



## Quality Clause

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Clause 07  
Mechanical Assembly  
General Requirements

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## **1 MECHANICAL ASSEMBLY**

All mechanical assembly work by contractor (supplier) shall be performed according to this chapter as minimum requirements if no other guidelines are given by the company (NOV).

Mechanical assembly work shall be executed in a clean area separated from steelwork such as grinding, welding and blasting.

The supplier shall ensure that workshop consumables meet the requirements for mechanical properties as specified by the PO documentation package.

Measures to avoid galvanic corrosion and corrosion in general shall be taken.

Assembly of components shall be carried out in accordance with instructions given in assembly drawings, part lists, Supplier's assembly instruction, this specification; direct instructions from Company's representative and reflect good workmanship and professionalism.

## **2 CPI (Company provided items)**

The Company may supply various components according to the PO. The supplier is fully responsible for establishing routines for call of the material, according to the field need date.

Material shall be stored separately at the supplier's site, under conditions preventing loss or damage to the material.

## **3 DOCUMENTATION.**

Marking requirement as Lot or serial marking and monograms can be required for traceability, this will be specified in the requirements on Part Descriptions, Drawings, Parts Lists or Defining Documents.

Serial or Lot numbers on critical components as CPI or delivered by supplier as listed but not limited to: Drives, Slewing rings, gears, Wirer sheaves, Blocks, lifting hooks, Steel wire rope, Critical fasteners, Brakes and Gearboxes needs to be listed and included in the final documentation.

## **4 FASTNERS**

All fasteners, if applicable, shall be ordered from a recognized supplier to the specified standards, property classes, and certifications requirements.

Use of Material property class above 10.9 /A490 shall be approved, in written, by NOV.

Protrusion of Bolt and Stud ends for all type of Nuts shall be minimum three (3) threads.

Split pin holes and wire holes in bolts, screws and studs for securing wire shall be located according to a recognized standard.

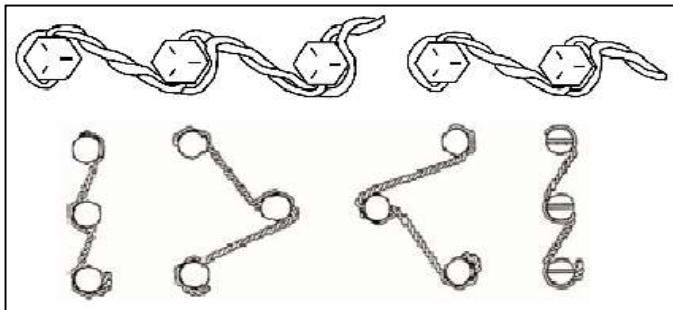
## 5 SECONDARY RETENTION

### Secondary retention by wire

If nothing else is stated on drawing, wire ties are the Company's preferred method for secure bolted connections as secondary retention.

The twisted wire is thread through the hole in the fastener and secured in the next bolt or adjacent structure, so the bolt cannot rotate loose.

The use of safety wire is illustrated in the figure below:



- 1) No more than three (3) bolts may be tied together
- 2) Groups which are situated far from each other shall not be serial linked. Securing wire shall not be used to secure nuts, bolts etc. that are further than 150 mm from each other, unless the wire is attached to an adjacent part of the structure so that the strain on the wire is less than 150 mm.
- 3) Bolt heads may be tied as shown only when the female thread receiver is captive.
- 4) Pre-drilled nuts may be tied in a fashion similar to that illustrated with the following conditions.
  - a. Nuts must be heat-treated
  - b. Nuts are factory drilled for use with lock wire
- 5) Lock wire must be Stainless Steel 316 of 0.5mm (0.020 inch) diameter, 0.8mm (0.032 inch) diameter, or 1.0 mm (0.042 inch) diameter.
  - a. Thread sizes of 6 mm (0.25 inch) and smaller use 0.5mm (0.020 inch) wire
  - b. Thread sizes above 6 mm (0.25 inch) to 12 mm (0.5 inch) use 0.8 mm (0.032 inch) wire.
  - c. Thread sizes > 12 mm (0.5 inch) use 1.0 mm (0.042 inch) wire.

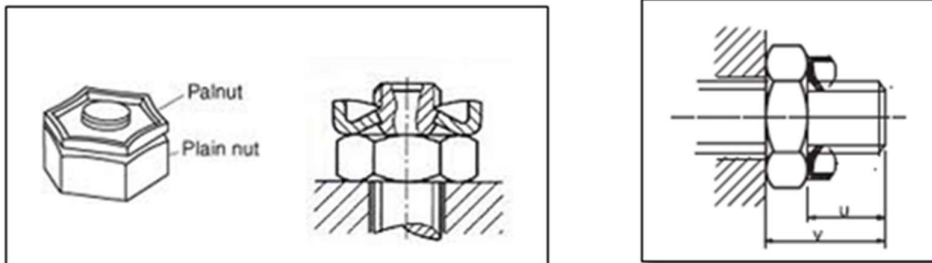
d. The larger wire may be used in smaller bolts in cases of convenience, but smaller wire must not be used in larger fastener sizes.

- 6) The securing wire must be installed in such a way that it contributes to tighten and hold the part secured in place, counteracting the parts natural tendency to loosen.
- 7) The ends of the securing wire must be bent in, to avoid any personal injury.
- 8) As long as it's practically possible the securing wire shall be placed around the head of the bolt, screw or nut and twisted in such a way that the loop in the wire is close into the contour of the part that is secured with the securing wire.

#### Secondary retention by self-locking nut (PAL nuts)

- 1) Self-locking counter nuts (PAL nuts) are the Company's preferred method for securing nuts if nothing else is stated on drawing or specification.
- 2) There is normally no need to secure bolts with wire when Self-locking counter nuts (PAL nuts) are installed.

Note: The Self-Locking Counter Nuts (PAL Nut) work in such a manner that they distort under load and return to their original shape in the threaded area because they are made from a spring like steel.



- 1) The main nuts (Plain Nut) to be properly torqued or tensioned
- 2) The Self Locking Counter Nut (Pal Nut) shall be installed on top with the flat part against the plain nut.
- 3) Tightening the self-locking nut:
  - Screw the Self-Locking Counter Nut hand –tight.
  - Give it a final tightening of 1/3 to 1/2 turn using a spanner
- 4) Inspecting: When the Self-Locking Counter Nut has been correct installed, the Hex faces become slightly concave, making visual examination a reliable inspection method.
- 5) Used Self Locking Counter Nut shall not be re-installed but replaced with a new one.

## **4 WORKING PLATFORM AND WALKWAYS**

When grating panels are used in working platforms and walkways above a place where people are passing or staying briefly, the grating panels shall have such maximum openings that a ball with a diameter of 15 mm/ cannot fall through.

Other openings and gaps shall follow the above standard accordingly.

The grating installation shall be permanently fastened to loadbearing structures in such a manner that when they are subject to loads, each section shall be sufficiently secured to the structural support, by the means of welded stud bolts, stud bosses, drilled holes with clamps or direct fastening for grating applications

## **5 TAGGING AND MARKING**

The contractor normally supplies all signs, but Company may provide labels and tag signs if nothing else is stated in the PO

The tag plates / signs shall be attached to structure steel by means of Marine adhesive and stainless steel, acid proof, rivets or alternatively by bolting or screw fixings, using locking devices, as per section 12 of this specification.

The tag plates / signs shall be attached to components by means of Marine adhesive or by use of wire.

Note: Plastic tag plates/ sign can be attached by means of Marine adhesive only.

Tagging and marking shall be performed before the equipment has left the assembly workshop for testing.

## **6 LUBRIACTION**

### **7.1 Lubrication Chart**

All lubrication products for the permanent work shall be in accordance with table below if not otherwise specified in Company Datasheet/ Lubrication Charts or PO documentation package.

FACTORY LUBRICATION OF NATIONAL OILWELL VARCO EQUIPMENT		
SERVICE	TYPE OF LUBRICANT	NOTES (Check lubrication chart per equipment)
Hydraulic System Mineral based hydraulic oil HEES-fluids	Nominated brand: Texaco Rando Oil HDZ, ISO grade 32-46 Castrol Biohyd SE	According to standard DIN 51524 part 3 HVLP.
Water based hydraulic fluids	Erifon 818TLP Houghto-Safe NL1, WL1 (273 CTF)	
Gear box	See gear supplier`s datasheet	
General grease points in: El. Motor, Winch Slew ring (Raceway) Blocks/sheaves Wheel bearing	Texaco Multifak EP2	Lithium based grease NLGI No.: 2. Lead additives. Color: dark green.
Boom bearing / cylinder bearing.	Texaco Multifak EP2	Lithium based grease NLGI No.: 2. Lead additives. Color: dark green. <b>NB! Bearing is self-lubricated. Do not use grease with molybdenum or silicon additives.</b>
Slew pinion teeth Open gear on slew ring rack and pinion drive	Klüberplex AG 11-462 or Moluh Alloy 936 SF Heavy A  Klüberplex AG 11-461	Mineral oil based. metal soap complex, powder, graphite additives.  When automatic lubricate or below minus 20 °C
Steel wire	Bridon Brilube 70	Only if re- lubrication is required.Steel wire is delivered ready lubricated from wire supplier.
Telescopic jib with sliding pads (Sliding surface only)	Texaco Multifak EP2	Lithium based grease NLGI No.: 2 Lead additives. Color: dark green
Motor shaft, spline Sleeve	Texaco Multifak EP2	Used for initial lubrication.



Threads on: Pipe and hose fittings	Parker Hanifin Niromont-Flüssig	
Lubrication for assembly and corrosion protection of pins, bearing surface and spherical bearings.	Texaco Multifak EP2	Used for initial lubrication.
Valve lever housing, Spring housing, Internally	Klüber; Klüberpaste 46 MR 401	No re-greasing required.
Pins/bolts in shackles	Klüber; Klüberpaste 46 MR 401	For easy dis-assembly
Threads on: Bolts, studs	Klüber; Staburags NBU-30K MOLYKOTE®G-RAPID PLUS paste	For easy dis-assembly
Dead-weight on wire rope. Including thimble	Klüber; Klüberpaste 46 MR 401	For corrosion protection and easy dis-assembly.
Piston rod extension on Hydraulic cylinders	SLIDER 2000 Special Grease Alt:Petrolon Slick 50 Actuated PTFE Grease	For additional corrosion protection. No re-greasing required.
Assembly of pneumatic high-pressure system >14 bar.	Fuchs: Gleitmo 599 MacDermid: Greasil 4000	Hydro carbon free grease for all connections.

Only non-flammable grease or oil products shall be used in assembly or mounting flanges, fittings or other systems related to air or oxygen high pressure contain equipment. This to prevent “hydrocarbon oxygen reactions”.

Lubricant for gears shall always follow the information given on the manufacturer’s assembly drawings.

For design temperature lower than -20° C special considerations shall be taken when selecting the lubricants to use if not defined by the PO documentation.

When central grease points shall be installed, the grease tubing lines shall not be of a smaller diameter than Ø10 mm.

The tubing quality shall be stainless steel (SS 316), and the tubing shall be properly filled with grease and all air vented out from the system before delivery.

All grease points shall be marked with a red circle around the grease nipple (red donut) and Protective Caps / Dust Caps shall be mounted on all the grease nipples.