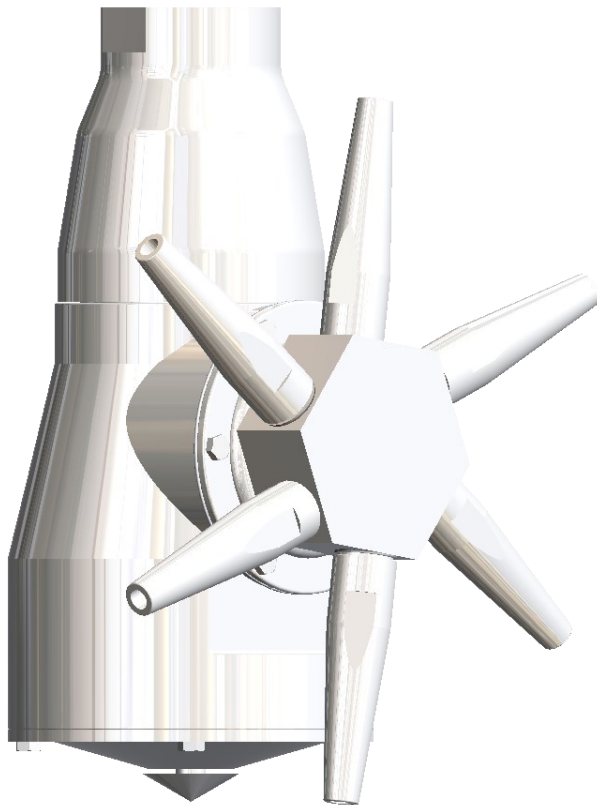


MANUAL

TCM-M20 C.I.P.



JA ENGINEERING A/S

TABLE OF CONTENTS

2. TABLE OF CONTENTS
3. SERVICE MANUAL
 - SPARES
 - TOOLS
 - SERVICE
5. PART LIST
7. INLET ASSEMBLY WITH 2103S
8. INLET ASSEMBLY WITH 2103R
9. BOTTOM COVER AND PRIMARY SHAFT ASSEMBLY
10. INTERNAL GEARFRAME
11. GEARFRAME ASSEMBLY
13. HUB ASSEMBLY
15. STEM AND CLUTCH ASSEMBLY

SERVICE MANUAL

T.C.M. TANK CLEANING MACHINES

When delivered, the Tank Cleaning Machine is ready for immediate use.

Care should be taken during use. Before connecting, flush all liquid lines and valves to purge the system of foreign matter which could cause blockage of liquid flow. It may be advisable to provide a filter (MESH 0,1-0,2mm) prior to the machine or suction side of the supply pump if the system is prone to such occurrences.

IMPORTANT: When connecting top cone thread to supply pipe, use OMNIFIT 100M (one part water proof glue) or a similar product to secure the TC Machine from unintentional loosening from supply pipe.

All piping or hose must have a minimum of 1 1/2" (38mm) I.D. to insure adequate volume and pressure are available at the machine. Operating pressure can vary between 3.5 and 10 bar (50 to 150 p.s.i.) depending on the nozzle configuration, to attain desired thru-put, radius of cleaning and cycle time. Please refer to the Capacities Chart in this manual when ordering or putting the machine into operation. Inadequate as well as excessive pressure will adversely effect performance.

Operating temperatures can vary between 2 to 95 deg.C (35 to 200 deg.F) (Above freezing and below boiling temperature.) The machine is Liquid-Hydraulically Motivated and no attempt should be made to operate it with steam, air or gas. After each use, the machine should be flushed and allowed to drain completely. Entrapped water may cause severe damage in freezing atmosphere.

Always open liquid supply valve slowly, to avoid hydraulic shock from entrapped air, etc. Repeated shock and surges can cause damage to piping, hose and other equipment as well as to the Tank Cleaning Machine.

The following information on your machine(s) should be documented and referred to when inquiring for information or ordering spare parts, etc.

1. Model number:
2. Serial number:
3. Parts:
 - a. Quantity required:
 - b. Item No:
 - c. Parts No:
 - d. Description:

SPARES

Maintenance and repair of T.C.M. Tank Cleaning Equipment as described and illustrated herein, is not difficult.

If you choose to maintain the equipment rather than return to us for overhaul, we recommend a minimum of spare parts be stocked at your facility. This will minimize the downtime of its very important cleaning function. Most importantly, maintenance personnel can compare the wear of various parts in the machine with the new parts. In this way it can be determined, on-site, if at least a "half service life" is still available for a particular part. This will reduce maintenance cost by unnecessary and premature replacement of useable parts.

For in-plant maintenance as described, we recommend:

Minimum	Item No.	Part No.	Description
1	9	2109C	Primary Shaft Bushing
1	11	2111P	Primary Shaft
1	16P	2116PTZ	Wormgear, Primary
1	16S	2116S8	Wormgear, Secondary
1	26BR	2126BR	Thrust Balls & Retainer
2	26R	2126R	Thrust Race
1	28S	2128S	Secondary Shaft Horizontal
2	29C	2129C	Shaftbearing
4	18S	2118S	Socket Screw 3/16" x 1/2" Stainless
4	33H	2133H	Hexhead Screw 3/16" x 1/2" Stainless

Please Never substitute steel screws for stainless steel as supplied with the machine. Corrosive and aggressive products may cause rapid deterioration and make repair difficult and costly.

Note: Periodically, a factory service check is recommended. Not later than 500 hours

TOOLS

Hexagonal screw driver SW4 or 5/32"
Open Ended or Socket Wrench SW8 or 5/16"
Hexagonal Key-2mm for HUB set screw
Pin Spanner-2in. Capacity x 3/16" pins
Screwdriver

SERVICE:

Whenever the machine ceases functioning and prior to a general overhaul or returning to the factory for service, please make sure there are no obstructions or blockage from debris preventing flow of cleaning fluid.

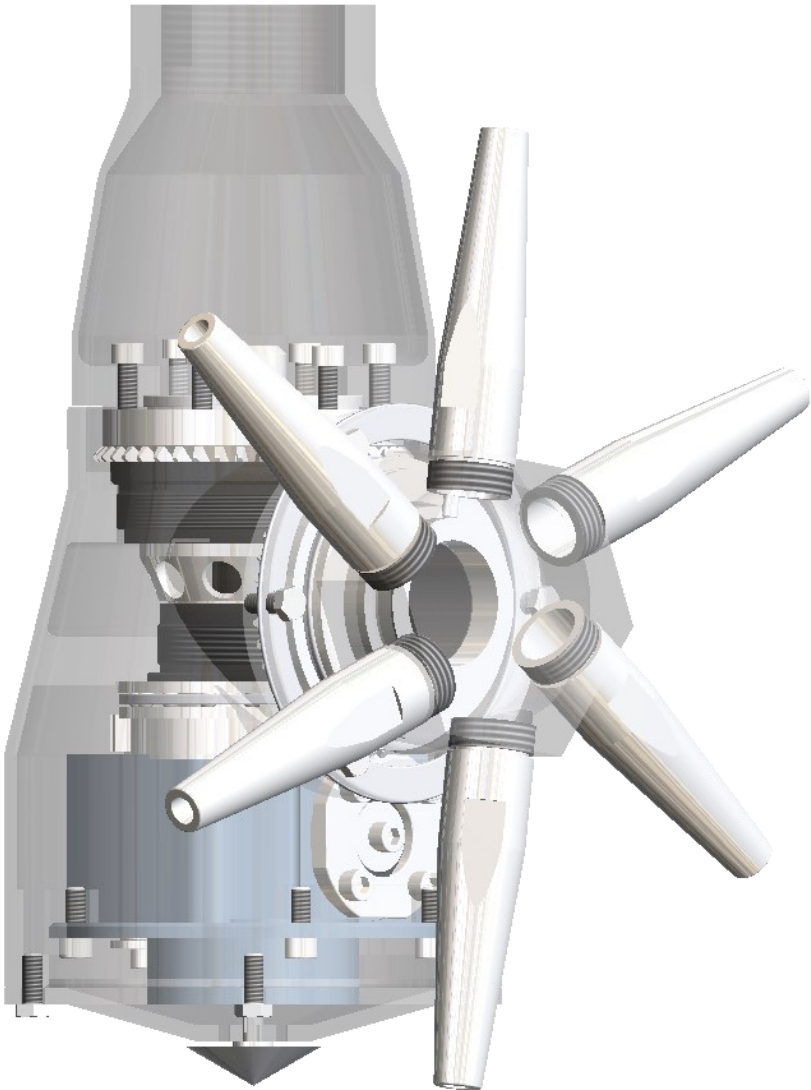
Disconnect the machine and unscrew the NOZZLES to remove any debris. Also remove the INLET NIPPLE and GUIDE so that the IMPELLER can be rotated and any obstructions removed. Back flush with air or water to completely evacuate any foreign materials. Reassemble the machine and test by putting into service. If unsuccessful, perform an overhaul as per instructions or return to JA ENGINEERING A/S for routine service.

MODEL 20 PARTS LIST

Item No	Part No.	Description	*Material
2FB	2102FB	Inlet Nipple: Female BSPS Thread	SS
2FS	2102FS	Socket Screw 3/16" x 3/4"	SS
2MS	2102MS	Socket Screw 3/16" x 1/2"	SS
3	2103S	Guide Standard	SS
3R	2103R	Guide Ring (optional high truput)	SS
4	2104V	Stem	SS
5	2105S	Impeller Standard	SS
9	2109C	Primary Shaft Bushing	C
11	2111P	Primary Shaft	SS
12	2112	Gearwheel	SS
13	2113	Clutch	SS
14	2114	Pinion Gear	SS
15C	2115C	Collar Bush	C
16P	2116PTZ	Wormgear Primary	SS/TC
16S	2116S8	Wormgear Secondary	SS
17	2117	Pinion Sleeve	SS
18S	2118S	Socket Screw 3/16" x 1/2"	SS
19	2119	Washer	SS
21	2121ND	Hub Cover	SS
21G	2121G	Hub Cover Gasket	T
22	2122	Bevelgear	SS
23	2123 Nozzle,	various Orifice 6-7-8-10-14mm	SS
24C	2124C	Hub Connector	SS
24/2	2124MD2	Hub, 2 Nozzle	SS
24/4	2124MD4	Hub, 4 Nozzle	SS
24/6	2124MD6	Hub, 6 Nozzle	SS
24S	2124S	Set Screw for MD Hub	SS
26BR	2126BR	Thrust Balls & Retainer	SS/T
26R	2126R	Thrust Race, (2 per set)	SS
27	2127	Body with Bushings (Factory Service)	SS
27U	2127/1Q	Body Bushing Upper (Factory Service)	SS
27L	2127/2Q	Body Bushing Lower (Factory Service)	SS
27H	21273Q	Body Bushing Hub (Factory Service)	SS
28S	2128S	Secondary Shaft Horizontal	SS
29C	2129C	Shaftbearing	C
30	2130	Gearframe	SS
31	2131	Bearing Support Cover	SS
33C	2133C	Bottom Cover C.I.P.	SS
33V	2133V	Valve for 2133C	SS
33	2133L	Bottom Cover, Portable Model	SS
33H	2133H	Hexhead Screw 3/16" x 1/2"	SS

*Material: SS = Stainless Steel, TC = Teflon Compound, T = Teflon, C = Carbon

ASSEMBLY PICTURES AND DESCRIPTIONS



INLET ASSEMBLY WITH 2103S

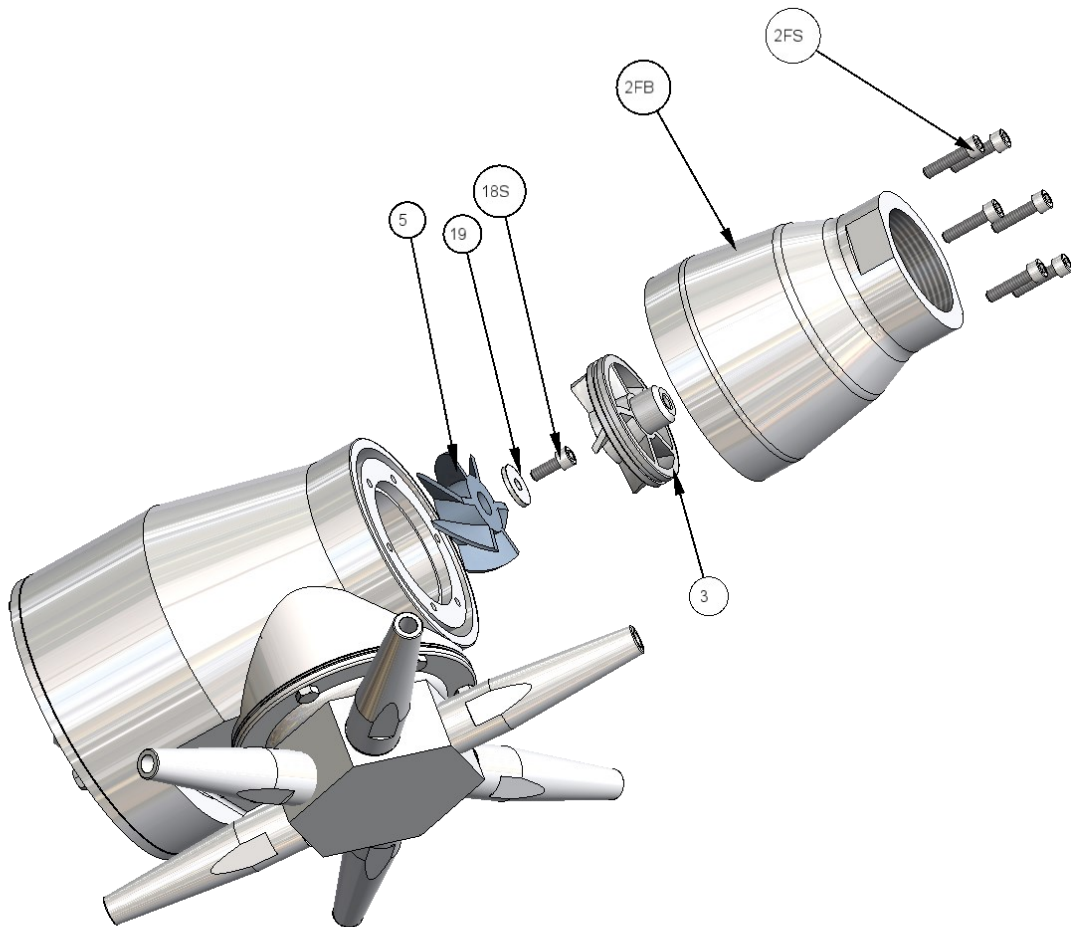
DISASSEMBLY:

1. Remove six screws (2FS) from INLET NIPPLE (2)
2. Lift off INLET NIPPLE
3. Remove GUIDE (3)
4. After inserting a screwdriver through the vanes of the IMPELLER (5) to prevent rotation, Using HEXKEY, REMOVE SCREW (18S) and WASHER (19) from PRIMARY SHAFT (11).
5. Remove IMPELLER (5)

ASSEMBLY - IN REVERSE ORDER.

NOTE: Please never use excessive force or heavy blows to remove or assemble parts. . Many parts are designed with close tolerances and damaged parts as well as worn parts may cause the unit to be inoperable.

IMPORTANT: When reassembling, secure the six screws (2FS) with OMNIFIT 100M (one part waterproof glue) or a similar product.



INLET ASSEMBLY WITH 2103R

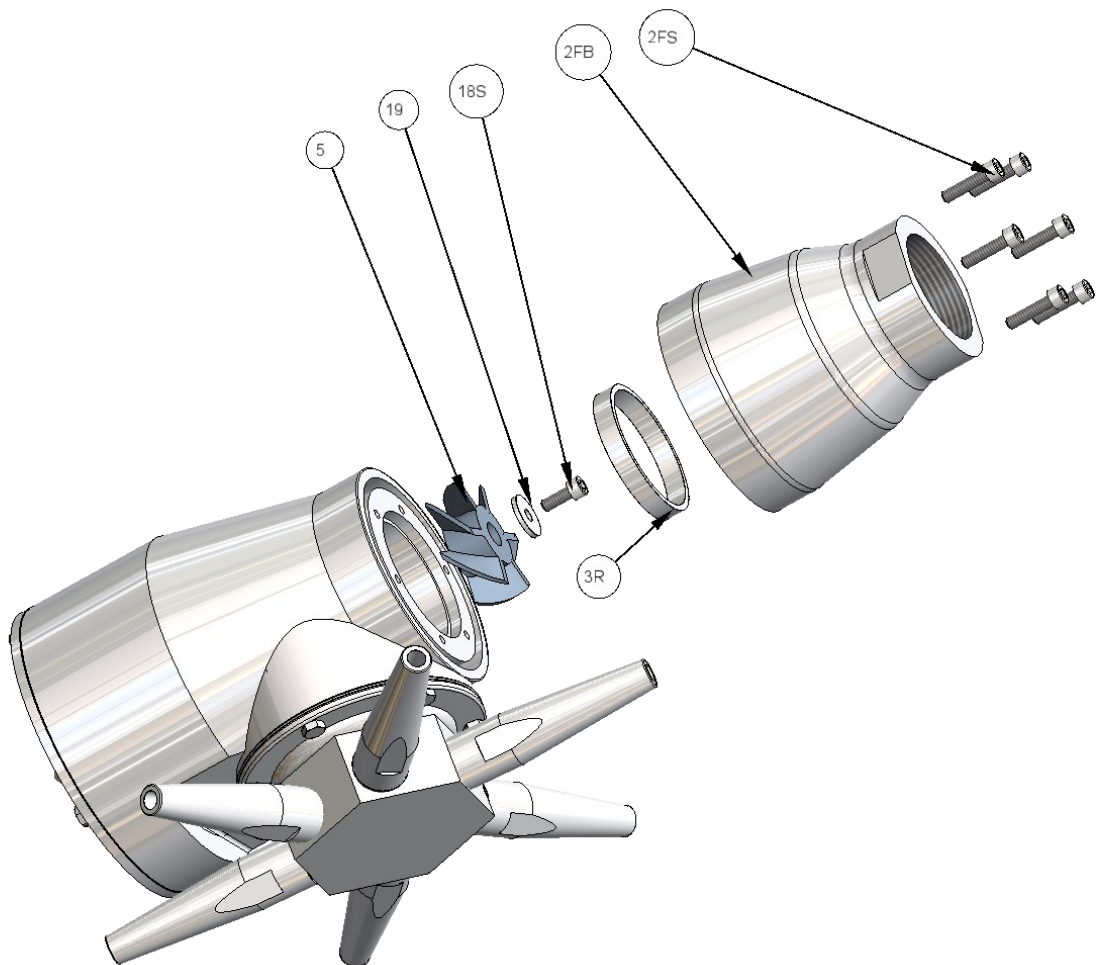
DISASSEMBLY:

1. Remove six screws (2FS) from INLET NIPPLE (2)
2. Lift off INLET NIPPLE
3. Remove GUIDE RING (3R)
4. After inserting a screwdriver through the vanes of the IMPELLER (5) to prevent rotation, Using HEXKEY, REMOVE SCREW (18S) and WASHER (19) from PRIMARY SHAFT (11).
5. Remove IMPELLER (5)

ASSEMBLY - IN REVERSE ORDER.

NOTE: Please never use excessive force or heavy blows to remove or assemble parts. . Many parts are designed with close tolerances and damaged parts as well as worn parts may cause the unit to be inoperable.

IMPORTANT: When reassembling, secure the six screws (2FS) with OMNIFIT 100M (one part waterproof glue) or a similar product.



BOTTOM COVER & PRIMARY SHAFT ASSEMBLY

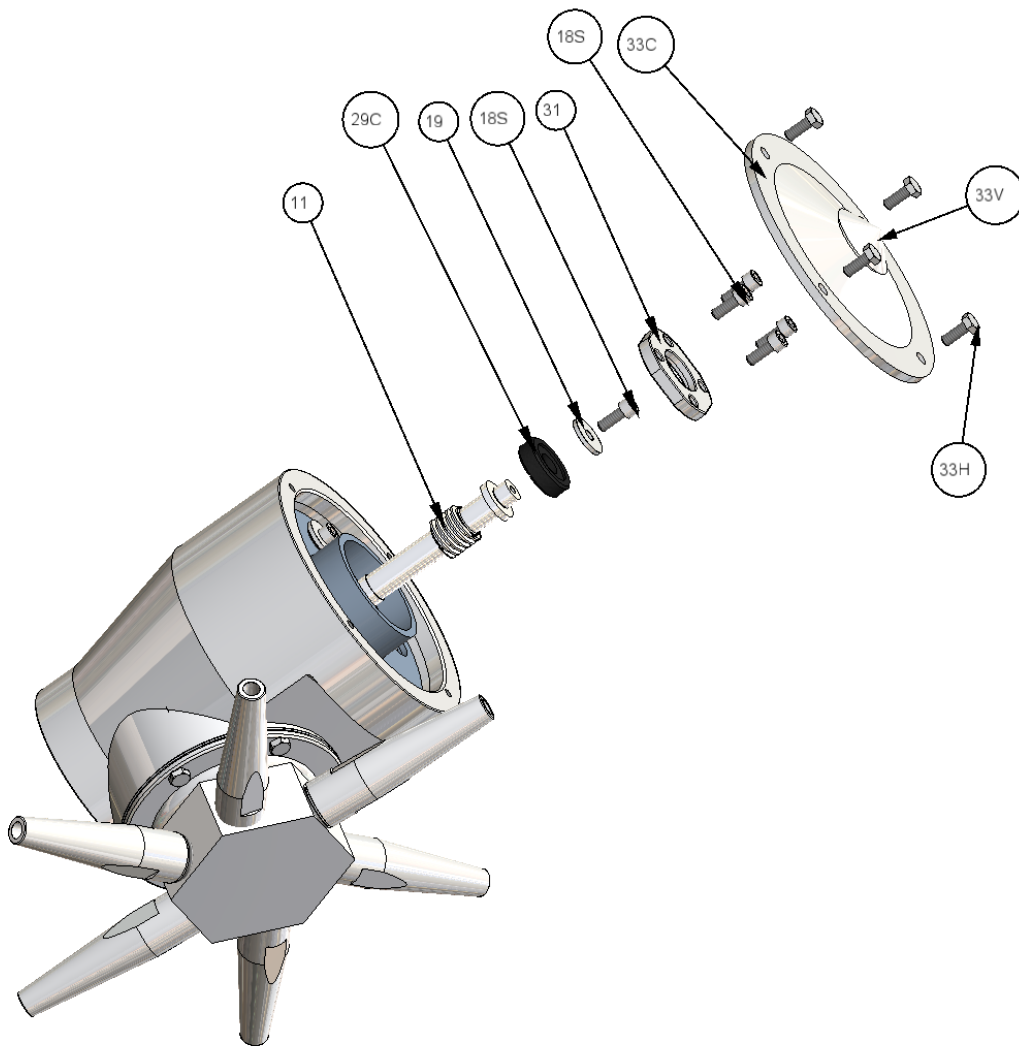
DISASSEMBLY

1. Turn machine up-side-down.
2. Remove four SCREWS (33H) in BOTTOM COVER (33C)
3. Remove BOTTOM COVER (33C)
4. Drain.
5. Remove four SCREWS (18S) in BEARINGCOVER (31).
6. Press out PRIMARY SHAFT (11) from opposite end along with SCREW (18S) WASHER (19) SHAFTBEARING (29C) and BEARINGCOVER (31).
Further, disassemble this assembly to check SHAFTBEARING (29C)*

ASSEMBLY - IN REVERSE ORDER.

* If bore I.D. is 10.4 mm or more, and or oval, replace bearing.
If horizontal bearing surface is worn 0.75 mm or more deep, and or oval, replace bearing.

IMPORTANT: When reassembling, secure the four SCREWS (33H) with OMNIFIT 100M or a similar product

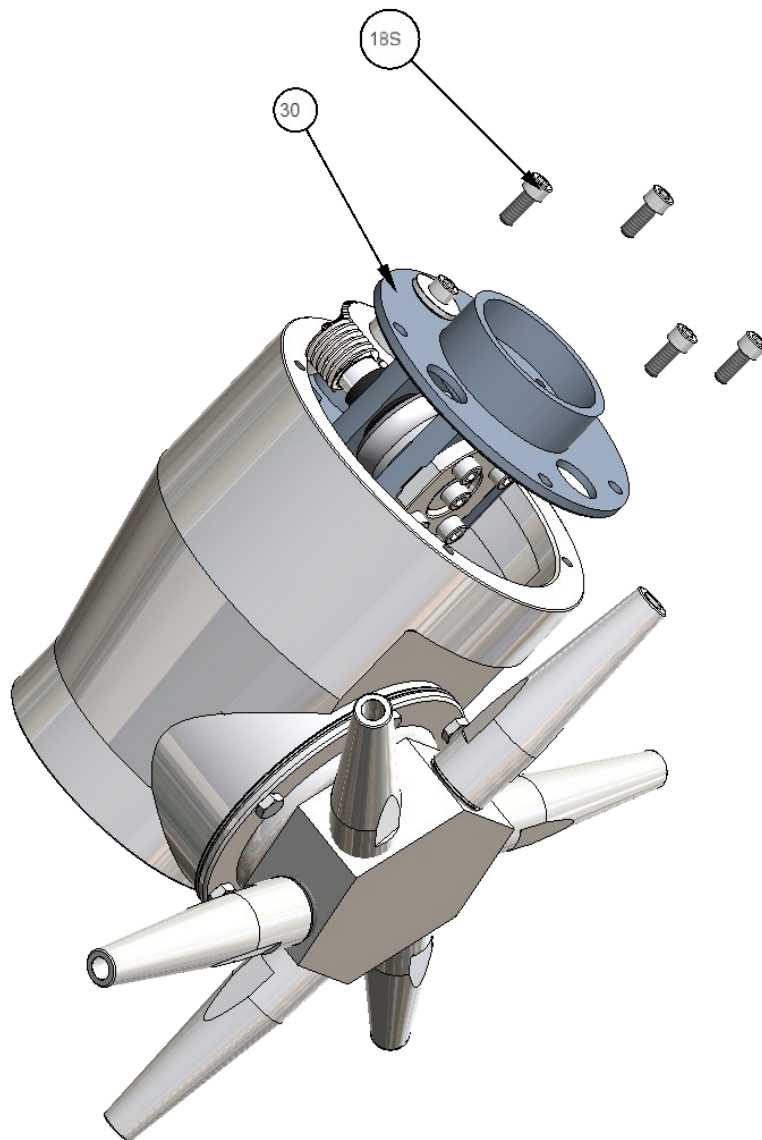


INTERNAL GEARFRAME

DISASSEMBLY

1. Remove four SCREWS (18S) around the circumference of the GEARFRAME (30)
2. Turn GEARFRAME about 10 mm (1/2"), clockwise, and lift out of body.
3. Observe the function and condition of the wormgears, horizontal shaft and bearings.
4. If deemed necessary, proceed further with the procedure in the following illustration, "GEARFRAME ASSEMBLY". Otherwise proceed to "HUB ASSEMBLY".

Wear limits: see "GEARFRAME ASSEMBLY".



GEARFRAME ASSEMBLY

DISASSEMBLY

It is necessary to prevent rotation of parts while removing screws from this assembly. This can be done by placing and firmly holding the PRIMARY SHAFT (11) horizontally onto and engaging the PRIMARY WORMGEAR (16P), thus preventing rotation of the WORMGEAR and SECONDARY HORIZONTAL SHAFT (28S). Proceed to loosen all screws in the assembly. Thereafter, disengage the PRIMARY SHAFT and all parts can easily be disassembled.

1. PINION GEAR (14), SECONDARY WORMGEAR (16S) and PINION SLEEVE (17) can be withdrawn after removing the SCREW & WASHER (18S & 19).
2. SECONDARY HORIZONTAL SHAFT (28S) and PRIMARY WORMGEAR (16S) can be withdrawn after removing the SCREW & WASHER (18S & 19).
3. Release SHAFTBEARING (29C) by removing four SCREWS (18S) from BEARING SUPPORT COVER (31).

ASSEMBLY

Inspect and reassemble in reverse order after replacing parts as necessary.

If WORMGEAR (16P or 16S) is extremely worn, replace the WORMGEAR.

COLLARBUSH (15C) : If I.D. is 13.4 mm or more and or worn oval it must be replaced as follows :

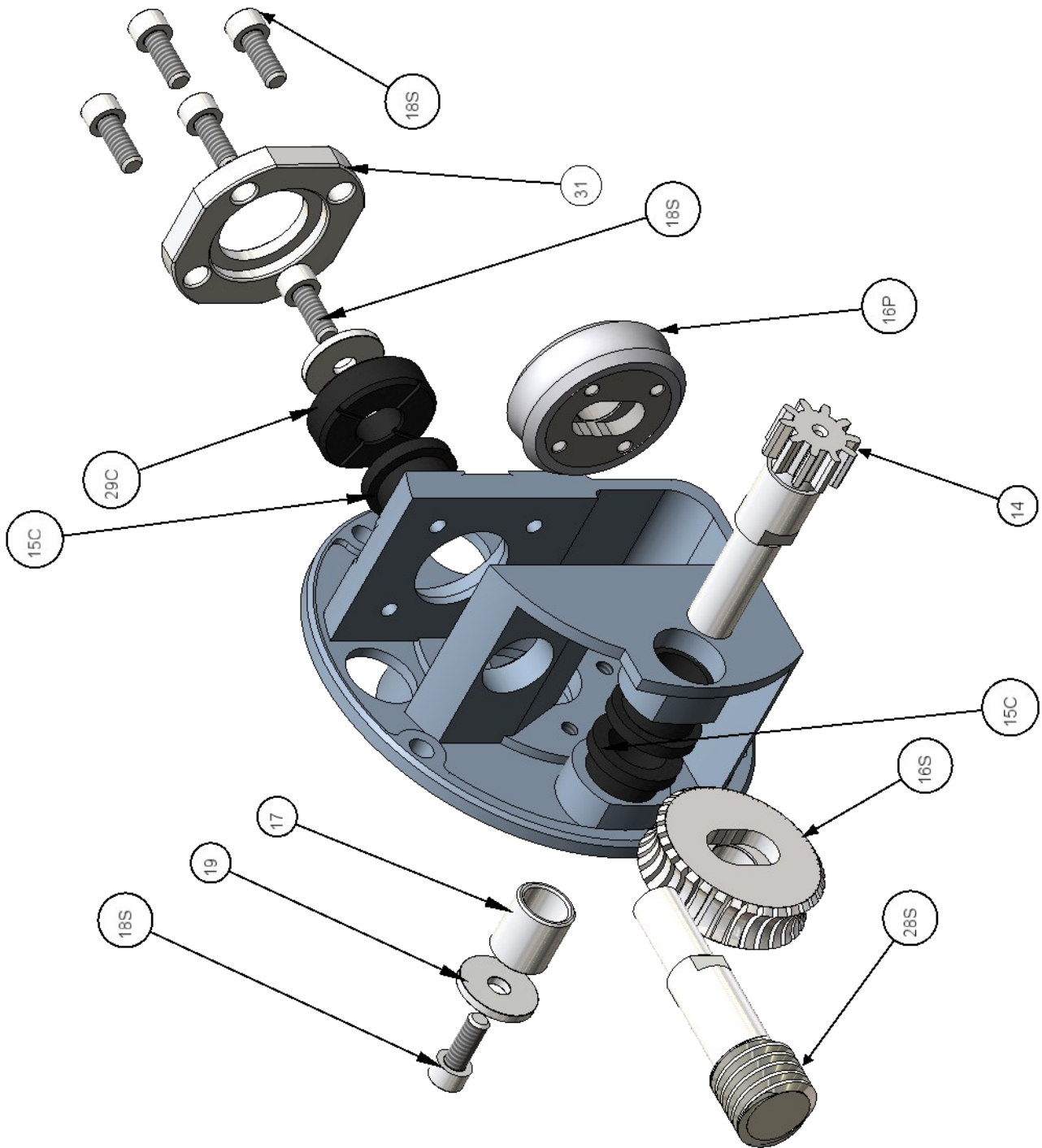
Press out the COLLAR BUSH with a wooden dowel (support below the gearframe when squeezing out the collar bush). Remove residue from glue and clean the bore in gearframe.

Put on OMNIFIT 230L or similar on the new collar bush and squeeze it into place.

Check BEARING (29C). If bore I.D. is 10.4 mm or more and or worn oval, replace bearing.

Also check the axial surface of the bearing, if worn 0.5 mm deep or more, replace bearing.

Inspect HORIZONTAL SHAFT (28S) and PINION GEAR (14), if worn in gear and bearing surface, replace the worn parts, including PINION SLEEVE (17).



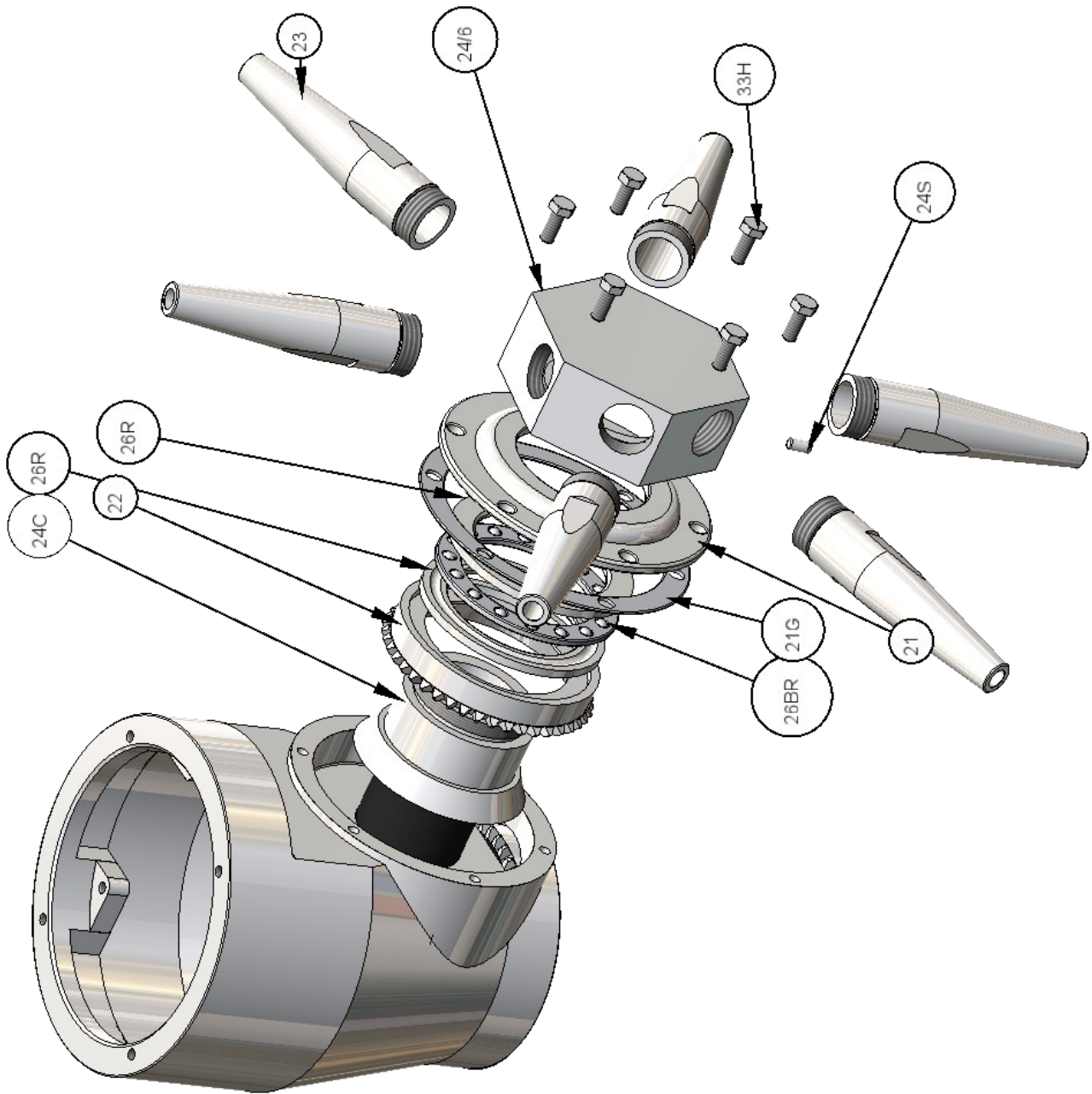
HUB ASSEMBLY

DISASSEMBLY

1. Remove NOZZLE (23)
2. Remove six SCREWS (33H) in HUB COVER (21).
3. Withdraw HUB ASSEMBLY: HUB (24), HUB COVER (21), GASKET (21G), THRUST BALLS (26BR), BEVELGEAR (22) and HUB CONNECTOR (24C).
4. Remove SET SCREW (24S) from HUB. This will allow the HUB to be unscrewed from the HUB CONNECTOR . Two holes are provided in the HUB CONNECTOR for the use of a "pin spanner". Holding the HUB in a vise, (with jaw protectors to prevent damage to polished parts), and rotating the HUB CONNECTOR (counter-clockwise) with the pin spanner, the balance of this assembly can be taken adrift.
5. Inspect the two RACES (26R) and BALL RETAINER (26BR) in particular. If the RACES are severely grooved and the assembly does not rotate smoothly, they may require replacement. First try replacing the BALL RETAINER and check again. If still no improvement, then replace both RACES and BALL RETAINER. Ordinarily these parts may deteriorate due to excessive grit and solids in the cleaning media. There is another set of races in the body. See "STEM & CLUTCH ASSEMBLY". Unless special care and tools are used to prevent damage to the races during removal and reinstallation, it is suggested that the machine be returned to the factory for replacement.

ASSEMBLY - IN REVERSE ORDER.

IMPORTANT: When reassembling, secure the six screws (21H) and nozzle (23) with OMNIFIT 100M or a similar product.



STEM & CLUTCH ASSEMBLY

DISASSEMBLY

To prevent rotation of the stem during disassembly and reassembly, insert a screwdriver through the water passage holes in STEM (4) so that it engages the body.

1. Remove six SCREWS (18S) from CLUTCH (13).
2. Pull out GEARWHEEL (12) together with its THRUST RACE (26R), THRUST BALLS & RETAINER (26BR) and CLUTCH (13).
3. Inspect the two RACES (26R) and BALL RETAINER (26BR) in particular. If the RACES are severely grooved and the assembly does not rotate smoothly, they may require replacement. First try replacing the BALL RETAINER and check again. If still no improvement, then replace both RACES and BALL RETAINER. Ordinarily these parts may deteriorate due to excessive grit and solids in the cleaning media. There is another set of races in the body. See "HUB ASSEMBLY".
Unless special care and tools are used to prevent damage to the races during removal and reinstallation, it is suggested that the machine be returned to the factory for replacement.
4. Press out STEM (4).
5. With a wood dowel or other relatively soft object, drive out the PRIMARY SHAFT BUSHING (9) in direction illustrated.
6. Check condition of bore in PRIMARY SHAFT BUSHING (9). If bore I.D. is 13.4mm or more and or worn oval, replace PRIMARY SHAFT BUSHING.
Glue PRIMARY SHAFT BUSHING into stem with OMNIFIT 230L or a similar product.

IMPORTANT: When reassembling, secure the six SCREWS (18S) with OMNIFIT 100M or a similar product.

NOTE: BODY (27) BUSHING (27U-27L and 27H) are factory service.

