

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)

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香港專業吊運聯會有限公司

1) 甚麼是維修?

(What is Maintenance ?)

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

1) 甚麼是維修? (What is Maintenance)

1.a) 預防性維修(Preventively)

1.a.1) 依保養/維修手冊 (可自行負責)

follow factory's Instruction & Service Manual (DIY)

1.a.2) 進行專業檢查 (由專業人仕執行)

Critical Inspection (by professionals)

1) 甚麼是維修? (What is Maintenance)

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1.a.2) 進行專業檢查 (由專業人仕執行)

critical Inspection (by professionals)

1.b) 損壞性維修(Damage Repair)

1.b.1) 由專業人仕負責

(by professionals)

在未開展維修前，必先

(Before servicing your crane, you have to...)

2) 認識你的隨車吊機

(Know Your Crane)

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

2) 認識你的隨車吊機 (Know Your Lorry Crane)

- 2.a) 了解你的工作需要?
(What you need the crane for ?)
- 2.b) 選/用合適的隨車吊機。
(Choose/Use the right crane)

3) 工廠及工業經營(起重機械及起重裝設)規例

Factories and Industrial Undertakings (Lifting Appliance and Lifting Gear) Regulations

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



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3) 工廠及工業經營（起重機械及起重裝設）規例
Factories and Industrial Undertakings (Lifting Appliance and Lifting Gear) Regulations

3.a) 表格一

起重機械的每周一次檢查結果報告

FORM 1

Reports of Results of Weekly
Inspections Of Lifting Appliances

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

Name of owner 擁有人姓名

FORM 1

表格一

【reg. 7A】
【規例第 7A 條】

Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
**REPORTS OF RESULTS OF WEEKLY INSPECTIONS OF
LIFTING APPLIANCES**

Address of installation 安裝地址

*Form approved by the Commissioner for Labour for the purposes of regulation 7A of the
Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations*

工廠及工業經營(起重機械及起重裝置)規例

起重機械的每週一次檢查結果報告

本表格乃由勞工處處長就工廠及工業經營(起重機械及起重裝置)規例第 7A 條的需要而認可

Description of lifting appliance and means of identification 起重機械說明及識別標誌	Date of inspection 檢查日期	Result of inspection (including all working gear and anchoring or fixing plant or gear, and where required the automatic safe load indicator and derricking interlock) state whether in safe working order. 檢查結果 (包括所有操作裝置及錨定或固定設置或裝置，在需要時並包括安全 負荷自動顯示器及人字吊臂聯鎖)。 註明是否處於安全操作狀態。	Signature and designation of person who made the inspection 檢查者簽署及職階
(1)	(2)	(3)	(4)

Any competent examiner or competent person who delivers to an owner a certificate or makes a report which is to his knowledge false as to a material particular shall be guilty of an offence and shall be liable on conviction to a fine of \$200,000.00 and to imprisonment for 12 months.

任何合資格檢驗員或合資格的人，如向擁有人交付他明知有任何要項屬虛假的證明書或作出他明知有任何要項屬虛假的報告，即屬犯罪；一經定罪，可被罰款二十萬元及監禁十二個月。

3) 工廠及工業經營（起重機械及起重裝設）規例
Factories and Industrial Undertakings (Lifting Appliance and Lifting Gear) Regulations
3.a) 表格一 (FORM 1)

需要了解的問題 (Questions) :

3.a.1) 作為預防性的檢查，是否經已足夠？

As preventive measure, is this enough?

3.a.2) 誰是「合資格人仕」？

Who qualified as the Competent Person?

4) 怎樣才算是「合資格的維修」

How to ensure quality maintenance and Service to your lorry crane

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

4) 怎樣才算是「合資格的維修？」

How to ensure quality maintenance and Service to your lorry crane

4.a) 一般預防性的維修 (General M & S):

可自己執行的維修 (Something you can DIY)

4.b) 較專業的預防性維修 (Special M & S):

自己未能執行的維修 (Something you can't DIY)



The operator or an authorised technician must use the following pages to fill in the service records in full so as to keep track of the maintenance operations performed.

It is a good idea to photocopy the pages containing the service records.

First 10 service hours and daily

Check hydraulic oil level
 Check operating efficiency of emergency push-buttons
 Check operating efficiency of main switch
 Check operating efficiency of control levers
 Check for leaks in hydraulic system joints
 Check for leaks on cylinders
 Check operating efficiency of limit stop devices

First 250 service hours

Grease slewing unit
 Grease articulation points
 Grease boom extensions
 Grease stabiliser cross-members
 Replace hydraulic oil filter
 Tighten slewing ring/column screws (*)
 Tighten slewing ring/base screws (*)
 Tighten counterframe/base screws (*)
 Tighten screws and ring nuts (*)

Every 500 service hours or every 6 months

Tighten slewing ring/column screws (*)
 Tighten slewing ring/base screws (*)
 Tighten slewing ring/base screws (*)
 Tighten screws and ring nuts (*)
 Grease slewing unit
 Grease articulation points
 Grease boom extensions
 Grease stabiliser cross-members
 Check rated capacity limiter
 Check wear on sliding pads (*)

Every 1000 service hours or yearly

Replace hydraulic oil filter
 Check the times of hydraulic cylinder movements
 Reset the boom extensions plays/gaps
 Inspect crane structure (*)
 Oil level check/replacement of rotation reducer

Every 2500 service hours

Replace hydraulic oil
 Replacement of rotation reducer
 Check/replace notices/plates fitted to the crane
 Check/replace hoses
 Joint clearance check with possible bushings substitution
 Check/replace wear on sliding pads
 Hydraulic cylinders seal check with possible substitution of the seals

(*) È consigliabile eseguire questi interventi presso un'Officina Autorizzata.
 (*) It is suggested to carry out these operation by an Authorised Workshop.



NKGH系列手动油脂泵
NKGH Series manual grease pump



Specifiche olio e grasso Oil and grease specifications



Specifiche olio idraulico

La gru è rifornita di olio idraulico **AGIP tipo ARNICA 46**

Questo è l'unico olio da noi autorizzato in quanto ha ottenuto il miglior risultato rispetto ad alcune prove comparative svolte.

Utilizzare la stessa marca e tipo di olio per le sostituzioni periodiche nell'ambito di climi temperati adatti agli oli multigradi.

ATTENZIONE

Non mescolare oli di tipo e caratteristiche diverse: rischi di anomalie all'impianto idraulico e rottura di componenti.

Se non è possibile reperire l'olio idraulico **AGIP ARNICA 46** e si è costretti ad usare un altro tipo di olio, esso deve comunque rispondere alle seguenti specifiche:

Densità a 15°C	0,875 kg/l
Punto di infiammabilità:	185°C
Punto di scorrimento:	-42°C
Viscosità cinematica a 40°C	46 mm²/s
a 100°C	9,1 mm²/s
Indice di viscosità	185

IMPORTANTE

Ridurre tassativamente l'intervallo di sostituzione periodica (escluso la prima sostituzione) se si usano oli diversi da quello autorizzato.

Grasso lubrificante

Nei punti di ingrassaggio della macchina è usato del grasso **AGIP tipo GR MU EP 2**.

ATTENZIONE

Evitare di mescolare grassi di tipo e caratteristiche diverse e non utilizzare grassi di caratteristiche inferiori.

Se non è possibile reperire il grasso lubrificante **AGIP tipo GR MU EP 2** e si è costretti ad usare un altro tipo di lubrificante, esso deve comunque rispondere alle seguenti specifiche:

Sapone:	Litio
Penetrazione (25°C 0,1mm):	265/295
Gradazione NLGI:	2
Punto di goccia:	180 °C

Hydraulic oil specifications

The crane is supplied with **AGIP ARNICA 46** hydraulic oil.

This is the only oil we authorise as it recorded the best results in a number of tests we performed.

Use the same make and type of oil when changing the oil in temperate climates suited to multigrade oils.

CAUTION

Do not mix oils of different types and characteristics, as this might cause abnormalities in the hydraulic system and lead to component failure.

If you cannot obtain **AGIP ARNICA 46** hydraulic oil and are compelled to use another type of oil, it must nevertheless comply with the following specifications:

Density at 15°C	0.875 kg/l
Flash point:	185°C
Pour point:	-42°C
Kinematic viscosity at 40°C	46 mm²/s
at 100°C	9.1 mm²/s
Viscosity Index	185

IMPORTANT

If oils other than the authorised type are used, you must shorten the periodic oil change times (except for the first oil change).

Lubricating grease

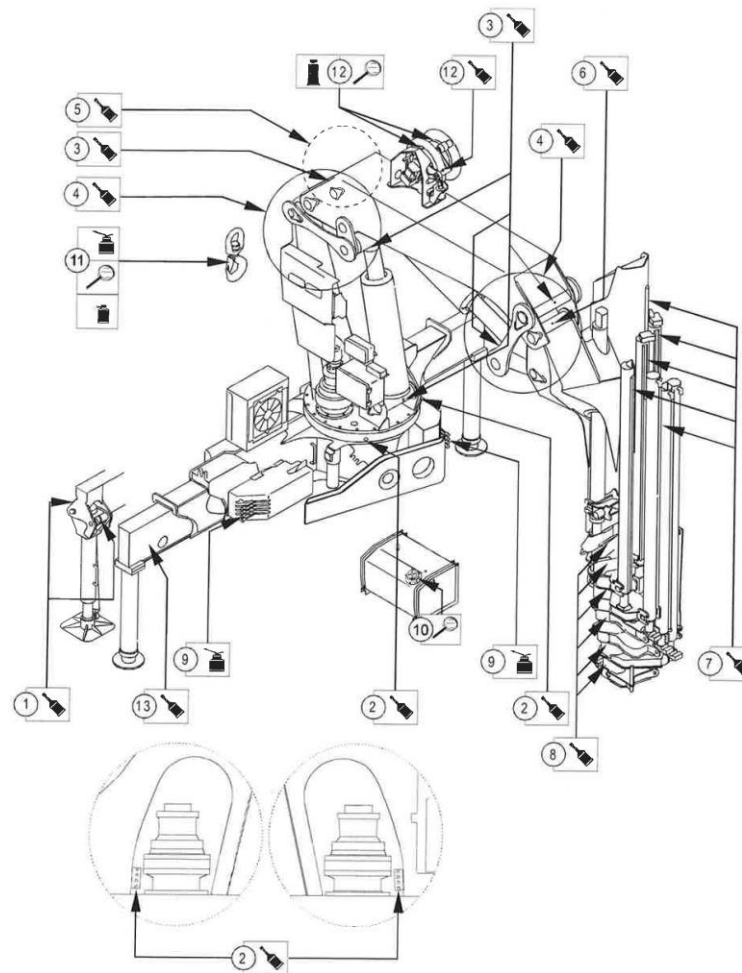
AGIP GR MU EP 2 grease is used on the machine's lubrication points.

CAUTION

Do not mix greases of different types and characteristics and do not use grease of inferior quality.

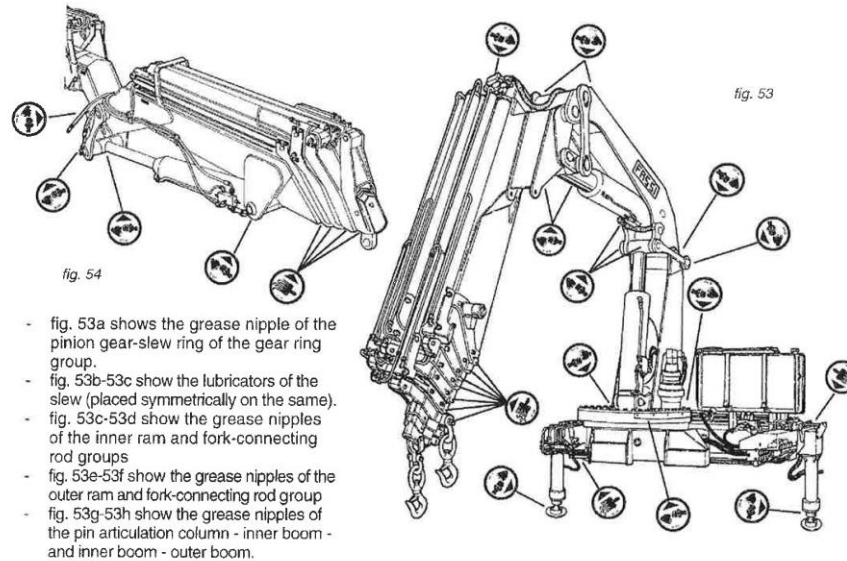
If you cannot obtain **AGIP GR MU EP 2** lubricating grease and have to use another type, it must nevertheless conform to the following specifications:

Soap:	Lithium
Penetration (25°C 0.1mm):	265/295
NLGI rating:	2
Dropping point:	180 °C



Periodically grease the points indicated on the crane (fig. 53) (and on the hydraulic jib, when fitted, fig. 54) paying particular attention to the points not easily detected.

MAINTENANCE
INSTRUCTIONS
F 460 **c XI**



- fig. 53a shows the grease nipple of the pinion gear-slew ring of the gear ring group.
- fig. 53b-53c show the lubricators of the slew (placed symmetrically on the same).
- fig. 53c-53d show the grease nipples of the inner ram and fork-connecting rod groups.
- fig. 53e-53f show the grease nipples of the outer ram and fork-connecting rod group.
- fig. 53g-53h show the grease nipples of the pin articulation column - inner boom - and inner boom - outer boom.

When the hydraulic jib is fitted

- fig. 54a shows the grease nipples of the pins articulation connecting boom - jib outer boom and fork
- fig. 54b-54c-54d show the grease nipples of the jib outer boom and fork-connecting rod groups



fig. 53a

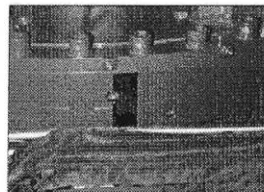


fig. 53b

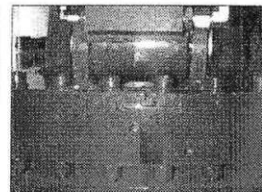


fig. 53c

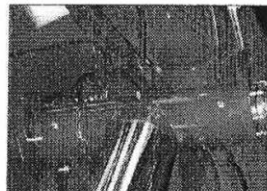


fig. 53d

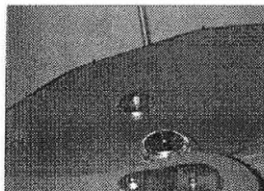


fig. 53e

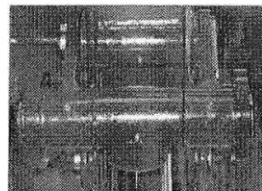


fig. 53f

After every 500 working hours

MAINTENANCE
INSTRUCTIONS
F 460 c XI

Check the tightening torque

- of the fixing rods of the crane
Tightening torque for fixing rods M39x3 = 1800 Nm
- of the slew gear screws
Tightening torque for bolts M20 Class 12.9 = 620 Nm
- of the securing bolts for the ram pins and of all the other bolts and screws,
where the tightening torque is not expressly indicated, consult the following
table in order to find its value according to the bolt diameter and class.

Table of the bolts tightening torque with average friction value (0,15) and average-
good tightening accuracy.

Bolt Diameter = D	Class 8.8 Torque = Nm	Class 10.9 Torque = Nm	Class 12.9 Torque = Nm
3	1,06	1,56	1,83
4	2,44	3,58	4,19
5	4,83	7,10	8,30
6	8,30	12,30	14,30
8	20	29	35
10	40	59	69
12	69	102	119
14	111	163	191
16	173	255	298
18	239	352	412

Bolt Diameter = D	Class 8.8 Torque = Nm	Class 10.9 Torque = Nm	Class 12.9 Torque = Nm
20	339	499	584
22	466	685	802
24	584	858	1004
27	865	1271	1487
30	1173	1723	2016
33	1594	2342	2740
36	2046	3006	3517
39	2658	3905	4570

From "ELEMENTS DE FIXATION ASSEMBLAGE VISSES"
E 25-030 AGOSTO 1984

Check the rotation control motoreducer oil level (fig. 55)

- Remove the bleed plug (1) using a 22 mm Allen wrench
 - Remove the plug (2) using an 8 mm Allen wrench and the O-ring.
 - Top up, if necessary, with the same type of oil as indicated on
page 42 via the mouth (bleed plug).
 - The correct level is reached when oil starts to escape from the
threaded hole in plug (2).
 - Check the state of wear of the O-rings (replace if necessary) and
then return the plugs.
- The lubrication oil can be drained completely by removing plug (3)
using an 8 mm Allen wrench.

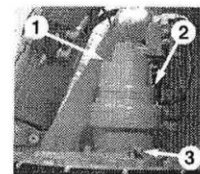


fig. 55

Check the guide shoe wear as it affects the sliding section tolerances; if the
clearances are considerable, damage to the rams and the structure may occur.

Replace the oil filter cartridges.

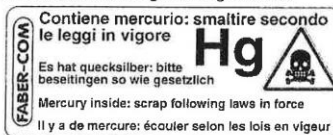
Clean the air filter placed in the top of the oil tank filter cap.

Completely replace the hydraulic oil.

(!) The waste oil must be disposed of by authorized persons.

(!) CAUTION DANGER (!)

On the outer boom there is a mercury capsule (mercury level switch) duly pro-
tected and provided with the following warning stickers.



**MERCURY IS EXTREMELY TOXIC. IN CASE OF REPLACEMENT AND/OR
SCRAPPING, DISPOSE OF OR RECYCLE THE CAPSULE CONTAINING
MERCURY WITH MAXIMUM CARE AND IN ACCORDANCE WITH THE NATION-
AL REGULATIONS IN FORCE.**



TABLE OF HYDRAULIC OIL AND LUBRICANTS CHARACTERISTICS

HYDRAULIC OIL WITH HIGH VISCOSITY: ISO-L-HV

Minimum external temperature:	maximum oil temperature:		
- 35°C	+45°C	Gradation	ISO VG 32
- 20°C	+75°C	Gradation	ISO VG 46

HYDRAULIC OIL WEAR RESISTANT: ISO-L-HM

Minimum external temperature:	maximum oil temperature:		
-10°C	+60°C	Gradation	ISO VG 32
+ 0°C	+75°C	Gradation	ISO VG 46
+ 5°C	+85°C	Gradation	ISO VG 68
+10°C	+90°C	Gradation	ISO VG 100

GREASE

Consistency: NLGI BEACON EP 2 - BEACON 3

HYDRAULIC OIL FOR MOTOREDUCTOR

Classification ISO-L-CC
Gradation EP ISO-VG 150

GREASE (for slew ring)

- 30°C up to +130°C EP2 Gradation

All grease used must be free from acid and resin, not hydroscopic and long-life such as BP GREASE LTX-EP2, ELF EPEXA 2, ESSO BEACON EP2 or SIMILAR.

LUBRICATING OIL (for winch cable)

The most suitable here is a general-purpose lubricating oil with about SAE 30 viscosity. A lubricating oil containing non-stick additives is recommended if the cables are expected to move quickly through the pulleys.

BRILUBE 50 (BRITISH ROPES - BRINDON)

(!) WARNING (!)

Don't use greases with solid particles as "Bisulphide of Molybdenum".



Tabella di serraggio Torque setting chart

08.IM.3080.005.En



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Se siamo in presenza di una serie di viti lubrificate va assunto il 60% del valore della coppia di serraggio, mentre se ci troviamo in presenza di viti non lubrificate va assunto il 70% del valore riportato in tabella.

In case of lubricated areas, the 60% of the torque wrench setting value shall be considered, on the contrary if the area is not lubricated the 70% of the value indicated in the table shall be considered.

PRECARICO E MOMENTO DI SERRAGGIO PER VITI CON FILETTATURA ISO A PASSO GROSSO

PRE-LOAD AND SCREWS TIGHTENING MOMENT WITH THREAD ISO WITH BIG PITCH

Diam. nom vite Nominal screw diameter	Precarico max V (kg.) Max preload V (kg.)				Momento max Ma (kgm.) Max moment Ma (kgm.)			
	6,6	8,8	10,9	12,9	6,6	8,8	10,9	12,9
	6 D	8 G	10 K	12 K	6 D	8 G	10 K	12 K
M 4x0,7	222	394	554	665	0,17	0,31	0,43	0,52
M 5x0,8	357	635	895	1070	0,33	0,60	0,84	1,01
M 6x1	507	902	1270	1520	0,58	1,03	1,46	1,75
M 7x1	728	1300	1820	2180	0,94	1,69	2,36	2,83
M 8x1,25	920	1640	2310	2770	1,39	2,48	3,49	4,19
M 9x1,25	1210	2160	3050	3630	2,05	3,67	5,18	6,17
M 10x1,5	1480	2600	3660	4380	2,83	4,97	7,00	8,37
M 12x1,75	2120	3780	5320	6380	4,74	8,46	11,90	14,30
M 14x2	2890	5160	7250	8700	7,54	13,46	18,92	22,70
M 16x2	3950	7020	9900	11900	11,50	20,40	28,80	34,60
M 18x2,5	4840	8600	12100	14500	16,00	28,40	40,00	48,00
M 20x2,5	6160	11000	15450	18500	22,20	39,60	55,60	66,60
M 22x2,5	7630	13600	19100	22900	30,00	53	74,50	90
M 24x3	8900	15900	22300	26700	39	70	98	117
M 27x3	11500	20600	28900	34700	56	101	142	170
M 30x3	14100	25200	35400	42400	77	138	193	232

PRECARICO E MOMENTO DI SERRAGGIO PER VITI CON FILETTATURA ISO A PASSO FINE

PRE-LOAD AND SCREWS TIGHTENING MOMENT WITH THREAD ISO WITH SMALL PITCH

Diam. nom vite Nominal screw diameter	Precarico max V (kg.) Max preload V (kg.)				Momento max Ma (kgm.) Max moment Ma (kgm.)			
	6 D	8 G	10 K	12 K	6 D	8 G	10 K	12 K
	6,6	8,8	10,9	12,9	6,6	8,8	10,9	12,9
M 8x1	995	1750	2470	2960	1,48	2,60	3,70	4,40
M 10x1,25	1540	2740	3860	4630	2,90	5,20	7,30	8,70
M 12x1,25	2420	4140	5800	6980	5,30	9,10	12,80	15,40
M 12x1,5	2220	3960	5570	6680	5	8,90	12,50	15
M 14x1,5	3150	5600	7880	9450	8	14,30	20	24
M 16x1,5	4200	7500	10500	12600	12	21,50	30	36
M 18x1,5	5430	9700	13600	16300	17,40	31	43	52
M 20x1,5	6900	12100	17150	20600	24,40	43	61	73
M 22x1,5	8400	15000	21000	25200	32	57,50	80,50	97
M 24x2	9650	17200	24200	29000	41	73,50	103	124
M 27x2	12500	22300	31300	37500	60	107	150	180
M 30x2	15700	27800	39200	47000	83	147	208	250

Il precarico è stato calcolato pari al 70% del carico di snervamento minimo.

Il momento torcente è stato calcolato impiegando la formula (39) del manuale Junker & Blume, ed attribuendo al coefficiente di attrito μ_{ges} il valore medio $\mu_{ges} = 0,14$.

The pre-load has been calculated up to the 70% of the minimum yield point.

The stress moment has been calculated with the formula (39) of the Junker & Blume handbook, and by attributing to the damping coefficient μ_{ges} the average value of $\mu_{ges} = 0,14$.



Serraggio viti ralla/basamento Slewing ring/base screws tightening



Configurare la gru con il primo braccio sollevato nella massima posizione verticale.

Ruotare la colonna fino a portare il foro **A** in corrispondenza della vite sottostante.

Togliere i controdati di sicurezza **B**.

Serrare i dadi avvalendosi di una chiave dinamometrica a bussola esagonale (vedi tabella sottostante).

Eseguire il serraggio con la coppia indicata in tabella.

Diametro minimo	20
Chiave	30
Coppia	40 Kgm

Rimontare i controdati e serrarli con la stessa coppia precedente.

AVVERTENZA

Il serraggio deve essere eseguito su coppie di viti diametralmente opposte.

Position the crane with the first boom raised to its maximum vertical position.

Slew the column so to have the hole (**A**) matching the screw underneath.

Remove the safety lock nuts **B**.

Tighten the nuts using a torque wrench with a hexagonal sleeve (see table below).

Tighten to a torque setting as shown on table.

Diameter	20
Wrench	30
Torque setting	40 Kgm

Replace the lock nuts and tighten them to the same torque setting.

WARNING

The tightening has to be carried out, by acting on the screws, two by two diametrically opposite.



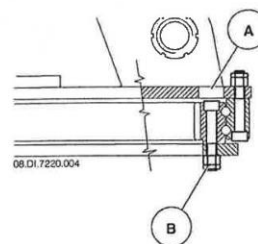
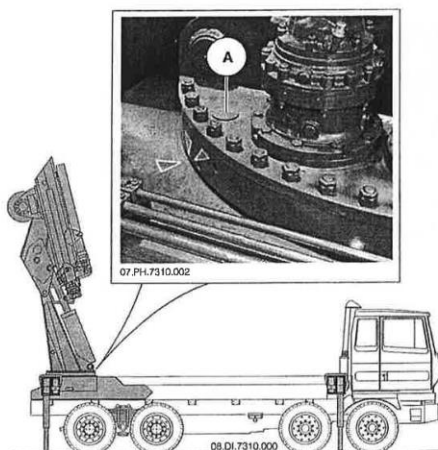
PERICOLO

L'operazione di serraggio viti ralla/basamento va rigorosamente eseguita da personale specializzato in una Officina autorizzata.



DANGER

The screw tightening operations may only be performed by skilled personnel at an authorised workshop.





Configurare la gru con il primo braccio sollevato nella massima posizione verticale.

Togliere i controdati di sicurezza.

Serrare i dadi avvalendosi di una chiave dinamometrica a bussola esagonale (vedi tabella sottostante).

Eseguire il serraggio con la coppia indicata in tabella.

Diametro minimo	30
Chiave	46
Coppia	115 Kgm

Rimontare i controdati e serrarli con la stessa coppia precedente.



PERICOLO

L'operazione di serraggio viti controtelaio/basamento va rigorosamente eseguita da personale specializzato in una Officina autorizzata.

Position the crane with the first boom raised to its maximum vertical position.

Remove the safety lock nuts B.

Tighten the nuts using a torque wrench with a hexagonal sleeve (see table below).

Tighten to a torque setting as shown on table.

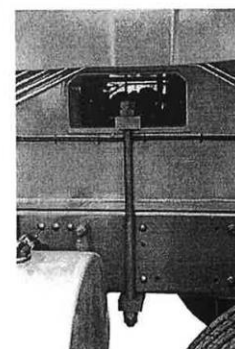
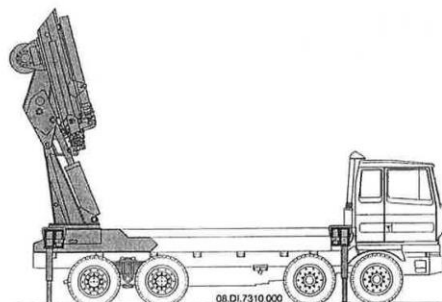
Diameter	30
Wrench	46
Torque setting	115 Kgm

Replace the lock nuts and tighten them to the same torque setting.



DANGER

The screw tightening operations may only be performed by skilled personnel at an authorised workshop.





Verificare lo stato di usura dei pattini di scorrimento, collocati tra gli elementi telescopici, misurandone lo spessore.

ATTENZIONE

Lo spessore dei pattini di scorrimento non deve essere inferiore a 10 mm.

IMPORTANTE

L'eccessiva usura dei pattini può provocare l'uscita non sequenziale degli elementi telescopici e un eccessivo gioco con conseguente disassamento tra i vari elementi telescopici.



PERICOLO

L'operazione di sostituzione dei pattini va rigorosamente eseguita da personale specializzato in una Officina autorizzata.

Check the wear on the sliding pads positioned between the boom extensions. To do this measure their thickness.

CAUTION

The thickness of the sliding pads must not be less than 10 mm.

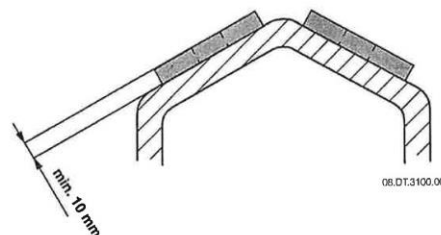
IMPORTANT

Excess wear on the sliding pads might cause the non-sequential opening of the boom extensions as well as excessive play leading to misalignment of the extensions themselves.



DANGER

The sliding pads may only be replaced by skilled personnel at an authorised workshop.





Per garantire un funzionamento ottimale dell'impianto idraulico, è bene tenere presenti le seguenti regole di montaggio dei tubi flessibili.

Avvitare i dadi di raccordo dei tubi flessibili fino a quando non si hanno più perdite di olio attraverso l'accoppiamento.

AVVERTENZA

Un ulteriore serraggio non migliora la tenuta, al contrario danneggia l'accoppiamento!

IMPORTANTE

Non sottoporre i tubi flessibili a torsione!

Durante il montaggio prevedere che sotto carico i tubi flessibili sono sottoposti a variazioni di lunghezza con conseguenti sforzi di torsione. Non scegliere, quindi, tubi flessibili troppo corti. Verificare il giusto assetamento del tubo in condizioni di riposo (fig. 1).

Fare attenzione al percorso, se i tubi flessibili devono compiere linee curve, scegliere opportuni raggi di curvatura. Un raggio di curvatura troppo stretto provoca restringimenti di sezione, quindi perdite di carico; inoltre le piegature che ne derivano provocano sforzi di torsione e rotture del tubo (fig. 2 e 3).

Scegliere una giusta lunghezza libera del tubo fra gli accoppiamenti.

Per un corretto montaggio dei tubi flessibili sono disponibili raccordi a gomito che soddisfano esigenze di montaggio in spazi ridotti senza pregiudicare l'efficienza e la durata del tubo flessibile (fig. 3 e 4).

In order to ensure efficient operation of the hydraulic system, you must observe the following rules regarding hose assembly.

Tighten the hose connector nuts until oil no longer leaks through the joint.

WARNING

Any tightening beyond this point will not improve tightness. On the contrary, it will damage the joint!

IMPORTANT

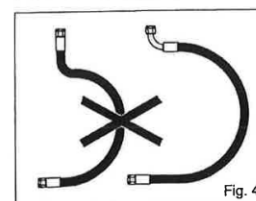
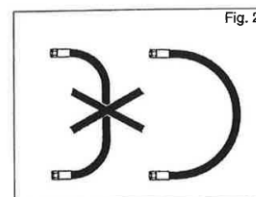
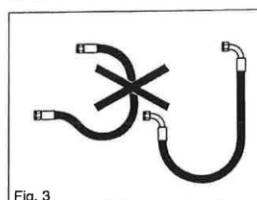
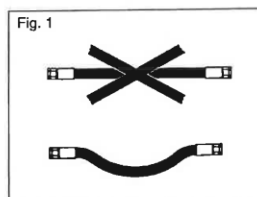
Do not twist the hoses!

During assembly, you must make allowance for the fact that the hoses will be subject to variations in length when under pressure, with resulting torsional stresses. Therefore, do not choose hoses that are too short. Check the correct arrangement of the hose in their rest condition (fig. 1).

Take care with hose routing. If the hoses have to describe curves, choose an appropriate radius of curvature. Too narrow a radius of curvature will constrict the cross-section of the hose and lead to load losses, while the kinks that ensue will cause torsional stresses and hose failure (figs. 2 and 3).

Choose the right free hose length between joints.

To ensure correct assembly of the hoses, elbow fittings are available for hose installation in confined spaces, without undermining the efficiency and working life of the hose (figs. 3 and 4).



5) 事故研究 Case Study

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司









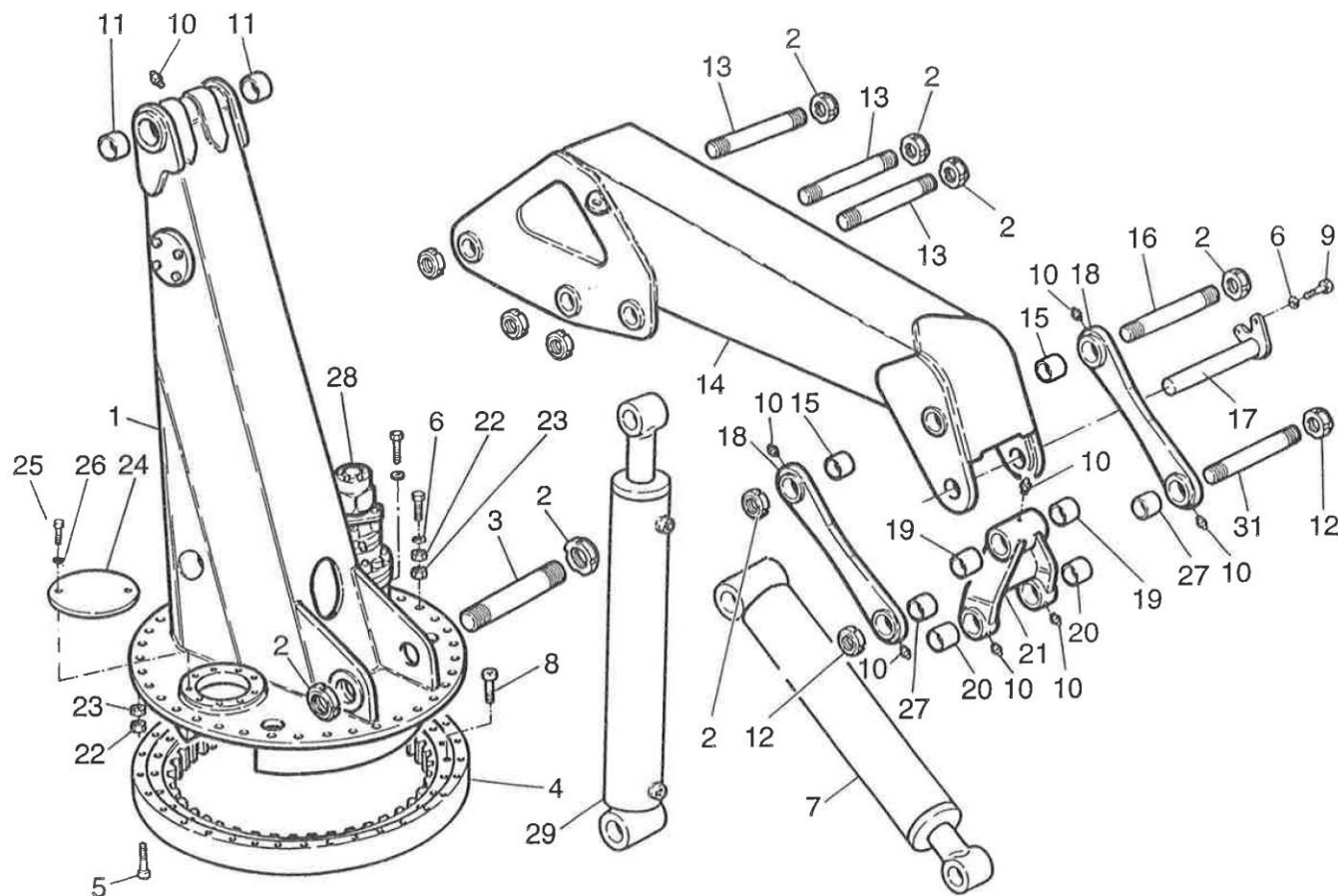


2/2

COLONNA, GRUPPO ROTAZIONE E BRACCIO PRIMARIO
COLUMN, ROTATION UNIT AND MAIN BOOM
COLONNE, ENSEMBLE DE ROTATION ET FLECHE PRINCIPALE
MAST, ROTATIONSGRUPPE UND 1. AUSLEGER
COLUMNA, GRUPO DE ROTACION Y BRAZO PRINCIPAL

Tavola
854.029.02

Rev.
2 06/1994



5) 事故研究 (Case Study)

5.a) 缺乏維修 (Lack of Maintenance) ?

5.b) 不正當使用 (Mis-Operated) ?

5.c) 其它問題 (Other reasons) ?

6) 大修之後/每四年之檢驗

Major Overhaul and/or every 4 Years Inspection.

隨車吊機的認識和保養

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2 法律規定

2.1 檢查、徹底檢驗及測試，對確保起重機械及起重裝置的安全和可靠性甚為重要。根據法例，合資格的人和合資格檢驗員須執行下述三類職責：

- 由合資格的人進行檢查；
- 由合資格檢驗員進行徹底檢驗；以及
- 由合資格檢驗員進行測試及徹底檢驗。

2.2 有關起重機械及起重裝置的「檢查」、「徹底檢驗」，以及「測試及徹底檢驗」的法律規定，現分別載於表一及表二內。而表三則列出檢查、檢驗及測試各種起重機械及起重裝置所須採用的表格。

機械的種類	檢查	徹底檢驗	測試及徹底檢驗
起重機械 (起重機、絞車 和起重滑車 除外)	在使用前7天 內進行 《起重機械及裝置 規例》第7A條	在使用前12個月 內最少進行一次 《起重機械及裝置規例》 第5(1)條	在首次使用前 或 在重大修理、重新架設、 失靈、翻倒或倒塌後進行 《起重機械及裝置規例》 第5(2)及5(4)條
起重機	在使用前7天 內進行 (包括安全負荷自動 顯示器) 《起重機械及裝置 規例》第7A及 7B(1)(c)條	在使用前12個月 內最少進行一次 或 架設之前 (所有用作起重機的 錨定及壓重的裝置) 《起重機械及裝置規例》 第5(1)及7E(1)條	在使用前4年內 或 在重大修理、重新架設、失靈、 翻倒或倒塌後進行 或 每次架設及移往新地點後 或 對任何涉及改變起重機的錨定 或 壓重安排作出調校後進行 或 在暴露於可能已 影響起重機穩定性的天氣後進行 《起重機械及裝置規例》 第5(3)、5(5)、7B(1)(b)、7E(2) 及7G(2)(a)條
絞車和起重滑車	在使用前7天 內進行 《起重機械及裝置 規例》第7A條	在使用前12個月 內最少進行一次 《起重機械及裝置規例》 第5(1)條	在使用前4年內 或 在重大修理、重新架設、 失靈、翻倒或倒塌後進行 《起重機械及裝置規例》 第5(3)及5(5)條

表一：有關「檢查」、「徹底檢驗」以及「測試及徹底檢驗」起重機械的法律規定

2 Legal Requirements

- 2.1** Inspections, thorough examinations and tests are particularly important for ensuring the safety and reliability of lifting appliances and lifting gear. Statutorily, there are three types of duties as follows:
- inspection by a competent person;
 - thorough examination by a competent examiner; and
 - test and thorough examination by a competent examiner.
- 2.2** The legal requirements of 'inspection', 'thorough examination' and 'test and thorough examination' of lifting appliances and lifting gear are summarized in Table 1 and Table 2 respectively. Table 3 tabulates the types of Forms used for inspections, examinations and tests of different lifting appliances or lifting gear.

Types of appliance	Inspection	Thorough examination	Test and thorough examination
Lifting appliance except crane, winch, crab.	within the preceding 7 days (Reg.7A of LALGR)	at least once in the preceding 12 months (Reg.5 (1) of LALGR)	before use for the first time or after substantial repair, re-erection, failure, overturning or collapse (Reg.5 (2) & 5 (4) of LALGR)
Crane	within the preceding 7 days (including the automatic safe load indicator) (Reg. 7A & 7B(1)(c) of LALGR)	at least once in the preceding 12 months or before erection (all of the devices used for the anchoring and ballasting of the crane) (Reg. 5 (1) & 7E (1) of LALGR)	within the preceding 4 years or after substantial repair, re-erection, failure, overturning or collapse or after each erection and removal to a new location or any adjustment which involves changes in the arrangements for anchoring or ballasting the crane or after exposure to weather likely to have affected the stability of the crane (Reg.5(3), 5(5), 7B(1)(b), 7E(2) & 7G(2)(a) of LALGR)
Winch and crab	within the preceding 7 days (Reg.7A of LALGR)	at least once in the preceding 12 months (Reg.5 (1) of LALGR)	within the preceding 4 years or after substantial repair, re-erection, failure, overturning or collapse (Reg.5(3) & 5(5) of LALGR)

Table 1 - Legal requirements for 'inspection', 'thorough examination' and 'test and thorough examination' of lifting appliances

6) 大修之後/每四年之檢驗

Major Overhaul and/or 4 Years Inspection.

6.a) 條例上要求的超重試力。

The requirment of overloading test.

6.b) 隨車吊機如何進行超重試力？

**How to carry out overloading test with
Truck Mounted Crane.**

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

SWL Chart for item 6 of the certificate

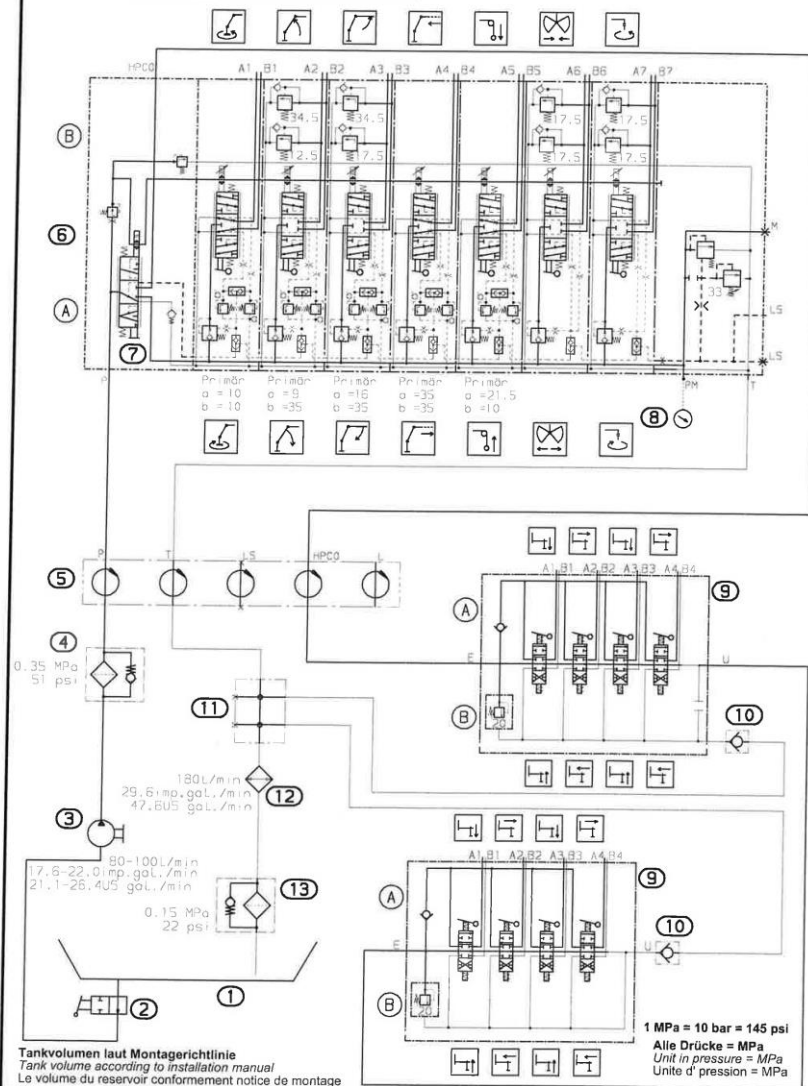
Working Radius(m)	With fully extended outrigger-over side and over rear									
	10.8m Boom		18.1m Boom		25.4m Boom		32.7m Boom		40.0m Boom	
	Proof load	SWL	Proof load	SWL	Proof load	SWL	Proof load	SWL	Proof load	SWL
3.0	63.15	50.5	35.00	28.00						
3.5	-	42.20	-	28.00	22.50	18.00				
4.0	-	37.00	-	28.00	-	18.00				
4.5	-			28.00	-	18.00				
5.0	-			28.00	-	18.00	16.25	13.00		
5.5	-			25.60	-	18.00	-	13.00		
6.0	-	25.00	-	23.50	-	18.00	-	13.00		
6.5	-	22.70	-	21.80	-	18.00	-	13.00	9.40	7.50
7.0	-	20.70	-	20.00	-	16.80	-	13.00	-	7.50
7.5	-	18.90	-	18.50	-	15.70	-	13.00	-	7.50

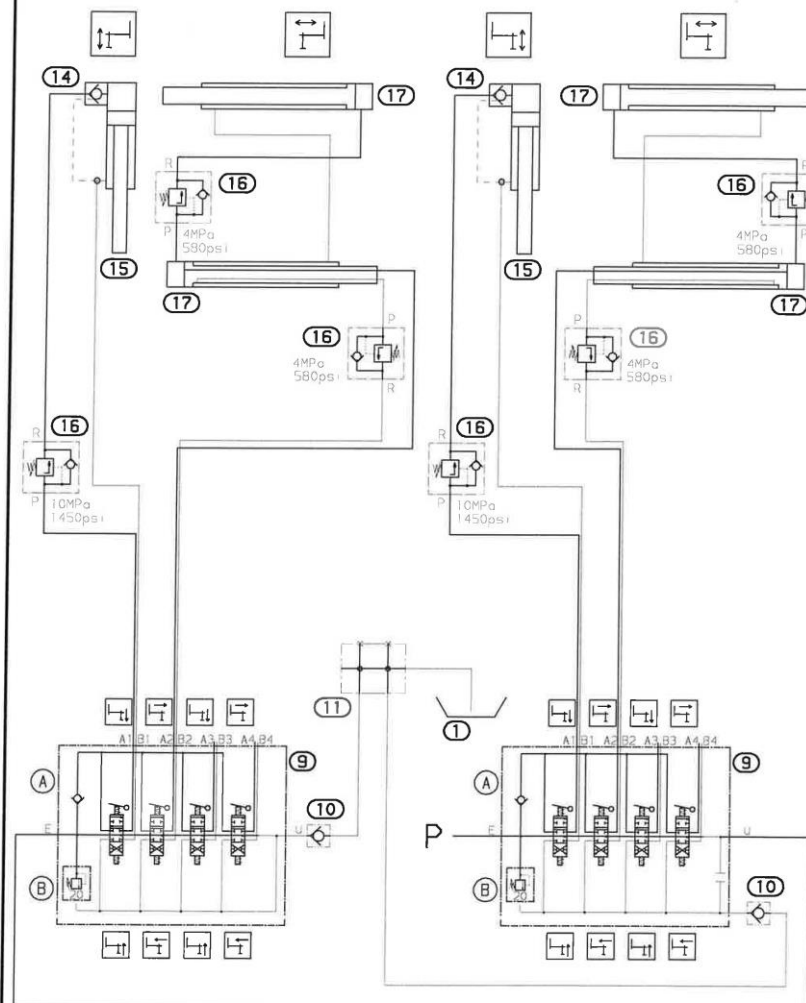
= 125%

Konstruktionsänderungen vorbehalten, fertigungsbedingt. Toleranzen müssen berücksichtigt werden.

Subject to change, production tolerances have to be taken into account.

Sous réserve de modifications de conception. Les inférences relatives à la technique de production (ciment) n'ont pas été conservées.





1 MPa = 10 bar = 145 psi

Alle Drücke = MPa

Unit in pressure = MPa

Unité d'pression = MPa

*Construktionsänderungen vorbehalten, fertigungstechn. Toleranzen müssen berücksichtigt werden.
Subject to change, production tolerances have to be taken into account.
Sous réserve de modifications de conception. Les tolérances relatives à la technique de production doivent être prises en considération.*



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Schema oleodinamico Hydraulic circuit diagram

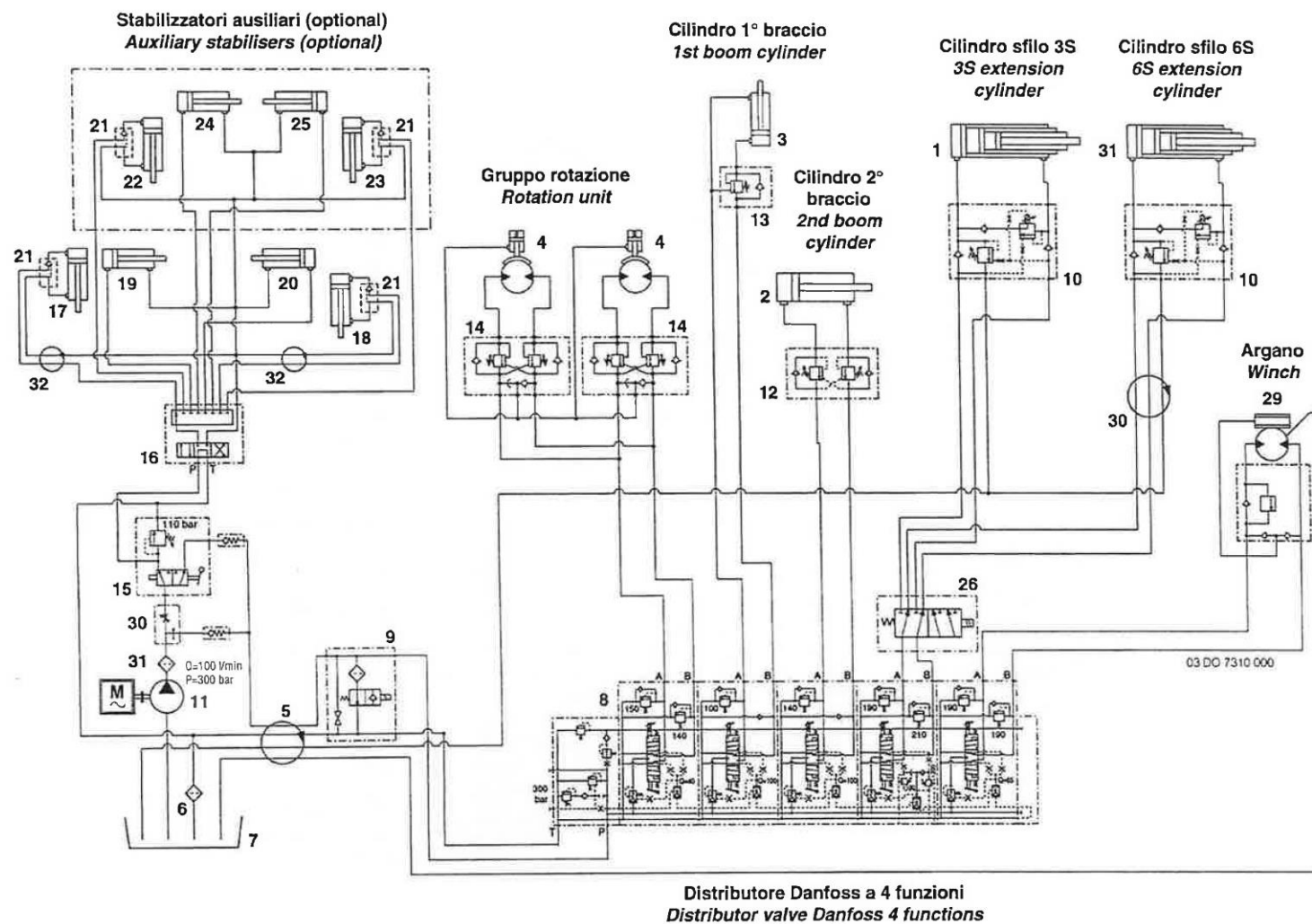


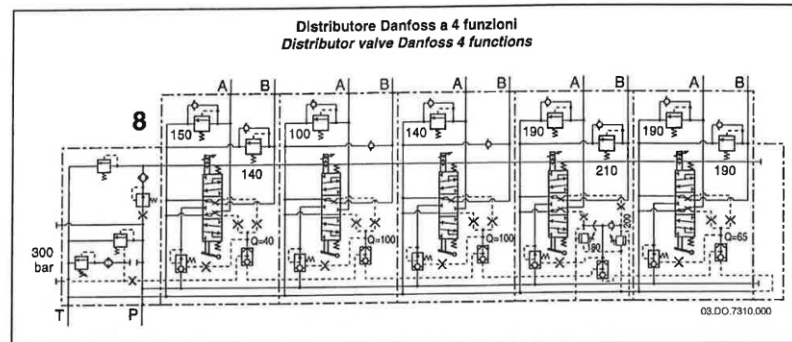
AVVERTENZA

In questo schema è stata rappresentata la gru nella versione standard.

WARNING

In this diagram the crane is represented in the standard version.





Legenda

- 1 Cilindro sfili 3S
- 2 Cilindro sollevamento 2° braccio
- 3 Cilindro sollevamento 1° braccio
- 4 Motoriduttore rotazione
- 5 Fermo di rotazione (360°)
- 6 Filtro
- 7 Serbatoio olio
- 8 Distributore proporzionale Danfoss a 5 funzioni
- 9 Elettrovalvola di messa a scarico (normalmente aperta 24 Vdc)
- 10 Valvola doppia overcentre con circuito rigenerativo
- 11 Pompa
- 12 Valvola di blocco doppio effetto
- 13 Valvola di blocco semplice effetto
- 14 Valvola di blocco controllo rotazione
- 15 Valvola intercettatrice
- 16 Deviatore multifunzione a 9 vie
- 17 Cilindro stabilizzatore anteriore sinistro
- 18 Cilindro stabilizzatore anteriore destro
- 19 Cilindro movimentazione asta anteriore sinistra
- 20 Cilindro movimentazione asta anteriore destra
- 21 Valvola di blocco con rubinetto
- 22 Cilindro stabilizzatore posteriore sinistro
- 23 Cilindro stabilizzatore posteriore destro
- 24 Cilindro movimentazione asta posteriore sinistra
- 25 Cilindro movimentazione asta posteriore destra
- 26 Elettrovalvola di scambio 3S/6S
- 27 Cilindro sfilo 6S
- 28 Avvolgitubo 3 vie per attivazione cilindro 6s
- 29 Argano
- 30 Valvola prioritari a 3 vie
- 31 Filtro in pressione
- 32 Avvolgitubo attivazione stabilizzatore

Legend

- 1 3S extensions cylinder
- 2 2nd. boom lifting cylinders
- 3 1st. boom lifting cylinders
- 4 Rotation element
- 5 Rotation pin (360°)
- 6 Filter
- 7 Oil tank
- 8 Distributor valve Danfoss 5 functions
- 9 Drain solenoid valve (normally open 24 V dc)
- 10 Overcentre double valve with regenerating circuit
- 11 Pump
- 12 Double effect block valve
- 13 Single effect block valve
- 14 Rotation control block valve
- 15 Storm choke
- 16 9 ways multifunction deflector
- 17 Left front stabilising cylinder
- 18 Right front stabilising cylinder
- 19 Cylinder for left front rod move
- 20 Cylinder for right front rod move
- 21 Block valve with cock
- 22 Left back stabilising cylinder
- 23 Right back stabilising cylinder
- 24 Cylinder for left back rod move
- 25 Cylinder for right back rod move
- 26 Selection solenoid valve 3S/6S
- 27 Extension cylinder 6S
- 28 3 ways hose-reel for 6s cylinder activation
- 29 Winch
- 30 Three-way priority valve
- 31 Pressurised filter
- 32 Stabilising device activation hose-reel

7) 問答時段? (Q & A)

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



香港專業吊運聯會有限公司

隨車吊機的認識和保養
Understand and Maintenance of Lorry Crane

- 1) 甚麼是維修 (What is Maintenance) ?
 - 1.a) 預防性維修 (Preventively)
 - 1.a.1) 依保養/維修手冊 (可自行負責)
Follow factory's Instruction & Service Manual (DIY)
 - 1.a.2) 進行專業檢查 (專業人士執行)
Critical Inspection (by professionals)
 - 1.b) 損壞性維修 (Damage Repair)
 - 1.b.1) 由專業人士負責 (by professionals)
- 2) 認識你的隨車吊機 (Know your Lorry Crane)
 - 2.a) 了解你的工作需要 (What you need the crane for...)
 - 2.b) 選/用合適的隨車吊機 (Choose/Use the right crane)
- 3) 工業及工廠經營 (起重機械及起重裝設) 規例
Factories and Industrial Undertakings (Lifting Appliance & Lifting Gear) Regulations
 - 3.a) 表格 (一) 起重機械的每周一次檢查結果報告
FORM 1 Reports of Results of Weekly Inspections of Lifting Appliance
 - 3.a.1) 作為預防性的檢查，是否足夠？ (As preventive measure, is this good enough?)
 - 3.a.2) 誰是「合資格人仕」 (Who qualified as the Competent Person?)
- 4) 怎麼樣才算是合資格的維修 (How to ensure quality maintenance & Service to your Lorry Crane)
 - 4.a) 一般預防性維修 (General M & S)
可自己執行的維修 (Something you can DIY)
 - 4.b) 較專業的預防性維修 (Special M & S)
自己未能執行的維修 (Something you cannot DIY)
- 5) 事故研究 (Case Study)
 - 5.a) 缺乏維修 (Lack of Maintenance...?)
 - 5.b) 不正當使用 (Mis-Operate...?)
 - 5.c) 其他可能？ (Other reasons...?)
- 6) 大修之後/每四年之檢查 (Major Overhaul and/or every 4 years Inspection)
 - 6.a) 條例上要求的超重試力 (The require of overloading test)
 - 6.b) 隨車吊如可進行超重試力 (How to carry out overloading test with Lorry Crane)
- 7) 問答時段 (Q & A)

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)

(完)

隨車吊機的認識和保養

(Understanding and Maintenance of Truck Mounted Crane)



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