

Operating Manual

DTB 25 BATCH



Customer: Ethicon Inc., Somerville, NJ					Application: Polycondensation of Polyoxaester				
P.O. no.: 991619626					LIST order no.: 5078.01.00.01.5078				
Rev:	8	7	6	5	4	3	2	1	0
Visa:									JW
Date:									May 07

LIST USA INC.
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1 GUIDE TO THE OPERATING MANUALS

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2 SAFETY INSTRUCTIONS

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3 SERVICE AND MAINTENANCE

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3.1 DTB 25 BATCH

- 3.1.1 Data sheet
- 3.1.2 Description of the machine
- 3.1.3 Handling and storage
- 3.1.4 Service and maintenance
- 3.1.5 List of lubricants and lubrication sheet
- 3.1.6 OEM Parts
- 3.1.7 List of spare part
- 3.1.8 Drawings and parts list

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3.1.1 Data sheet

Technical specification

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3.1.2 Description of the machine

LIST Single shaft technology Prospect

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3.1.3 Handling and storage

Instructions on how to avoid damage due to local overcharge

When considering LIST Technology, the total torque, measured on the shaft, is the sum of the individual torques applied to each kneading element. In some circumstances it is possible that the torque will not be evenly distributed across all kneading elements but will be concentrated on a few, or even a single, shaft element. This condition can result in extensive damage to shaft and casing. Unfortunately, it is very difficult, and there are limited possibilities, to detect these localized torques and prevent the subsequent damage. It is important that someone with experience constantly monitors the equipment during operation to intervene in the case of excessive torque loads.

Causes of excessively high peak loads on one single kneading element are:

- Harmful foreign objects such as fasteners, tools, etc.
- Products that turn into viscous lumps during the process (e.g. during solidifying processes with stationary shaft).
- Backward rotation of the agitator when the machine is filled up.

In order to avoid costly damage to the shaft and to the kneading hooks the following precautions should be taken:

- Shaft torques must be monitored continually through hydraulic pressure or the power of the electric motor with a high-speed measuring instrument.
- Make sure that the machine is not overcharged.
- The machine should be constantly monitored during operation allowing immediate intervention in the case of unexpected peak loads, suspicious noises or vibrations occur. We encourage you to involve the LIST staff when attempting to process new materials or when changing significant process parameters
- The maximum torque may not be exceeded.
- If necessary, the product inlet must be provided with a filter of some sort to eliminate foreign objects.

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Heating/cooling medium

Liquid thermal mediums or vapour are adequate heating mediums.

Water quality of heating and cooling systems

In order to prevent corrosive damages by water in the heating system and the heating jackets of the LIST units as well as in ancillary's cooling units the following rules must be followed:

quality of the water

pH-value	8,3 - 9,0
conductivity	< 600 µS/cm
oxygen	< 0,1 mg/l
total water hardness	< 1 °fH

The construction, the installation and the operating pressure of the heating unit must be selected so that no oxygen can be drawn into the system (e.g. by under pressure at the suction connection of the circulation pump).

The filling and refilling of closed systems should be made by fully desalted water or soft fresh water (< 12 °fH).

The water quality should be checked and verified every 6 months.
 For corrosion protection we recommend the installation of magnesium anodes (anostate) or a chemical conditioning.

Installation instructions

The machine must be lifted or suspended only at the support frame. Lifting gear and ropes must be suitable and approved. Dedicated instructions of the machine manufacturer have to be followed.

Heating or cooling connections must be made with flexible hose specified according to the heating media and temperature.

- Site conditions:
- Installation inside closed building
 - Temperature min. 0°C, max. 40°C
 - Altitude < 1000m

Caution:

Accessories connected directly with the dryer must remain unaffected by heat expansions.

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Transport, packing and unpacking

The packing of the equipment will differ depending on the method of shipment and size.

For sea transport the equipment will be shipped in wooden crates, seaworthy packed.

The scope of the shipment is listed in the shipping documents. They should be checked for completeness on receipt. Any shipping damage and/or missing parts have to be reported in writing at once. After consulting LIST an expert is to be called in.

The equipment is delivered ready for operation with the exception of connections to utilities and ancillary process equipment.

The equipment should remain in the closed and sealed boxes and shall be stored as described in this document until it is put on place.

Please note the indications on the packages for proper opening of the containers.

For on-site transportation the original packing shall be used.

Foundation and loads

The equipment weights and foundation loads – where applicable - are as shown on the dimensional drawings.

Storage and conservation

In case the apparatus is stored after delivery please contact LIST for storage instructions

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3.1.4 Service and maintenance

Shaft bearings and seals

- The rotary joint for the heating or cooling medium on the shaft is self-cleaning. If leaks occur, the seals must be replaced.
- Seals:
 It is recommended to keep 2 sets of seals in stock for the commissioning and start-up (see list of spare parts enclosed), and later on further service and maintenance works (2 years period).
- Maintenance of the gears: see lubrication sheet.

Service inspection

The LIST Tech Center will gladly support you with Service Inspections. An advance notice of two weeks will allow for your request to be accommodated.

For more instructions see lubrication sheet and supplier's instructions.

Spare parts

Please order spare parts from the list enclosed or from the assembly drawings. It is sufficient to indicate the drawing and item number.

We endeavour to supply you as fast as possible and at a favourable price and, if possible, from stock.

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Disassembly / assembly

Exchange the seal cartridge and the shaft

Disassembly

No.	Drawing	Item no	Item	How to proceed
1	313097	104/102	Process connections, heating hoses, Cover	dismount the connections and hoses demount the cover
2		201	Hex nuts	remove the nuts
3		100	Rotary head	demount the rotary head
4		116/117 118/119	Counter hook incl. flange	demount
5		215	Hex nuts	remove the nuts
6			Drive incl. shaft	pull backwards to the mechanical stop
7		4	Locknut	remove the locknut
8		3 107	Chain wheel distance ring	remove
9		210	Hex. socket set screw	loosen
10		130	Sprocket	loosen
11		234	Socket head cap screw	remove
12			Bearing housing incl. mixing shaft	lift of frame and set it vertical on bearing plate
13		113	Shaft	carefully pull shaft out of mechanical seal and bearing
14		112	Bearing housing	rotate it and set on front plate
15		213	Hex bolt	demount

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Removal of the shaft for cleaning

No.	Drawing	Item no	Item	How to proceed
1	313097	116/117 118/119	Counter hook incl. flange	demount
2		215	Hex nuts	remove the nuts (drive side)
3			Drive incl. shaft Assembly	pull backwards to the stopper
4			Drive incl. shaft	push the drive in position
5		214	Stud bolt	mount
6		116/117 118/119	Counter hook incl. flange	mount

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3.1.5 List of Lubricants and Lubrication sheet

DTB 25 BATCH (Dwg. No. 313097) lubricate according to the following instructions:

Item to be lubricated	Quantity	Type of lubricant	Frequency	Checks	Cleaning
Bearing item no. 6	50 grams	Mobilgrease 28	1 x per week	3 x per year	1 x per year
Mech. seal Flowseve Dwg. 51018 90 0 1 Bearing item no. 35	50 grams	Mobilgrease 28	1 x per week	3 x per year	1 x per year
Planetary gear item no. 11	1 litre	Gear oil ISO VG 320 e.g. Mobilgear 632	first time after 100 h, then every 1'000 h or twice a year	every 6 months	1 x per year
Chain item no 10	spray in thoroughly	HOTEMP 2000 Klüber Lubrication	1 x per month	3 x per year	1 x per year
Hydraulic unit item no.	60 Gal	Hydraulic oil ISO VG 46 e.g. Mobil D.T.E. 25	according to separate instructions		
Sealant liquid unit item no. 35	2,64 Gal	Diethylene Glycol	according to separate FLOWSERVE instructions		

After discussion with LIST AG it is possible to use corresponding products of grease with similar parameters..
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Attention	<ul style="list-style-type: none"> - First greasing when assembling the machine - First regreasing when starting up the machine - Replace lubricant each year when inspecting the machine - When using other products, check that they are compatible with one another
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3.1.6 OEM Parts

Roller bearings
 Chain wheel and chain
 Hydraulic motor with gearbox
 Mechanical seal
 Barrier fluid unit
 Resistance thermometer
 Ball valve
 Trolley and rail
 Proximity switch
 Frequency to current converter
 Rotary joint
 Hydraulic power unit

SKF
 PLÜSS
 SAI / BREVINI
 FLOWSERVE
 FLOWSERVE
 ALBERT BALZER AG
 TRIGRESS
 REXROTH
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 MAIER
 MICHAELSON

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3.1.7 List of spare parts

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3.1.8 Drawings and parts lists

DTB 25 BATCH Dimension drawing	Dwg. No.	312708 Rev. b
DTB 25 BATCH Assembly DWG parts list	Doc. No.	050629 Rev. 1
DTB 25 BATCH Assembly drawing	Dwg. No.	313097 Rev. a
DTB 25 BATCH Heating manifold parts list	Doc. No.	050560 Rev. 1
DTB 25 BATCH Heating manifold	Dwg. No.	313514 Rev. a
DTB 25 BATCH Jacketed tee piece parts list	Doc. No.	056019 Rev. 0
DTB 25 BATCH Jacketed tee piece	Dwg. No.	257.01.05 Rev. C
DTB 25 BATCH P & I Diagram	Dwg. No.	314241 Rev. -

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4 INSTALLATION AND OPERATION

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4.1 Installation

4.1.1 Utilities and Energies

Cooling water:	Inlet temp. Pressure Flow rate	22 – 32 °C max. 6 bar specified by customer
Nitrogen N ₂ :	Pressure	6 bar
Thermal oil:	Inlet temp. Pressure Flow rate	max. 250°C ~ 3 bar ~ 1,2 m ³ /h
Electric machines:	Hydraulic unit Sealant liquid unit	20 HP 0,37 kW

4.1.2 List of Interlocks

Interlocks are not provided by LIST

Process related interlocks have to be specified and provided by others.
 Preventive measures must be taken for the following situations (by others):

- Power failure
- Failure of cooling water supply
- Failure of other utilities

4.1.3 P & ID

P & ID
 List of Instruments

Dwg. No. 314241 Rev. -
 PDM No. 053605 Rev. 0

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4.2 Start-up and Operation

4.2.1 Mechanical start - up

Preparation / Check list

Before starting-up the machine, check the following points:

- Check that all leads are connected with the correct power line and that the operating pressure inside the dryer cannot be exceeded.
- Check the sealing medium level of the sealant liquid unit
- The mechanical seal chamber must be vented carefully before start-up.
- Check that the shaft is firmly seated into the bearing housing and that the shaft nut is tightened and secured.
- Check that the rotary joint on the shaft cannot be involved in rotation.
- Check the oil level of the planetary gear.
- Connect the heating hoses in such a way that the shaft and casing can only be heated together.
- Check direction of shaft rotation (see direction arrows).
- Check that no foreign objects, such as fasteners, tools, etc. are inside the machine
- After the first heating-up the screws on the sealing flanges have to be retightened.

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Hydraulic unit

- Check the oil level before starting up the units.
- Voltage: 460 V / 60 Hz
 When the unit is electrically connected, check the direction of rotation of the electric motor by switching it on for a short time.
- The cooling water supplying pipes must be connected to the heat exchanger of the hydraulic power units. The cooling water should flow opposite to the direction of the hydraulic oil. The oil temperature, which is adjusted with a thermostat, should not exceed 70°C.
- The connections (oil supply, oil return and case drain) to the hydraulic motors have to be connected with quick disconnect couplings.
- The direction of shaft rotation can be changed with an electrical proportional directional valve
- The shaft RPM's can be adjusted by the same electrical proportional directional valve (See „Hydraulic documentation“).
- The locked pressure relief valve must not be adjusted without the written permission of LIST USA. They are used as a protection against overload and shaft damage.

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4.2.2 Start-up of the machine

- 1.) Check if all energy and process connections are correct and connected tightly
- 2.) Start the sealant liquid unit
- 3.) Apply the required barrier pressure through connection N (1-2 bar higher than the process pressure)
- 4.) Start the DTB shaft by engaging the directional valve on the hydraulic unit
- 5.) Set the desired shaft speed
- 6.) Establish the process pressure
- 7.) DTB is ready for trials

4.2.3 First start-up with product

Heat up the machine with rotating shafts until the operating temperature is reached. Do not heat up or cool down faster than 3°C (5°F) per minute!

4.2.4 Instructions on how to implement tests

Adjustment of the optimal filling level

The best mixing and kneading effect is achieved with a filling ratio of 60 - 80 %. The product room must not be overfilled; otherwise the DTB drive will be overloaded.

For Batch units the filling ratio should not exceed the 80%.
 For pasty phase the filling ratio should not remain under 50%

The max torque of the shaft is limited by a hydraulic safety valve. Nevertheless there is a remaining risk that local torque peaks might lead to a damage of the kneading elements. For example caused by local solid lumps in the product room.

Required power

According to the calculation for the power consumption of agitators in the viscous range, the required power rises in relation to the shaft rotation. Moreover, the required power for DTB increases with the increase of the average filling level. Make sure that the product room will not be overfilled in order to avoid the overload of the DTB drive.

Caution!

Never start the drive before you have made sure that the machine is free of hard lumps or foreign objects. Otherwise the machine will be damaged.

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Observing the product chamber, discharging gases and vapours

The vapors are removed through the 4" nozzle (Nozzle # 14 on dimensional DWG) on the vapor dome

Product inlet:

- The 2" nozzle (Nozzle # 1 on dimensional DWG) is intended for the product inlet.

Product outlet:

- The product discharge can be performed either with pasty or free flowing granular product thru the discharge valve (Nozzle # 3 on dimensional DWG)
- Peripheral equipment, such as heating, condensation and vacuum units etc. should not be used without prior consultation of LIST.

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Customer: Ethicon Inc., Somerville, NJ P.O. no.: 991619626					Application: Polycondensation of Polyoxaester LIST order no.: 5078.01.00.01.5078				
Rev:	8	7	6	5	4	3	2	1	0
Visa:									JW
Date:									May 07

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4.3 Trouble shooting

DTB 25 BATCH

Problem	Possible cause	Remedy
Shafts do not turn Shafts turn in the wrong direction	Hydraulic drive: - is not connected - is running w/o oil - piping is not correct	Hydraulic drive: - connect - fill in oil - change piping
Excessive noise	- Impurity in the process chamber - flange connection loose	- switch off, open and clean - check and tighten flange connections
Operating temperature too high	- cooling water not connected or switched off	- connect/switch on
Bad vacuum	- leakage - vacuum pump operates faulty	- check piping and flanges - check for plugs
Vacuum deteriorates during operation	- seal cartridge damaged	- check/change the seal cartridge - see instructions sealant pressure unit
Machine blocks during operation	- overload by process	- discharge the machine at atmospheric conditions
Vibrations	- blockage of the machine - insufficient fixation on the foundation	- see above - check/improve fixation
Error at hydraulic unit		- see instructions Hydraulic unit
High consumption of barrier medium	- seal cartridge damaged (e.g. breakage of seal ring)	- check seal cartridge, change seal ring or seal cartridge - see instructions sealant pressure unit
Alarm by level switch	- barrier medium low - seal cartridge damaged (e.g. breakage of seal ring)	- refilling with the refill unit - check seal cartridge, change seal ring or seal cartridge - see instructions sealant pressure unit

In case your remedies do not lead to the resolution or in case of problems not listed above please contact the LIST Tech Center!