor shaft diameter [mm]	Clamp ring for bolt	Tightening torque for bolt [Nm]	Bolt quality	Transmittable torque T1 [Nm]	With bushing
Ø9	M5	5.5	8.8	6.0	o
Ø10	M5	5.5	8.8	6.5	o
Ø11	M5	5.5	8.8	7.5	o
Ø14	M5	5.5	8.8	11.1	
Ø16	M6	5.5	8.8	15.0	o
Ø17	M6	5.5	8.8	16.5	o
Ø19	M6	9.5	8.8	21.5	
Ø22	M8	23.0	8.8	39.0	o
Ø24	M8	23.0	8.8	49.7	
Ø28	M10	46.0	8.8	79.0	o
Ø30	M10	46.0	8.8	85.0	o
Ø32	M10	46.0	8.8	106.0	
Ø35	M12	117.0	10.9	213.8	o
Ø38	M12	117.0	10.9	269.9	

Tab. 2 Bolt tightening torque and permissible drive torque values for input shafts with clamping ring F4CF-D (clamp ring design)

Note: reduced transmittable torques with bushing, different from standard!

Motor shaft diameter [mm]	Clamp ring for bolt	Tightening torque for bolt [Nm]	Bolt quality	Transmittable torque T1 [Nm]	With bushing
Ø9	M5	4.1	10.9	9.0	o
Ø10	M5	4.1	10.9	10.0	o
Ø11	M5	8.1	10.9	11.0	o
Ø14	M5	8.1	10.9	16.4	
Ø16	M6	8.1	10.9	22.7	o
Ø17	M6	8.1	10.9	24.1	o
Ø19	M6	14.0	10.9	31.3	
Ø22	M8	34.0	10.9	56.9	o
Ø24	M8	34.0	10.9	72.2	
Ø28	M10	34.0	10.9	116.0	o
Ø30	M10	68.0	10.9	124.3	o
Ø32	M10	68.0	10.9	154.1	
Ø35	M12	68.0	10.9	213.8	o
Ø38	M12	117.0	10.9	269.9	

Tab. 3 Bolt tightening torque and permissible drive torque values for input shafts with clamp ring F4CF-D (clamp ring design)

Note: reduced transmittable torques with bushing, different from standard

DANGER!

The specifications of the transmittable input torque of the clamp ring connection are only valid for gearboxes of the D, DA, and UA series (clamp ring design) according to catalogue design and must not be exceeded.
For all other clamp designs, the bolt tightening torques and transmittable torques can be obtained from Sumitomo Drive Technologies.

4.10 Installation instructions for clamp ring connections

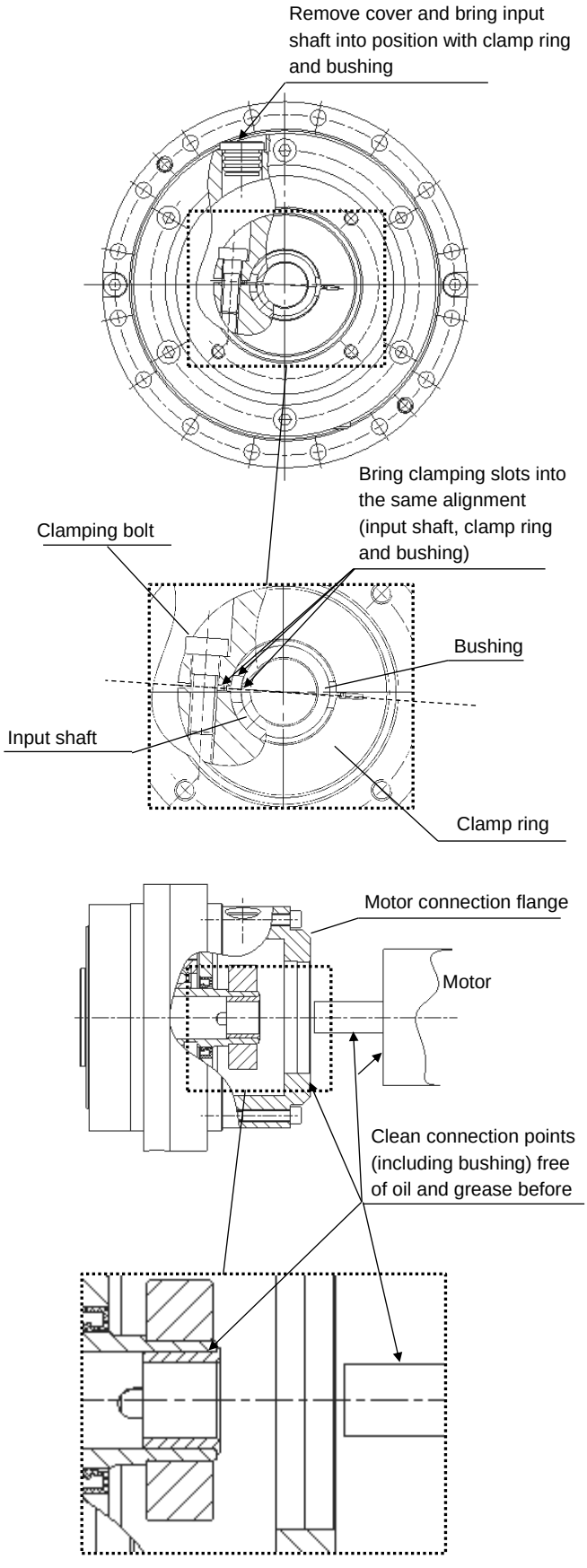


Fig. 2 *Motor mounting with clamp ring*

☒ The alignment of the central axis of the motor (motor shaft) and the gearbox drive shaft (gearbox axis) must match (see the assembly tolerance chapter of the corresponding series).

☒ For the clamp ring design, the required tightening torques and the transmittable torques under Tab. 1 to 3 or according to the specifications of the dimensional drawing assigned to the specific product must be taken into account.

☒ The motor is installed in the sequence 1-7 as described below. When fitting motors with keys, the key must first be removed.

1. *Remove the cover over the mounting opening in the flange.*
2. *The flat contact surfaces of motor connection flange and motor, as well as the motor shaft and the clamping bore, must be cleaned free of oil and grease.*
3. *Turn the clamp ring until the fastening bolt is located underneath the mounting opening. Make sure that the slots of the clamp ring, a possibly existing bushing and the input shaft are on top of each other.*
4. *Insert the motor shaft into the clamping bore.*
5. *Bolt the motor to the motor connection flange.*
6. *Tighten the fastening bolt of the clamping ring through the mounting opening of the motor connection flange with a torque wrench. To this end, the tightening torques must be observed according to the specifications in the dimensional drawing or according to Tab. 1 to 3.*
7. *Insert the cover from the motor connection flange into the mounting opening.*

5 Fundamentals of gearbox lubrication

5.1 Standard lubricant

For each of the gearbox series described in these instructions, specific lubricants are provided as standard (see Tab. 4). In principle, these lubricants are suitable for a temperature range of -10 °C to +40 °C of the ambient temperature. Only when using the lub**ric**ants specified in Tab. 4 are the specifications regarding permitted speed and permitted torque, as you will find in other technical documentation (catalogue), valid. If other lubricants are used, this information cannot be guaranteed. If it is necessary to use non-standard lubricants (e.g. food industry), please consult Sumitomo Drive Technologies.

Gearbox type	Lubricant for reduction	Lubricant for main bearings
FC-A	Kyodo Yushi CitraxFA NO. 2	-
F1C-A15 to A35	Kyodo Yushi Citrax FA NO. 2	
F1C-A45 to A75	Kyodo Yushi Citrax FA NO. 2	Shell GADUS S2 V220 2
F2C(F)-A	Kyodo Yushi Citrax FA NO. 2	
F3C-A		
F4CF-D	Kyodo Yushi Multemp FZ NO. 00	
F4CF-DA		
F2CF-C		
F4C(F)-C		
F2C(F)-T		
F2CF-UA		
F4CF-UA		
F4C-UA115	Castrol Optigear Synthetic R0 150	

Tab. 4 Fine Cyclo standard lubricant

5.2 Pre-filling and maintenance

NOTE!

Maintenance work requires experience and specialised knowledge and must only be performed by authorised specialised staff. The lifetime of the gearbox can be increased by returning it to the factory for overhauling.

In cases in which the ambient temperature is high or subject to major fluctuations, or the ambient air contains corrosive gases, please consult Sumitomo Drive Technologies or the lubricant manufacturer in question. Such ambient conditions may result in premature "ageing" of the lubricant.

When handling lubricants, the personal and environmental safety regulations are to be observed in accordance with the DIN 52 900 safety data sheets.

5.2.1 Pre-filling

Non-sealed gearboxes as well as oil-lubricated gearboxes are delivered without filling with lubricant. Observe the instructions assigned to the gearbox in this document or, in the case of special designs, the additional documentation assigned to the specific product (dimensional drawing).
This does not include FC-A series reduction kits. These gearboxes are not sealed on the input side, but are filled with lubricant at the factory.

5.2.2 Maintenance with grease lubrication

It is generally recommended to change the gearbox grease after 20,000 operating hours or every 3-5 years irrespective of use.
For main bearings (cross roller bearings) of F1C-A gearboxes of sizes 45G, 65G and 75G, regreasing is required after every 4,000 operating hours, but at least every 6 months. Please note the information under Tab. 12.

5.2.3 Maintenance with oil lubrication

The replacement intervals to be fulfilled are linked to the operating conditions. Perform the respective maintenance tasks according to Tab. 5 as per the operating conditions.

Task	Replacement interval	Conditions for use
Fill in the correct oil volume	At the time of commissioning	Under all ambient conditions
Oil change with prescribed oil volume	After 2 years	Indoor use, temperature range from -10 °C to 40 °C
Oil change and gearbox operation for some minutes. Before recommissioning, drain oil and proceed as for initial commissioning.		Preparation for down-time of the gearbox for up to a month
Flush the gearbox with new oil, and then completely fill the gearbox with anti-corrosion oil. When recommissioning the system, flush it again with the specified oil, and then proceed as for initial commissioning.		Preparation for downtime of the gearbox for more than a month

Tab. 5 Maintenance intervals and tasks with oil lubrication

5.3 Lubricant maintenance for oil lubricated gearboxes with prestage

This section concerns the gearbox designs for oil lubricated Fine Cyclo gearboxes, which are fully sealed at the factory and whose input was implemented using a prestage.
In the case of designs with sealing provided by the customer or for which gearboxes from other manufacturers are used as the prestage input, a reference can only be made to the general process described below. The manufacturer's specifications must be noted for special features resulting from the customer design or the external manufacturer.

NOTE!

Maintenance work requires experience and specialised knowledge and must only be performed by authorised specialised staff. The lifetime of the gearbox can be increased by returning it to the factory for overhauling.

Fill in lubricant when the gearbox is not in use.
Due to the viscosity of the lubricant and the geometric characteristics of the gearbox interior, it may take a while for the gearbox to achieve the correct lubricant levels.
However, the prescribed oil quantity in accordance with the drawing/item number is authoritative.

When handling lubricants, the personal and environmental safety regulations are to be observed in accordance with the DIN 52 900 safety data sheets.

5.3.1 Horizontal or vertical mounting position (output downwards)

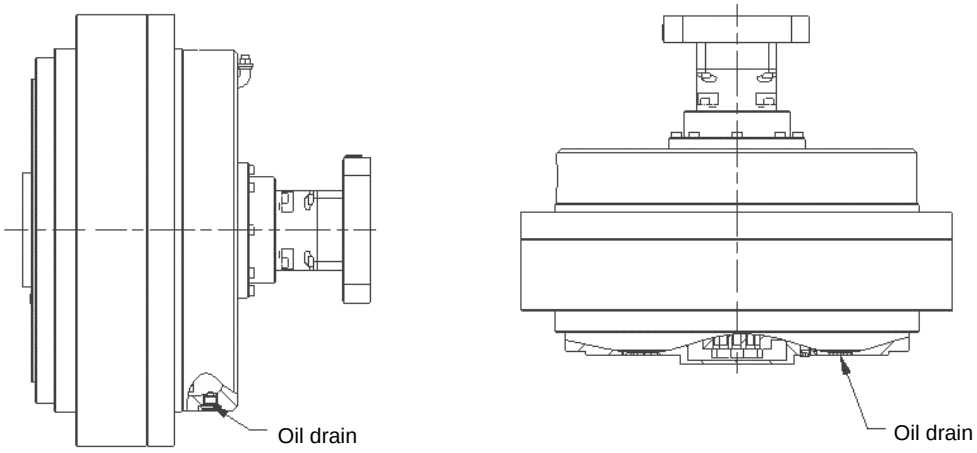


Fig. 3 *Oil change horizontal or vertical mounting position (output downwards)*

- ☒ **Open the drain plug(s) and empty the gearbox completely.**
  Additional locking screws located on the gearbox should be opened to provide support by accelerating the drainage of the lubricant.
- ☒ **Close the drain plug again** and refill the gearbox with the required fresh oil quantity as specified in the drawing.
- ☒ **Close and secure all of the remaining locking bolts again which were opened for filling.**
- ☒ When closing the opened inlet or outlet ports, we recommend securing the affected locking bolts with Loctite 243.

5.3.2 Vertical mounting position (output upwards)

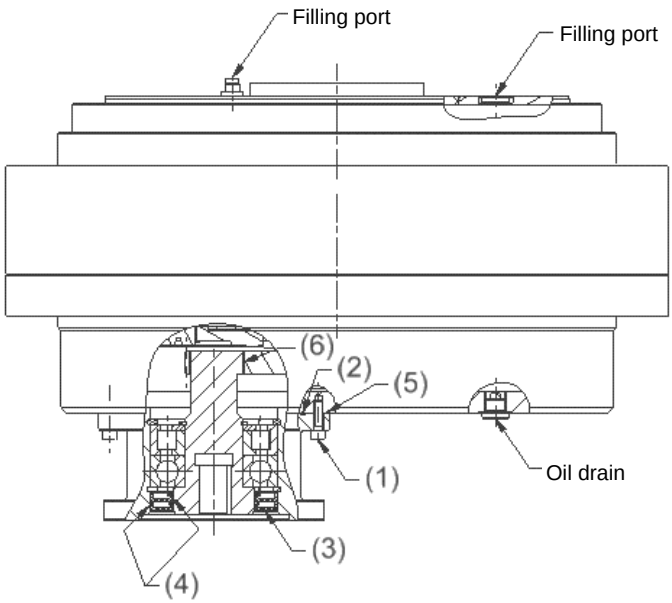
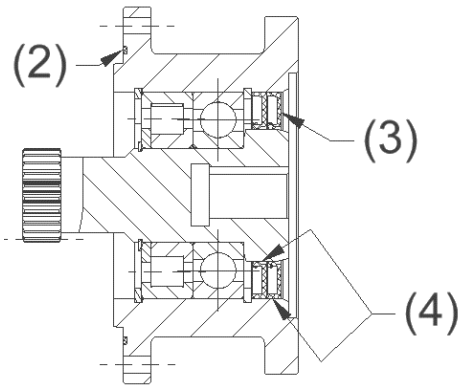


Fig. 4 *Oil change vertical mounting position (output upwards)*

☒ **Open the drain plug(s) and empty the gearbox completely.**
Additional locking screws located on the gearbox should be opened to provide support by accelerating the drainage of the lubricant.

☒ **Remove the prestage attachment.** The bolts (1) of the prestage attachment must be loosened for this purpose. **Caution! The amount of used oil remaining in the gearbox leaks out when the prestage attachment is removed.**

☒ **Flush the prestage attachment with fresh oil.**
It is recommended that the sealing elements of the pre-stage attachment [(2) and (3)] are removed and replaced if damaged (by dismantling or wear). Any possibly required components or item numbers will differ depending on the gearbox design; please ask for them from Sumitomo Drive Technologies if required.
Special care must be taken when replacing such sealing elements to ensure that no functional surfaces for the sealing elements are damaged, neither during removal nor installation [see example (4)].



☒ **Installing the prestage attachment**. It must first be ensured that the bolt connection surfaces are clean, that the bolts to be used are in good condition [(1),(5)], and that all required sealing elements are installed functionally and properly.
When installing the prestage attachment, ensure that the gearing is carefully inserted into the gearbox counter-spline without any resistance (6).
Then secure the **bolt connections of the prestage attachment** with Loctite 243 and tighten them as per Tab. 6 to the tightening torque required with a torque spanner (according to thread size and strength data on the bolt head).

Size	Quality		
	8.8	10.9	12.9
	M_A [Nm]	M_A [Nm]	M_A [Nm]
M4	2.8	4.1	4.8
M5	5.5	8.1	9.5
M6	9.5	14.0	16.5
M8	23.0	34.0	40.0
M10	46.0	68.0	79.0
M12	79.0	117.0	135.0
M14	125.0	185.0	215.0
M16	195.0	280.0	330.0

Tab. 6 Tightening torques for the pre-stage attachment

☒ **Close the drain plugs again on the gearbox** and refill it with the required fresh oil quantity as specified in the drawing.

☒ **Close and secure all of the remaining locking bolts again which were opened for filling**.

☒ When closing the opened inlet or outlet ports, we recommend securing the affected locking bolts with Loctite 243.

6 Checklist for commissioning ATEX-approved gearboxes

ATEX = **AT**mosphère **Ex**plosibles

- ❒ Does the information on the gearbox name plate correspond to the permitted Ex application on site?
- ❒ Are the gearbox and its components undamaged (check for possible transport and storage damage)?
- ❒ Does the mounting design correspond to the information on the nameplate?
  Please note the following:
  If a design change is implemented without consulting Sumitomo Drive Technologies, the ATEX approval will no longer be valid!
- ❒ Has an unhindered supply of cold air been ensured? Is the warm exhaust air from other systems entering the system? The cooling air may not exceed 40 °C.
- ❒ Have all input and output elements been ATEX-approved?

☒ Where possible, the gearbox should be switched on and off without load.
Once it runs smoothly and without abnormal noises, the gearbox can be used to operate the machine.

☒ The surface temperature should be measured after approximately 3 hours.

☒ The maximum permitted difference from the ambient temperature must be checked. If the value is above that given for the machine in question, the input drive should be switched off immediately and Sumitomo Drive Technologies should be consulted.

ATEX labelling according to directive 2014/34/EU and EN ISO 80079-36

a)	Device group	II	Devices for explosive atmospheres (except underground)	2014/34/EU
b)	Device category	2	Potentially explosive atmosphere occasionally present (zone 1 or 21)	
		3	Potentially explosive atmosphere briefly present (zone 2 or 22)	
c)	Area at risk of explosions	G	Area with potentially explosive gas, vapour or dust, mist, air mixtures	
		D	Areas where dust can accumulate and cause explosive atmospheres	EN ISO 80079-36
d)	Ignition protection type	h	Design safety “c”	
e)	Division of the group	IIC	Typical gases: Propane, ethylene, hydrogen	
		IIIC	Suitable for combustible suspended solids, non-conductive dust and conductive dust	
f)	Temperature class	T3	Max. surface temperature ≤ 200 °C	
		T4	Max. surface temperature ≤ 135 °C	
	Max. surface temperature	T135°C	Max. surface temperature ≤ 135 °C	
		T200°C	Max. surface temperature ≤ 200 °C	
g)	Equipment protection level (EPL)	Gb	Device with "high" protection level	
		Gc	Device with "extended" protection level	
		Db	Device with "high" protection level	
		Dc	Device with "extended" protection level	

Explosion protection symbol	a) Device group	b) Device category	c) Area at risk of explosion	Labelling	d) Ignition protection type	e) Division of the group	f) Temperature class / max. surface temperature	g) Equipment protection level (EPL)
	II	2	G	Ex	h	IIC	T3	Gb
	II	2	G	Ex	h	IIC	T4	Gb
	II	3	G	Ex	h	IIC	T3	Gc
	II	3	G	Ex	h	IIC	T4	Gc
	II	2	D	Ex	h	IIIC	T135°C	Db
	II	2	D	Ex	h	IIIC	T200°C	Db
	II	3	D	Ex	h	IIIC	T135°C	Dc
	II	3	D	Ex	h	IIIC	T200°C	Dc
2014/34/EU				EN ISO 80079-36				

7 Operating faults

In the event of operating faults, please consult Sumitomo Drive Technologies.
The proper function of the precision gearbox is no longer guaranteed once the gearbox has been disassembled and/or individual parts have been exchanged.
In this event, all warranty claims are invalidated.

8 FC-A without output bearing

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

8.1 FC-A installation instructions

Fine Cyclo gearbox reduction kits of the type FC-A are delivered ready for installation but without paint.
Reduction kits are delivered without support bearings on the output side. Use without bearings provided by the customer is not allowed. Suitable bearings with a sufficient stiffness must be used for installation in the machine to be driven.

☒ Attach the Fine Cyclo FC-A slow-speed shaft flange to your output shaft.
The required assembly tolerances as per 8.5 must be observed.

☒ Place the entire reduction part onto the slow speed shaft pins of the output shaft flange.
The slow-speed shaft flange is connected with the slow-speed shaft rollers of the reduction part via the slow-speed shaft pins. Please make sure that none of the slow speed shaft rollers are lost.
The ring gear housing should be aligned or centred in the intended mounting position.

☒ An adapter is required for the installation of the motor on the input side flange (see installation example).

☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 7).

8.2 FC-A installation example

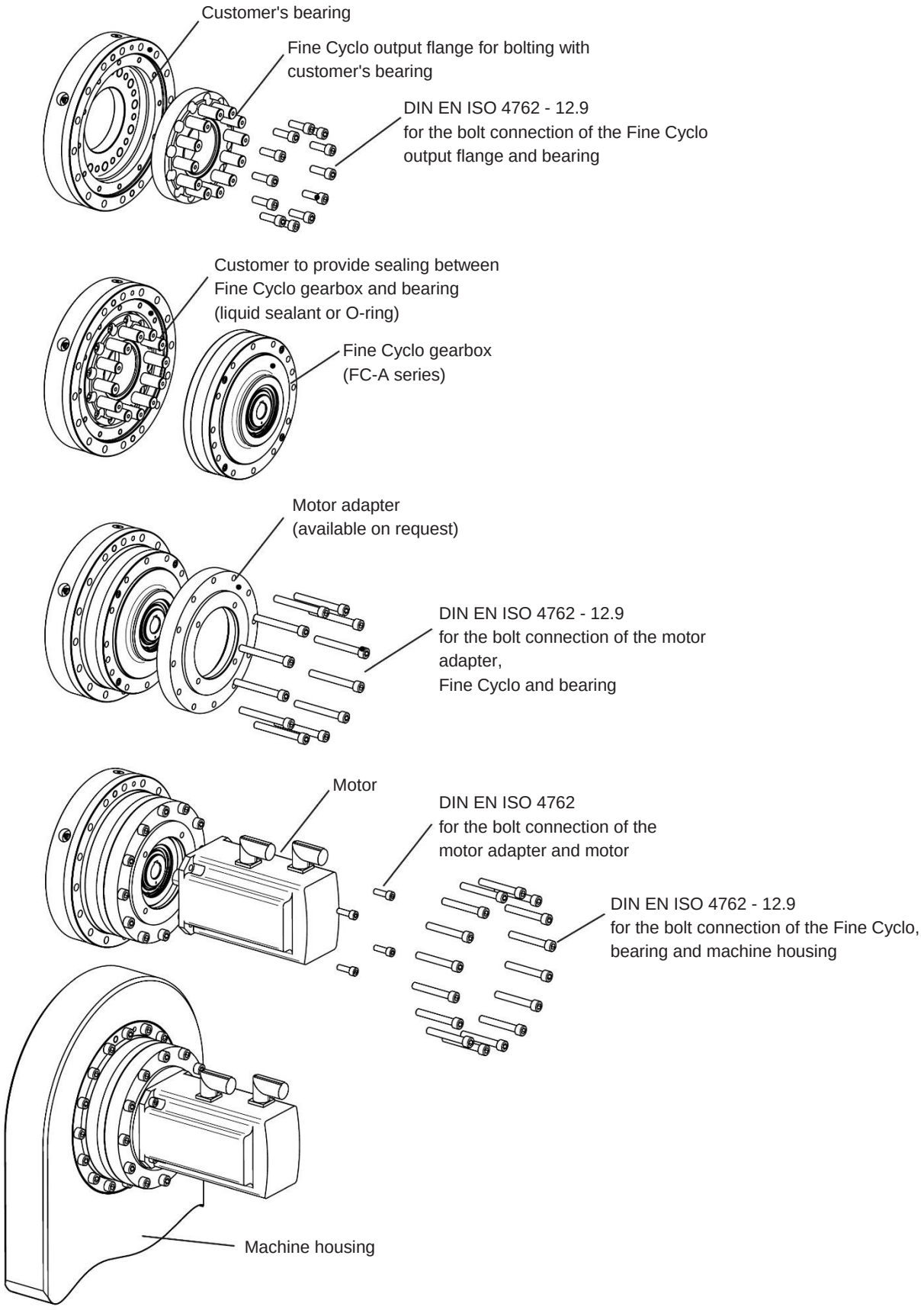


Fig. 5 *FC-A installation example*

8.3 FC-A bolt tightening torque and permitted torque

The permitted transmittable torque is also limited by bolts. For the number, size, and tightening torque of the bolts for fastening the output-side flange and ring gear housing, see Tab. 7.

FC-A	Output-side bolts			Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15G	12	M5	9.2	8	M5	9.2	470
25G	12	M6	16.0	8	M6	16.0	830
35G	12	M8	39.0	8	M8	39.0	1900
45G	12	M10	77.0	12	M8	39.0	3550
65G	12	M12	135.0	12	M10	77.0	7000
75G	12	M12	135.0	12	M10	77.0	8000

Tab. 7 FC-A fixation

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

8.4 Additional dowel pinning for FC-A

In cases where higher limit torques (please also see 4.5) than in Tab. 7 are to be expected or if the bolt tightening torque cannot be correctly observed, additional dowel pinning is recommended. See Tab. 8 and Fig. 6. In all cases, the values specified in the catalogue always apply with regard to the maximum permitted gearbox torques.

FC-A	Slow-speed shaft flange				Ring gear housing			
	Number of bolts	Size DIN 4762	Number of dowel pins	Dowel pin size [mm]	Number of bolts	Size DIN 4762	Number of dowel pins	Dowel pin size [mm]
15G	10	M5	2	6	6	M5	2	6
25G	10	M6	2	8	6	M6	2	8
35G	10	M8	2	10	6	M8	2	10
45G	10	M10	2	12	10	M8	2	10
65G	10	M12	2	16	10	M10	2	14
75G	9	M12	3	16	9	M10	3	16

Tab. 8 FC-A dowel pinning

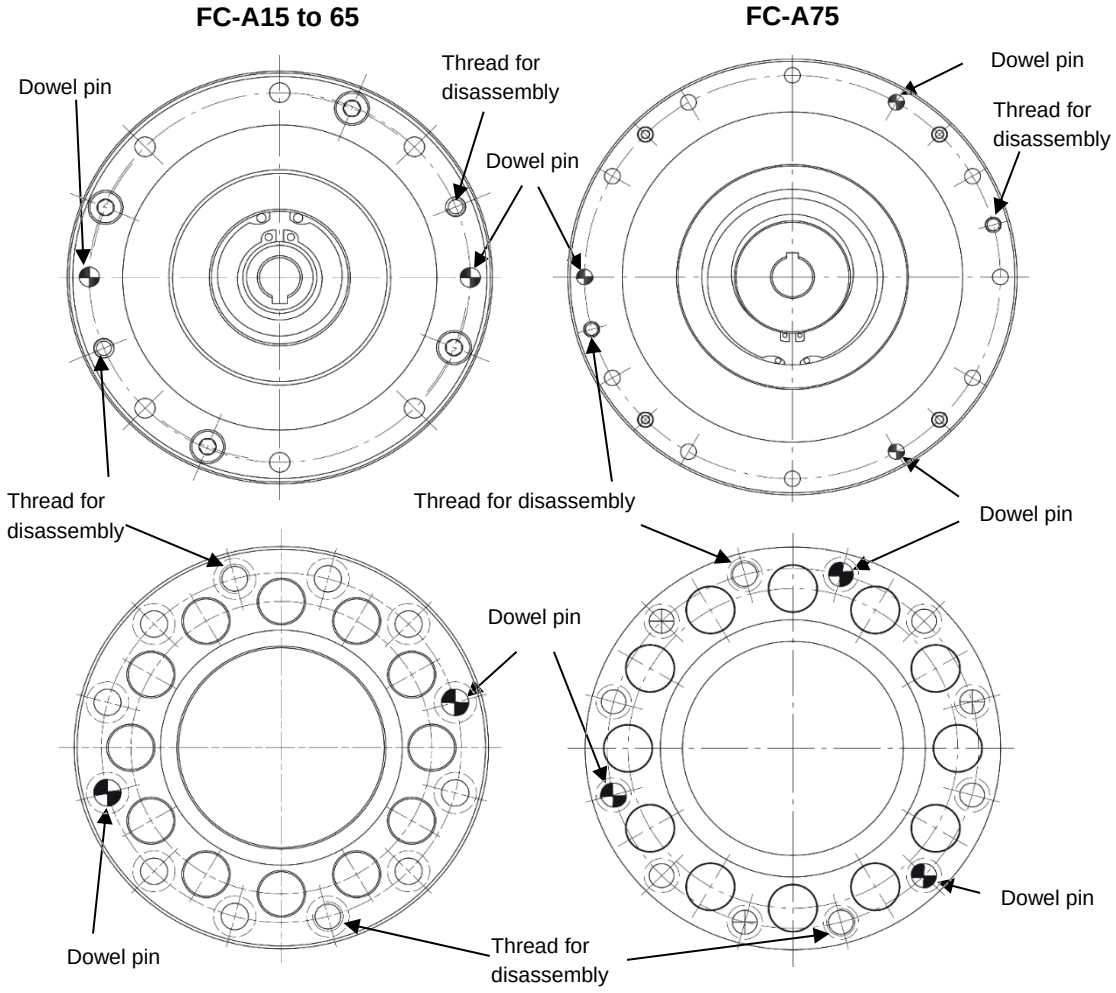


Fig. 6 *FC-A additional dowel pinning*

8.5 FC-A assembly tolerances

In order for the thrust washer to be held by the customer's housing, the internal diameter B must not exceed the specified values. The depth of the output shaft spigot must be equal to or less than dimension D to prevent jamming the output flange. Furthermore, dimension E must be observed. The recommended precision of the assembly part (housing and output shaft) must lie within coaxiality k and parallelism p.

The recommended diameters of the housing, output shaft, and input side flange spigots are shown schematically below.

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50%.

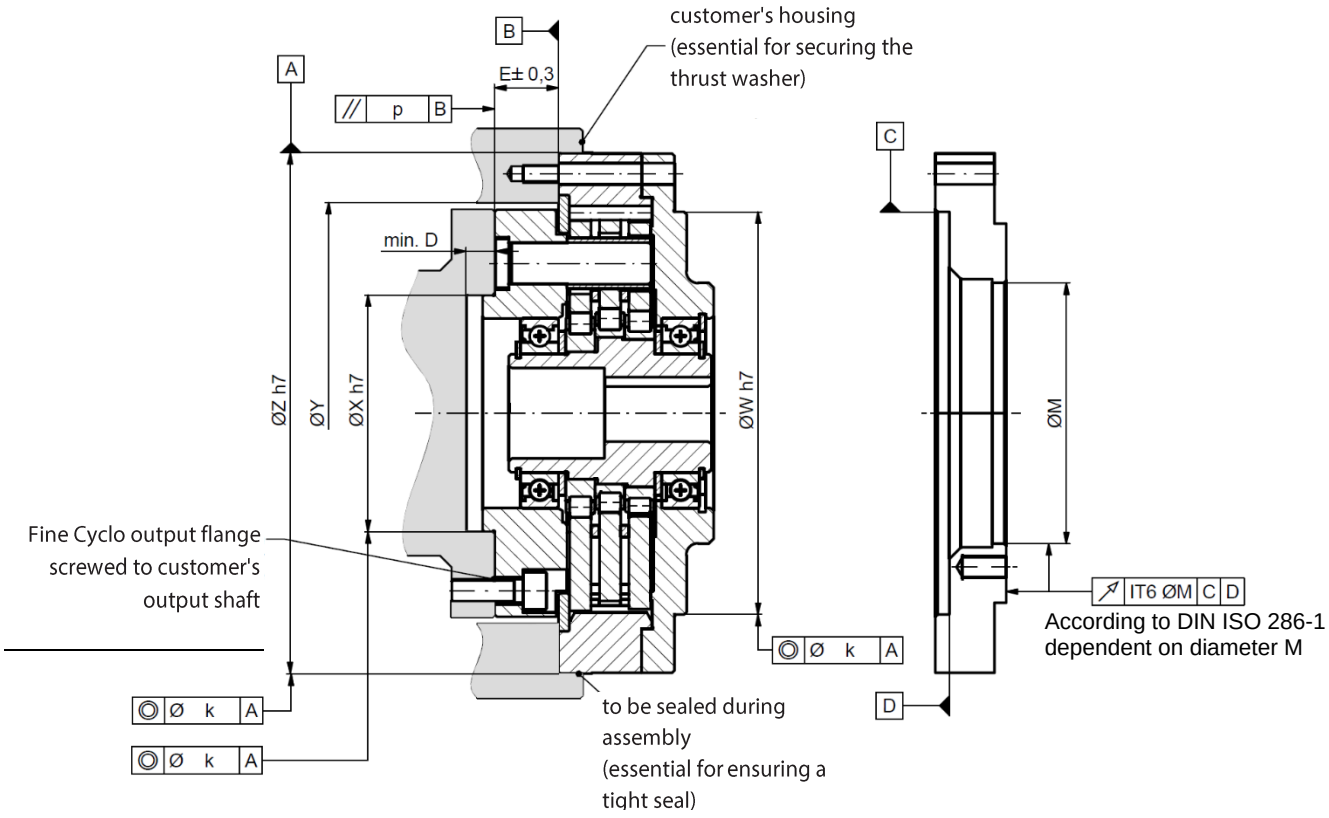


Fig. 7 *FC-A assembly tolerances*

NOTE!

To ensure the safe and smooth functioning of the reduction kits, the prescribed connection dimensions and tolerances must be observed.
You must ensure complete cleanliness when carrying out this work. In particular, the greased reduction part must be carefully covered.

FC-A	Ø Z [mm]	Ø Y min. [mm]	Ø Y max. [mm]	Ø X [mm]	Ø W [mm]	D min. [mm]	E [mm]	k [mm]	p [mm]
15G	115	89	90	45	85	5	15.5	0.030	0.025
25G	145	114	115	60	110	6	21	0.030	0.035
35G	180	139	144	80	135	6	24	0.030	0.040
45G	220	174	182	100	170	8	27	0.030	0.050
65G	270	214	226	130	210	8	33	0.030	0.065
75G	310	239	262	150	235	8	38	0.030	0.070

Tab. 9 FC-A assembly tolerances

8.6 FC-A lubrication and maintenance

Observe the basic information under 5 Fundamentals of gearbox lubrication.
Fine Cyclo gearboxes of the FC-A series are filled with lubricant at the factory and are suitable for any mounting position.

8.7 FC-A use in Ex area

The gearboxes in the FC-A series meet the requirements of Directive 2014/34/EU if the assembly tolerances and fastening requirements (Tab. 7, Tab. 8 and Tab. 9), as well as the safety measures as described in points 4.6, 4.7 and 6, are observed.

9 F1C-A with cross roller bearing on output side

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

9.1 F1C-A installation instructions

Fine Cyclo gearboxes of the type F1C-A are delivered ready for installation but without paint.

☒ The flange on the output side must be fixed to the machine shaft to be driven.

☒ The required assembly tolerances as per 9.4 must be observed.

☒ An adapter is required for the attachment of the motor to the input side flange (see the installation suggestions in the catalogue).

☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 10).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.

9.2 F1C-A installation example

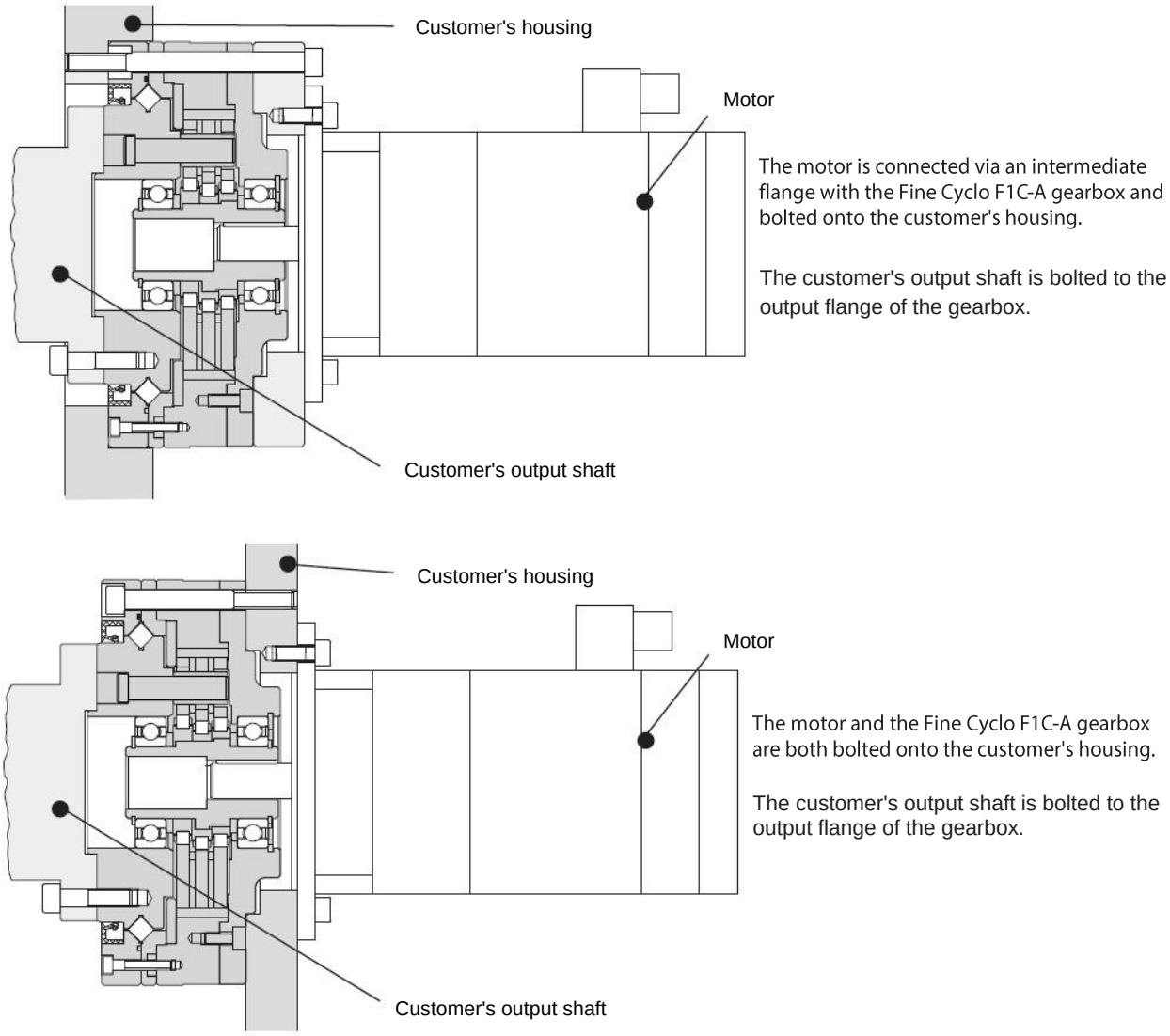


Fig. 8 *F1C-A installation examples*

9.3 F1C-A bolt tightening torque and permitted torque

The permitted transmittable torque is also limited by bolts (see Tab. 10). For the number, size, and tightening torque of the bolts for fastening the output-side flange and ring gear housing, see Tab. 10. Here, observe the information in 4.5.

F1C-A	Output side flange bolts			Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15	12	M6	16	12	M6	16	750
25	12	M8	39	12	M8	39	1700
35	12	M10	77	12	M10	77	3150
45G	12	M14	210	16	M10	77	3550
65G	16	M16	330	20	M12	135	7000
75G	16	M16	330	20	M12	135	8000

Tab. 10 Bolt tightening torque and permitted torque F1C-A

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN 13 Part 13, as well as according to DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

9.4 F1C-A assemblytolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes.
When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50 %.

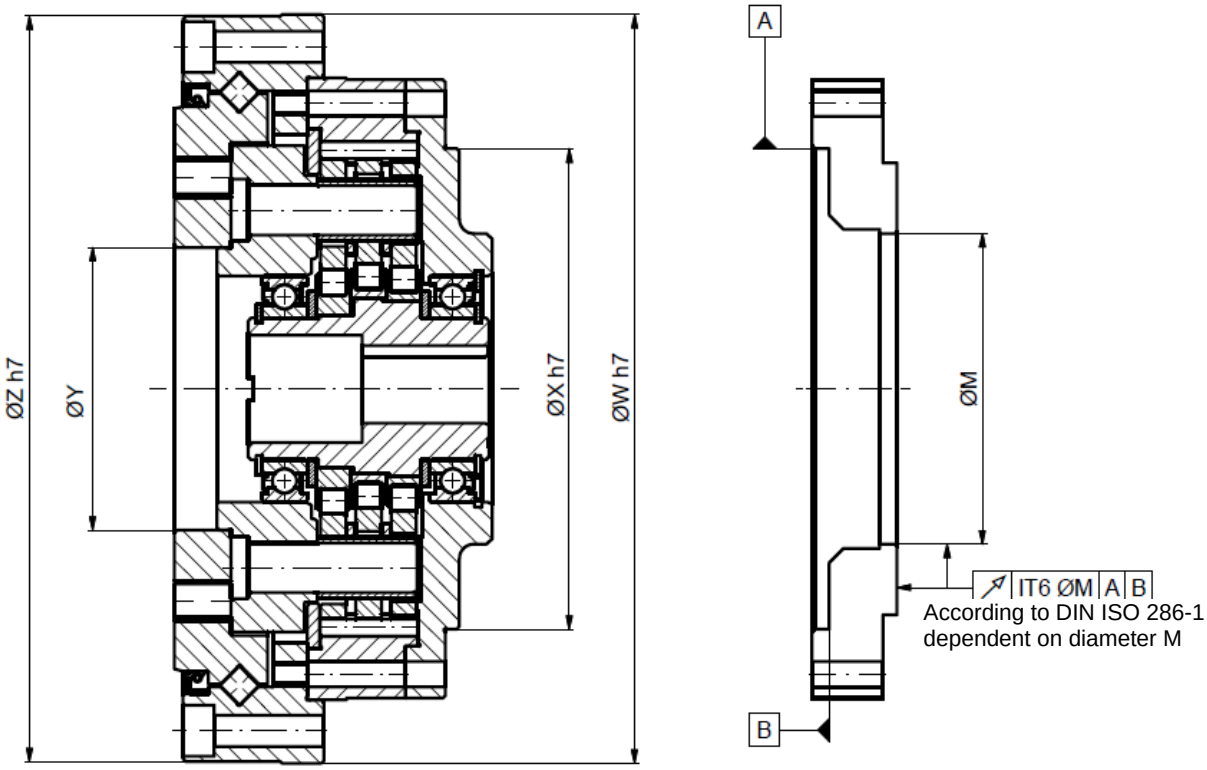


Fig. 9 *F1C-A assembly tolerances*

F1C-A	Ø Z [mm]	Ø W [mm]	Ø Y [mm]	Ø X [mm]
15	140		45 h7	85
25	170		60 h7	110
35	205		80 h7	135
45G		265	100 M7	170
65G		350	130 M7	210
75G		430	150 M7	235

Tab. 11 F1C-A assembly tolerances

9.5 F1C-A lubrication and maintenance

Please note the basic information under 0 5. Fine Cyclo gearboxes of the F1C-A series are filled with lubricant at the factory and are suitable for any mounting position.
The cross roller bearings of the F1C-A gearboxes in sizes 45G, 65G and 75G are also suitable for all mounting positions, but require regreasing after 4,000 operating hours.
For information on regreasing quantities for the cross roller bearings and on grease types, see Tab. 12.

☒ During regreasing, the bearings must be turned in order to evenly distribute the fresh grease.

F1C-A	Grease type	Initial greasing quantity	Regreasing quantity	Interval
45G	**Shell GADUS S2 V220 2**	~ 23 g	~ 10–15 g	4,000 h *
65G	**Shell GADUS S2 V220 2**	~ 62 g	~ 25–30 g	4,000 h *
75G	**Shell GADUS S2 V220 2**	~108 g	~ 45–50 g	4,000 h *

* But at least every 6 months

Tab. 12 Grease quantities/types for regreasing F1C-A cross roller bearings

When handling lubricants and anti-corrosion agents, the personal and environmental safety regulations are to be observed in accordance with the DIN 52 900 safety data sheets.

9.6 F1C-A use in Ex area

The gearboxes in the F1C-A series meet the requirements of Directive 2014/34/EU if the assembly tolerances and fastening requirements
(Tab. 10 and Tab. 11) as well as the safety measures as described in points 4.6, 4.7 and 6 are observed.

10 F2C(F)-A with tapered roller bearings

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

10.1 F2C(F)-A installation instructions

Fine Cyclo gearboxes of the type F2C(F)-A are delivered ready for installation but without paint.

☒ The flange on the output side must be fixed to the machine shaft to be driven.

☒ The required assembly tolerances as per 10.4 must be observed.

☒ An adapter is required for the attachment of the motor to the ring gear housing (the input-side flange turns at the output speed) – see 10.2

☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 13).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.

10.2 F2C-A installation example

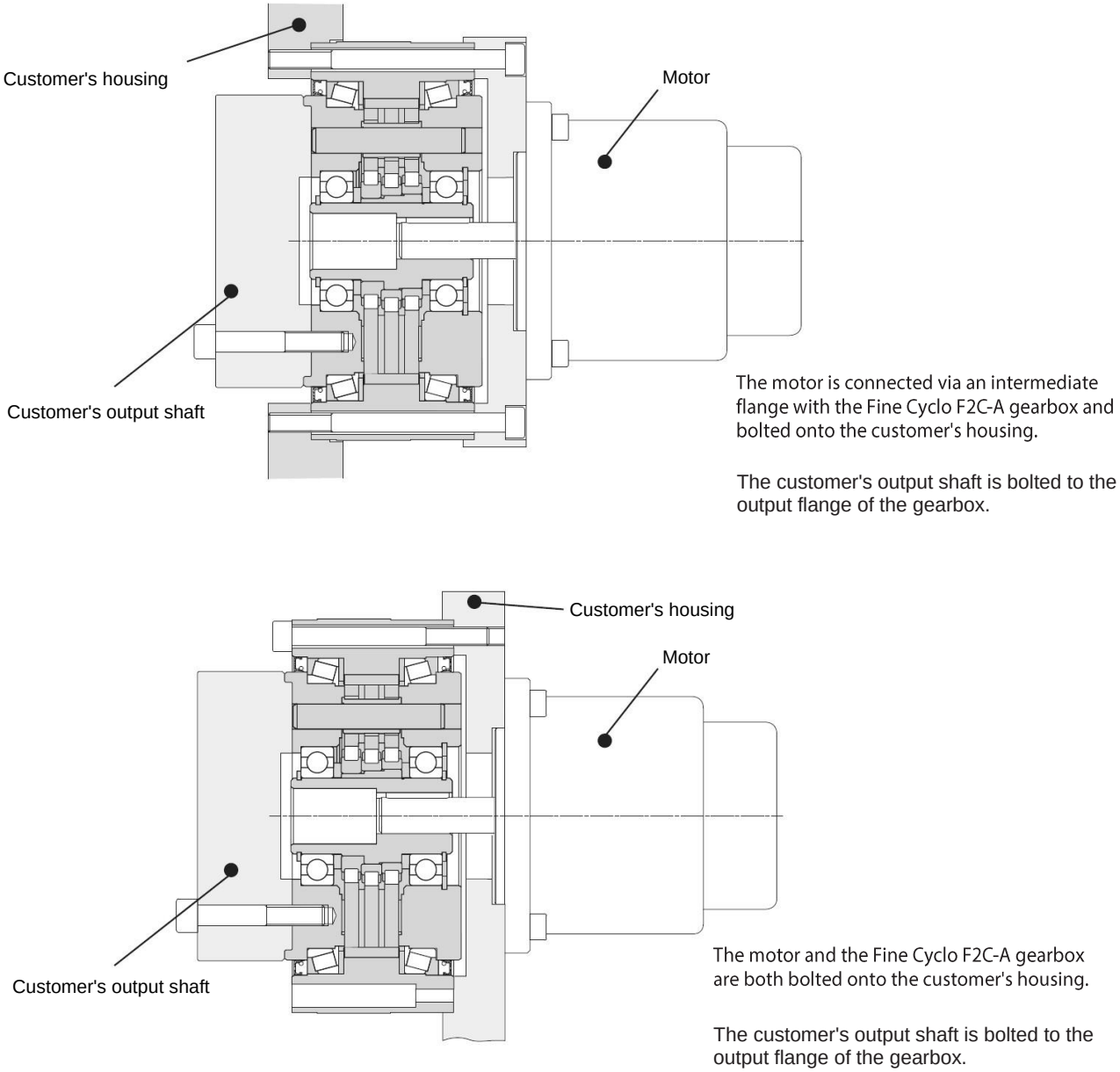


Fig. 10 *Installation examples for F2C-A*

10.3 F2C(F)-A bolt tightening torques and permitted torques

The permitted transmittable torque is also limited by the bolt connections (see Tab. 13). For the number, size, and tightening torque of the bolts for fastening the output-side flange and ring gear housing, see Tab. 13.

F2C(F)-A	Output side flange bolts			Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15	12	M6	16	16 (8)*	M6	16	700
25	12	M8	39	12 (16)*	M8	39	1500
35	12	M10	77	16	M8	39	3200
45	12	M14	210	12 (16)*	M12 (M10)*	135 (77)*	8200

* Values in brackets apply only for type F2CF-A

Tab. 13 Bolt tightening torque and permitted torque F2C(F)-A

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

10.4 F2C-A assembly tolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes.

When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50 %.

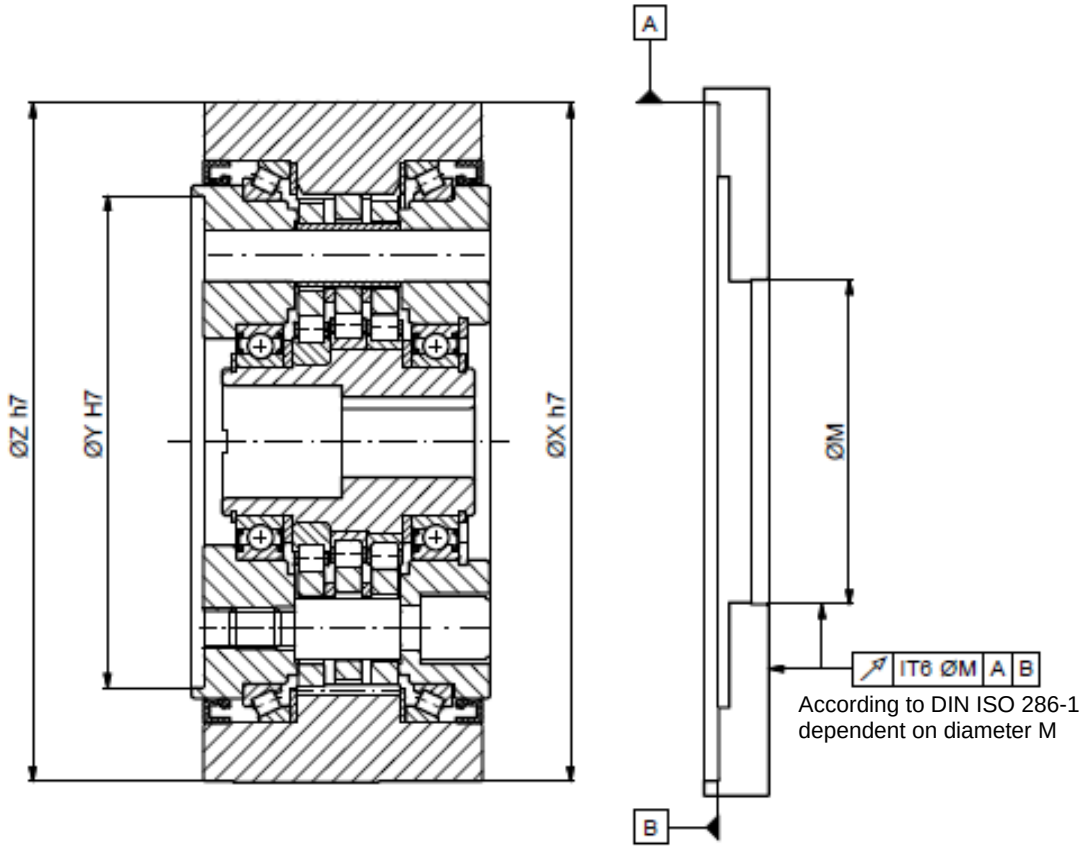


Fig. 11 *F2C-A assembly tolerances*

F2C(F)-A	F2C-				F2CF-			
	Ø X [mm]	**Ø Y** [mm]	**Ø Z** [mm]	**Ø M**	**Ø X** [mm]	**Ø Y** [mm]	**Ø Z** [mm]	**Ø M**
15	125	84	125	Motor spigot seat depth	124	84	123	Motor spigot seat depth
25	155	106	155		160	106	160	
35	185	133	185		190	133	190	
45	230	167	230		220	167	220	

Tab. 14 F2C (F)-A assembly tolerances

10.5 F2C(F)-A lubrication and maintenance

Observe the basic information under 5 Fundamentals of gearbox lubrication.
Fine Cyclo gearboxes of the F2C-A series are filled with lubricant at the factory and are suitable for any mounting position.

10.6 F2C(F)-A use in Ex area

The gearboxes in the F2C (F)-A series meet the requirements of Directive 2014/34/EU if the assembly tolerances and fastening requirements (Tab. 13 and Tab. 14), as well as the safety measures as described in points 4.6, 4.7 and 6, are observed.

11 F3C-A with output shaft and tapered roller bearings

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

11.1 F3C-A installation instructions

Fine Cyclo gearboxes of the type F3C-A are delivered ready for installation.

☒ The output shaft must be fastened to the machine shaft to be driven.

☒ The required assembly tolerances as per 11.5 must be observed.

☒ An adapter is required for the installation of the motor at the input-side flange.

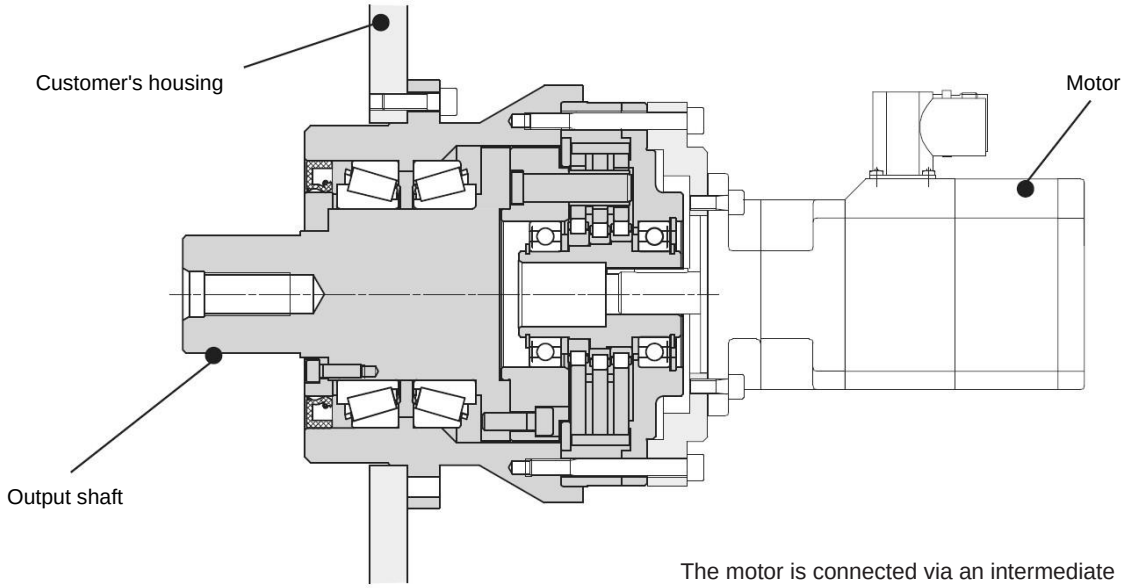
☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 15).

11.2 F3C-A installation example



The motor is connected via an intermediate flange with the Fine Cyclo F3C-A gearbox and bolted onto the customer's housing.

Fig. 12 *F3C-A installation example*

11.3 F3C-A paint

F3C-A gearboxes are delivered with a two-component polyurethane-based paint coating in RAL 9005 (Jet Black) as standard. Other colours are available by agreement.

11.4 F3C-A bolt tightening torques and permitted torques

The permitted transmittable torque is also limited by bolts (see Tab. 15). For the number, size, and tightening torque of the bolts for fastening the output-side flange and the housing, see Tab. 15.

F3C-A	Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15G	8	M6	16	550
25G	8	M6	16	1000
35G	8	M8	39	2100
45G	12	M8	39	4000
65G	12	M10	77	7700
75G	12	M10	77	9000

Tab. 15 Bolt tightening torque and permitted torque F3C-A

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING!

The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

11.5 F3C-A assembly tolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50 %.

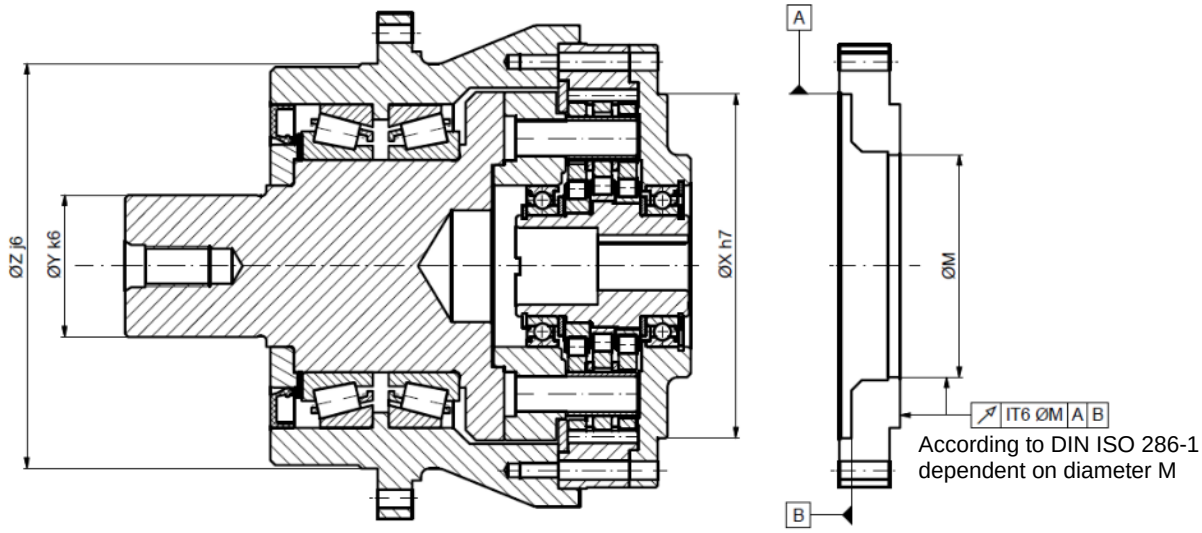


Fig. 13 *F3C-A assembly tolerances*

F3C-A	Ø X [mm]	Ø Y [mm]	Ø Z [mm]	ØM
15G	85	35	110	Motor centering
25G	110	45	135	
35G	135	55	160	
45G	170	70	200	
65G	210	90	240	
75G	235	100	280	

Tab. 16 F3C-A assembly tolerances

11.6 F3C-A lubrication and maintenance

Please note the basic information under 0 5. Fine Cyclo gearboxes of the F3C-A series are filled with lubricant at the factory and are suitable for any mounting position.

11.7 F3C-A use in Ex area

The gearboxes in the F3C-A series meet the requirements of Directive 2014/34/EU if the assembly tolerances and fastening requirements (Tab. 15 and Tab. 16), as well as the safety measures as described in points 4.6, 4.7 and 6, are observed.

12 F4C(F)-C with integrated angular ball bearings/ F2CF-C with tapered roller bearing

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

12.1 F2/4C(F)-C assembly instructions

Fine Cyclo gearboxes of the type F2/4C(F)-C are delivered ready for installation, but without paint.

☒ The output shaft must be fastened to the machine shaft to be driven.

☒ The required assembly tolerances as per 0 must be observed.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 17).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.

12.2 F2/4C(F)-C installation example

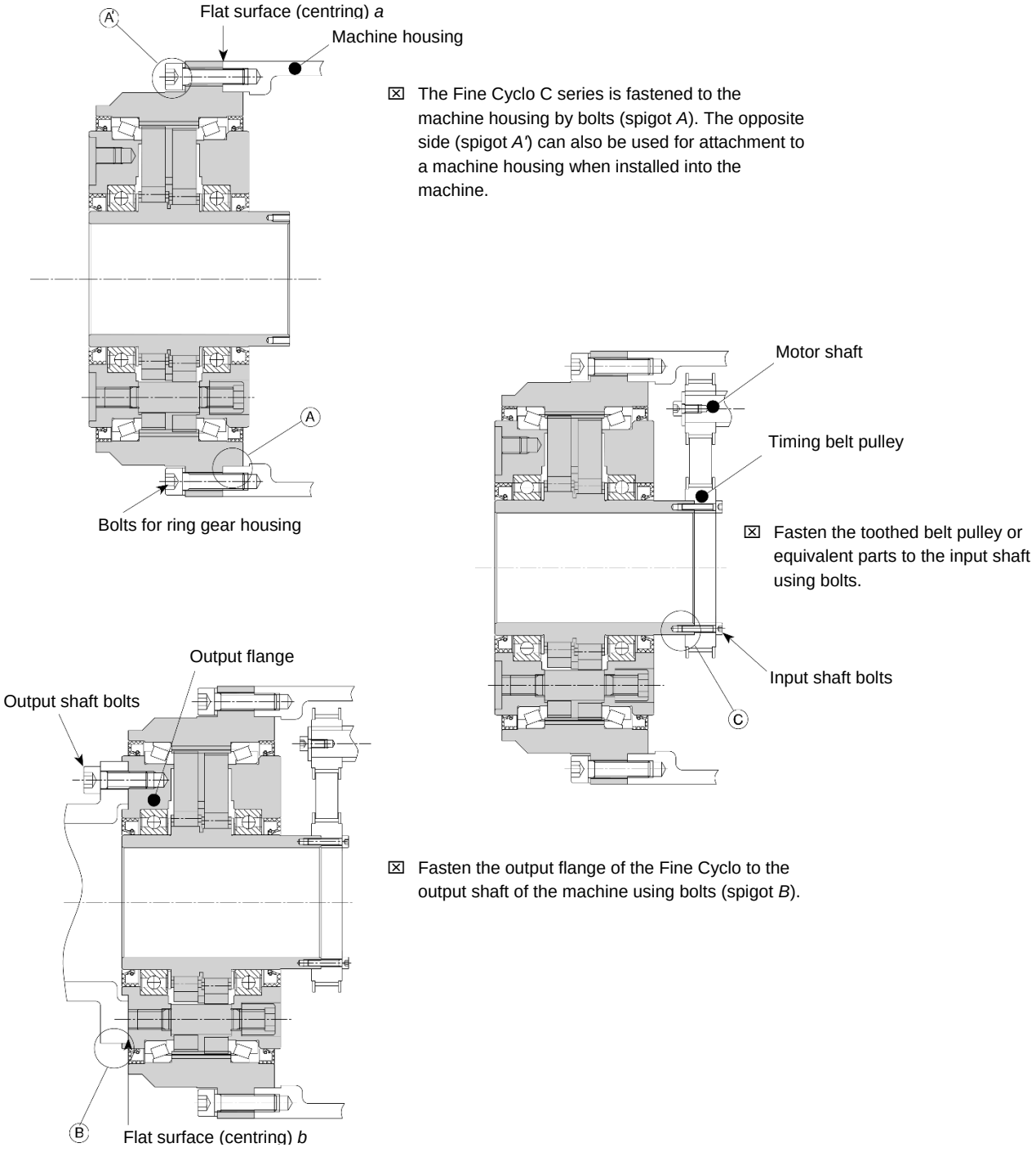


Fig. 14 *F2/4(F)C-C installation example*

12.3 F2/4C(F)-C bolt tightening torque and permitted torques

The permitted transmittable torque for bolts and the number, size, and tightening torque for fastening the output-side flange and the ring gear housing, as well as the maximum permitted transmittable torque through the bolts, are listed in Tab. 17.

F2/4C(F)-C	Output side flange bolts				Ring gear housing bolts (housing)			
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Permitted transmittable torque through bolts [Nm] T_{2t}	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Permitted transmittable torque through bolts [Nm] T_{2t}
25	12	M8	33.4	2080	12	M8	33.4	3178
35	12	M10	65.7	4267	8	M10	65.7	4670
45	12	M12	114.0	7191	8	M12	114.0	7760
55	12	M14	181.0	10919	12	M12	114.0	13008
65	12	M16	284.0	16893	16	M12	114.0	19404

F2/4C(F)-C	Eccentric input shaft			
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Permitted transmittable torque through bolts [Nm] T_{2t}
25	6	M3	1.67	69
35	6	M4	3.92	157
45	6	M4	3.92	196
55	8	M5	8.04	481
65	12	M5	8.04	785

Tab. 17 Bolt tightening torque and permitted torque F2/4C(F)-C

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 10.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

12.4 F2/4CF-C assembly tolerances

Fittings for assembly of input and output parts (timing belt, disc, gear, etc.) are shown schematically in the following figure. Use the diameters and tolerances shown in the table below.

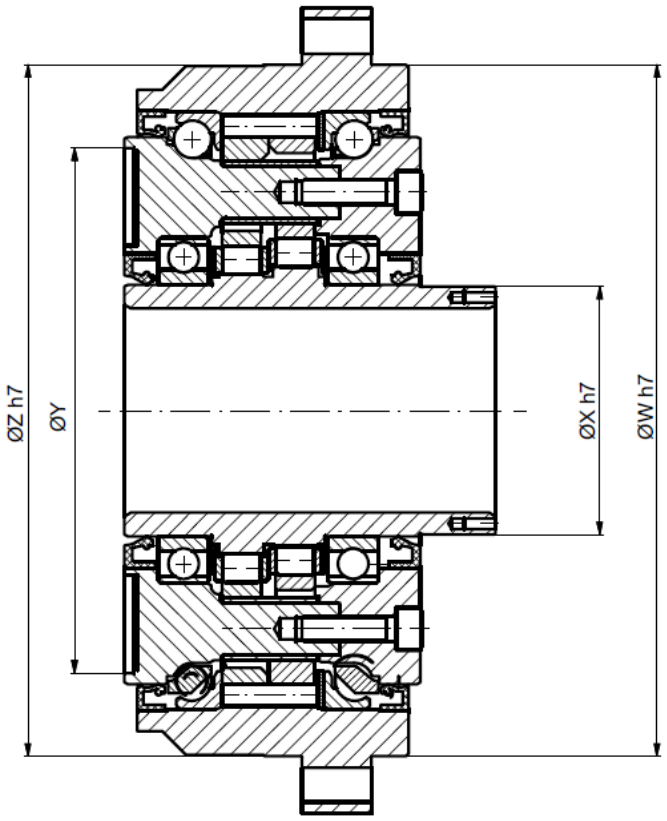


Fig. 15 *Assembly tolerances F2/4C(F)-C*

F2/4C(F)-C	Ø W [mm]	Ø X [mm]	Ø Y [mm]	Ø Z [mm]
15	137	49.5	71 h7	137
25	185	59	133 H7	185
35	220	79	167 H7	220
45	250	94	192 H7	250
55	284	109	218 H7	284
65	320	119	245 H7	320

Tab. 18 Assembly tolerances F2/4C(F)-C

12.5 F2/4C(F)-C lubrication and maintenance

Observe the basic specifications under 5 Fine Cyclo C series gearboxes are filled with lubricant at the factory and are suitable for any mounting position.

13 F4CF-D with angular ball bearings

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

13.1 F4CF-D installation instructions

The gearboxes are delivered without a paint coating.

Fittings for the installation of drive parts (motor adapter plate or machine housing) are shown in Tab. 20.

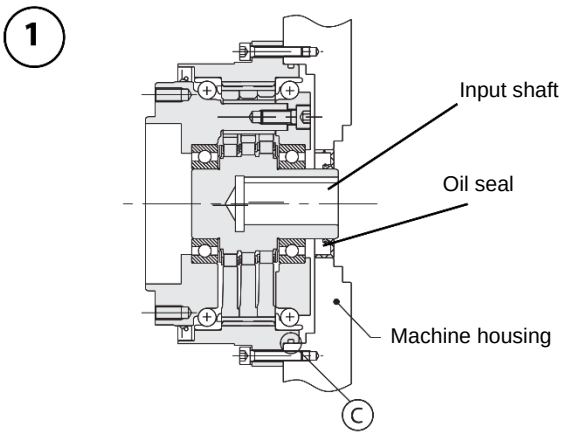
☒ In the case of installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

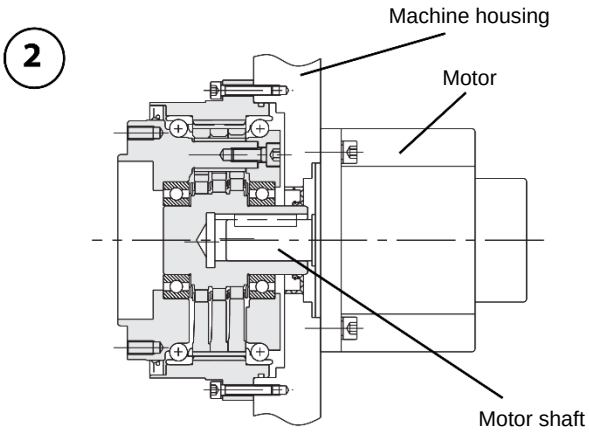
☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 19).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.
☒ Recommended liquid seal: Three Bond 1215 by Three Bond Co., Ltd.

13.2 F4CF-D installation example

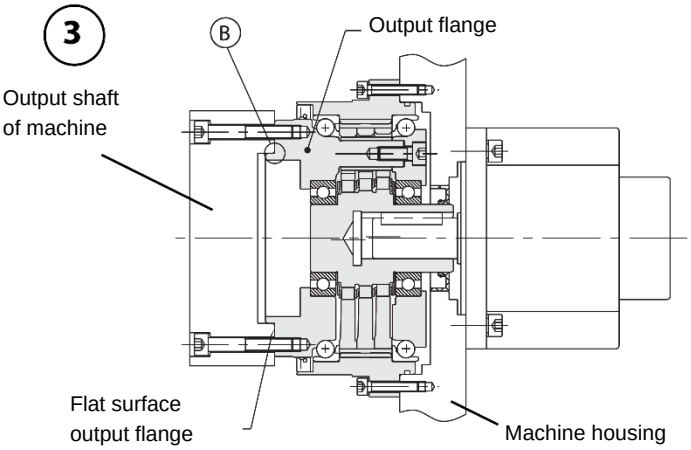


Installation example 1

- ☒ The gearboxes of the D series according to Tab. 19 are to be fastened to the machine housing with bolts (spigot *C*).
- ☒ The motor adapter is a part of the machine housing in this example. Please bear this in mind!



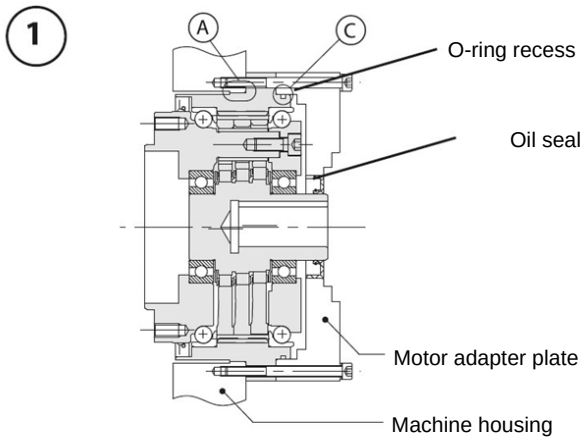
- ☒ The alignment of the central axis of the motor (motor shaft) and of the gearbox drive shaft (gearbox axis) must match.
- ☒ Fasten the motor to the motor plate with bolts.
- ☒ Apply anti-corrosive agent to motor shaft before assembly in order to avoid fretting corrosion!



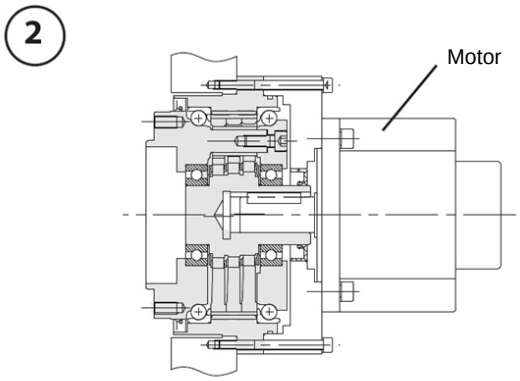
- ☒ Fasten the output flange of the Fine Cyclo gearbox to the output shaft of the machine with bolts (spigot *B).*
- ☒ Please note! If the Fine Cyclo gearbox is not sealed on the output side as standard, use liquid sealant on the flat face of the output flange.
- ☒ Liquid sealing material, washers for the bolts and the fastening bolts are to be provided and fitted by the customer.

Fig. 16 *Installation example 1 F4CF-D*

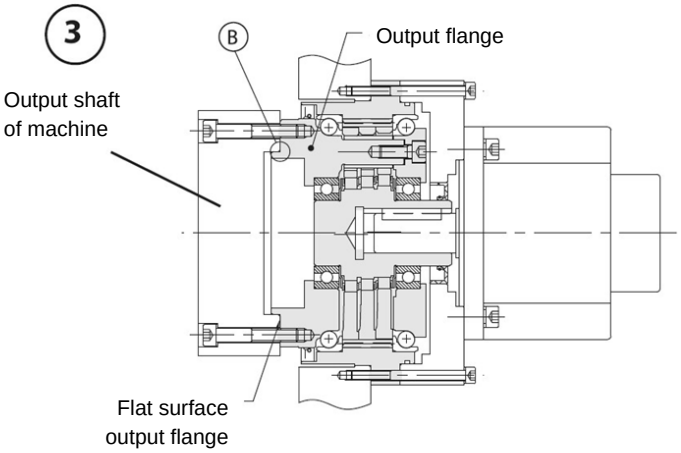
Installation example 2



- ☒ The D series gearbox must be attached to the machine housing with bolts as per Tab. 19 (spigot *A*). When fastening the motor adapter plate, bolt it together with the gearbox.
- ☒ The gearbox must be sealed with an oil seal and O-ring at spigot *C* between the motor adapter plate and the input shaft. The oil seal is not part of our standard delivery scope if the delivery does not include the motor adapter (installation example 2).



- ☒ The alignment of the central axis of the motor (motor shaft) and of the gearbox drive shaft (gearbox axis) must match.
- ☒ Fasten the motor to the motor plate with bolts.
- ☒ Apply anti-corrosive agent to motor shaft before assembly in order to avoid fretting corrosion!



- ☒ Fasten the output flange of the Fine Cyclo gearbox to the output shaft of the machine with bolts (spigot *B)*.
- ☒ Please note! If the Fine Cyclo gearbox is not sealed on the output side as standard, use liquid sealant on the flat face of the output flange.
- ☒ Liquid sealing material, washers for the bolts and the fastening bolts are to be provided and fitted by the customer.

Fig. 17 *F4CF-D installation example 2*

13.3 F4CF-D bolt tightening torques and permitted torques

The permitted transmittable torque for bolts and the number, size, and tightening torque for fastening the output-side flange and the ring gear housing, as well as the maximum permitted transmittable torque through the bolts, are listed in Tab. 19.

F4CF-D	Output-side bolts			Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15	12	M8	38.3	12	M6	15.7	1478
25	12	M8	38.3	16	M6	15.7	2065
30	16	M8	38.3	16	M6	15.7	2786
35	12	M10	76.5	16	M8	38.3	3962
45	16	M12	133	16	M10	76.5	9347

Tab. 19 Bolt tightening torque and permitted torque for F4CF-D

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

13.4 F4CF-D assembly tolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50%.

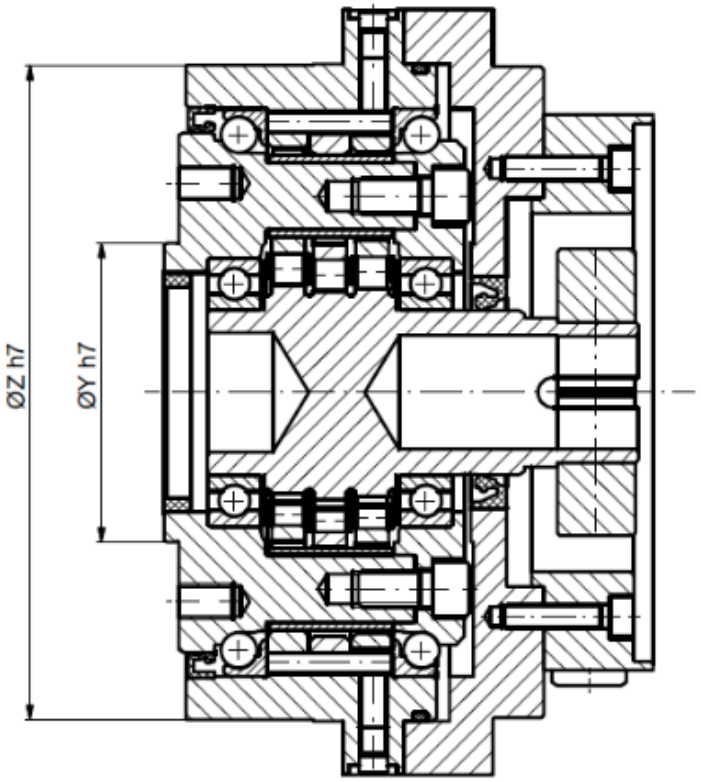


Fig. 18 *F4CF-D assembly tolerances*

F4CF-D	Ø Z [mm]	Ø Y [mm]
15	124	47
25	145	113
30	163	100
35	174	75
45	220	100

Tab. 20 F4CF-D assembly tolerances

13.5 F4CF-D lubrication and maintenance

Observe the basic information under 5 Fundamentals of gearbox lubrication. For gearboxes that are not sealed, delivery does not include grease filling. These gearboxes must first be filled with grease (Kyodo Yushi Multemp FZ No.00) and sealed before commissioning in accordance Tab. 21 or with the dimensional drawing assigned to the specific product (see filling port Fig. 19).

F4CF-D	Quantity of grease [g]			Lubrication port distance A [mm]
	Vertical 1	Vertical 2	Horizontal	
15	55	40	50	20
25	100	45	95	26
30	220	85	200	29
35	190	150	160	34
45	320	260	270	39

Tab. 21 Grease quantities F4CF-D (if delivery is without grease filling)

The hollow between the gearbox and the connection structure must additionally be taken into account horizontally: 50% vertical 1: 0% vertical 2: 100 %

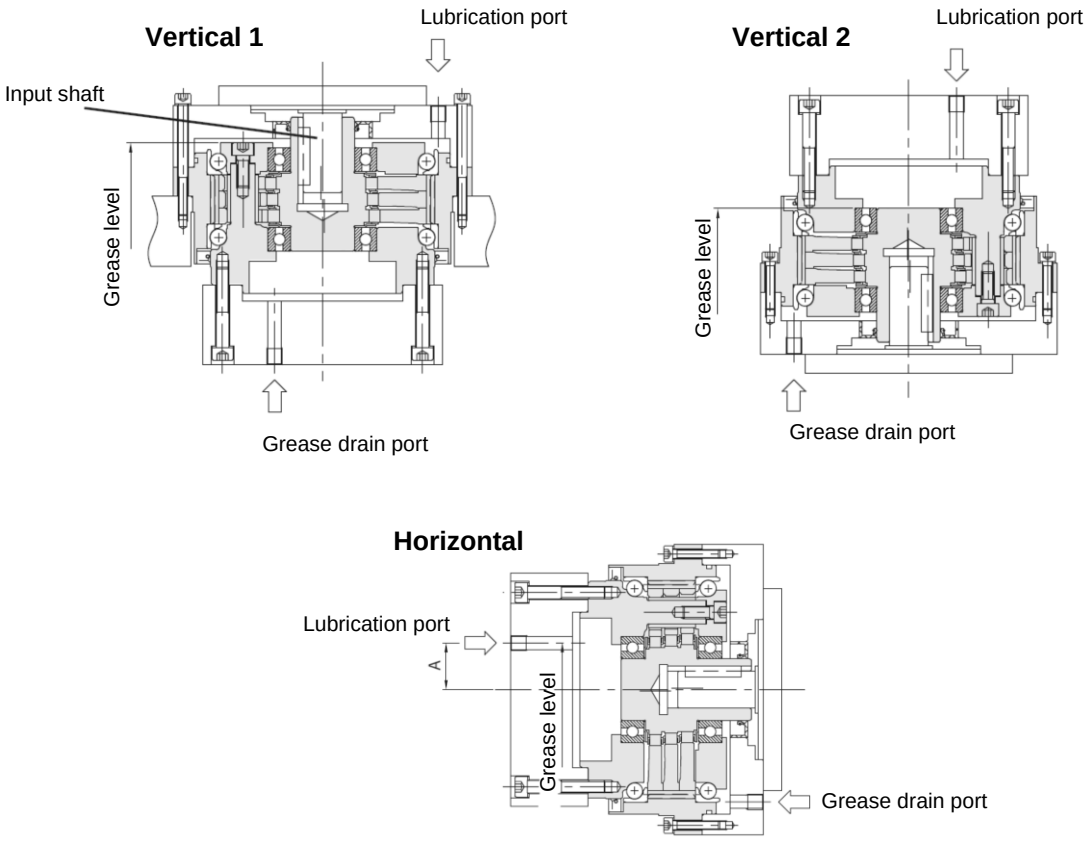


Fig. 19 *F4CF-D grease filling*

14 F4CF-DA with angular ball bearings

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

14.1 F4CF-DA installation instructions

The gearboxes are delivered without a paint coating.

Fittings for the installation of drive parts (motor adapter plate or machine housing) are shown inTab. 22.

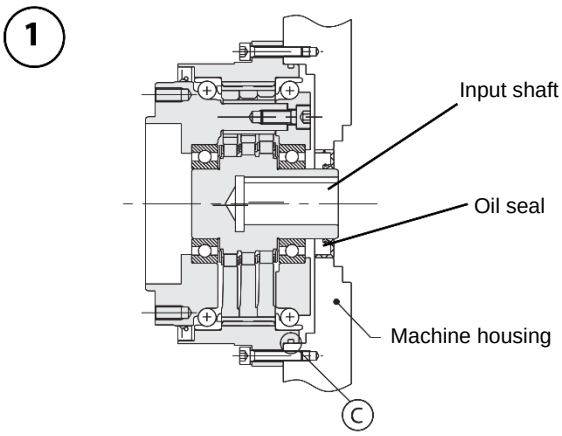
☒ In the case of installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

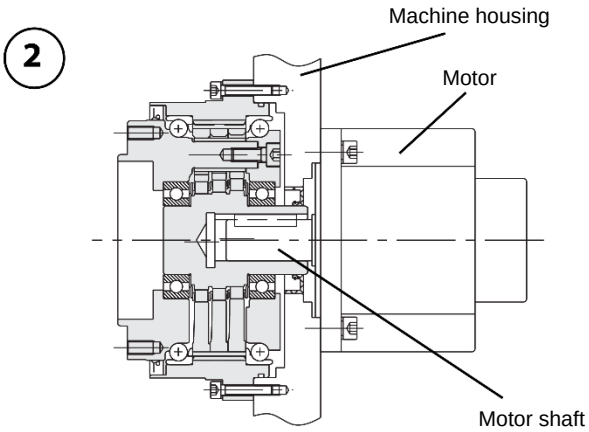
☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 22).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.
☒ Recommended liquid seal: Three Bond 1215 by Three Bond Co., Ltd.

14.2 F4CF-DA installation example

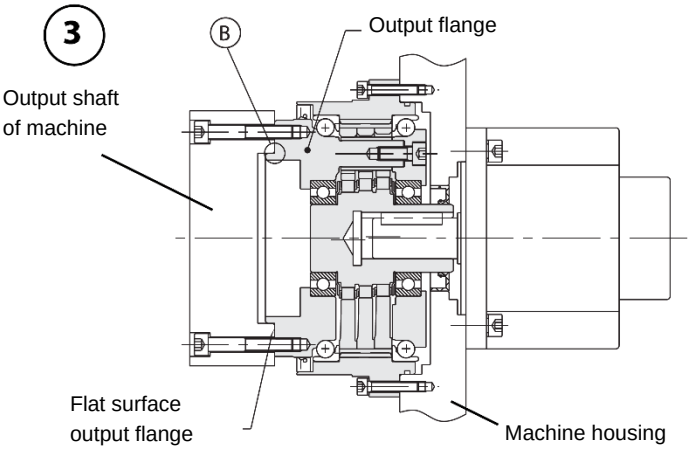


Installation example 1

- ☒ The gearboxes of the DA series according to Tab. 22 are to be fastened to the machine housing with bolts (spigot *C*).
- ☒ The motor adapter is a part of the machine housing in this example. Please bear this in mind!



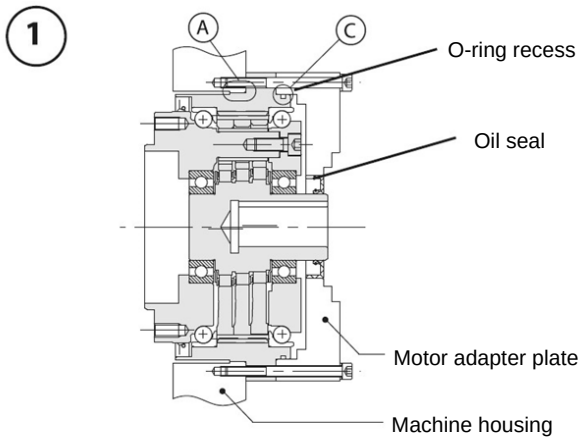
- ☒ The alignment of the central axis of the motor (motor shaft) and of the gearbox drive shaft (gearbox axis) must match.
- ☒ Fasten the motor to the motor plate with bolts.
- ☒ Apply anti-corrosive agent to motor shaft before assembly in order to avoid fretting corrosion!



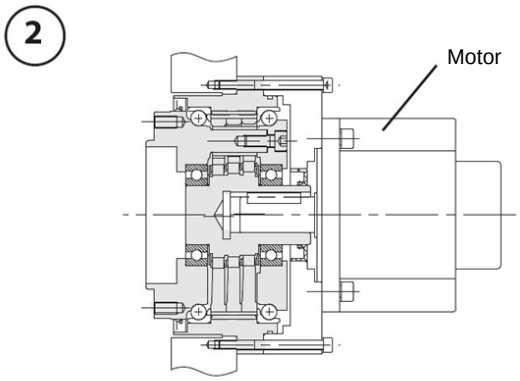
- ☒ Fasten the output flange of the Fine Cyclo gearbox to the output shaft of the machine with bolts (spigot *B).*
- ☒ Please note! If the Fine Cyclo gearbox is not sealed on the output side as standard, use liquid sealant on the flat face of the output flange.
- ☒ Liquid sealing material, washers for the bolts and the fastening bolts are to be provided and fitted by the customer.

Fig. 20 *F4CF-DA installation example 1*

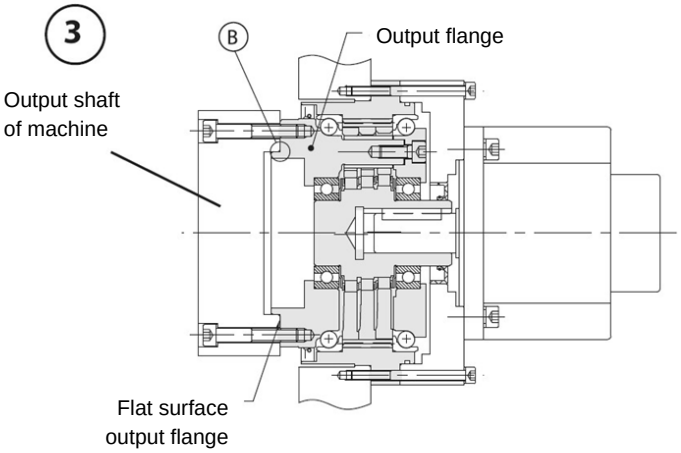
Installation example 2



- ☒ The DA series gearbox must be attached to the machine housing with bolts as per Tab. 22 (spigot *A*). When fastening the motor adapter plate, bolt it together with the gearbox.
- ☒ The gearbox must be sealed with an oil seal and O-ring at spigot *C* between the motor adapter plate and the input shaft. The oil seal is not part of our standard delivery scope if the delivery does not include the motor adapter (installation example 2).



- ☒ The alignment of the central axis of the motor (motor shaft) and of the gearbox drive shaft (gearbox axis) must match.
- ☒ Fasten the motor to the motor plate with bolts.
- ☒ Apply anti-corrosive agent to motor shaft before assembly in order to avoid fretting corrosion!



- ☒ Fasten the output flange of the Fine Cyclo gearbox to the output shaft of the machine with bolts (spigot *B)*.
- ☒ Please note! If the Fine Cyclo gearbox is not sealed on the output side as standard, use liquid sealant on the flat face of the output flange.
- ☒ Liquid sealing material, washers for the bolts and the fastening bolts are to be provided and fitted by the customer.

Fig. 21 *F4CF-DA installation example 2*

14.3 F4CF-DA bolt tightening torques and permitted torques

The permitted transmittable torque for bolts and the number, size, and tightening torque for fastening the output-side flange and the ring gear housing, as well as the maximum permitted transmittable torque through the bolts, are listed in Tab. 22.

F4CF-DA	Output-side bolts			Ring gear housing bolts			Permitted transmittable torque through bolts [Nm] T_{2t}
	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	
15	12	M8	38.3	16	M5	9.1	1389
25	18	M8	38.3	16	M6	15.7	2356
35	16	M10	76.5	16	M8	38.3	5073
40	16	M10	76.5	18	M8	38.3	6000
45	18	M10	76.5	16	M10	76.5	9371
50	18	M12	133.0	16	M10	76.5	10106

Tab. 22 Bolt tightening torque and permitted torque for F4CF-DA

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING!

The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

14.4 F4CF-DA assembly tolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes. When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50%.

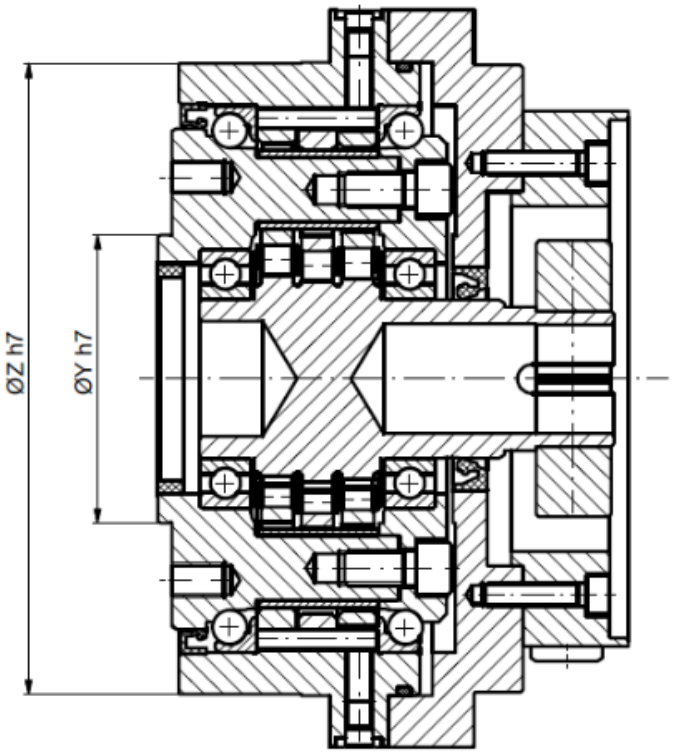


Fig. 22 *F4CF-DA assembly tolerances*

F4CF-DA	Ø Z [mm]	Ø Y [mm]
15	113	47
25	136	65
35	160	80
40	170	75
45	186	90
50	202	100

Tab. 23 F4CF-DA assembly tolerances

14.5 F4CF-DA lubrication and maintenance

Observe the basic information under 5 Fundamentals of gearbox lubrication. For gearboxes that are not sealed, delivery does not include grease filling. These gearboxes must first be filled with grease (Kyodo Yushi Multemp FZ No.00) and sealed before commissioning in accordance with Tab. 24 or the dimensional drawing assigned to the specific product (see filling port Fig. 23).

F4CF-DA	Quantity of grease [g]			Lubrication port distance A [mm]
	Vertical 1	Vertical 2	Horizontal	
15	52	52	39	20
25	113	113	91	27
35	196	196	161	34
40	204	204	170	36
45	222	222	178	39
50	305	305	252	43

Tab. 24 Grease quantities F4CF-DA (if delivery does not include grease filling)

The hollow between the gearbox and the connection structure (space on device side) must additionally be taken into account
horizontal: 50% vertical 1: 0% vertical 2: 100 %

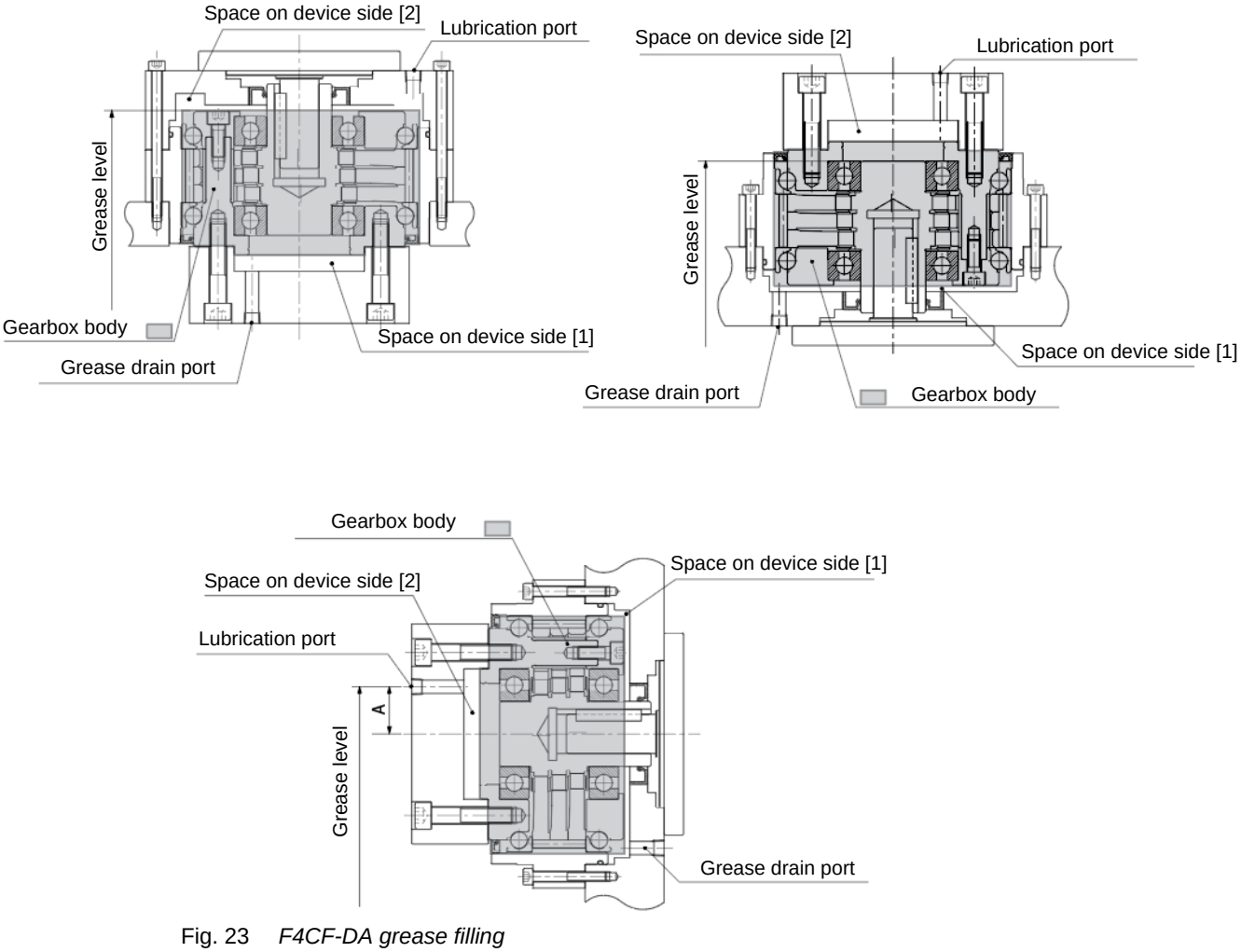


Fig. 23 *F4CF-DA grease filling*

15 F2C(F)-T with tapered roller bearing and spur gear prestage

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

15.1 F2C(F)-T installation instructions

The gearboxes are delivered without a paint coating.

☒ The flange on the output side must be fixed to the machine shaft to be driven.

☒ An adapter is required for the installation of the motor at the input-side flange. An oil seal must be provided in this adapter.

☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input-side clamp ring, the connecting elements must be cleaned of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 25).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.
☒ In the standard version the input shaft of the gearbox is not mounted in the gearbox.
☒ The correct insertion depth of the gearing (shaft distance from output) must be observed as per the Fine Cyclo catalogue (see the dimension sheets).

15.2 F2C(F)-T installation example

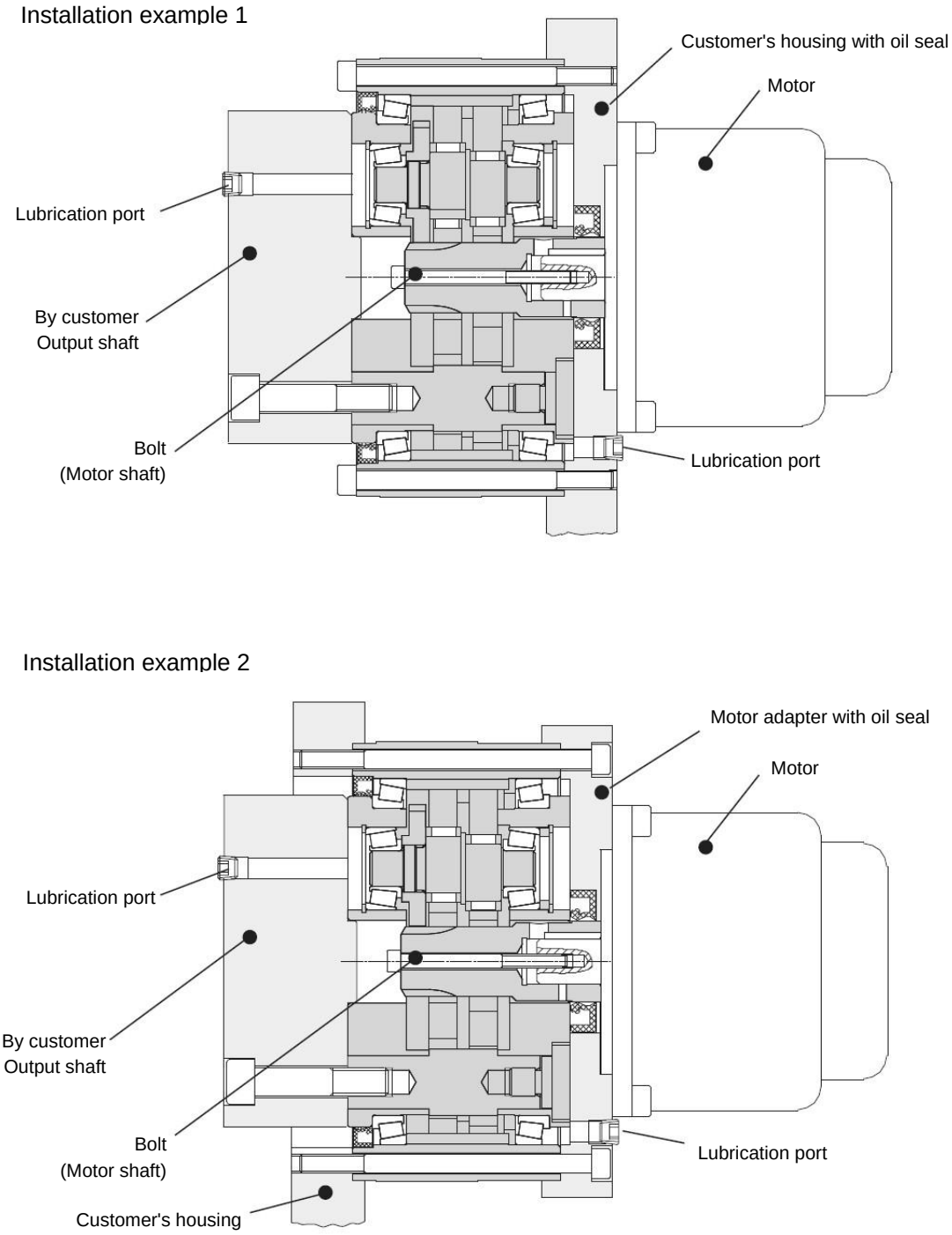


Fig. 24 *F2C-T installation examples*

15.3 F2C(F)-T - sealing of fittings

☒ Liquid sealing material must be applied between all fittings of the gearbox with the customer's applications.

☒ Liquid sealing material and washers for the bolts are to be provided and fitted by the customer. Recommended liquid seal: Three Bond 1215 by Three Bond Co., Ltd.

15.4 F2C(F)-T bolt tightening torques and permitted torques

For assembly purposes, all bolts provided by the customer must be tightened with the correct tightening torque as per Tab. 25.

F2C(F)-T	Output side flange bolts					Ring gear housing bolts				
	Number of bolts**	Size DIN 4762	Pitch circle Ø [mm]	Tightening torque per bolt [Nm]	Permitted transmittable torque [Nm] T_{2t}	Number of bolts**	Size DIN 4762	Pitch circle Ø [mm]	Tightening torque per bolt [Nm]	Permitted transmittable torque [Nm] T_{2t}
155	6	M6	45	14	970	16	M6	114 (135)**	14	1250 (1480)**
	3*	M8	66	33						
	6	M8	72	33						
255	6	M12	84	115	2160	12 (16)**	M8	142 (175)**	33	2150 (3500)**
	3*	M8	82	33						
	6	M8	50	33						
355	6	M14	104	180	4500	16	M8	171 (206)**	33	3450 (4150)**
	3*	M12	102	115						
	6	M12	63	115						
455	6	M16	135	280	7250	12 (16)**	M12 (M10)**	210 (238)**	115 (66)**	7350 (7650)**
	3*	M12	129	115						
	6	M12	93	115						
555	6	M18	165	390	11200	16	M12	240 (272)**	115	11200 (12700)**
	3*	M14	150	180						
	6	M14	115	180						
655	6	M22	180	750	18200	16	M14 (M12)**	272 (304)**	180 (115)**	17400 (14300)**
	3*	M16	170	280						
	6	M16	115	280						
755	6	M24	200	950	24000	16 (24)**	M16 (M12)**	305 (348)**	280 (115)**	27000 (24300)**
	3*	M18	190	390						
	6	M18	130	390						

Tab. 25 Bolt tightening torques and permitted torques for F2C(F)-T

* To ensure that the gearbox works reliably and to safeguard the warranty, you must use these bolts

** Values in brackets apply only for type F2CF-T

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 10.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING! The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

15.5 F2C(F)-T assembly tolerances

The radial run-out of the motor shaft, the coaxiality and the axial run-out of the mounting surface according to EN 50347:2001 are sufficient to maintain the function, lifetime and characteristics of the gearboxes.
When used in high-precision applications, the tolerance according to EN 50347:2001 should be reduced by 50 %.

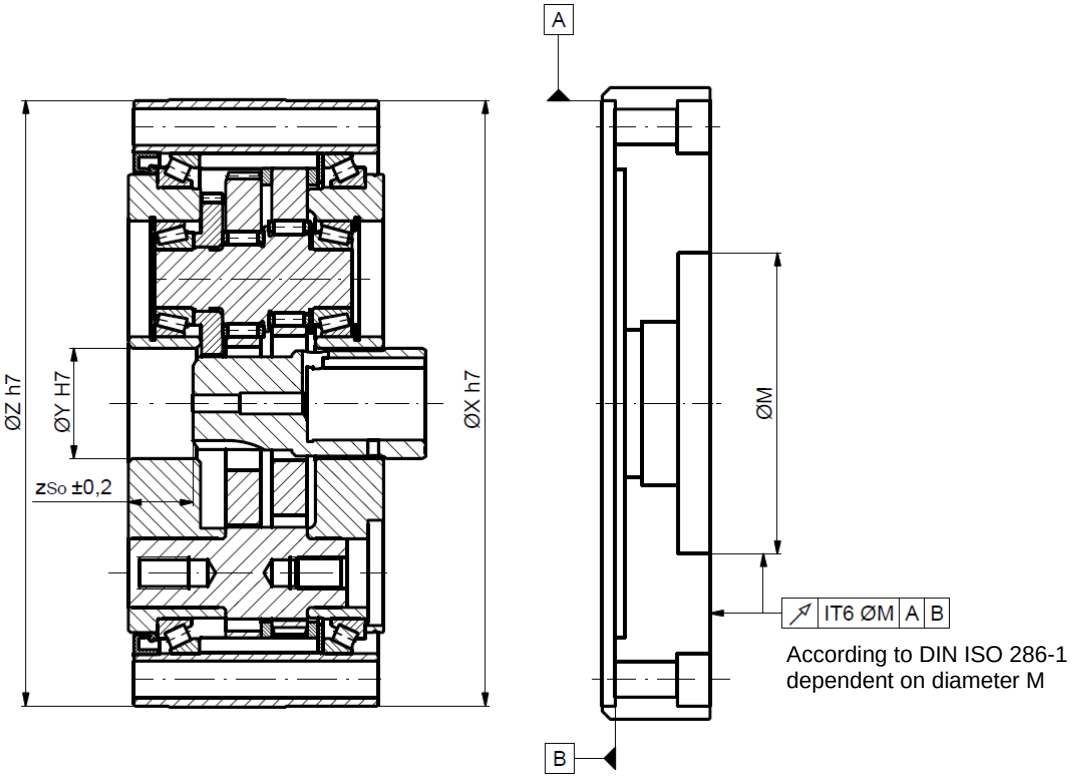


Fig. 25 *F2C(F)-T assembly tolerances*

F2C-T	Ø Z [mm]	Ø Y [mm]	Ø X [mm]	zso [mm]
155	125	23.5	125	17.5
255	155	28.0	155	19.0
355	185	35.0	185	22.5
455	230	42.0	230	24.5
555	160	47.0	260	27.5
655	295	58.0	295	31.0
755	330	62.0	330	34.5

F2CF-T	Ø Z [mm]	Ø Y [mm]	Ø X [mm]	zso [mm]
155	124	23.5	124	17.5
255	160	28.0	160	19.0
355	190	35.0	190	22.5
455	220	42.0	220	24.5
555	250	47.0	250	27.5
655	284	58.0	284	31.0
755	328	62.0	328	34.5

Tab. 26 F2C(F)-T assembly tolerances

15.6 F2C(F)-T lubrication and maintenance

Observe the basic information under 5 Fundamentals of gearbox lubrication. For gearboxes that are not sealed, delivery does not include grease filling. These gearboxes must first be filled with grease (Kyodo Yushi Multemp FZ No.00) and sealed before commissioning in accordance Tab. 27 or with the dimensional drawing assigned to the specific product (see filling port 0).

F2C(F)-T	Quantity of grease [g] *		
	vertical	horizontal	A [mm]
155	80	60	25
255	120	100	31
355	230	180	39
455	300	240	47
555	400	320	55
655	700	560	63
755	800	640	73

* The grease quantity relates to the gearbox

Tab. 27 F2C(F)-T grease quantities

The hollow between the gearbox and the connection structure must additionally be taken into account horizontally: 50% vertical 1: 0% vertical 2: 100 %

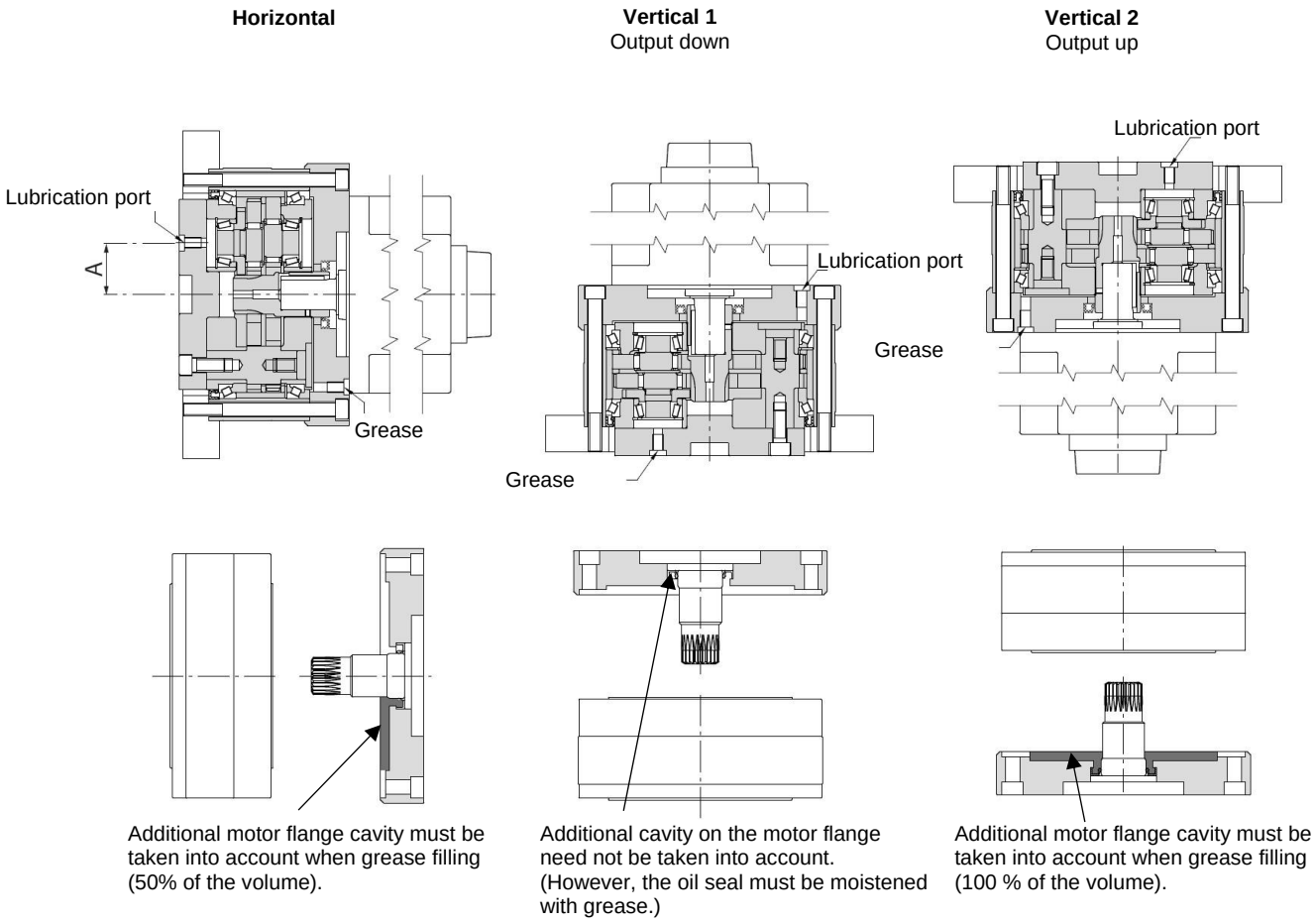


Fig. 26 *F2C(F)-T grease filling*

15.7 F2C(F)-T use in Ex area

The gearboxes in the F2C(F)-T series meet the requirements of Directive 2014/34/EU if the assembly tolerances and fastening requirements (Tab. 25, Tab. 26 and Tab. 26), as well as the safety measures as described in points 4.6, 4.7 and 6, are observed.

16 F4CF-UA with angular ball bearings and spur gear prestage/ F2CF-UA with tapered roller bearing and spur gear prestage

WARNING!

The safety instructions for the installation from point 4 to point 6 must be observed. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

16.1 F2/4CF-UA installation instructions

The gearboxes are delivered without a paint coating.

☒ The flange on the output side must be fixed to the machine shaft to be driven.

☒ An adapter is required for the installation of the motor at the input-side flange.

☒ An oil seal must be provided in this adapter.

☒ In the case of standard installations with a hollow shaft and keyway, MoS_2 paste or spray (e.g. Molykote) must be applied to the motor shaft.

☒ In the case of designs with an input side clamp ring, the connecting elements must be cleaned free of oil and grease. Refer to the mounting instructions under 4.9 and 4.10.

NOTE!

☒ Make sure that you use the correct tightening torque for the bolts when fastening the gearbox (Tab. 28).
☒ Use bolts which are shorter than the threaded hole depth indicated in the dimensional drawings for the output flange.
☒ In the standard version the input shaft of the gearbox is not mounted in the gearbox.
☒ The correct insertion depth of the gearing (shaft distance from output) must be observed as per the Fine Cyclo catalogue (see the dimension sheets).

16.2 F2/4CF-UA installation example

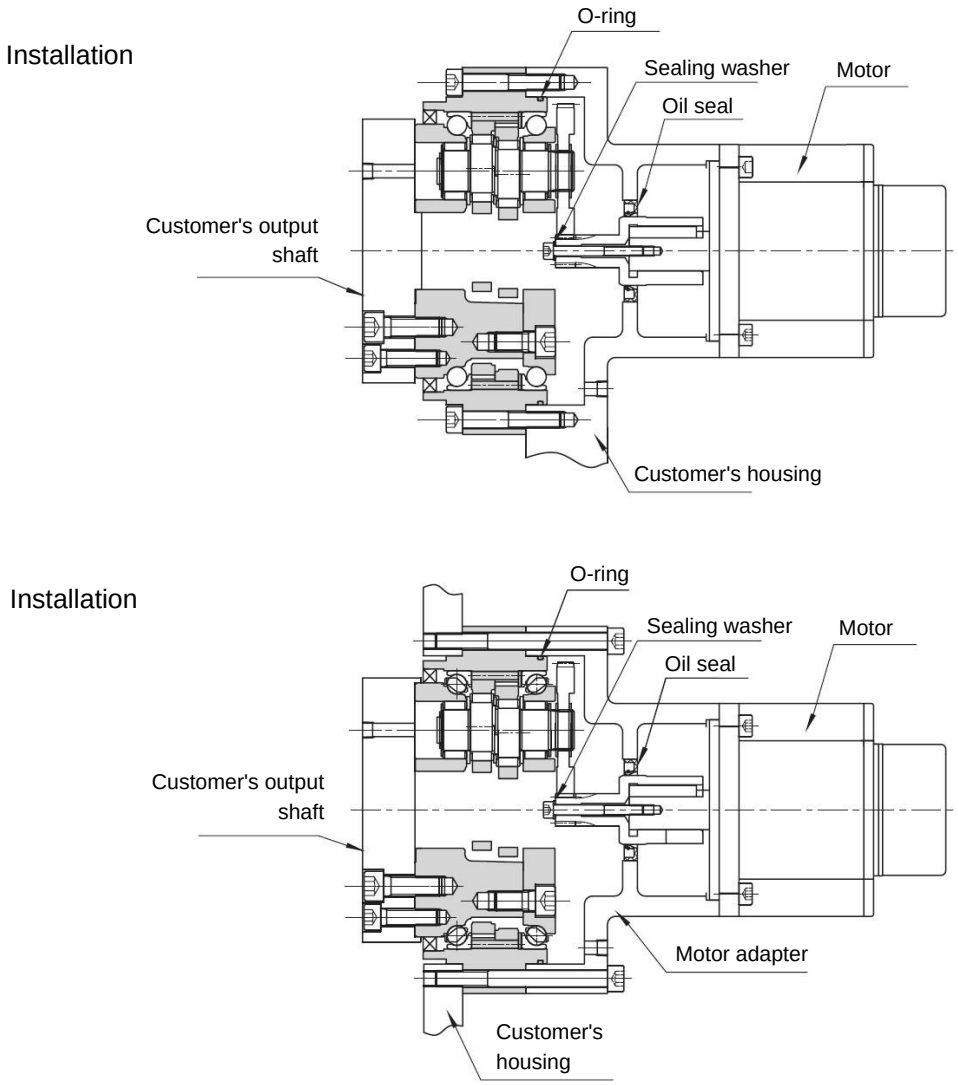


Fig. 27 *F2/4CF-UA installation examples*

16.3 F2/4CF-UA sealing fittings

☒ If an unsealed gearbox is purchased, liquid sealing material must be applied between all fittings of the gearbox with customer's applications.

☒ Liquid sealing material and washers for the bolts are to be provided and fitted by the customer. Recommended liquid seal: Three Bond 1215 by Three Bond Co., Ltd.

16.4 F2/4CF-UA bolt tightening torque and permitted torques

For assembly purposes, all bolts provided by the customer must be tightened with the correct tightening torque as per Tab. 28.

F2/4CF-UA	Output side flange bolts				Ring gear housing bolts			
	Size DIN 4762	Tightening torque per bolt [Nm]	Permitted transmittable torque [Nm] T_{2t}	Number of bolts	Size DIN 4762	Tightening torque per bolt [Nm]	Permitted transmittable torque [Nm] T_{2t}	Number of bolts
15	M6	15.7	1505	24	M5	9.1	1389	16
25	M10	76.5	3083	15	M8	38.3	3283	12
35	M10	76.5	5848	21	M8	38.3	5707	18
45	M10	76.5	10262	18	M10	76.5	10646	18
	M12	133.0		9				
55	M12	133.0	12406	24	M10	76.5	12977	20
65	M12	133.0	22321	33	M12	133.0	20656	18
80	M16	331.0	32221	24	M12	133.0	30545	24
115	M20	650.0	94500	32	M20	650.0	149000	28

Tab. 28 Bolt tightening torque and permitted torques UA

☒ Use all of the bolt connection points on the gearbox.
☒ We recommend using bolt lockers such as Loctite 243 to secure the bolt connections.
☒ Use metric hexagon socket screws with metric regulation threads as per DIN EN ISO 4762 strength category 12.9.
☒ Use spring washers (DIN 6796/ISO 10670) when connecting the gearbox to the flange side to prevent the bolt contact faces from becoming damaged.

WARNING!

The permitted transmittable torques of the gearboxes ($T2_{max}$ and $T2_A$) must be observed according to catalogue and must not be exceeded. Failure to observe these torques can result in injuries, machine damage, and the invalidation of the warranty!

16.5 F2/4CF-UA assembly tolerances

To ensure the function, lifetime, and characteristics of the reduction kits, the radial run-out of the motor shaft, coaxiality, and axial run-out of the fastening flange as per DIN EN 50347 are sufficient. When used in high-precision applications, it is recommended to reduce the tolerance according to DIN EN 50347 by 50%. For the assembly tolerances, see Tab. 29.

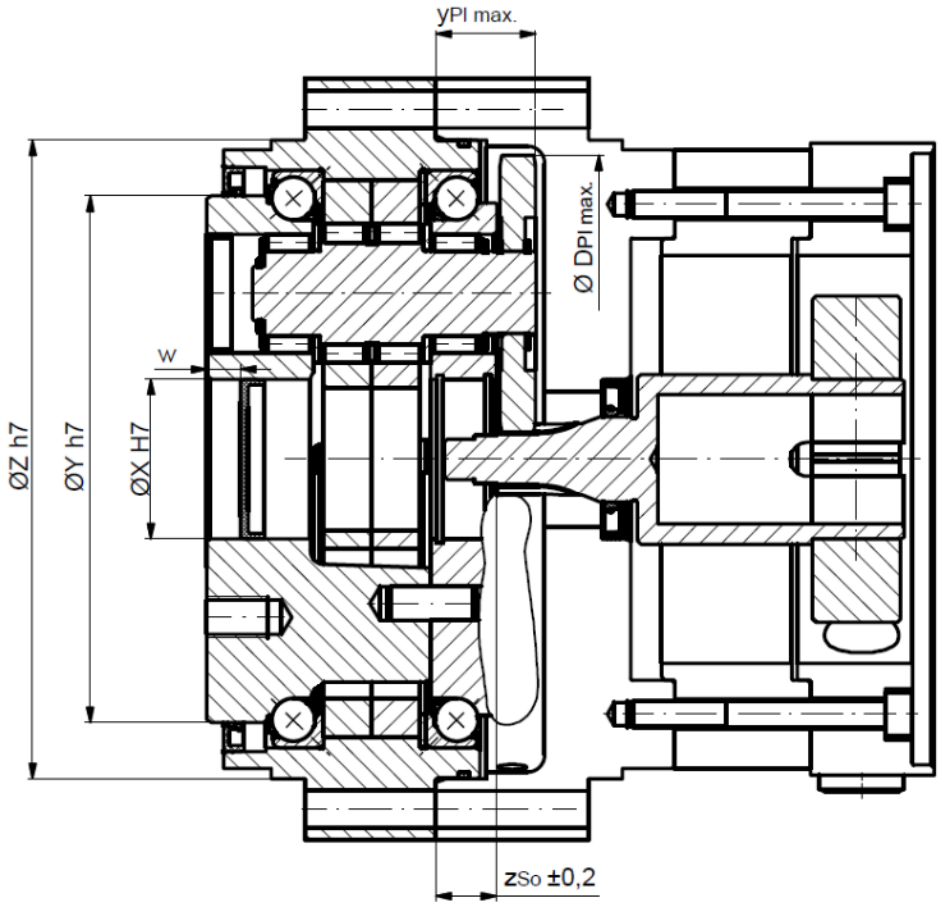


Fig. 28 *Assembly tolerances UA*

F2/4CF-UA	Ø X	Ø Y	Ø Z	Ø D_{PI} max.	y_{PI} max.	z_{SO} ± 0.2	w
15	28	90	113	104.5	28.4	19.0	6
25	32	110	137	124.3	29.5	18.5	8
35	35	130	160	143.2	31.5	18.5	8
45	47	155	188	179.0	30.2	18.0	8
55	42	174	208	199.7	32.8	17.5	8
65	55	210	255	231.3	41.0	26.5	10
80	62	238	284	262.7	60.7	46.0	10

Tab. 29 Assembly tolerances UA

16.6 F2/4CF-UA lubrication

16.6.1 Grease lubrication

Observe the basic information under 05 Fundamentals of gearbox lubrication. For gearboxes that are not sealed, delivery does not include grease filling. They must first be filled with grease (Kyodo Yushi Multemp FZ No.00) and sealed before commissioning in accordance with Tab. 30 or with the dimensional drawing assigned to the specific product (see filling port Fig. 29).

F2/4CF-UA	Quantity of grease [g] *			
	vertical	horizontal	A [mm]	B [mm]
15	152	122	29	33
25	261	209	34	34
35	400	313	39	45
45	487	383	49	50
55	818	679	54	65
65	1180	940	63	74
80	2140	1700	71	75

* The grease quantity relates to the gearbox.

Tab. 30 Grease quantities UA series

16.6.2 Oil lubrication

Please note the basic information under 0 5. Non-sealed gearboxes, as well as sealed gearboxes, are delivered without filling with oil. They must first be filled with oil (Castrol Optigear Synthetic Ro 150) and possibly sealed before commissioning in accordance with Tab. 31 or with the dimensional drawing assigned to the specific product.

F4CF-UA	Oil quantity [dm^3] *		
	vertical	horizontal and vertical 2	A [mm]
115	9.4	7.8	136.5

* 1 dm^3 ≈ 1 litre.

Tab. 31 Oil quantities UA series

WARNING!

Fill in lubricant when the gearbox is not in use. Due to the viscosity of the lubricant and the geometric characteristics of the gearbox interior, it may take a while for the gearbox to achieve the correct lubricant levels.

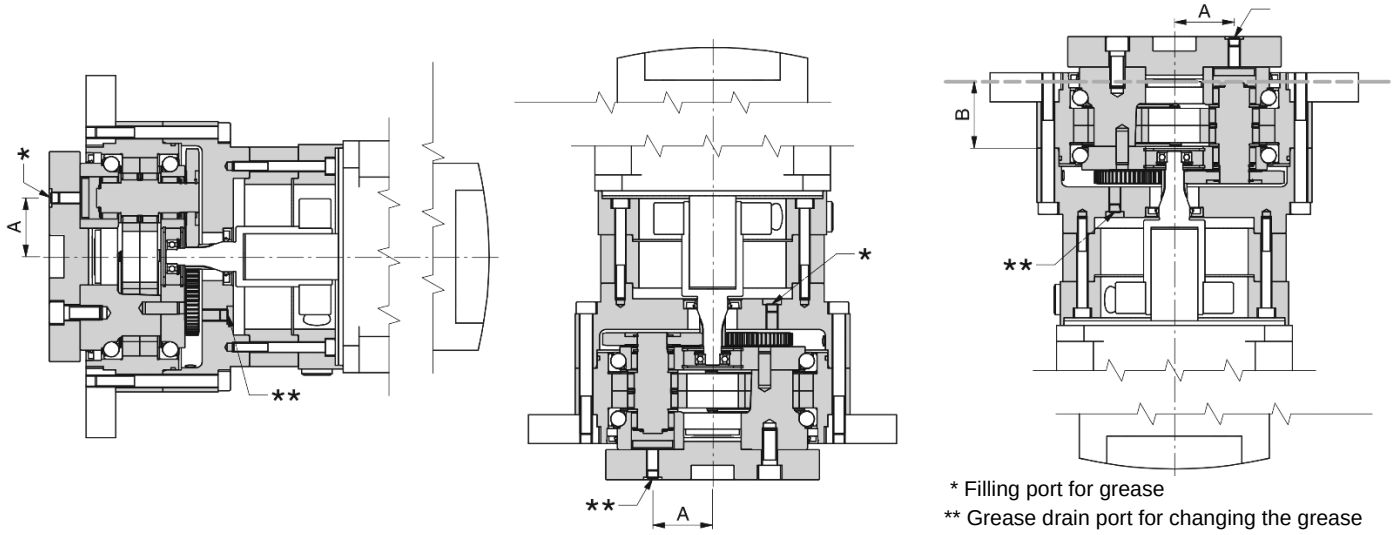
16.6.3 Filling the gearbox

The hollow between the gearbox and the connection structure must additionally be taken into account.

Mounting position
Horizontal
Additional amount of grease for flange: 50% of the cavity

Mounting position
Vertical 1
Output down
Additional amount of grease for flange: 0% of the cavity

Mounting position
Vertical 2
Output up
Additional amount of grease for flange: 100% of the cavity



* Filling port for grease
** Grease drain port for changing the grease

Determination of the cavity

The additional amount of grease is necessary for the functioning of the gearbox.

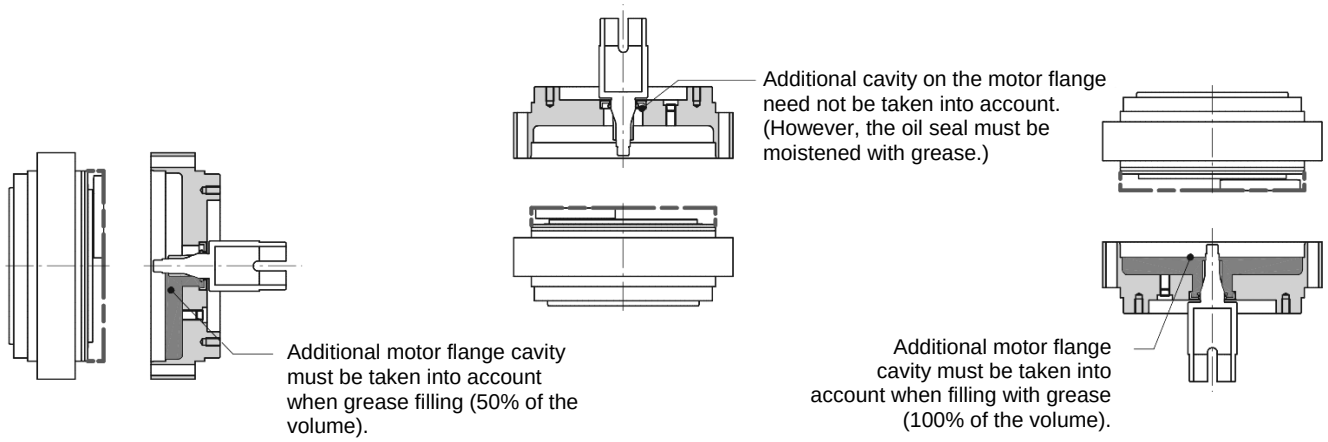


Fig. 29 *Filling UA series*

17 Disposal

NOTE!

The gearboxes described in this guide must be disposed of in accordance with their composition and the applicable regulations.
Used oil and lubricants must be collected and disposed of in accordance with regulations.

The gearbox components must be disposed of as scrap steel.

When handling lubricants, the personal and environmental safety regulations are to be observed in accordance with the DIN 52 900 safety data sheets.
Make sure that you dispose of the gearbox properly.
The best way to avoid waste is to recycle it:

- Sort metallic components correctly and feed them into the recycling cycle.
- Sort electronic components correctly and feed them into the recycling cycle.
- Dispose of materials properly that are not suitable for recycling.

18 EU Machinery Directive

Gearbox

Gearboxes are regarded as "machine components" and are thus not subject to the EU Machinery Directive 2006/42/EC.
Within the area covered by the EU directive, commissioning is prohibited until it has been determined that the machine into which this gearbox is fitted complies with the stipulations of this directive.
Since 2010, manufacturer declarations, EU conformity declarations and installation declarations have no longer been issued for gearboxes.

Geared motors

Geared motors are issued with a declaration of conformity according to the Low Voltage Directive.

		Machinery Directive 2006/42/EC	Low Voltage Directive 2014/35/EU	EMC Directive 2014/30/EU	ATEX Directive 2014/34/EU
Gearbox	CE label	no	no	no	yes
	Declaration of conformity	no	no	no	yes
	Installation Declaration	no	no	no	no
Geared motor	CE label	no	yes (on motor)	no	yes (gearbox)
	Declaration of conformity	no	yes (on motor)	no	yes (gearbox)
	Installation Declaration	no	no	no	no
Frequency converter	CE label	no	yes (converter)	yes	no
	Declaration of conformity	no	yes (converter)	yes	no
	Installation Declaration	no	no	no	no

Tab. 32 EU directives

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