Bantex
DENMARK
Nr. 6211

1
2
3
4
5
6
7
8
9
10
11
12

Bantex STRONG LINE®

PG 621107

1 INTRODUCTION

1.1 Introduction

1.1.1 Purpose

The purpose of this manual is to provide information to the user and maintenance personnel regarding the following:

- How the system works
- The purpose of the equipment
- How to operate the equipment
- How to maintain the system
- How to make rectifications and necessary modifications
- How to order spare parts

in order to operate the equipment in a safe and efficient manner.

1.2 Useful information

Supplier information:

Manufacturer: Dreggen Crane AS – Bergen - Norway

Address: Post Box 3434
N-5815 BERGEN
NORWAY

Telephone - office hours: + 47 55 33 36 50

Telefax: + 47 55 33 36 51/52

E-mail: mailbox@dreggen.no

Homepage: www.dreggen.com

CRANES & SERVICE

PHONE: +47 55 33 36 50, FAX: +47 55 33 36 51/52
E-mail: mailbox@dreggen.no

24 HOUR SERVICE

Contact persons:

Eric Gullestad	
Phone Priv.	
Mobil	+47 970 52 889

Tormod Gullestad	
Phone Priv.	+47 55 33 04 00
Mobil	+47 970 52 886

Halldor Rongve	
Phone Priv.	+47 55 98 88 90
Mobil	+47 970 52 883

Tor Kenneth Johnsen	
Phone Priv.	+47 55 53 07 20
Mobil	+47 900 53 570

Karsten Rongve	
Phone Priv.	+47 55 16 53 99
Mobil	+47 911 40 221

Phone Priv.	
Mobil	

1.3 Qualifications and training

1.3.1 General

Dreggen Crane AS offers operator and system courses on all Dreggen equipment. The purpose is to make operators and maintenance personnel focus on safety and reduce expensive downtime. As the equipment has become increasingly complicated, a multi-disciplined staff is required. We therefore intend to go through the system step by step; mechanically, hydraulically and electrically. This enables us to give our employees a basic understanding of the complete system and to improve the communication between the hydraulic, mechanical, electrical and instrumentation staff. Please take contact for further information.

1.3.2 Operator course

We recommend that a system operation course be held prior to the initial start-up period. The duration of the operator course depends entirely on the equipment. The exact fee is dependent on the scope and duration of the course.

Recommended topics:

- Introduction and general description
- Technical specifications and performance data
- How to operate the equipment
- Control system
- Hazards
- Daily checks
- Exercises

The number of participants should not exceed five (5).

1.3.3 System course

A tailor-made system course can be arranged when the system has been in operation for 3-6 months. The duration of a system course depends on the equipment. The exact fee is dependent on the scope and duration of the course.

Recommended topics:

- General description and system philosophy
- Technical specifications and performance data
- How to operate the equipment
- Description of the hydraulic system
- Hydraulic components
- Hydraulic flow diagrams
- Description of the electrical system
- Electrical components
- Electrical drawings
- Trouble shooting
- Maintenance
- Exercises

The number of participants should not exceed eight (8).

1.4 Health, Environment and Safety (HES)

1.4.1 General

The equipment has been designed in accordance with current HES regulations and standards. It is recommended that you read this manual prior to operating the equipment. To ensure safe operation and avoid personnel injuries as well as damage to the equipment and the environment, please observe the instructions herein.

The operator is responsible for making sure that instructions in this manual are followed at all times.

It is also important to observe any general legal and mandatory regulations in force relating to accident prevention and environmental protection.

1.4.2 Health

Protection of health implies that personnel should not be exposed to excessive workloads. Elements taken into account are:

- Ergonomics
- Noise
- Vibrations
- Chemical substances and products
- Illumination
- Indoor climate
- Outdoor operation

Procedures, instructions and guidelines incorporated in this manual reflect the result of studies carried out by Dreggen Crane AS.

1.4.3 Safety

The operator shall ensure that only authorized personnel are allowed to use, operate and maintain the equipment. Such authorized personnel shall be properly trained and skilled in accordance with relevant statutory regulations and requirements as well as Dreggen Crane AS' requirements and recommendations for correct and safe use of the equipment or similar authorization level.

Dreggen Crane AS shall be under no liability whatsoever in respect of any damage, personnel injury, defect, delay or any consequences of such arising from incorrect use or maintenance of the equipment, or arising from unqualified personnel using or having access to the equipment.

1.4.3.1 Safety during operation

The equipment shall only be operated by authorized personnel.

The equipment shall be used only when in proper technical condition and for its intended purpose. Functional disorders, in particular disorders that would prejudice safety, must be rectified immediately.

The operator is responsible for ensuring that no personnel are within, or in the vicinity of, the equipment operation area before starting or during operation of the equipment.

1.4.3.2 Safety during maintenance

Maintenance personnel must be familiar with the equipment, hydraulic and electrical diagrams and maintenance procedures before attempting to carry out repair or maintenance work.

The maintenance area must be safely and properly secured.

When replaced, individual parts and large and/or heavy structural components must be carefully attached to the lifting appliance and safeguarded in order to avoid accidents. Only approved lifting equipment with sufficient carrying capacity must be used.

Do not stay or work underneath or in the vicinity of a suspended load.

1.4.3.2.1 Hydraulics

Some hydraulic circuits contain high-pressure hydraulic fluid. Prior to inspection, maintenance or repair, maintenance personnel should make sure to bleed off any high pressure in the circuits.

1.4.3.2.2 Electrical

Only personnel authorized according to the regulations in force shall perform work on electrical equipment.

If, according to specifications for inspection, maintenance or repair, the equipment needs to be voltage free, please observe the following procedure:

For power systems:

- Switch off and secure the main circuit breaker in Panel X1 according to current isolation procedures.
- Refer to procedures specific for the equipment.

For instrumentation systems:

- Isolate the equipment control panel from the main power supply.
- Open the fuses in the control panel according to the relevant interconnection diagrams.
- Open the terminal strip isolation knives in the control panel according to the relevant interconnection diagrams.
- Refer to procedures specific for the equipment.

Prior to commencing the work, make sure that all circuits are voltage free.

During maintenance, measures must be taken to prevent accidental activation of the equipment. Such measures may include shutting off the power supply or putting up warning signs on all power distribution, control and operator panels.

In case of a power supply malfunction (voltage, frequency or other disruptions), the equipment must be switched off immediately.

In order to maintain the integrity of the system, it is important that all spare parts are of identical quality or better than the original part. This is particularly important with regard to protective equipment such as fuses and circuit breakers. If in doubt, contact Dreggen Crane AS for assistance.

1.4.4 Environment

Prior to carrying out maintenance work on hydraulic circuits, necessary measures must be taken to avoid fluid spills.

1.5 CE-marking

The equipment is CE-marked according to relevant EU directives.

Conditions for CE-marking:

- The equipment has to be transported, installed and used according to approved procedures and Equipment Users manual.
- Operational Safety Test has to be completed before operational use.
- Other equipment, working together with this equipment, has to be CE-marked.
- It is the operator's responsibility to ensure that risk analyses is considered/carried out prior to every operation and when evaluating a risk situation.
- Any modifications must be approved by the manufacturer and must be documented.

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 1 in the Equipment User Manual - Introduction.

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

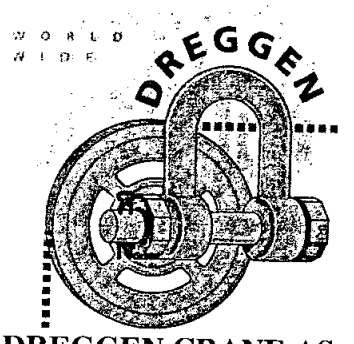
Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
INTRODUCTION

Client Doc no:			Rev.	
Proj.no. Disc. Prod.code	Doc. code Seq.no		Rev.	Total no. of pages
60338			**01**	**9**



DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 2 in the Equipment User Manual - Main data

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. FREIRE. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
MAIN DATA

Client Doc no:					Rev.	
Proj.no.	Disc.	Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338					**01**	**4**

2 MAIN DATA

2.1 Performance data

Hydraulic/Electrical operated jib crane, type: DK220-12T-16m, Electro hydraulic knuckle boom deck crane.

Operation:		
SWL	12,0	Ton
MAX OUTREACH, horizontal jib	16	m
MIN OUTREACH	3,2	m
HOOK SPEED, full load	0-20	m/min
HOOK SPEED, no load	0-20	m/min
HEIGHT OF LIFT (hook travel)	30	m
SLEWING SECTOR, continuously	360	Deg
SLEWING SPEED	0-1	Rpm
HEEL / TRIM	5 / 2	Deg
LUFFING TIME, average up/down	60	Sec
WEIGHT OF CRANE, approx.	20,0	Ton
POWER CONSUMPTION, motor rating S6-40%	97	kW
WORKING PRESSURE	250	Kg/cm2
NOMINAL CURRENT, appr	175	A
STARTING CURRENT (Star DELTA), appr	320	A
MAIN ELECTRIC SUPPLY	400V-50HZ-3PH	

NOTE! Speeds, weight and power consumption are approximate within +/- 5%

2.2 Restriction in use

ENVIRONMENT:	High humidity. The design temperature is defined as the minimum service temperature, for which operation of the crane is anticipated. Td = minus 10deg. Design temp.: -10deg – + 45deg.

2.3 Rules, Regulations, Codes and Standards

The crane has been designed in accordance with requirements as stated in the following regulations:

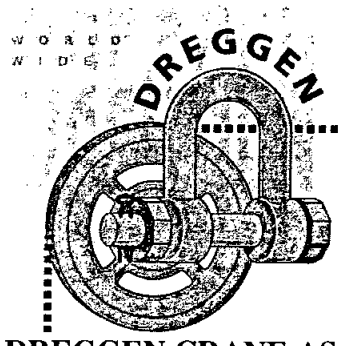
2.3.1 Plan Approval

- BV ALM rules for certification of lifting appliances,
- Further according to SHIP`s P.O.S

2.4 Certification

The crane will be delivered with the following certification:

- BV ALM certificate for crane



DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 3 in the Equipment User Manual - Technical Description

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
TECHNICAL DESCRIPTION

Client Doc no:					Rev.	
Proj.no.	Disc.	Prod.code	Doc. code	Seq.no	Rev.	Total no. of pages
60338					**01**	**6**

3 TECHNICAL DESCRIPTION

3.1 Introduction

The crane is designed for safe and efficient handling of load within the deck area and/or onto pier/quay.

The crane is of the Electro-Hydraulic Slewing Deck Cranes, Type DK220-12T-16m, Hose Handling Crane. Features as per Dreggen Crane AS technical specification No.: L2578/03, dated 24.06.2005.

3.2 Equipment description

3.2.1 Crane Control

The crane is controlled from open platform above the slewing ring or radio remote control.
Entrance to platform by ladder.
The speeds are controlled stepless from 0 to max.
Two motions can be operated at the same time with full capacity, but with reduced speed.

3.2.2 Load Limiting System

Each hydraulic circuit is provided with equipment for limiting hydraulic pressure to preset values corresponding with crane capacity.

3.2.3 Limit switches

- Hook travel up
The crane is provided with an automatic hook stop in top and bottom position.

- Luffing/folding up/out – down/inn
The luffing cylinder is designed for safe buffering in extreme positions

3.2.4 Electro-Hydraulic Power Pack

- The crane is provided with a built in hydraulic power pack.
- The electric pump motor is located in centre of the pedestal with output shaft pointing upwards and driving the hydraulic pump through a flexible coupling.
- The slewing column steel structure is utilized as tank for hydraulic oil.
- The hydraulic oil circuit has a full flow return filter with changeable filter inserts.
- The tank is provided with an oil level indicator and temperature gauge.

3.2.5 Electric pump motor

The electric pump motor is of squirrel cage type, fan cooled and certified for use in hazardous area, type of enclosure, IP56, isolation class B and provided with an anti condensation heater for 220V.

Duty: S6-25%ED

3.2.6 Electric starter

A STAR/DELTA starter for location in safe area will be supplied as a loose item. The starter will be included as standard, hour meter, amp meter, light for motor running and power available, and start/stop buttons in the front door.
In addition a start/stop push button on crane pedestal.

3.2.7 Slewing Machinery

The crane is provided with a slewing ring designed for marine applications. The gearing is internal. The slewing gear is of the planetary type with multi disk brake.

3.2.8 Hoisting Machinery

The winch unit consists of:

- Drum with bearing and brackets
- Winch gear with hydraulic operated fail safe brake
- Hydraulic motor with safety valve to "freeze movement in case of pressure drop"

The drum is designed for a capacity to take the wire rope on max 3 layers.

The wire rope is the non-rotating type and is galvanised.
Minimum safety factor is 5.

The wire sheaves are provided with heavy-duty roller bearing on stainless axles.

3.2.9 Jib Cylinder

The jib cylinder is designed for marine use and has maintenance free composite bearings on stainless steel axles.

The piston rod is chrome plated to prevent rust attack.

3.2.10 Safety Features

1. The hoisting machinery is designed with equipment for emergency lowering of load in case of power failure.

2. The jib cylinders load control valve is designed for emergency lowering of the jib in case of power failure.

3.2.11 Hydraulic Pipes and Flexible Hoses

1. Hydraulic pipes are of the stainless steel type with chromated fittings.

2. The hoses are selected to give a safety factor of min 4 against rupture.

3.2.12 Steel Structure

The steel quality is selected in accordance with the classification societies recommendation to obtain necessary ductility for the lower temperature design limit.

All important welds are carried out in accordance with welding procedures. After welding, a certain amount of NDT control is carried out.

3.2.13 Surface Treatment

EXTERIOR:
Abrasiv blast clean of all structure to SA 2,5

One coat of two – pack zinc rich epoxy primer.
Dry film thickness approx 30 – 40 microns.

One intermediate coat, type two pack mastic mio epoxy.
Dry film thickness approx 125 microns.

All types of paint can be applied, both one –, and two – pack qualities.

Topcoat colour will be delivered upon customers request.

INTERIOR CRANE HOUSE (Hydraulic oil tank):

Abrasiv blast clean of all structure to SA 2,5

INTERIOR PEDESTAL:

Abrasiv blast clean of all structure to SA 2,5

One coat of two – pack zinc rich epoxy primer.
Dry film thickness approx 30 – 40 microns

One intermediate coat, type two pack mastic mio epoxy.
Dry film thickness approx 125 microns.

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 4 in the Equipment User Manual - Handling, Storage and Preservation Guidelines

01	Issued for use	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
HANDLING, STORAGE AND PRESERVATION GUIDELINES

Client Doc no:			Rev.	
Proj.no. Disc. Prod.kode	Doc. kode Seq.no		Rev.	Total no. of pages
60338			**01**	**6**

4 HANDLING, STORAGE AND PRESERVATION GUIDELINES

4.1 Storage Guidelines

- Sensitive equipment (control box, instrument panels, motors, etc.) shall be stored indoors in dry areas and shall be stored and transported in up-right position.
- If equipment or cabins are stored in outdoor conditions, the cabinet heater or the motor heater shall be energized.
- Electronic panels/equipment or junction boxes must not be unpacked out-doors.
- The crane parts shall be stored and transported in the original transport cradle.

4.2 Preservation Guidelines

4.2.1 General

This standard for preservation shall be used if not otherwise agreed.
Responsible;

- Sub-suppliers, until the equipment is delivered to Dreggen Crane AS
- Dreggen Crane AS, until the equipment is delivered to the customer
- Customers, until the equipment is installed

(after installation the customer is required to preserve and maintain to keep the equipment according to the Equipment User Manual).

Preservation shall never replace surface treatment.

4.2.2 Initial Preservation

- The equipment shall be clean and without any corrosion prior to preservation.
- Exposed unpainted machined surfaces, gasket faces on carbon steel flanges, access hatch covers, wheels, rack, bolt ends and other unpainted surfaces, shall be coated with rust preventive, type Tectyl 506 or similar protection.
- Hydraulic system; fittings, pipes, hoses and motors, shall be filled up with Hydraulic oil ISO VG 32, if stored more than 12 months. The equipment shall be marked with a label telling that it is filled with oil.
- All inlets/outlets on equipment, hydraulic flange connections and open flexible hose connections shall be plugged or blanked with plugs of metal if stored more than 12 months that is equal to the metal in the threaded opening and plugged with plastic/metal plugs if stored less than 12 months.

- Gearboxes and swivels are filled up with oil (operational type). Rotate pinions to ensure the gearbox/swivel is totally filled up. The equipment shall be marked with a label telling that it is filled with oil, if stored more than 12 months.

- Door hinges and grease nipples are to be re-lubricated and plastic plug installed, if stored more than 12 months.

- Acid free vaseline is to be applied to door and window gaskets, if stored more than 12 months.

- Grease lubricated bearings shall be greased (Texaco Rodine 2/Shell Alvania EP2/equal).

- Manometers and level gauges shall be enveloped with aluminium sheeted glass fibre cloth if stored more than 12 months.

Note;
If the equipment may be exposed to welding and grinding splatter after initial preservation, it shall be protected with aluminium sheeted glass fibre cloths or similar fire resistant material.

4.2.3 Special for Electrical and Electronic Equipment

- Sensitive equipment (control cubicles, instrument panels, panels, junction box, control box, motors, etc.) shall be stored indoors in dry areas.

- If electrical equipment is stored in outdoor conditions, the cabinet heater or the motor heater shall be energized. This is also applicable for electrical motors installed in base columns.

4.2.4 Preservation Record and Periodical Preservation

Preservation shall be checked and maintained according to Periodical Preservation procedures listed above documented in the Preservation records Mechanical MP-01.

PRESERVATION RECORD
MECHANICAL (MP-01)

Project No. : 60338
Manufacturer : DREGGEN CRANE AS
Description : DK220-12T-16m

Tag no. L723A

VALID STATUS CODE = OK, NA

	INSPECTION ITEM	SUPPL.	FABR.	HOOKUP	COMMENTS
01	Preservation performed	OK			
02	Corrosion protection applied	OK			
03	Frost precautions taken	NA			
04	Storage/transport protection correct	OK			
05	Loose items marked and preserved	OK			
06	Equipment enclosure sealed off	OK			
07	In/outlets sealed off	OK			
08	Periodical preservation carried out see item 14	NA			
09	Storage conditions are according to specifications	NA			
10	No damage on the equipment after transport	NA			
11					
12					
13					

14	PERIODICAL PRESERVATION LIST	INTERVAL
	Shafts on rotating equipment that are not locked shall be rotated 1 1/4 turn in the rotating direction to avoid brinelling when located in one position for long periods. Make sure that the new shaft position varies from check to check. Bearings with lube oil housing, check that oil level is adequate prior to rotation	8 weeks
	Check that Initial Preservation is not damaged or destroyed	8 weeks

VERIFIED		By Dreggen Crane AS	Yard	End-user
Name	Executor			
Sign				
Date				
Name	Comp.			
Sign				
Date				

4.3 Packing Guidelines

- The equipment is packed in such a way as to restrict movement under transportation.
- A minimum of 2 address labels are attached to each separate package

Further precautions with reference to equipment that is not encased;

- All protruding parts (junction boxes etc.) are packed in strong wooded cases suitable for transportation by truck on highway.
- Cables, flexible hoses etc. is secured to ensure they do not drag along the ground.

4.4 Unpacking Guidelines

- The crane parts with their wooden frame are placed directly on the truck body and secured longitudinal and transversal using wood beams and strapping tool. Strapping tools are used to secure the units to the floor. The fastening tools are to be removed prior to unloading the truck.
- Lifting of the crane parts are to be performed in accordance with sketches below.

4.5 Handling/lifting and Transportation Guidelines

4.5.1 Transportation Guidelines

After transport the incoming components/equipment shall be inspected to ensure that:

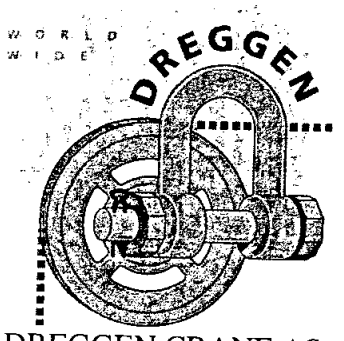
- No transport damages have occurred.
- The preservation is correct
- The equipment has been transported according to specifications.

Incoming inspection shall also check that there is conformity between prescribed quality and quantity on purchase documents and received material. Any damages, non-conformances and in-correct preservation must be reported to Dreggen Crane AS, prior to unloading the truck. Photos are to be taken and submitted to Dreggen Crane AS, to substantiate any demands towards Dreggen Crane AS and/or the protractor.

4.5.2 Handling/lifting Guidelines, General

The object of this procedure is to ensure a safe and secure lifting, handling and transportation of the crane parts. Improper lifting operation may result in damage to personnel and property. The operation must conform to national standard. Before lifting, remember to check the lifting capacity. When lifting, ensure sufficient clearance to other items to avoid damage.

5



DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 5 in the Equipment User Manual – Installation instruction

01	Issued for approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:

C. N. P. Freire. S.A.

Project:

ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:

INSTALLATION INSTRUCTION

Client Doc no:					Rev.	
Proj.no.	*Disc*	*Prod.kode*	*Doc. kode*	Seq.no	Rev.	Total no. of pages
60338					**01**	**11**

5 INSTALLATION GUIDELINES

5.0 General

Installation Report, Chapter 1.4, is to be completed prior to Mechanical Completion Test is carried out.

Drawings and parts list, referred to in this chapter are enclosed.

Components referred to with Item numbers can be found in Dwg. No.: D723-1 Main Assembly drawing.

The Crane will be delivered in the following main parts suitable for transport:

- Pedestal, weight 1750 kg
- Slewing column w/operating platform and completely mounted main valve, slewing gear/ motor and hydraulic system.
  Weight: 3000kg
- Main Jib with Folding cylinder with hydraulic pipe, fittings and load limit valve
  Weight: 6400 kg
- Front jib with winch, weight: 2700 kg
- Hydraulic luffing cylinder with hydraulic pipe, fittings and load limit valve
  Weight: 1200 kg
- Starter panel X1, radio remote controller
- Electro motor
- Emergency Hand operated pump with flexible hoses
- Spare parts and tools

5.1 Mechanical installation

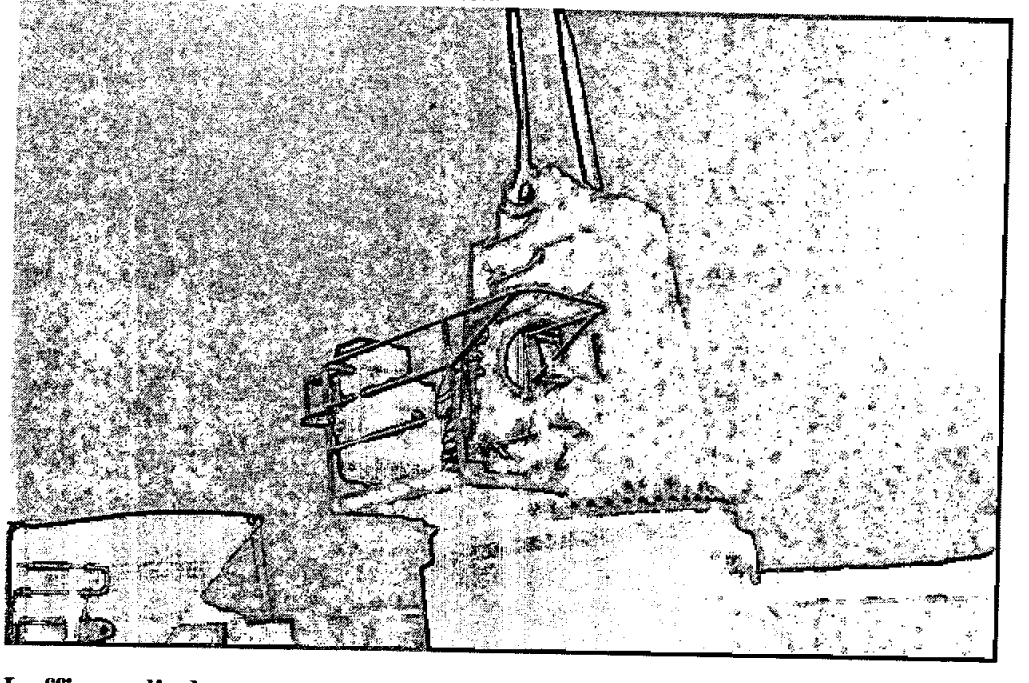
All crane parts are delivered separately packed suitably for transport.
The following procedure to be used to install the crane:

1. Pedestal - weld on the deck
2. Mount electro motor inside pedestal **before** mounting slewing column.
3. Slewing column – Mount on the top of pedestal
4. Lift luffing cylinder in the position and support temporary
5. Lift Main jib with folding cylinder and mount it on the top of slewing column by axle and retainer
6. Lift Front jib and mount it on the end of Main jib by axle and retainer
7. Connect hydraulic hoses between main and front jib
8. Connect hydr. hoses between main jib and slewing column
9. Connect hydr. hoses between luffing cylinder and slewing column
10. Fill in oil in the tank to the middle of level indicator
11. Connect el.power to the main starter box, before START – see instruction 5.2 and 5.3
12. Connect folding cylinder with front jib

PEDESTAL/SLEWING COLUMN

1. Lift up pedestal and place it in position and weld it for main deck as stated on General arrangement drawing, D723.
2. Mount electro motor inside pedestal **before** lifting the slewing column in place.
3. Lift slewing column on the top of pedestal and fasten it by screws 10.9 quality, D723-1 item 40,41
4. Make sure bolts are properly tightened. Tightening moment for bolts, M30*190 DIN6914-10.9BLACK according to enclosed diagram. (M_A = 1800 Nm, see "Tightening torque for bolts)
5. Check that brackets for cylinder and jib direction point out on correct side.
6. Remove the fastening/ strapping tools and lifting slings.

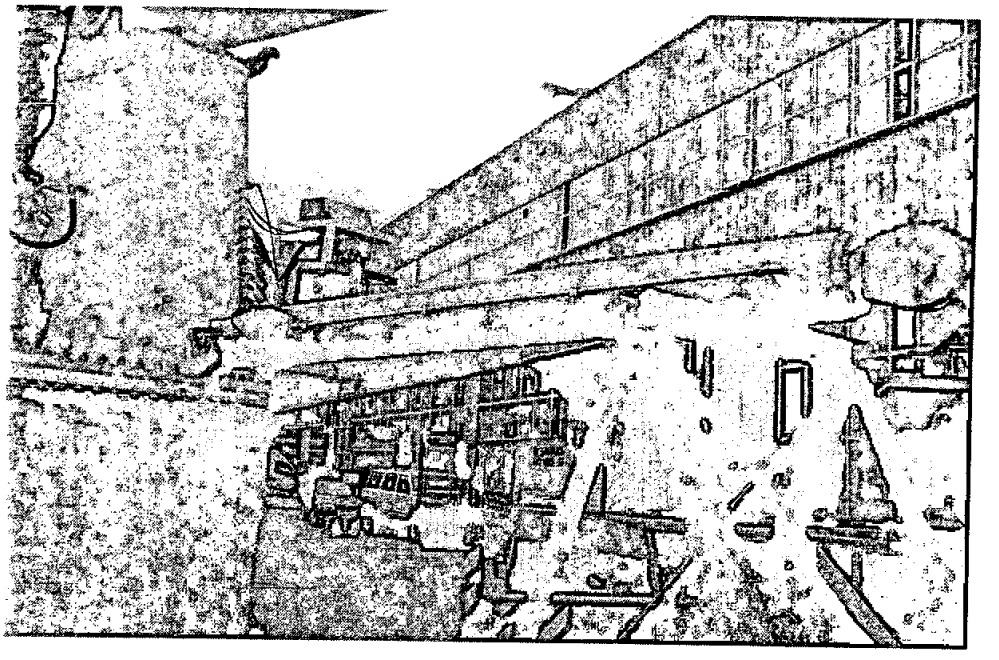
Figure 1. Slewing and base column erection.



Luffing cylinder

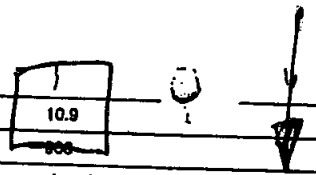
1. Assemble the hydraulic luffing cylinder on the slewing brackets for cylinder mounting with bolt and retainer, support cylinder temporary
2. Check that valve and pipe are on the right side of cylinder

Figure 2. Luffing cylinder erection



TIGHTENING TORQUE FOR BOLTS

1. Bolts easily oiled.
2. Support surface to be clean and dry.
3. Tight torque.



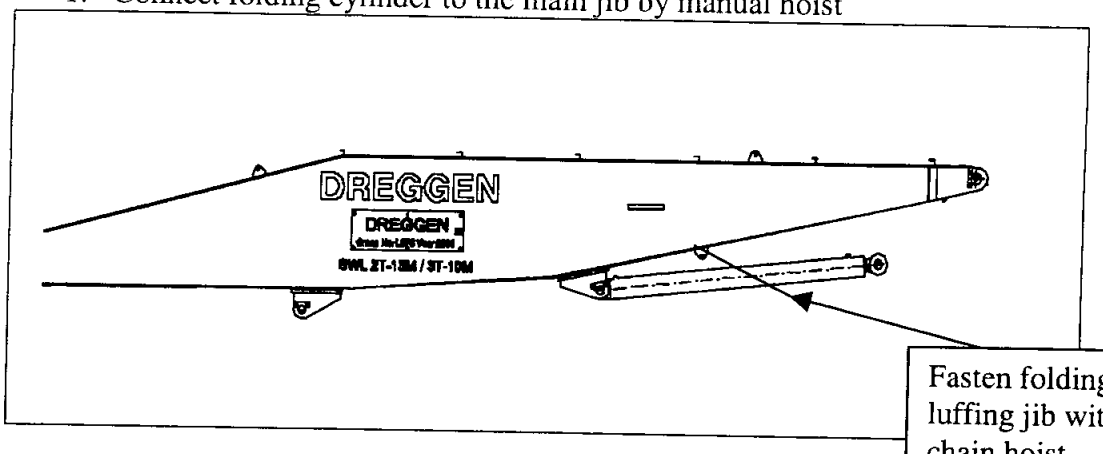
Material strength grades to DIN 267			8.8			10.9			12.9		
Limit of proportionality $R_{p\,0.2}$ N/mm²			640			900			1080		
Thread Ø	effective cross sectional area A_s mm²	cross sectional area A_3 mm²	clamping load Fsp N	theoretical tightening torque Msp Nm	M_A* = 0.9 Msp for torque spanner Nm	clamping load Fsp N	theoretical tightening torque Msp Nm	M_A* = 0.9 Msp for torque spanner Nm	clamping load Fsp N	theoretical tightening torque Msp Nm	M_A* = 0.9 Msp for torque spanner Nm
M 5	14.2	12.7	6350	6	5.5	8950	8.5	7.5	10700	10	9
M 6	20.1	17.9	9000	10	9.0	12600	14.0	12.5	15100	17	15
M 8	36.6	32.8	16500	25	22.5	23200	35.0	31.5	27900	41	36
M 10	58.0	52.3	26200	49	44.0	36900	69.0	62.0	44300	83	75
M 12	84.3	76.2	38300	86	77.5	54000	120.0	110.0	64500	145	130
M 14	115.0	105.0	52500	135	120.0	74000	190.0	170.0	88500	230	210
M 16	157.0	144.0	73000	210	190.0	102000	295.0	265.0	123000	355	320
M 18	192.0	175.0	88000	290	260.0	124000	405.0	365.0	148000	485	435
M 20	245.0	225.0	114000	410	370.0	160000	580.0	520.0	192000	690	620
M 22	303.0	282.0	141000	550	500.0	199000	780.0	700.0	239000	930	840
M 24	353.0	324.0	164000	710	640.0	230000	1000.0	900.0	276000	1200	1080
M 27	459.0	427.0	215000	1050	950.0	302000	1500.0	1350.0	363000	1800	1620
M 30	561.0	519.0	262000	1450	1300.0	368000	2000.0	1800.0	442000	2400	2160
M 33	694.0	647.0	326000	determine by elongation measurement of bolt		458000	determine by elongation measurement of bolt		550000	determine by elongation measurement of bolt	
M 36	817.0	759.0	382000			538000			645000		
M 39	976.0	913.0	460000			646000			776000		
M 42	1120.0	1045.0	526000			739000			887000		
M 45	1300.0	1224.0	614000			863000			1035000		
M 48	1470.0	1377.0	692000			973000			1167000		
M 52	1760.0	1652.0	833000			1171000			1406000		
M 56	2030.0	1905.0	959000			1349000			1619000		
M 60	2360.0	2227.0	1120000			1576000			1801000		

Note: Information may be obtained on request for bolts not manufactured to DIN 13

* = M_A will vary if μ total is other th

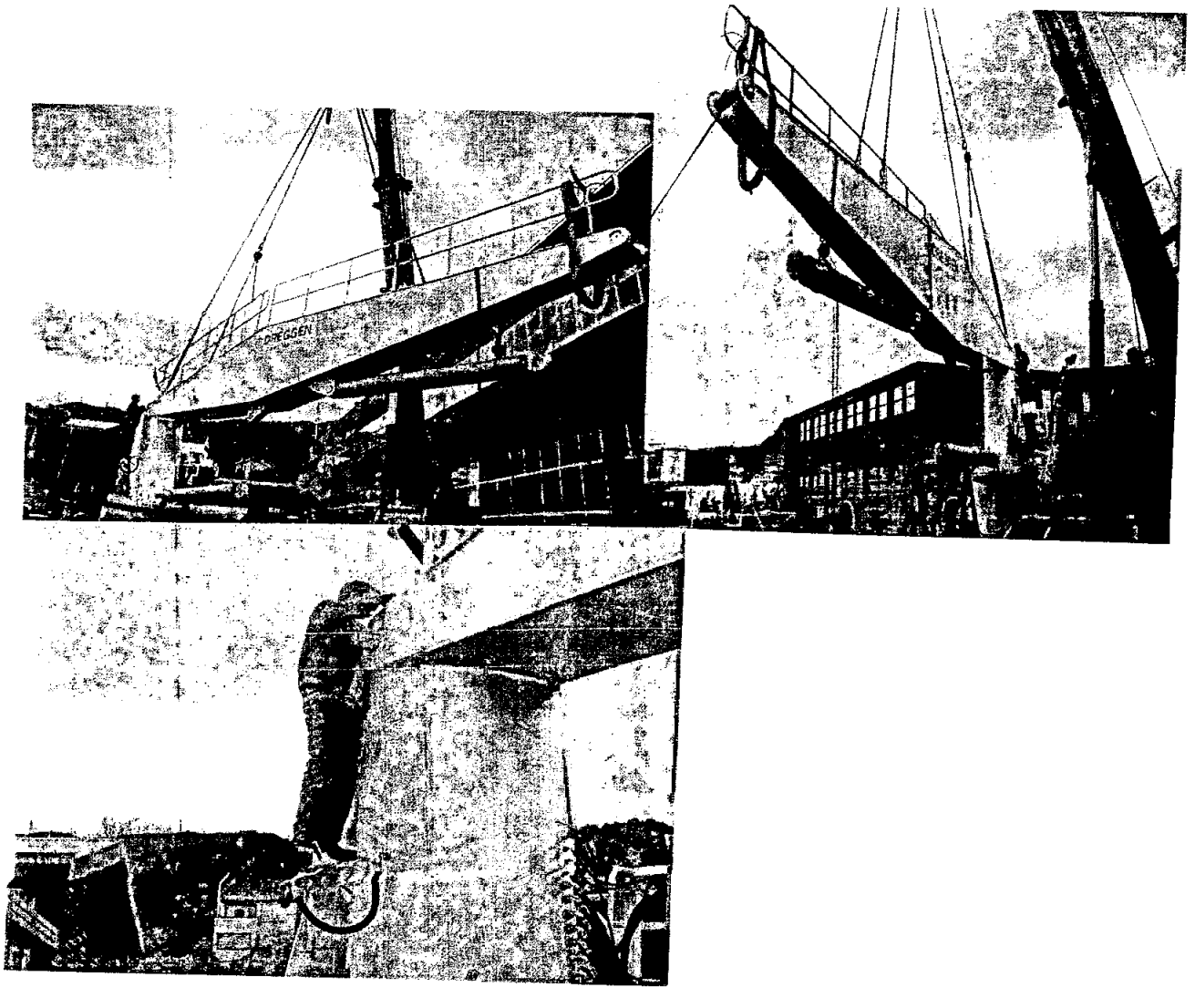
MAIN JIB WITH FOLDING CYLINDER

1. Connect folding cylinder to the main jib by manual hoist

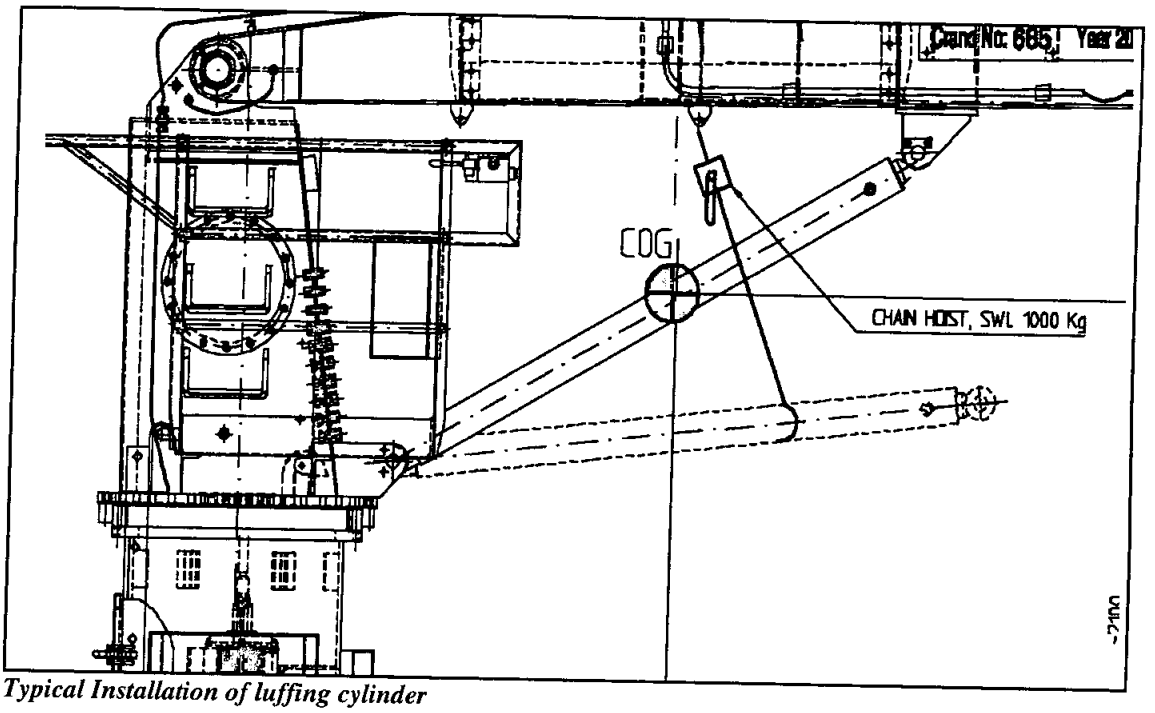


2. **Hold complete jib by building crane and guide end into the slewing connecting brackets and hinge it by the special made axle and lock with retainer.**

Figure 3. Main jib with folding cylinder erection

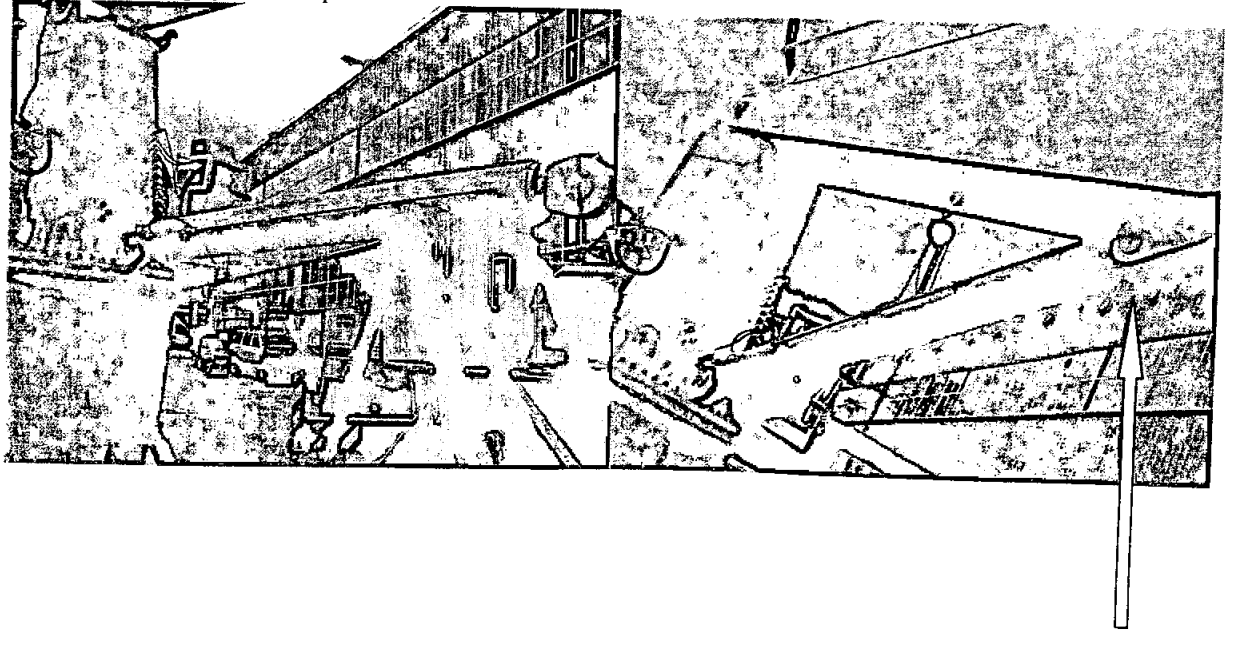


2. Lift luffing cylinder to the bracket on the main jib and fasten it by axle and retainer. Now Main jib can stay without help-crane holding.



Typical Installation of luffing cylinder

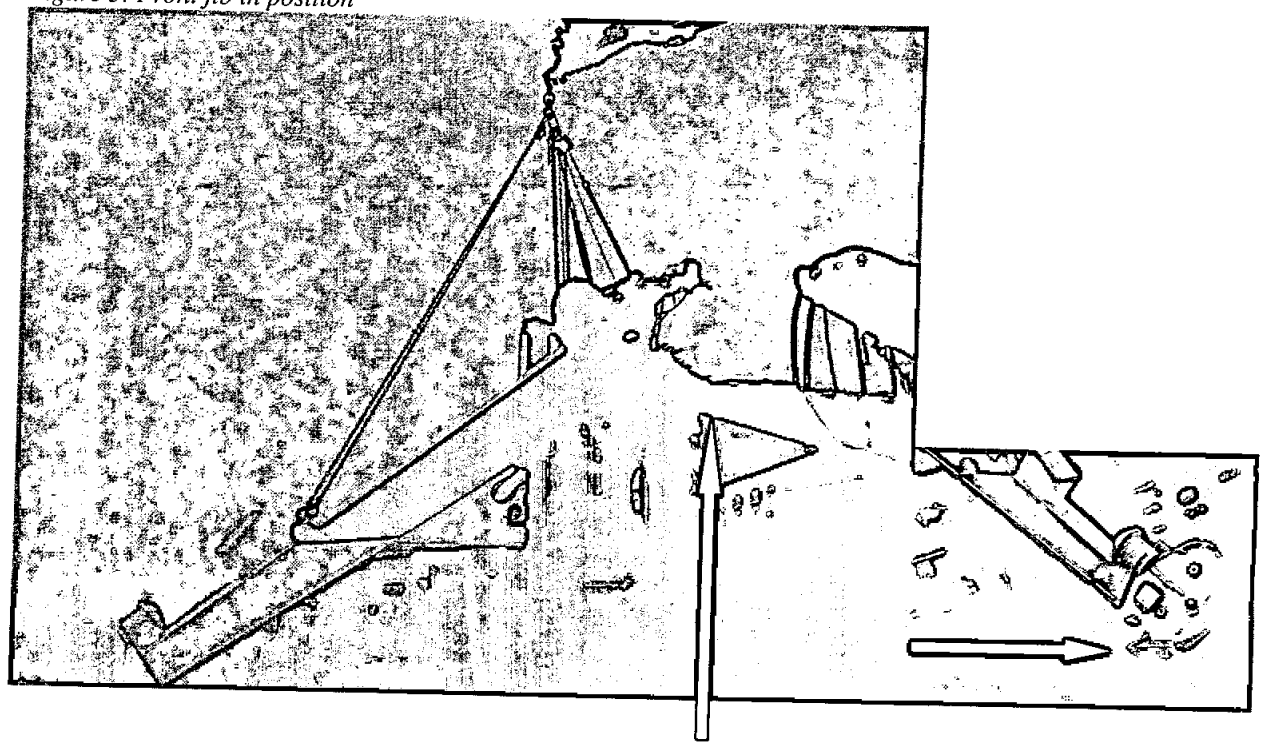
Figure 4. Luffing cylinder in position



FRONT JIB

1. Lift front jib by crane and make sure the winch is turned upwards, ready for connecting with main jib. Use manual chain hoist to get this position.
2. Use axle and retainer to fasten front jib to the main jib.
3. Put some "wheels" under jib head before leaving it on the deck.

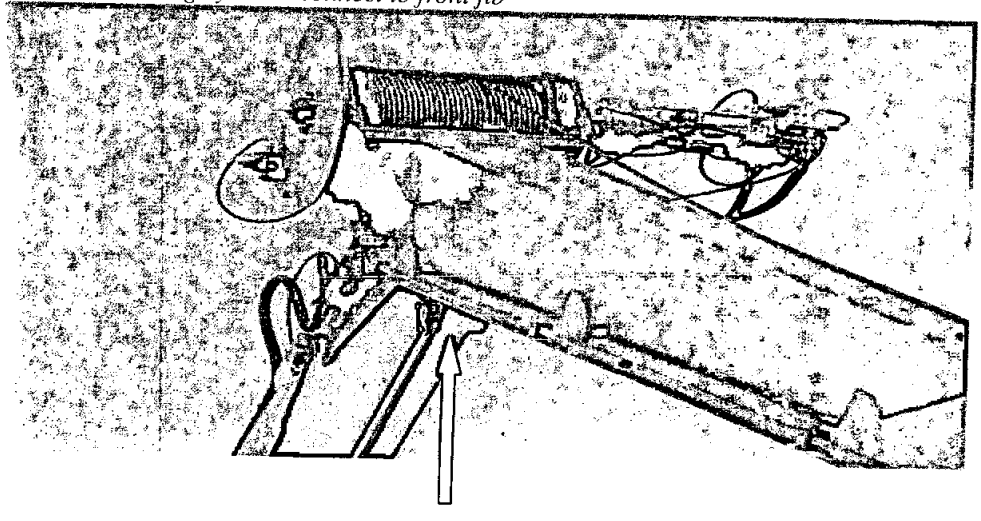
Figure 5. Front jib in position



FOLDING CYLINDER

1. Connect folding cylinder to the front jib by axle and retainer.

Figure 6. Folding cylinder connect to front jib



HYDRAULIC INSTALLATION

All internal hydraulic connection on different crane components are already installed and tested at factory and further connection between main components should be done according to identical markings found at end of each hose lines.

Ref. hydraulic diagram No.: C723-1013 latest revision and make sure that the numbers marked in each hose ends connected to the same number at connecting points.

1. Connect flexible hoses between slewing column and cylinder. – see figure 7.
2. Connect flexible hoses between slewing column top and jib. – see figure 8.
3. Connect flexible hoses between main jib and front jib - see figure 9.

Figure 7. Hoses between slewing column and luffing cylinder

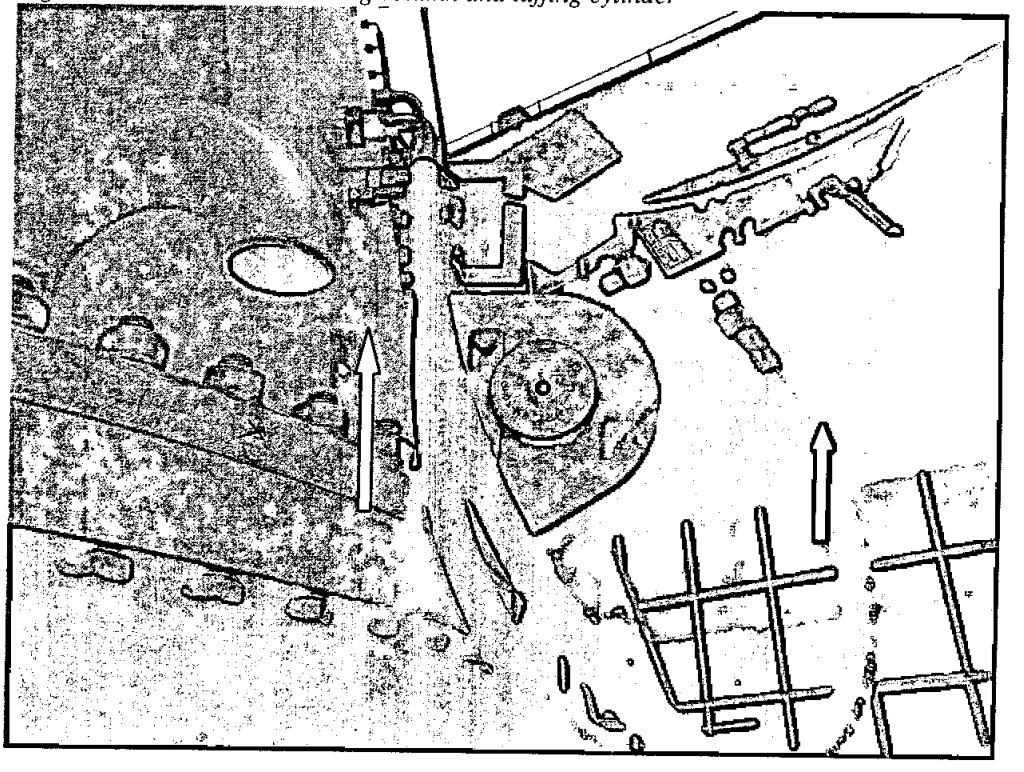


Figure 8. Hoses between slewing column and main jib

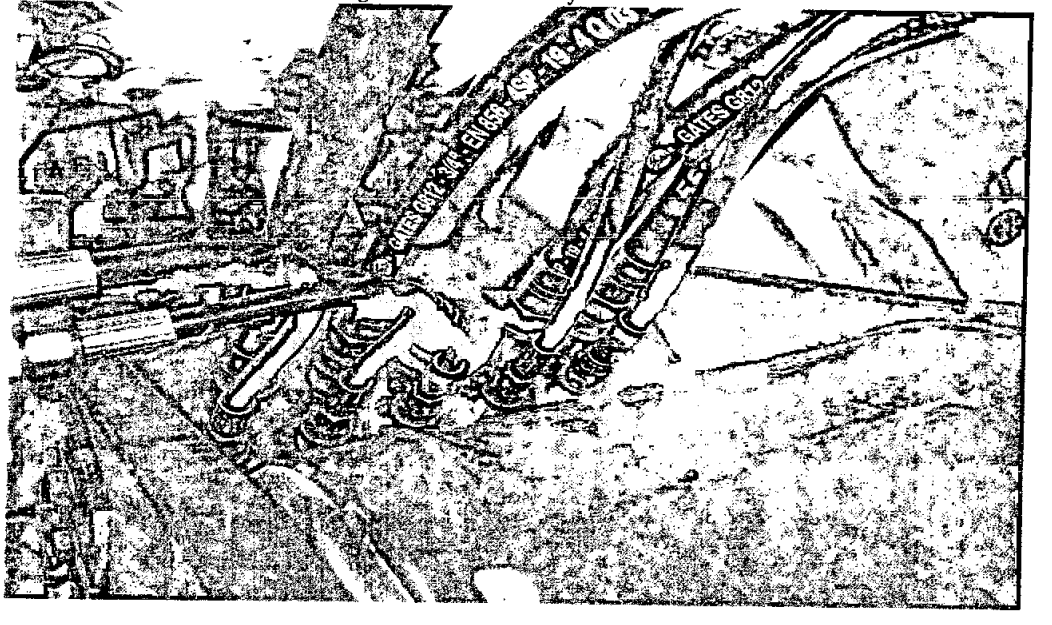
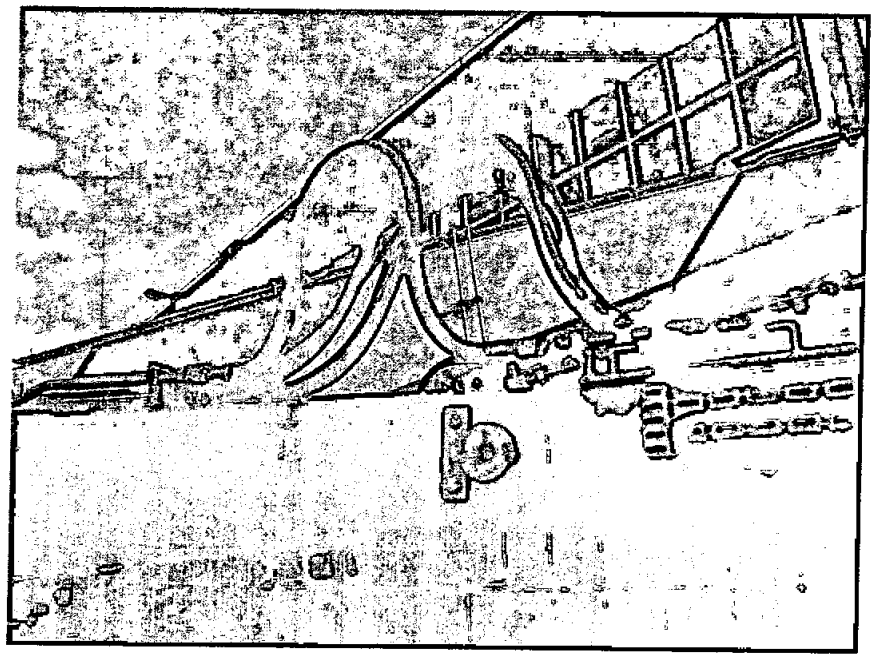


Figure 9. Hoses between main jib and front jib



Lubricate all grease points, ref. Lubrication Chart.
Fill hydraulic oil in the tank to the level on the indicator about middle.

Electric Installation

1. Connect electro motor to starter box, X1, by cable.
2. Connect main power supply cable in starter panel X1.

5.2 Start-up check

The following is to be checked prior to start-up:

The unit installed with all hydraulic hook-up performed

- The unit installed with all electric hook-up performed
- All grease nipples properly greased, ref. Lubrication Chart.
- Check that oil level is within acceptable limits in all gearboxes, ref. Lubrication Chart
- Check power supply to the crane, ref Electro drawings L723-80
- Before operating the crane, ensure that no foreign elements are located in the operation area.

5.3 Start-up

Start the pump and stop immediately. Check direction of rotation of the pump by looking at el. motor fan inside pedestal. Rotation to be **ANTI-clockwise seen towards pump shaft.**

- Run the crane without load using all crane motions for about 30 minutes in order to empty the hydraulic system of air.
- Check for hydraulic oil leakages.
- Control, by operating the crane, that all crane movements are correct in comparison with the symbols at the control unit.
- Check for correct operation of limit switches (hoist up/down).
- Make sure the wire rope is tense on the wire rope drum before regular operation.
- Limit switch, Hoist Up, to be adjusted to correct position
- Limit switch, Hoist Down, to be adjusted to correct position (lifting height 30m).
- Installation Report, is to be completed prior to Mechanical Completion Test
- Touch-up painting

Touch-up painting to be carried out after Installation Report is completed.

5.4 Installation Report

	Installation Report	
Project No. : 60338 Manufacturer : DREGGEN CRANE AS Description : DKF220-12T-16m		Ser.no. L723A Tag. No.:

	DESCRIPTION	Expected Result/Criteria	Result	COMMENTS
01	Mechanical hook-up performed	Accepted		
02	Hydraulic hook-up performed	Accepted		
03	Electric hook-up performed			
04	Lubricate all grease points, Lubrication Chart.	Performed		
05	Check that oil level is within acceptable limits in all gearboxes. Fill up if necessary with gear oil specified in Lubrication Chart.	Accepted		
06	Check the hydr. oil pressure and flow rate from platform P-line.	Performed		
07	Check for hydraulic oil leakages.	Accepted		
08	Make sure the wire rope is tense on the wire rope drum before regular operation.	Accepted		
09	Check for correct operation of limit switches (hoist up/down).	Accepted		
10	Control, by operating the crane, that all crane movements are correct in comparison with the symbols at the control unit.	Accepted		
11	Limit switch, Hoist Up, to be adjusted to correct position.	Accepted		
12	Limit switch, Hoist Down, to be adjusted to correct position (lifting height 40m).	Accepted		
13	Touch-up painting to be carried out after Installation Report is completed.	Noted		

VERIFIED	Class		Buyer		End-User	
	Executor		Executor		Executor	
	Comp.		Comp.		Comp.	

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 6 in the Equipment User Manual – Factory Acceptance test procedure (FAT)
Commissioning procedure

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:

C. N. P. Freire. S.A.

Project:

ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:

Factory Acceptance test procedure (FAT)
Commissioning procedure

Client Doc no:					Rev.	
Proj.no.	Disc.	Prod.code	Doc. code	Seq.no	Rev.	Total no. of pages
60338					**01**	**9**

6 FACTORY ACCEPTANCE TEST PROCEDURE (FAT)

6.1 General

This test is to be carried out after Installation Report, Chapter 5.8, is completed and shall take place prior to the Commissioning Procedure, Chapter 6.5

The operation of the crane are to be controlled by Main Valve on operation platform and Radio controller.

Be sure to read and understand the user manual before operating/testing the cranes.

6.2 Requirements

The following to be completed/clarified prior to start of testing:

- Installation Report in Chapter 5.4
- Qualified personnel to operate the Crane
- Test load (SWL 12T x 1.25 = 15T). Water bags are recommended.

6.3 Utilities required

- Electro power supply: 400V/50Hz

FACTORY ACCEPTANCE TEST PROCEDURE

ELECTRO-HYDRAULIC JIB CRANE DKF220-12T-16M

CRANE No.: **L723A**

Customer: **C. N. P. Freire S.A**

Hull no. : NB 600

Dreggen Project no: 60338

Class: **N/A** **Class No:**_____

Controlled and tested

Bergen,

_____ _____

Class/Signature **DREGGEN CRANE AS**

_____

Customer representative

NO	CONTROL ITEM	DATA	CONTROL
1.0	**Crane**	**Drawing no: D723**	
1.1	Max. outreach Min. outreach	16m 3,2m	
1.2	Working sector	360°	At site
1.3	Test bed (angle)	Trim:2 ° Heel: 5 °	
1.4	Steel const. check dim.	DWG no: D723	
1.5	Bolts and nuts locked	PS 1003-507 "Tightening torque for bolts"	OK
1.6	Steel surface Preparation	According to document requirements	OK
1.7	Paint type, colour	According to customer request	Ok
1.8	Load plate	SWL 12T-16m	Ok
1.9	Name plate L703A	Mounted	Ok
1.10	Hook travel	30 m	At site
1.11	Check for workmanship	Performed	OK
2.0	**Winch SWL 12T**	**Parts list: P80-125** **Drawing: C80-125**	
2.1	Hydraulic motor 51V160 RF1N N2NN NNA0 NNN 160 AANN 0000	Art. No: 14222 Serial no.	
2.2	Gear type/ratio: i=74,3 713C3B	Art. No: 21307 Serial no.	
2.3	Brake	Operation	
2.4	Drum	Drwg.D80-12501	
2.5	Wire rope Ø26MM, -1960KP/MM2	Art. No: 14240	
2.6	Safety hook with weight	Checked	
2.7	Limit switch hydraulic	Mounted	
2.8	Wire / Drum - connection	Checked	
2.9	Spooling of wire	Checked	

NO	CONTROL ITEM	DATA	CONTROL
3.0	**Slewing machinery**		
3.1	Hydraulic motors 2000-104-1471-006 100CM3	Art. No: 13266 Serial no.	
3.2	Gear types /ratio: RPR3255/140/FL250 FRONT	Art. No: 14235 Serial no.	
3.3	Oil in reducer	Filled	Ok
3.4	Gear rim / pinion	Greased	Ok

4.0	**Luffing / Folding cylinder**	2 pcs	
4.1	Cylinder type: Ø280/200 x 2890	Art. no.10915	Ok

6.0	**Hydraulic arrangement**	**Drawing no: C723-1013**	
6.1	Operation valves/handles	Checked operation	Ok
6.2	Limit switch, Hoist bottom pos.	Mounted/ Function	Ok
6.3	Limit switch, Hoist top position	Mounted/ Function	Ok
6.4	Pipes / hoses	Checked	Ok

7.0	**Overload Test – 1,25 x SWL**	**15T at 16m**	
7.1	Slewing in both directions	± 360 degrees	170/170 bar
7.2	Main Jib luffing up / lowering down		210/60 bar
7.3.1	Main Jib lowered incl. 3 stops		Ok
7.3.2	Front jib, fold out/fold in		170/80 bar
7.4	Hook hoisting / lowering	x 3 stop	245/80 bar
7.5	Brake Hoist test, keep load	5 minutes	Ok
7.6	Brake slewing test, keep against heel	5 minutes	Ok
7.7	Lift load 2m , stop crane OFF	Emergency lowering by manual pump	Ok
7.8	Lift load 2m , stop crane OFF	Emergency luffing by manual hand pump	Ok

8.0	**Load test SWL 12T at 16m**		
8.1	Hoisting speed / lowering	0-20 m/min	bar
8.2	Luffing up / down average	60sec	bar
8.3	Slewing right	0-1,0 rpm	bar
8.4	Slewing left	0-1,0 rpm	bar

9.0	**Test of Radio Control and Electro Equipment**		
9.1	Radio on/off	Function	
9.2	Pump start/stop	Function	
9.3	Emergency stop on radio	Function	
9.4	Luffing up-down	Function	
9.5	Folding out/in	Function	
9.6	Slewing right-left	Function	
9.7	Hoist up-down	Function	
9.8	Emergency stop on pedestal	Function	At site

Note: Crane to be delivered with all valves set at SWL x 1,1 = 13,2T

Commissioning Test Procedure Log

	Commissioning Test Procedure Log	Sheet no. 1	DREGGEN CRANE AS
Project No. : 60338 Manufacturer : DREGGEN CRANE AS Description : DKF220-10T-18m Ser. No. L703A		C. N. P. Freire. S.A. Tag. No.:	

	DESCRIPTION	Expected result/Criteria	Result	COMMENTS
1.00	Crane Installation Report	Accepted		
2.00	FAT report	Accepted		
3.00	Commissioning Test			
3.01	Power supply 400V/ 50Hz	Accepted		
3.02	Operation valves/handles	Accepted		
3.03	Operation radio control	Accepted		
	OVERLoad Test SWLx1.25	SWL 15T		
3.05	Function, Hoist	Accepted		
3.06	Function, Slewing	Accepted		
3.07	Function, Luffing Jib	Accepted		
3.08	Function, Folding front jib	Accepted		
3.09	Limit switch, Hoist Up/Hoist down	Accepted		
3.12	Lifting height	30m		
3.13	Outreach, max/min	16m / 3,2m		
3.14	Brake test, check for creep. Hoisting brakes are to be tested with SWL from maximum lowering speed to full stop.	Check for creep, 5 min.		
3.15	Slewing Brake, check for creep.	5 min		
3.16	LS – Pressure limiting valves, Checked. Safety valves are to be adjusted to specified working pressure, secured and sealed after overload test is carried out.	Performed		
3.17	Load Test , all functions	SWL 15T		
3.18	Hook speed, full load	0-20 m/min		
3.19	Luffing time: average up / down	60 sec		
3.20	Slewing right / right	0-1 rpm		
3.21	Emergency lowering to be demonstrated, ref. Chapter 7, Emergency Lowering Procedure. Demonstrated using emergency hand pump.	Function		
3.22	Sea fastening to be demonstrated, Ref. Chapter7.	Accepted		

VERIFIED	Yard	End-User	Class
	Executor:	Executor:	Executor:
	Comp.:	Comp.:	Comp.:

Commissioning Test Report

CUSTOMER: C. N. P. FREIRE. S.A.		
MANUFACTURER: Dreggen Crane AS	Tag. No.: L723A	
EQUIPMENT: **DECK CRANE DKF220-12T-16M**	EQUIPMENT INTENDED FOR: NB 600	
PLACE:	DATE:	
Customer REPRESENTATIVES:	End-User REPRESENTATIVES:	
Dreggen Crane AS REPRESENTATIVES:	Customer Order no..: 2578/03	
FUNCTION	**RESULT**	**REMARKS**
DKF220-12T-16m		
Load Test SWL 12T		
Overload Test 15T lifting height 30m		

COMMENTS

WITNESSED

C. N. P. FREIRE. S.A. **End-User**

Date/sign.

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 7 in the Equipment User Manual – Operation instruction

01	Issued for approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
OPERATION INSTRUCTION

Client Doc no:					Rev.	
Proj.no.	Disc	Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338					**01**	**15**

7 OPERATING INSTRUCTIONS

7.1 Start, normal operatio

7.1.1 Pre-Start Preparatio

The crane is to be inspected prior to use in acc ; specified in Chapter 3.2, Routine Inspections before each working perio

The following safety precautions are to be adhered to:

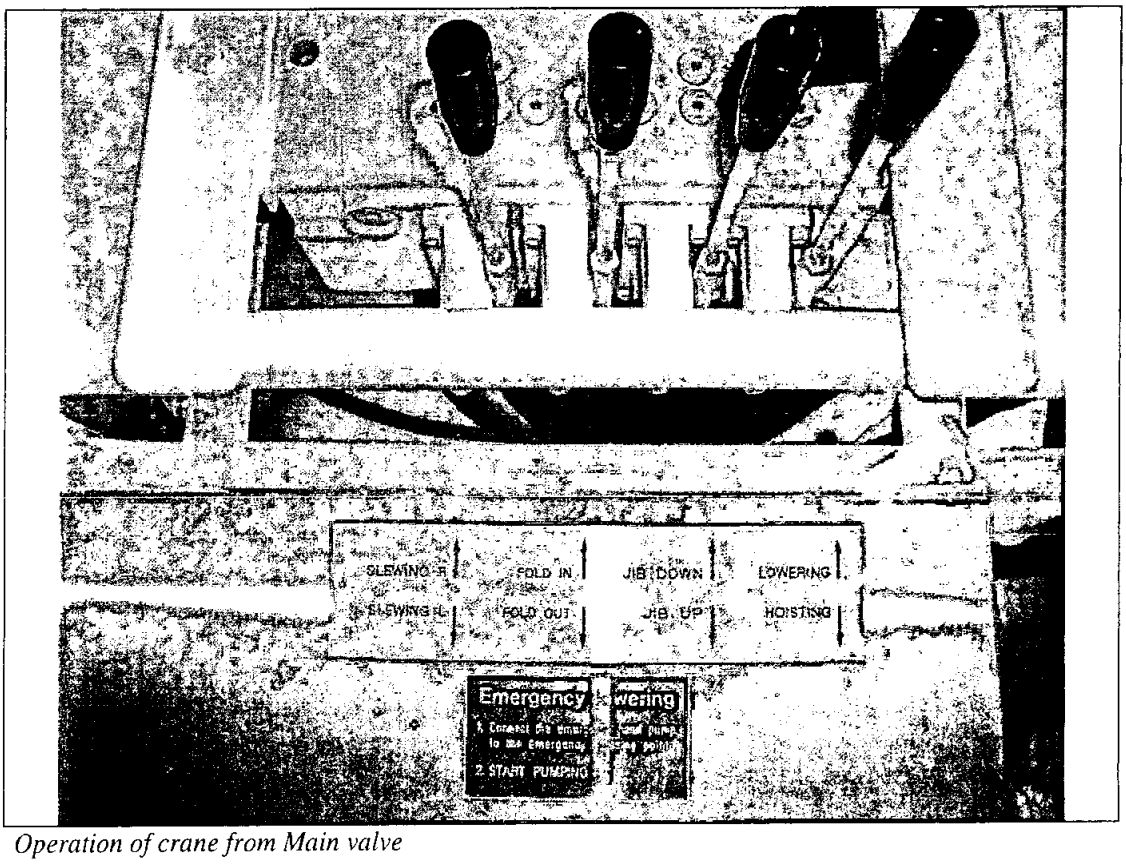
1. Before the crane is taken into use, make sure that the crane s a fastening locking system is unfastened.
2. Note all appropriate regulations when attaching load.
3. Check that load which should be lifted/lowered is fasted on proper way.
4. Operation of the crane is only to be carried out by people familiar with lifting appliances.

7.1.2 Crane Operation

The crane is operated by "Main Valve Controller" on operation platform or by Radio remote controller. All motions has stepless control from 0- to max. Two motions can be operated at the same time with full capacity, but with reduced speed.

All the crane movement symbols are shown on the sign plate under the main valve. When the crane is not in use, the "STOP" button on main starter box is to be pressed. It cuts supply to solenoid for main valve.

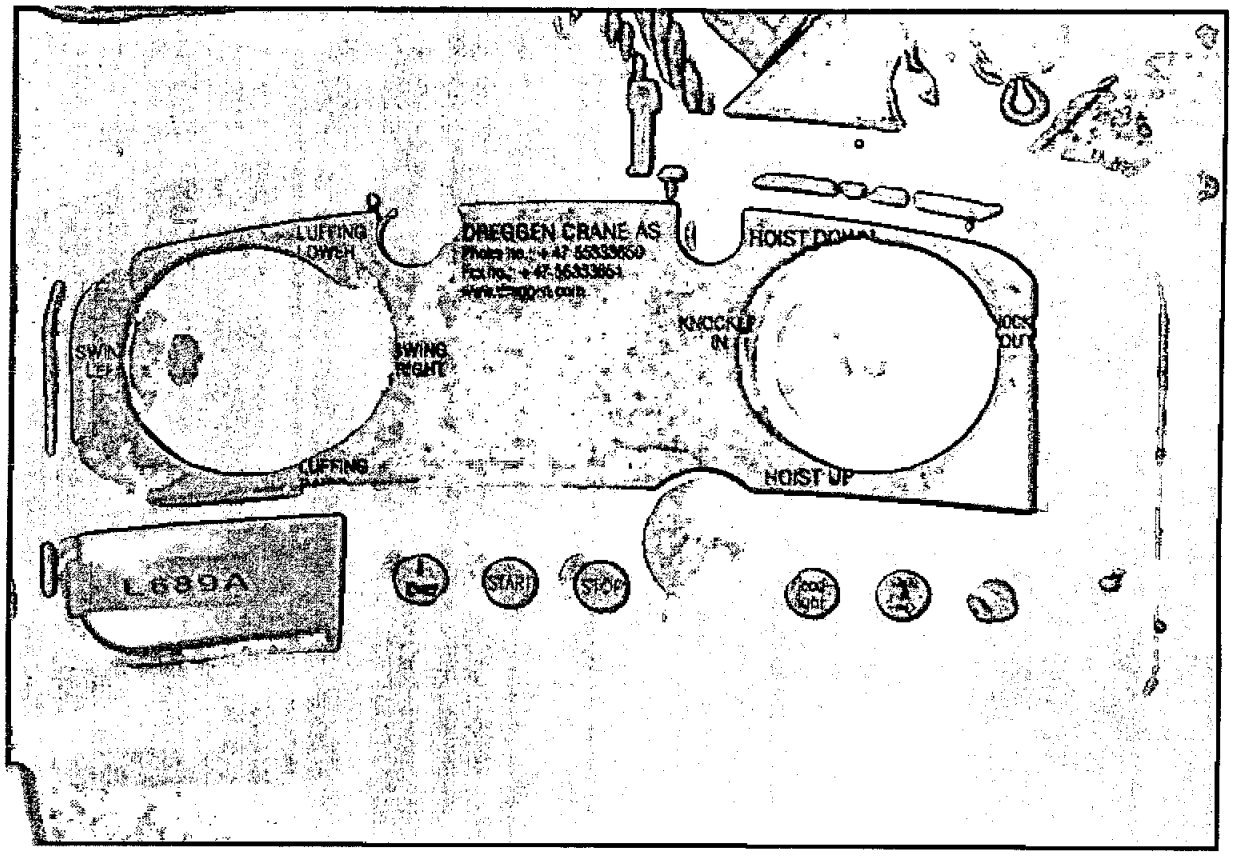
START CRANE – 1. Main switch on starter box, X1, in position "ON".
2. Push green button "START" – el.motor/pump start.



Operation of crane from Main valve

Operation of crane by Radio controller

Switch on the el.box. X2 (placed on operation platform) has to be change from manual operation to radio operation.



7.1.3 Restriction in use

The following is to be adhered to:

ENVIRONMENT:	High humidity. The design temperature is defined as the minimum service temperature, for which operation of the crane is anticipated. Td = minus 10deg. Design temp.: -10deg – + 45deg.

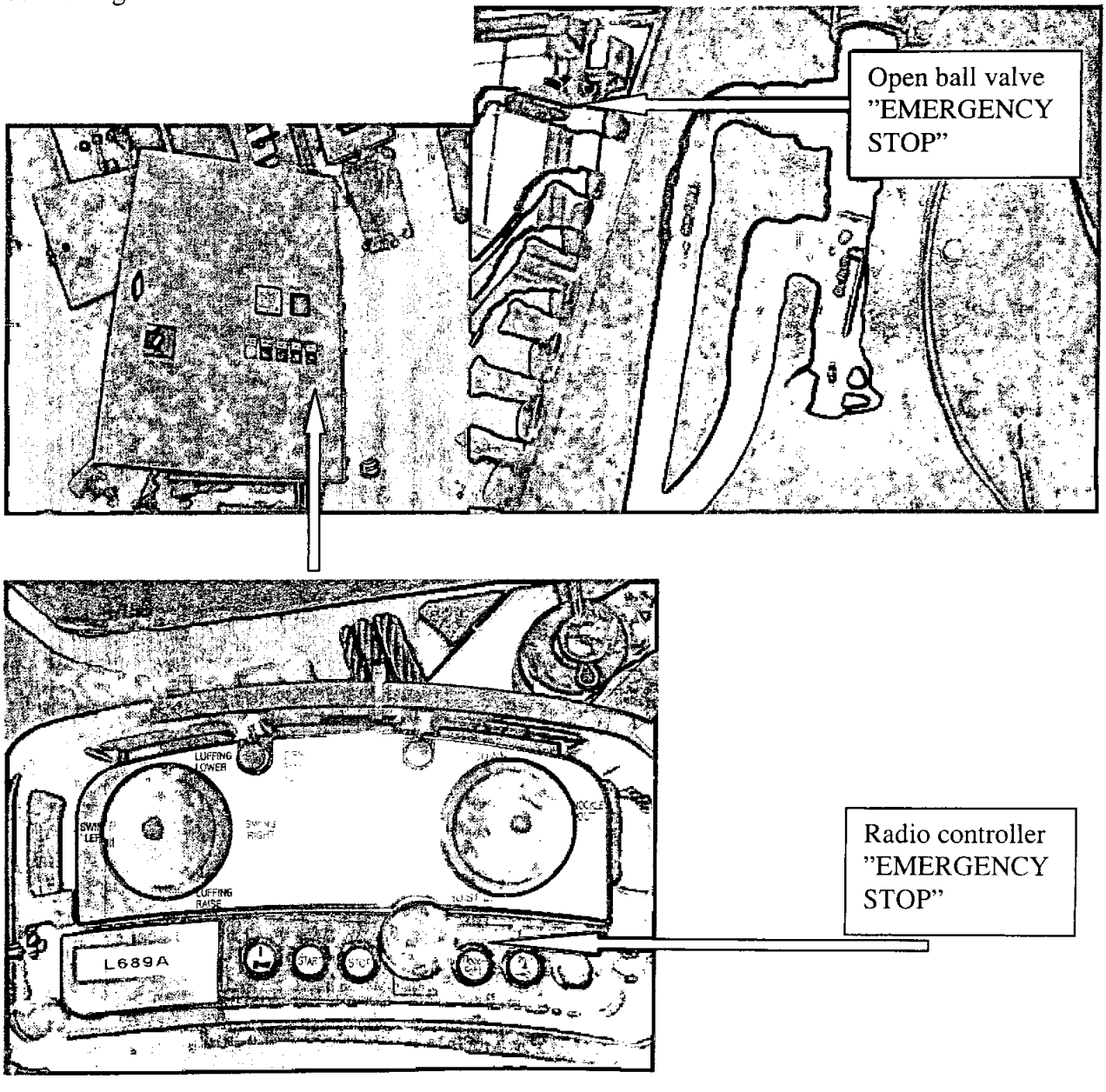
7.1.4 Observations to be Made During Start Sequence and Normal operation

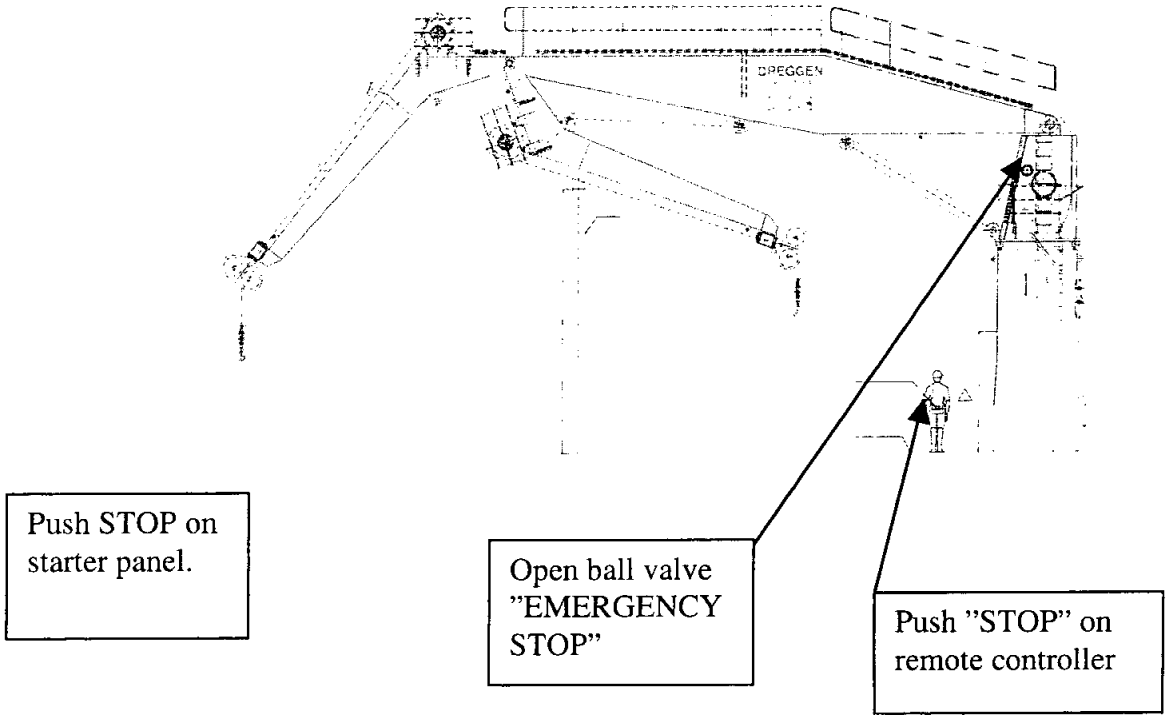
- Ensure that all mechanical functions are running properly.
- Ensure that all hydraulic functions are running properly and that there are no leaks.
- Strictly observe and always adhere to the respective regulations on labour safety and accident prevention when operating the crane.

7.1.5 Emergency Stop

Emergency stop is done manually by using one of the following methods:

1. OPEN "EMERGENCY STOP" valve, fitted close to Main Valve Controller on the right side of operation platform.
2. Pushing the button STOP on starter panel X1.
3. Pushing the button STOP on radio controller.





7.1.6 Start After Emergency Stop, Due to System Failure

The following procedure is to be adhered to:

1. Chapter 7.3, Emergency Operation Instructions.
2. Fault finding/trouble shooting to be initiated, possible findings are to be rectified prior to use of crane.
3. Inspection prior to operation procedure to be carried out, ref. Chapter 3.2, Routine inspections before each working period.

7.1.7 Start after emergency stops, due to hazardous situations:

The following procedure is to be adhered to:

1. Clear the area for unauthorized personnel.
2. Normal start.

7.2 Hazards and protective measures

7.2.1 General

Crew must under no circumstances be located below the crane during lifting operations.
Access platforms are only for inspections and maintenance use.

7.2.2 Overload Protection

The overload protection renders impossible hoisting/jib luffing up, if the overload setting is exceeded. Only the lowering function can be used, once the overload protection has been activated. As soon as the load on the hook is reduced to a weight below the overload setting, the switch-off devise allows the hoist to function again.
We thus recommend, the wire rope to be taken up gradually using the variable speed control before the load is lifted.

7.2.3 Do and Don'ts for Safe Operation

What should be Done:

- Activate the stop button when crane is left unattended.
- Regularly cleaning the complete crane.
- Check limit switch action periodically.
- Regularly lubrication to be carried out as specified in Chapter 3
- Operate the hoist/crane within the designed duty class.
- The crane is to be properly secured at sea (when not in use).
- Renew twisted wire rope if detected, ref. ISO 4309.
- Lifting of loads should in general start carefully.

What should Not be Done:

- Do not exceed permitted carrying capacity, and permitted operating pressure.
- Use limit switches as normal working limit switches.
- Lift loads at an angle or attempt to pull loads sideways. This will most certainly damage the wire rope and cause additional wear to the wire rope.
- Leave hook at head height.
- Let lower block lie on the ground causing the hoist wire rope to become loose. Wire rope may jump off the sheaves and thus be damaged.
- Inch the hoist, as this will shorten motor life and cause excessive wears on brakes. Always try to keep starts to a minimum.
- Never transport loads over the heads of workmen.
- Never have a load suspended in mid-air unattended.
- Never use hoisting machinery to free stuck loads.
- Do not use the hoist wire rope as a sling for suspension.
- Handling moving wire rope is not permitted.

7.2.4 Consequences of Misuse

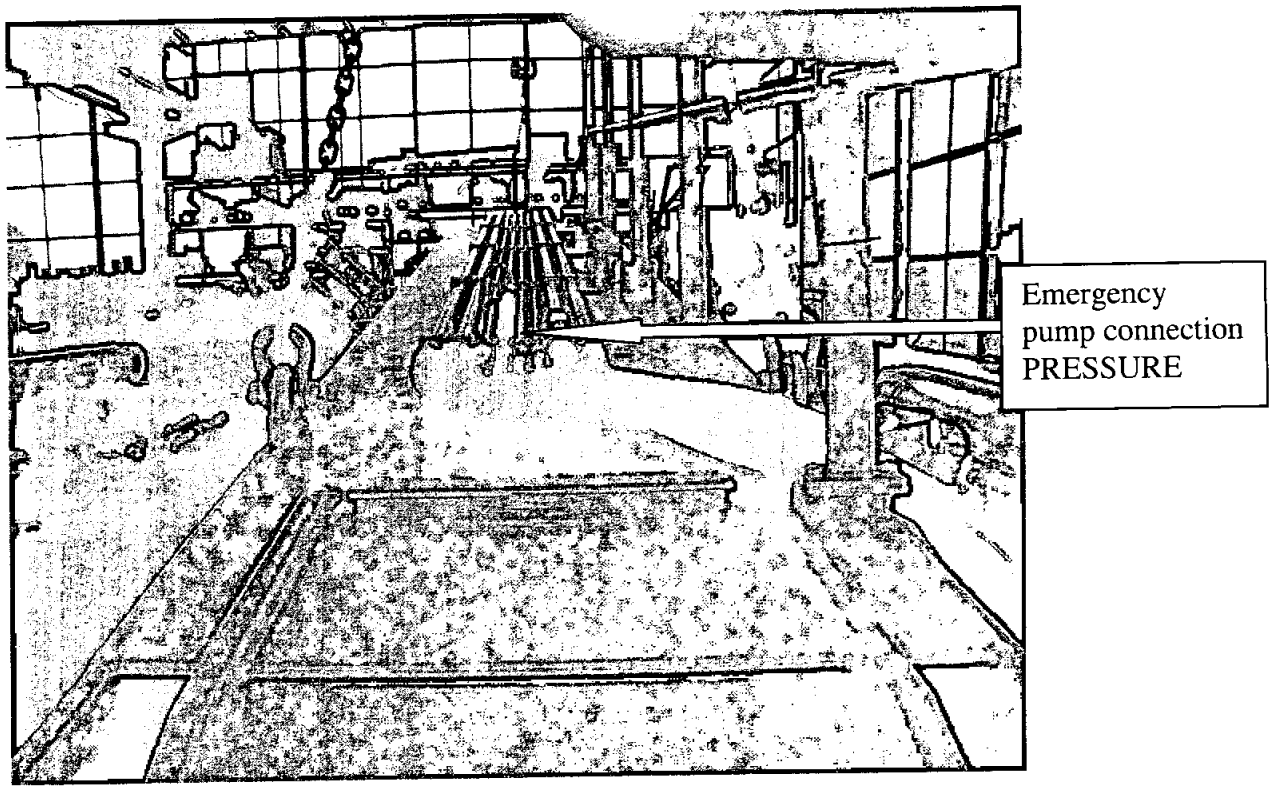
It is of great importance that the crane is operated in accordance with the operating procedure.
NOTE! Any misuses may cause damages, and will always be hazard to personnel safety.

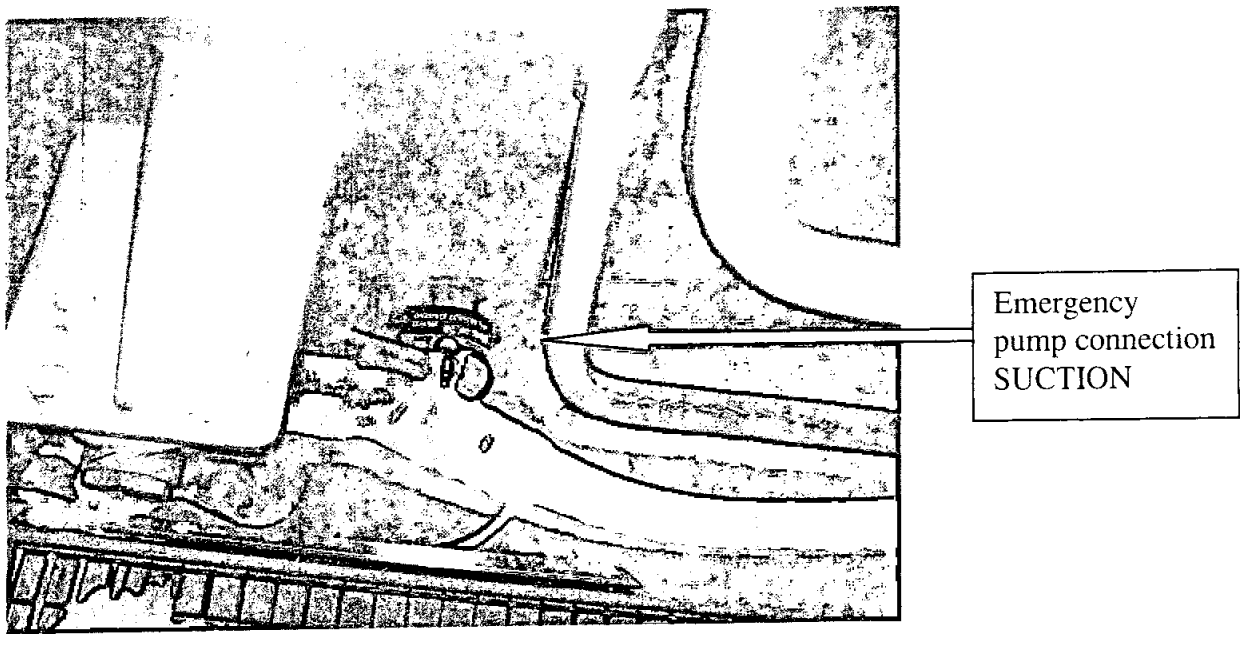
7.3 Emergency Operation Instructions

7.3.1 Emergency Lowering of load

Emergency Lowering is to be performed in accordance with the following procedure:

1. Clear the area for unauthorized personnel.
2. Make sure that the power is off.
3. Connect flexible hoses on "Emergency Hand Pump" between "Emergency Lowering Point, (Suction)", and "Emergency Lowering Point, (Pressure)"- mounted on top of jib.
4. Apply pressure from the hand pump. This opens the brake and lower the load.
5. Keep on pumping until the load is resting on deck.
6. Disconnect flexible hoses on "Emergency Hand Pump" between "Emergency Lowering Point, (Suction)", and "Emergency Lowering Point, (Pressure)".

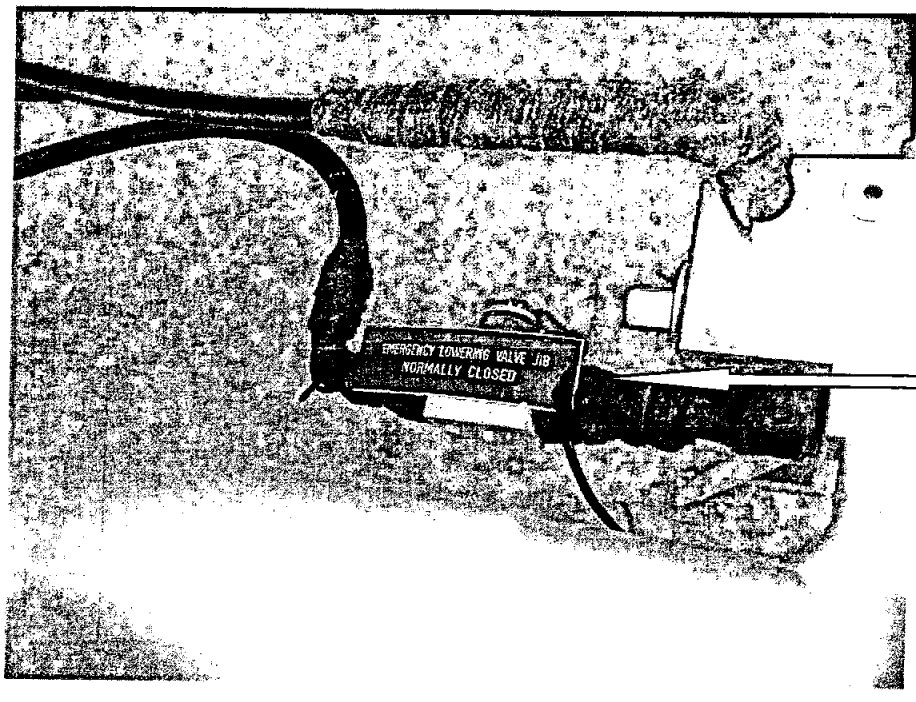




7.3.2 Emergency Lowering of Jib

Emergency lowering of jib is to be performed in accordance with the following procedure:

1. Clear the area for unauthorized personnel.
2. Make sure that the power is off.
3. Open ball valve on the right side of cylinder "Emergency lowering jib- Normally closed".
4. After operation is finished, close the ball valve.



Emergency lowering jib
NORMALLY CLOSED

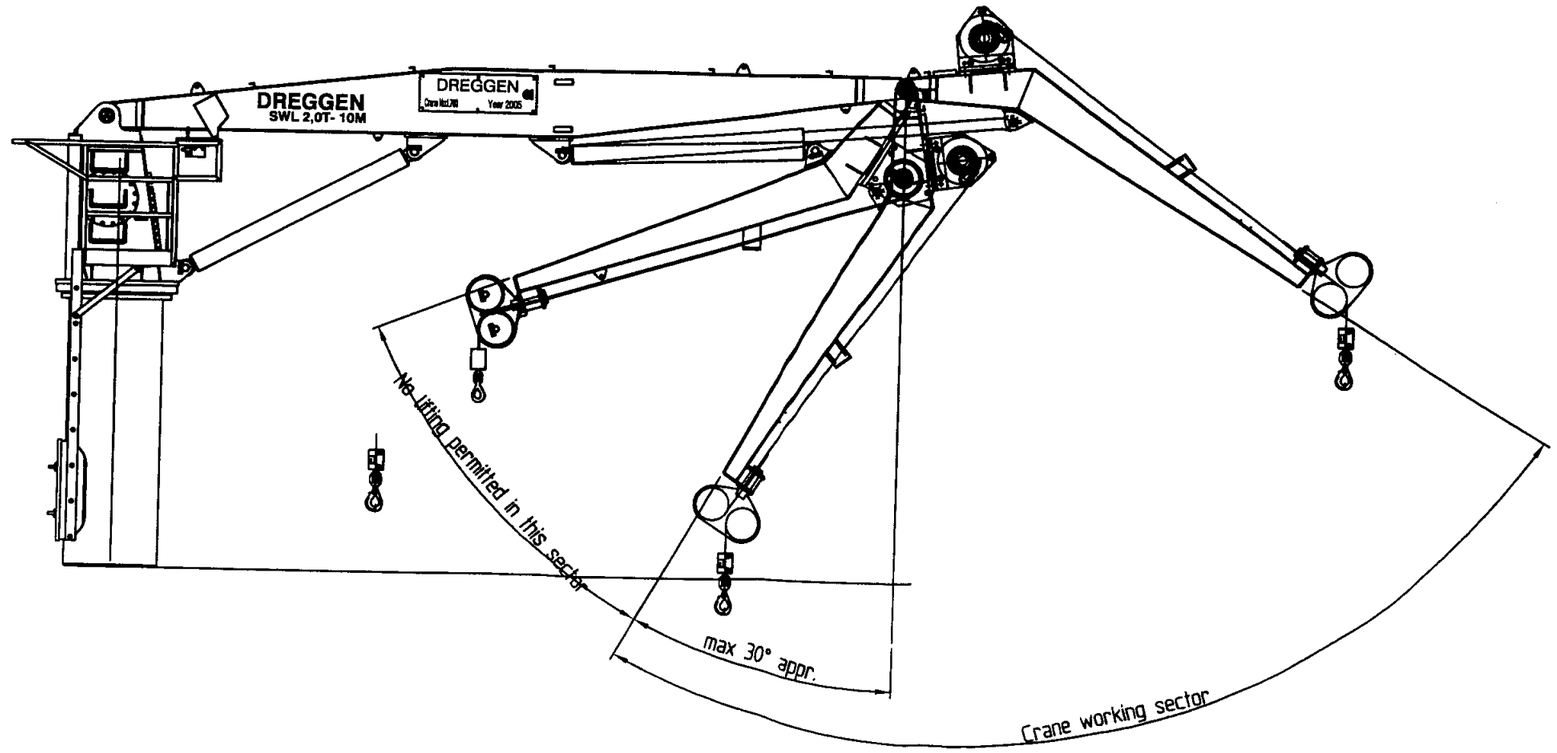
7.4 Crane Parking

7.4.1 Sea Fastening

The crane is to be properly secured at platform (when not in use).

1. The jib to be strapped to avoid sideway movements.

2. Secure the hook block by fastening chains between the hook and at fixed points on jib rest. This to reduce movement of the hook during sea towage. The hook is to be secured in top position.



Index	Date	Revisions	Sign

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Calculations:

Customer / Vendor:

Plot Date: 2006.05.16

Cad file:

DREGGEN

HEGRENESVEIEN 17a
P.O. BOX 3434
PHONE: +47 55 33 36 50
FAX: +47 55 33 36 51/52
5815 BERGEN, NORWAY

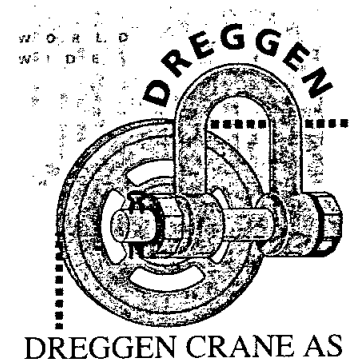
Title:

DKF cranes
Lifting restrictions

Date:	Drawn:	Scale:
16/5-06	TB	1:50
Checked:	Verified:	Format: A3
Replacement for:	Replaced by:	Proj.

DRAWING NO.:

REVISION: B



DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 8 in the Equipment User Manual – Maintenance & Lubrication chart

01	Issued for approval	27.10.2005.	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
MAINTENANCE & LUBRICATION

Client Doc no:					Rev.	
Proj.no.	Disc	Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338					**01**	**15**

8. MAINTENANCE

8.1 Maintenance Guide Lines

PLANNED LUBRICATION – RELIABILITY
The following lubrication instructions are based on reasonable minimum requirements and are designed to guide the equipment user in formulating and carrying out a regular lubrication schedule.

Frequency of application is based on a standard 8-hour day, 5-day week.

Consideration must be given to hourly duty, atmospheric and ambient conditions, and it should be noted that over-lubrication could be as dangerous as under-lubrication.

Except where otherwise stated, the lubricants in this manual are suitable for average ambient range –20 degr. C to + 50 degr. C.

For extreme ambients or working conditions consult lubricant manufacturers.

For equipment operating outside in extremely low temperatures it is advisable to use electric coil heaters or similar devices to bring the oil to normal operating temperatures before putting the crane of machine to work.

The symbols shown in the lubricant columns should be referred to the section 9.1, to identify the lubricants prescribed for each application. Before using an alternative grade of lubricant it is recommended that Dreggen Crane AS and/or the lubricant manufacturer be consulted.

WHILST EVERY EFFORT HAS BEEN MADE TO ENSURE THE ACCURACY OF THE LUBRICATION INSTRUCTIONS, THEY DO NOT FORM ANY PART OF A GUARANTEE OF PERFORMANCE EITHER EXPRESSED OR IMPLIED.

Dreggen Crane AS reserves the right to withdraw and amend the information given without prior notice.

Thorough lubrication is important for performance and lifetime of the Dreggen Crane AS equipment. For trouble free operation the machine should be lubricated as per lubrication chart and data drawing. When applying grease to a fitting, continue application until fresh grease can be seen (where possible). Rotate all moving parts to distribute the grease.

8.2 Routine inspections before each working period

8.2.1 General

- Inspection, service and repairs on the crane must be performed in accordance with local statutory requirements.
- Preventive maintenance should be practiced to minimize the chance for breakdown.
- It is important that the crane is inspected regularly and need for maintenance is noted accordingly and taken care of within convenient time.
- The maintenance should be executed in accordance with an established routine.
- The person responsible for maintenance should ensure that the routine is adhered to.
- Inspection and maintenance of the crane is to be carried out by people familiar with lifting appliances.
- Repairs are to be carried out by experts. Experts are those who, through their training and experience have sufficient knowledge about winches, lifting and pulling devices and are familiar with the relevant legislation concerning health and safety at work, accident prevention regulations, guide lines and generally accepted technical rules, that they can assess the safe working conditions of winches, lifting and pulling devices.

8.2.1.1 What should Not be Done:

- Do not leave tools or parts on the crane after maintenance.
- Do not attempt to carry out maintenance work on hoist/crane while power supply is on.
- Do not heat treat wire rope.

8.2.2 Consequences of Misuse

It is of great importance that the crane is maintained in accordance with the maintenance procedure.

NOTE! Any misuses may cause damages, and will always be hazard to personnel safety.

8.2.3 Inspection prior to operation

Trained staff must inspect all parts of the crane and required/necessary cleaning is to be carried out before the crane is put into operation.

The inspection should at least contain the following items:

1. Check the crane for visible damages.
2. Ensure that all parts have been lubricated according to Lubrication Chart.
3. Special attention should be paid to the hydraulic system. Check for damage.

4. Check that there are no signs of hydraulic oil leakage from hydraulic hoses, tubes and fittings.

5. Ensure that all hydraulic valves are in normal position.

6. Check filters flow.

7. Check that wire rope runs correctly in the sheaves and that the wire ropes ends are securely clamped.

8. Ensure that the wire rope of the hoist is in perfect condition.

9. Control oil level on winch gear (at least on weekly basis).

10. Check that the crane can move freely in its operation area.

11. Check that the cranes hoisting characteristics are functioning correctly and that brakes are operating satisfactorily.

12. Check that the limit switches are operating satisfactorily.

NOTE! Possible findings are to be rectified prior to use of crane.

8.3 Periodic Inspection & Maintenance

Inspection and maintenance are to be carried out in accordance with prevailing statutory requirements.
The crane's condition is to be within acceptable limits as specified in prevailing statutory rules and regulations.

The following procedures are to be followed, to ensure that the above requirements are obtained, and to gain the expected operating time/lifetime.

Hook, SWL 12T

Interval	*Inspection*	*Maintenance*
Monthly	Check the complete lower block for damage, corrosion, wear & tear. Check locking of hook nut. Check all bolt and nut connections.	Possible findings are to be rectified prior to use of crane. Check protection against corrosion, and apply grease if needed, ref. Lubrication Chart.
Yearly	Ref. monthly inspection.	Ref. monthly maintenance. Check protection against corrosion, and apply paint/grease if needed, ref. Lubrication Chart.
5 yearly	The lower block to be dismantled. Check all parts for damage, corrosion, wear & tear (especially hook with nut). NDT to be evaluated. Check hook and nut for fatigue cracks (especially threaded area). NDT to be evaluated. Reassemble and carried out overload test. Overload test: SWL x 1.25	Ref. yearly maintenance.

Wire Rope

Interval	*Inspection*	*Maintenance*
Monthly	Check that the wire rope has not been damaged in any way, ref. ISO 4309. Check for tear & wear.	Possible findings are to be rectified prior to use of crane, ref. ISO 4309. Check protection against corrosion, and apply lubrication if needed, ref. Lubrication Chart.
Yearly	Ref. monthly inspection.	Ref. monthly maintenance. Clean and lubricate the total length of the wire rope, ref. Lubrication Chart

Winch		
Interval	***Inspection***	***Maintenance***
Monthly	Check the winch for damage, corrosion, wear and tear. Check locking of shafts for winch foot brackets. Check locking of friction block for wire rope.	Possible findings are to be rectified prior to use of crane.
Yearly	Ref. monthly inspection. Check all bolt and nut connections. Spot-check (20%) pre-tensioning of nut and bolt connections. Check wire rope drum for damage, wear and tear.	Ref. monthly maintenance. Check protection against corrosion, and apply paint if needed.
5 yearly	Ref. yearly inspection. Check shafts for winch foot brackets, for fatigue cracks. NDT to be evaluated. Check foot brackets, for fatigue cracks. NDT to be evaluated. Spot-check (50%) pre-tensioning of nut and bolt connections.	Ref. yearly maintenance.

Winch Gear with Brake and Adaptors Housing and Winch Support Bearing		
Interval	***Inspection***	***Maintenance***
Monthly	Check that the winch gear is not damaged. Control oil level. Fill, if necessary. Check that the winch support bearing is not damaged. Check all bolt connections.	Possible findings are to be rectified prior to use of crane. Oil change see producer instruction, Chapter 12. Check protection against corrosion, and apply grease if needed, ref. Lubrication Chart Clean the gear prior to oil filling, using pre-heated part of new oil when ambient temperature is low, so that the abrasion and contamination can flow away. Ref. Chapter 12, Component Datasheet Winch Gear Maintenance Instruction.
Yearly	Ref. monthly inspection. Oil sample to be taken to evaluate wear & tear of the gear. Check wear & tear of the winch support bearing. Check all bolt connections. Spot-check (20%) pre-tensioning of winch gear bolt connections. Brake test to be carried out.	Ref. monthly maintenance. Oil change at least once a year. Check protection against corrosion, and apply paint/grease if needed, ref. Lubrication Chart.
5 yearly	Ref. yearly inspection. Check (100%) pre-tensioning of winch gear bolt connections.	Ref. yearly maintenance.

Hydraulic Motor for Winch		
Interval	***Inspection***	***Maintenance***
Monthly	Check that the hydraulic motor is not damaged. Check bolt connections between hydraulic motor and winch gear.	Possible findings are to be rectified prior to use of crane.
Yearly	Ref. monthly inspection.	Ref. monthly maintenance. Check protection against corrosion, and apply paint if needed.
5 yearly	Ref. monthly inspection. Check (100%) pre-tensioning of winch gear/motor bolt connections.	Ref. yearly maintenance. Component Datasheet, Ch.12

Slewing Ring with Gear Rim and Pinion		
Interval	***Inspection***	***Maintenance***
Monthly	Check that the slewing ring with gear rim and pinions are not damaged. Check all bolt connections.	Possible findings are to be rectified prior to use of crane. Check protection against corrosion of gear rim and pinions and apply grease if needed, ref. Lubrication Chart.
Yearly	Oil sample to be taken to evaluate wear & tear of the gear. Check wear & tear of gear rim and pinion. Check slewing ring bearings for wear & tear. Check all bolt connections. Spot-check (20%) pre-tensioning of slewing ring bolt connections.	Ref. quarterly maintenance. Check and apply grease in all grease points if necessary.
5 yearly	Ref. yearly inspection. Check (100%) pre-tensioning of slewing ring bolt connections.	Ref. yearly maintenance. Check protection against corrosion and apply paint if needed.

Slewing Gear with Brake and Adaptors Housing		
Interval	***Inspection***	***Maintenance***
Monthly	Check that the slewing gear is not damaged. Control oil level. Fill, if necessary. Check all bolt connections.	Possible findings are to be rectified prior to use of crane. Check protection against corrosion, and apply grease if needed, ref. Lubrication Chart. Clean the gear prior to oil filling, using pre-heated part of new oil when ambient temperature is low, so that the abrasion and contamination can flow away. Ref. Chapter 12, Component Datasheet, Slewing Gear Maintenance
Yearly	Ref. monthly inspection. Oil sample to be taken to evaluate wear & tear of the gear. Check wear & tear of the winch support bearing. Check all bolt connections. Spot-check (20%) pre-tensioning of winch gear bolt connections.	Ref. monthly maintenance. Oil change after 200-1000-2000 operating hours, but at least once a year. Check protection against corrosion, and apply paint if needed.

	Brake test to be carried out.	
5 yearly	Ref. yearly inspection. Check (100%) pre-tensioning of winch gear bolt connections.	Ref. yearly maintenance.

Hydraulic Motor for Slewing Gear

Interval	*Inspection*	*Maintenance*
Monthly	Check that the hydraulic motor is not damaged. Check bolt connections between hydraulic motor and winch gear.	Possible findings are to be rectified prior to use of crane.
Yearly	Ref. monthly inspection.	Ref. monthly maintenance. Check protection against corrosion, and apply paint if needed.
5 yearly	Ref. monthly inspection. Check (100%) pre-tensioning of winch gear/motor bolt connections.	Ref. yearly maintenance. Component Datasheet, Chapter 12

Hydraulic System including Hydraulic Flexible Hoses

Interval	*Inspection*	*Maintenance*
Monthly	Check that there are no signs of hydraulic oil leakage from hydraulic hoses, tubes and fittings.	Possible findings are to be rectified prior to use of crane. Apply hydraulic oil if needed, ref. Lubrication
Quarterly	Ref. monthly inspection. Check flow in hydraulic oil filter (ref. filter service indicators). Check oil cooler externally.	Ref. monthly maintenance. Change the hydraulic oil filter if necessary. Clean if necessary.
Yearly	Ref. monthly inspection. Check all hoses for surface cracking/fissure. Check load control valve by performing a brake test of each function.	Ref. monthly maintenance.

Crane Steel Structure

Interval	*Inspection*	*Maintenance*
Monthly	Ref. Ch. 8.2.4 Inspection prior to operation. Check protection against corrosion of hinges and handles on slewing base hatch w/coaming.	Possible findings are to be rectified prior to use of crane. Apply grease if needed, ref. Lubrication Chart
Yearly	Ref. monthly inspection. Check that the complete crane is not damaged. Check highly stressed areas (e.g. jib hinge, cylinder hinges etc.) for fatigue cracks. NDT to be evaluated. Check jib hinge bearing for wear & tear. Check cylinder hinge bearings for wear and tear.	Ref. monthly maintenance. Check protection against corrosion, and apply paint/lubrication if needed.

Nut and Bolt Connections		
Interval	***Inspection***	***Maintenance***
Monthly	Ref. Ch. 8.2.4 Inspection prior to operation. Check all bolt connection used to secure axle retainers.	Possible findings are to be rectified prior to use of crane.
Yearly	Ref. monthly inspection. Visually inspect all Nut and bolt connections (not included in above inspection and maintenance procedures).	Ref. monthly maintenance. Check protection against corrosion, and apply paint/lubrication if needed.
5 yearly	Ref. yearly inspection. Spot NDT of critical bolts to be evaluated.	Ref. yearly maintenance.

8.4 Crane Maintenance specification

8.4.1 Operating mechanisms

- The operating elements on the crane must return automatically to the off position when they are released.
- Special care should be taken with respect to the following parts:
- Hoist upper limit switch
- Hoist lower limit switch
- Hydraulic Operating valve

8.4.2 Testing the hoist brake function

The brake functions to be checked prior to operation and in accordance with the following procedure:

- Static Test: Lift the load just clear of the deck and evaluate the brake function (5min). The load's distance above deck is to be constant during the test.
- Dynamic Test: The brakes are to be check by lowering the load at full speed with subsequently activation of the brakes. The brake retardation is to be momentarily. Evaluate the brake function for 5min. The load's distance above deck is to be constant during the test.

8.4.3 Testing the limit switch

Move the hooks in succession into the upper and lower end position. Stop just before the end positions are reached, and carefully (e.g. by pressing the operating mechanism several times) move the hook into the end position.

8.4.4 Maintenance of the wire

Note that a worn or damaged wire rope is extremely dangerous. If there is any doubt as to whether the wire rope should be renewed, local authorities must be consulted.

The following is a general guide representative of the most common norms. However, local regulations should be consulted and given priority. In addition confer ISO 4309.

- If over a length equal 8 times the wire rope diameter, there is seen a number of broken wires which together are more than 10% of the total number of wires (shown in chart or on wire rope certificate) then the wire rope should be renewed.
- If a strand has broken the rope must be replaced immediately.
- The wire rope must be replaced as soon as swelling, bruises, permanent bends, kinks or other serious damages (e.g. severe rust formation) and especially if heavy wear has occurred.

Increased wear & tear can occur due to aggressive environmental influences. Time intervals between maintenance should then be shortened.

The wire rope is to be maintained in accordance with the following general procedure:

- The wire rope of the hoist must be lubricated in unloaded condition.
- Ensure that the wire rope is completely covered with lubrication, at all time.

Note: When checking the extent of wear and tear, the expected wear & tear for the succeeding period until the next examination must be taken into consideration.

It is NOT allowed to heat treat wire rope.

8.4.5 Hook

Load hooks may not be

- Loaded on the point
- Dressed
- Annealed
- Bent

Increase tear and wear can occur due to aggressive environmental influences. Time intervals between maintenance should then be shortened.

8.5 Corrections and minor repairs

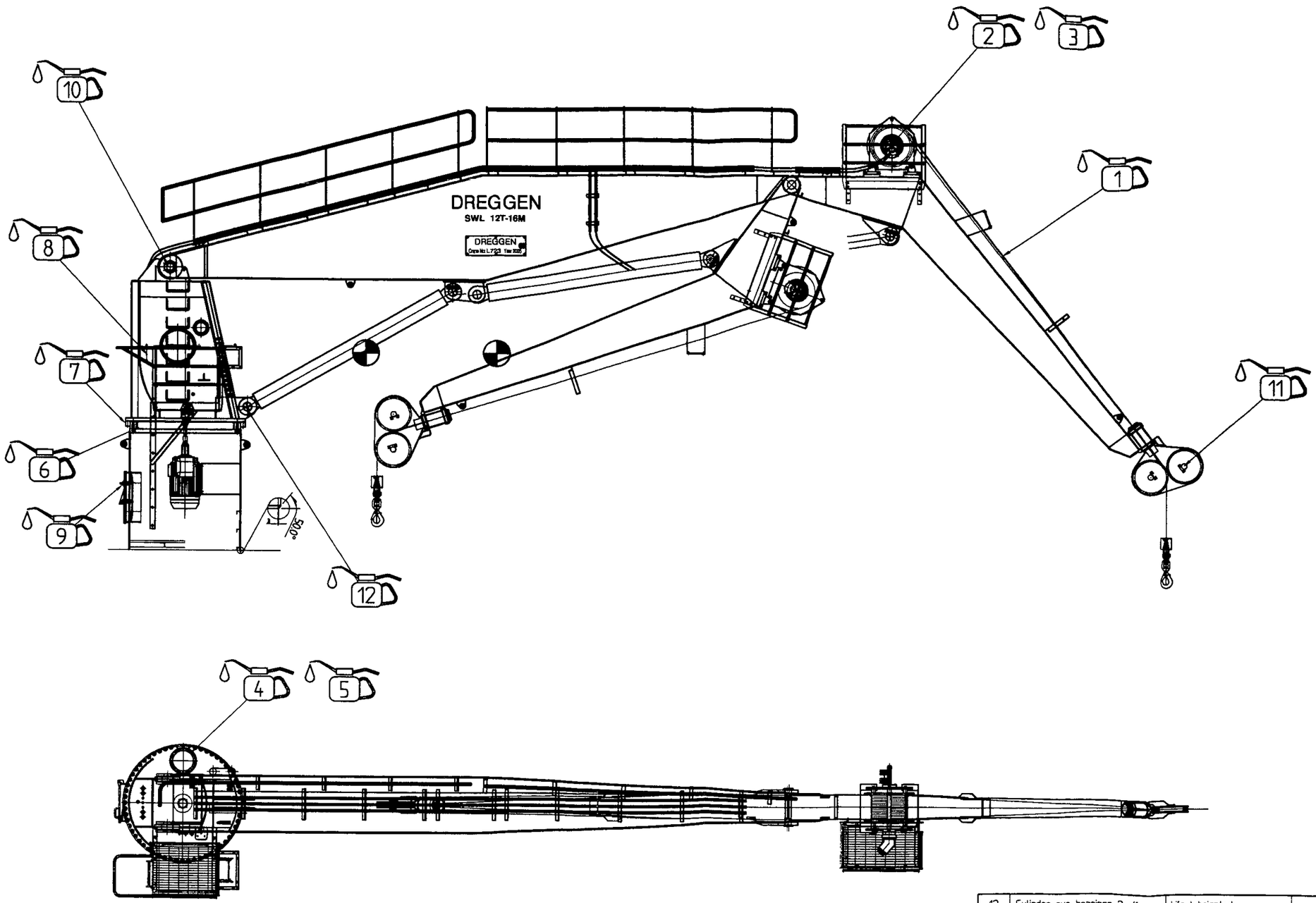
Leakage in hydraulic hoses, fittings can be repaired, replaced by user.

8.6 Major repairs and modifications

Repairs on valve blocks, hydraulic motors etc. Dreggen Crane AS shall be notified, ref. Chapter 1, Introduction.

8.7 Start-up after maintenance

Start-up of the crane after maintenance is to be carried out in accordance with Chapter7, Operation Instructions.



No:	Item	Type lub.	Owners type	Interval
12	Cylinder eye bearings 2 off	Life lubricated-	-	Grease after dismantling
11	Jib head bearings- 2 off	Life lubricated	-	Grease after dismantling
10	Jib hinge bearing	Life lubrication	-	Grease after dismantling
9	Hatch: Hinges & handles	Grease nipple	Grease MULTIFAK EP2	Yearly
8	Hydraulic oil in tank	Hydraulic oil appr. 1100 l.	Hydraulic oil RANDO HDZ 32	Check & refill every 50 h
7	Slewing ring	Lube nipple- 6 off	Grease MULTIFAC EP2	Every 50 h
6	Slewing gear-pinion	Grease	Grease, TEXCLAD PREMIUM 2	Check every 50 h- apply as needed
5	Slewing gear brake	Oil filling plug	Hydraulic oil RANDO HDZ 32	Check every 50 h- change yearly
4	Slewing gear box	Oil filling plug	MEROPA 150	Check every 50 h- change yearly
3	Winch gear box	Oil filling plug	MEROPA 150	Check each 50 h- Change yearly
2	Winch bearing	Nipple	GREASE, MULTIFAK EP2	Every 50 h or as needed
1	Wire rope	Grease, brushed	TEXCLAD ORENYUN 2	Every 50 h or as needed

Freire

DECK CRANE DKF220-12T-16m: LUBRICATION OIL CHART

Dreggen project : 60338/51

No.	EQUIPMENT			Aplication point	Lub. Oil / Grease		Required Quantity / set	Initial filling by maker
	Name	Model	QTY ship		Recommended Oil / Grease Dreggen- TEXACO	Customer		
1	Wire rope	Ø26MM, -1960KP/MM2	1	Brushed	Grease, Texckad ORENUYN 2		2,5 kg	Done
2	Winch drum bearing	Roller bearing	1	Grease nipple 1/8"	Grease, MULTIFAK EP2		0,3kg	Done
3	Winch gear box	Transmital 713C3B	1	Oil filling plug	MEROPA 150		4 lit.	Filled
4	Slewing gir box	Brevini RPR 3255	1	Oil filling plug	MEROPA 150		10 lit.	Filled
5	Slewing gir brakes	Brevini RPR 3255	1	Oil filling plug	Hydraulic oil RANDO HDZ 32		0,6 lit.	Filled
6	Slewing gir rim/pinion	Brevini RPR 3255	1	Brushed	Grease, TEXCLAD PREMIUM 2		0,5 kg	Done
7	Slewing bearing	Hoesch Rothe Erde 062.40.1773.001.49.1522	6	Gr.nipple AM10x1	Grease, MULTIFAK EP2		0,5 kg	Done
8	DRIVE hydraulic oil	in tank	1	Hydraulic oil	Hydraulic oil RANDO HDZ 32		approx 1100	YARD
9	Hinges/handles on hatch		4	Grease nipple 1/8"	Grease, MULTIFAK EP2		0,5 kg	
10	Bearing in jib hinge	GE120 UK 2RS	2	-	Life lubricated			Done
11	Bearing in jib head	SL04 5016 PP	2	-	Filled with grease before assembling - for ever			Done
12	Bearing in cylinder eye	composite	4	-	Filled with grease before assembling - for ever			Done

8.9 LUBRICATION COMPARISON CHART

BRAND NAME	GREASE Bearings	GREASE Gearrack/ Pinion	OIL	GREASE Wire rope	HYD. OIL Norm. cond. -10dg.	HYD. OIL Low temp. -40dg.
MOBIL	Mobillux EP2	Mobiltac 375N	Mobilgear 630	Mobilarma 798	Mobil DTE13M	SHC524
ESSO	Beacon EP 2N	Mobiltac 375N	Spartan 150	Surret N 5 K	Univis N32	Univis N15
SHELL	Alvania EP2	Malleus GL95	Omala oil 150	Malleus GL95	Tellus T32	Tellus T15
TEXACO	Starplex EP2	Molytex EP2	Meropa Lub.150	Molytex EP2	Rando HDZ 32	Rando HDZ 15
BP	Energrease MM-EP2	Energrease OG-EP	Energol GR-XP150	Energol WP	Bartran HV 32	Bartran HV 15
CHEVRON	Dura-lith grease EP2	Open gear Lubricant 250 NC	Gear compound 150/220	Open gear Lubricant 250 NC	Mechanism LPS32	Mechanism LPS15
CASTROL	MS 3	Spheerol SX2	Alpha SP150	Spheerol SX2	Hyspin AWH 32	Hyspin AWH 15
ELF	Ceran WR2	Ceran AD	Epona Z150	Ceran AD	Visga 32	Visga 15
STATOIL	UniWay LiX 22 PA	GreaseWay HT2	LoadWay EP 150	GreaseWay HT2	HydraWay HVXA 32	HydraWay HVXA 15 LT

NOTE!	For winch gearbox, see lubrication instruction

DKF220 DECK CRANE: **WINCH GEAR 4 LITRE**
WINCH BRAKE 0,3 LITRE

SLEWING GEAR W/BRAKE 10 LITRE

8.10 SLEWING RING BOLTS TIGHTENING

EVERY 1 YEAR

Inspect the slewing ring bolts. If a screw shows a tendency to slacken, tighten all bolts with a torque wrench or a hydraulic bolt-tensioner.

Tightening torque and pre-tension forces are shown in the tables below.

EVERY 4 YEAR

Re-tighten as described above.

Screw grade 10.9	Tightening Nm	Torque kpm
M16	260	27
M18	360	37
M20	520	53
*M24	900	92
*M30	1800	183
M36	2800	285
M39	3600	367
M42	4450	454

Screw grade 10.9	Pre-tensioning before tightening nut
M30	437 kN
M33	540 kN
M36	637 kN
M42	877 kN
M48	1155 kN

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 9 in the Equipment User Manual - Spare Parts

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
SPARE PARTS LIST FOR 1 YEARS OPERATION

Client Doc no:					Rev.	
Proj.no.	Disc.	Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338					**01**	**4**

9 SPARE PARTS LIST FOR 2 YEARS OPERATION

9.1 How to Order Spare Parts

To ensure a correct delivery of Spare Parts, and to avoid any misunderstandings, we recommend that our customers make use of the enclosed formula, ref. Chapter 9.2, when requesting spare parts. This formula asks for the required information to supply correct parts.

9.2 Spare Parts Inquiry

VESSEL NAME:			COMPANY: C. N. P. FREIRE. S.A.
PRODUCT: DK220-12T-16m			DATE:
SIGN: Authorised representative			☐REGULAR ☐URGENT
Dreggen Art. No.:	Quantity:	Drawing ref. pos. No.:	Technical description/further information

9.3 Recommended Spare Parts

PROJECT: DKF220-12T-16M

DETAIL: SPARE PARTS

SHEET NO. 1 OF 1 SHEET

P 723-90

REVISION NO: 0

DRAWN: 19.08.05 R.E.

CHECKED:

DREGGEN

CUSTOMER: FREIRE SY

CONTROL VOLTAGE: 230/24 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
14053	1	HP FILTER ELEMENT				HP320-3-A10-AN
12252	1	RETURN FILTER ELEM.				MF400-3-A-P10-M-B
12880	1	PRESS. GAUGE 400BAR INCL. HOSE/COUPL.				FIG. A Ø63 0-400 +PA-11-600-Y4

REVISION	DATE/SIGN.		

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 10 in the Equipment User Manual – Certificates

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
CERTIFICATES

Client Doc no:					Rev.	
Proj.no.	Disc	Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338					**01**	**10**

10 CERTIFICATES

10.1 Slewing ring art.no. 21560

60338/51

Kollmeder
Preßwerk GmbH & Co. KG
Ergolding/Bayern

TÜV CERT
DIN ISO 9002
Reg.-Nr. 12 100 5540

Gewölbte Scheiben
Fischboden
Normal gewölbte Boden
Klöpperböden
Korbbogenböden
Halbkugelböden
Diffusorböden
Koner
Durchmesser bis 6700 mm
Preßteile nach Zeichnung
Geschmiedet nahtlos gewalzte Ringe und Flansche bis Ø 3500 mm nach DIN und Sonderanfertigung
Schmiedeteile

Kollmeder
PRESSWERK

Kollmeder Preßwerk GmbH & Co. KG - Zeißstraße 1 – 84030 Ergolding

Besteller / Customer
IMO Industrie-Momentenlager
Stoll & Roß GmbH
Imostr. 1

91350 Gremsdorf

Abnahmeprüfzeugnis 3.1B nach EN10204
Work's test certificate acc. To 3.1B/EN10204

Datum / Date: 03.05.2004 Nr / Nr.: 30391 h

Zeichen des Lieferwerks / Stamp of Supplier: K

Ihre Best. Nr. / Datum
Your Order / Date
21265 / 03 vom 03.07.2003

Kennzeichnung:
Marking:
42CrMo4V
267764
6854

Bestellanforderung:
Demand of Order:

Pos. Item	Stück Quantity	Artikel / Abmessung Product / Demension — Geschmiedet/nahtlos gewalzte Ringe/Flansche forged/seamless rolled rings/flanges	Gewicht / St. Weight / o.	Werkstoff Material	Schmelze Heat	Probe Sample / Test
	6	Außenringe 1930/1771x87,5mm nach Zeichnung 12-401773/2-05851-3		42CrMo4V	267764	6854
	6	Innenringe 1774/1532x121,5mm nach Zeichnung 12-401773/2-05851-4		42CrMo4V	267764	6854

Wärmebehandlung / Heat treatment

☐ Normalglühen / normalize — bei / by

☐ Lösungsglühen / solution annealing

☒ Härten bei / harden by 880°C

☒ Anlassen bei / temper by 610°C 4 Std

☒ Abkühlen / cooling Polymer / Luft

Besichtigung und Ausmessung: ohne Beanstandung / Inspection and dimensional control without objection

☐ Oberflächenrißprüfung / Surface crack testing

☐ Ultraschallprüfung / Ultrasonic testing

☐ Werkstoff- und Verwechslungsprüfung / Material and Test of identy

☐ Prüfung auf interkristaline Korrosion / Test of interkristaline corrosion

Form [1]) Type	Prüftemperatur Test temp	
D = DVM	A = + 20°C	G = - 50°C
V = ISO-V	B = + 10°C	H = - 60°C
S = Längs	C = + 0°C	I = - 80°C
T = Tangential	E = - 20°C	J = - 100°C
	F = - 40°C	K = - 196°C

Pos. Item	Anforderungen Requirements	Probe-Nr. Test-No.	Prüf-Temp. Test-temp.	Probenlage Direction	Streckgrenze (RT) Yield strength ReH 0,2 % N/mm² MPa	Streckgrenze (RT) Yield strength ReH 1% N/mm² MPa	Zugfestigkeit Tensile strenght Rm N/mm² MPa	Dehnung A Elongation % A: Lo = 5 do B: G = 2 h C: Lo = 5,65 Fo E: G = 1,4 h F: Lo = 4 do	Einschnürung Reduction of area %	Probenlage Direction	Form / Type	Prüf-Temperatur Test temp.	Schlagarbeit Energy of impact Av/J	Härte / Hardness HB 2,5 / 187
	EN 10083-1 vergütet auf 850 - 1000 N/mm²	6854	A	T	ReH	638	851	14	55	T	V	G	32/28/28 ≙ 29	

Chemische Analyse gemäß Vormaterialzeugnis / siehe Anlage 1 / Chemical analysis, enclosure 1

Wir bescheinigen, dass die Teile geprüft wurden und den Bestellanforderungen entsprechen
We hereby certify that the material described above has been tested and complies with the terms of the order.

Kollmeder Preßwerk GmbH & Co. KG

Stempel des Werkssachverständigen
Inspector's stamp

Ergolding, den 03.05.2004

Der Werkssachverständige / The Works-Inspector

Hausanschrift
Zeißstraße 1 – 84030 Ergolding / Bayern
Telefon (0871) 9 75 39 – 0
Telefax (0871) 9 75 39 – 40
e-mail: webmaster@kollmeder-pressewerk.de
Internet: http://www.kollmeder-pressewerk.de

Bankverbindungen
Raiffeisenbank Ergolding
BLZ 743 626 53 – Kto.-Nr. 13 251
IBAN DE21 7436 2663 0000 0013 251
Oberbank München
BLZ 701 207 50 – Kto.-Nr. 351 100 012
Postgiro Nürnberg
BLZ 760 100 50 – Kto.-Nr. 1956 83 800
Sparkasse Landshut
BLZ 743 500 00 – Kto.-Nr. 4121999
IBAN DE87 7435 0000 0004 1219 99

Komanditgesellschaft, Sitz Ergolding – Registergericht Landshut HRA 7586
persönlich haftende Gesellschafter: Kollmeder Preßwerk Verwaltungs GmbH, Sitz – Ergolding – Registergericht Landshut HRB 3558
Geschäftsführer: Johann Kollmeder, Johann Kollmeder jun., Stefan Kollmeder
USt-IdNr. DE 811 601 424
Bankverbindung Bayerische Landesbank
Steuernummer 132/158/03502

Kollmeder
Preßwerk GmbH & Co. KG
Ergolding/Bayern

TÜV CERT
DIN ISO 9002
Reg.-Nr. 12 100 5544

Gewölbte Scheiben
Flachböden
Normal gewölbte Böden
Klöpperböden
Korbbogenböden
Halbkugelböden
Diffusorböden
Konen
Durchmesser bis 5700 mm
Preßteile nach Zeichnung
Geschmiedet nahtlos gewalzte
Ringe und Flansche bis Ø 3500 mm
nach DIN und Sonderanfertigung
Schmiedeteile

Kollmeder
PRESSWERK

Kollmeder Preßwerk GmbH & Co. KG - Zeitlstraße 1 - 84030 Ergolding

Anlage zu Abnahmeprüfzeugnis Nr. 30391 hi vom 03.05.2004

C	Mn	Si	P	S	Cr	Ni	Mo	Cu	Sn
0,43	0,72	0,31	0,012	0,022	1.12		0,22		
Ca	Al	V	Ti	W	Ta	As	Co	Nb	Pb
B	N	Zr	Sb						

Der Werksachverständige

Hausanschrift
Zeitlstraße 1 – 84030 Ergolding / Bayern
Telefax (0871) 9 75 39 - 40
Internet: http://www.kollmeder-presswerk.de

Bankverbindungen
Raiffeisenbank Ergolding
Hypobank München
Postgiro München
Sparkasse Landshut

Kommanditgesellschaft, Sitz Ergolding – Registergericht Landshut HRA 7588
Sitz = Ergolding – Registergericht Landshut HRB 3558
Steuernummer 132 168/03802

10.2 Hydraulic cylinder art.no. 10915

BAUER
HYDRAULICS
BRØDR. BAUER-NILSEN AS

TEST CERTIFICATE
FOR HYDRAULIC CYLINDER(S)

Customer	:	**Dreggen Crane AS**
Order no.	:	**31945, Project 60338**
Serial no.	:	**69187 - 69188 (2 off)**
Job no.	:	**8979**
Approbation date	:	**NA**
Class. society	:	**None**

Type	:	**HS 1578 S10.2 ø280/ 200 x 2890**
Drawing no.	:	**AS 280 BDD**
Design pressure	:	**250 bar**

Intended use	:	Hydraulic Jib Cylinders
Design	:	Double acting cylinder
Pushing force	:	1539.3 kN / 250 bar
Pulling force	:	754.0 kN / 250 bar

Materials	:	Cylinder tube	: St. 52.3N
		Dimension	: 324/ 280 mm
		Rod	: St. 52.3N
		Dimension	: 200 mm

Test	:	Functional test	: OK
Measure contr.	:	C-C min.	: 3810 mm
		Stroke	: 2890 mm
		Pressure test	: 400 bar

We hereby confirm the above data.
All tests are carried out at our workshop.

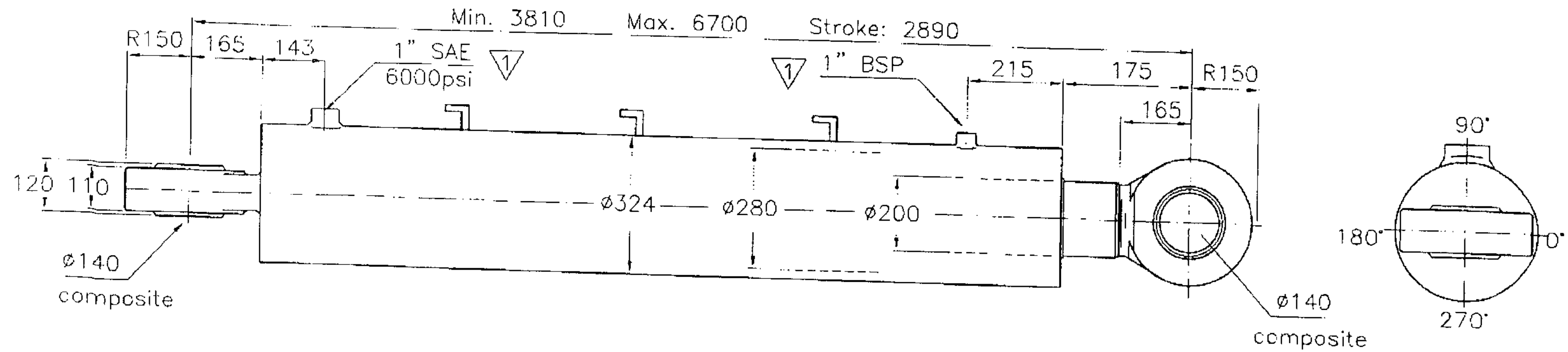
Haugesund, 04th of November 2005
BRØDR. BAUER-NILSEN AS

Finn Runge

Brodr. Bauer-Nilsen AS, Haugesund, Norway Tel.: +47 5270 7770 Fax: +47 5270 7799

1B

BUCKLING LOAD VARIES: 299-280-200-0-6700-3625-( )-140-484-0.20-345-2890)



Brackets for Ø20 pipe.

TECHNICAL DATA

Push (spes.)................: 6.1572 kN/ 1 bar
Pull (spes.)................: 3.0159 kN/ 1 bar
Buckling load ....: 4030 kN

Weight ....: 2295 kg

MATERIALS
Cylinder tube ....: St.52.3 N
Piston Rod ....: St.52.3 N w/80my Cr

Design pressure ....: 250 bar
Test pressure ....: 400 bar
Working pressure ....: 250 bar
Flow ....: 150 l/min
Grease nipples ....: M10x1.0

ART.NO: 502309

PRESERVATION: Sandblasted sa 2.5 - 50 my Zinc
150 my Hempadur mastic 4588
CLASSIFICATION: TBA

	FULL BORE SIDE	ANNULAR SIDE
PORTS	Pos. 90°	Pos. 90°
BLEEDERS	NO!	NO!

PART: HYDRAULIC CYLINDER 2 off
PROJECT: 60338 O.No: 31945
CUSTOMER: DREGGEN CRANE AS

Rev.	Alteration	Date / By		
1	1" SAE + 1" BSP	190105 / atk		
		Drawn	Checked	Approved

Date: 80898 Drawn by: K.S Traced Scale: --

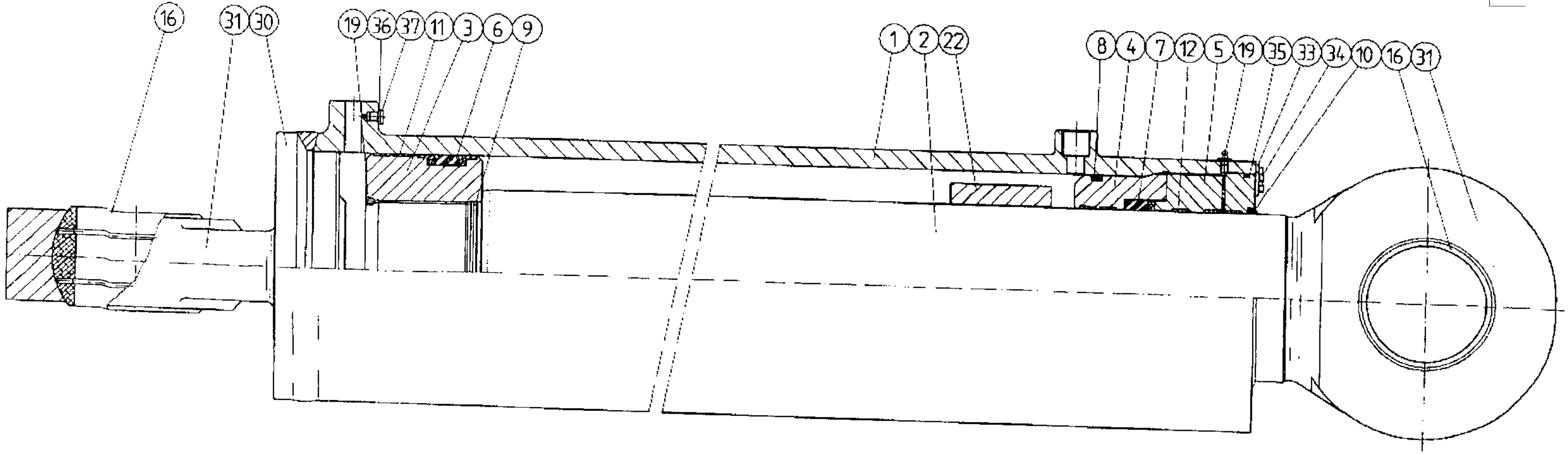
BAUER hydraulics HAUGESUND NORWAY

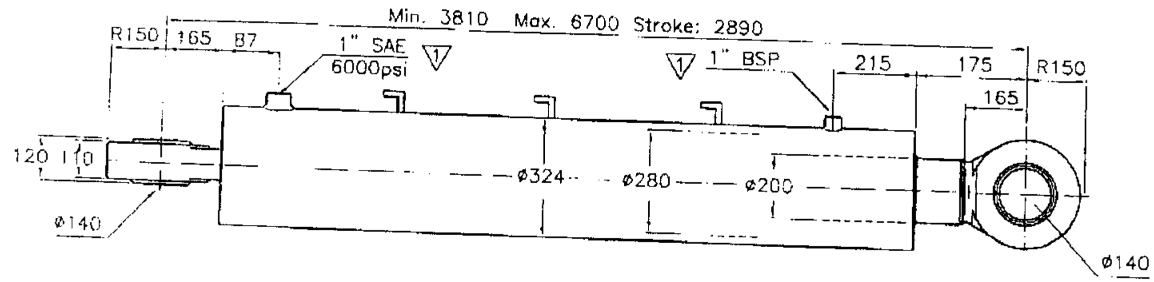
HYDRAULIC CYLINDER

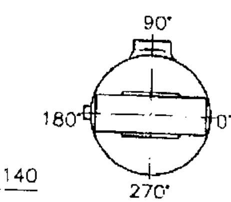
Reference to: HS 1578 S10.2 Calculation:

Drawing no: AS280 BDD Rev: 1

BRØDR. BAUER-NILSEN AS







Seal Kit 203746

POS	NO. OFF	PART	ART.NO	POS.	NO. OFF	PART	ART.NO	POS	OFF	PART	ART.NO
								37	1	PLUG	300478
								36	1	BONDED SEAL	302163
9	1	O-RING	301960					35	1	O-RING	302093
8	1	O-RING W/S. RING	301920 302981					34	4	SCREW	300227
7	1	PACKING	301647					33	1	LOCK PLATE	
6	1	PACKING	301619					31	2	END EYES	200395
5	1	STUFFING BOX	201604	16	2	SPHERICAL BEARING	304235	30	1	CYLINDER END	201535
4	1	GLAND	202112					22	1	DISTANCE RING	207479
3	1	PISTON HEAD	200107	12	5	GLIDING RING	302867	19	1	SCREW	300440
2	1	PISTON ROD	207478	11	2	GLIDING RING	302837	18	1	GREASE NIPPLE	301501
1	1	CYLINDER TUBE	207477	10	1	DIRT WIPER	302224				

CYLINDER TUBE ... Ø280
PISTON ROD Ø200

Date: 170105 astc/glk

Scale: 1 : 3.5

HYDRAULIC CYLINDER

Reference no: 502309

BAUER hydraulics HAUGESUND NORWAY

HS 1578 S10.2 BDD

BRØDR. BAUER-NILSEN AS

STINNES V. 1074870 213529,00 342625 Elisabeth Floen 23.06.2005 Z073016.001 S. 1 v.

TenarisDalmine

INSPECTION CERTIFICATE
ABNAHMEPRUEFZEUGNIS
(UNI EN 10204 3.1.B / ISO 10474 3.1.B)

N/N: 04/00493 Page/Seite: 001/002
Date/Datum: 13/01/2004

Dalmine plant
Piazza Caduti 6 luglio 1944, 1
24044 Dalmine - Italy
39 035 560 111 tel
39 035 560 3827 fax

Customer/Kunde: STINNES ROHRUNION GMBH
Address/Anschrift: AM INDUSTRIEPARK 2
Town/Stadt: 46562
Customer's order/Bestellung: 59014234.00
Country/Nation: D..
Customer's Refer./Position Kunde:
Job Number/Job Nummer: E/370368/17
Mill order/Ordre-Auftragsbestätigung: 1250371/017
Shipping Note/Versandanzeige: 00001071 - 13/01/2004

Product/Produkt:
SEAMLESS HOT ROLLED STEEL PIPES ACCORDING TO DIN 1629, EN 10210 ADW4 STEEL ST. 52.0 DIN 1629 AND S355J2H EN 10210-1 NORMALISED BLACK PLAIN ENDS.
NAHTL. STAHLROHRE, DIN 1629, EN 10210 AD-MERK-BLATT W4, STAHL ST 52.0 DIN 1629 UND S355J2H EN 10210-1 NORMALGEGLUEHT, ROHSCHWARZ, ENDEN GLATT.

Dimensions/Abmessungen

Lg. From/Lg. Von	Lg. To/Lg Bis	O.D. mm/AD mm	W.T. mm/WD mm	Pieces/Stueck	Mt/Mt	Kg/Kg	Feet/Feet	Lb/Lb
10000	13000	323,900	28,000	10	121,66	25553	399' 2"	56334,6

TENSILE TEST/ZUGVERSUCH

Test/Probe	Heat/Schmelze	°C	T	L/T	Type/Typ	Dimensions/Abmessungen	Sec./Sec. mm²	Rs N/MM2 % 0,20	Rs Min. 345	Rs Max.	Rm N/MM2 Min. 500	Rm Max. 630	Elongation(%)/Dehnung(%) Cal.	mm	Min.	Obt./Erm.
P2596	936603	+ 20		L	C11	13,95	152,6		405,0		544,0		5D	70,0	22,0	30,0
P2597	935420	+ 20		L	C11	13,90	151,7		386,0		555,0		5D	70,0	22,0	30,0

T = 1:AFTER P.W.H.T./NACH P.W.H.T.
2:AFTER 'STRAIN AGEING'/NACH 'STRAIN AGEING'
3:AFTER P.W.H.T.+AFTER 'STRAIN AGEING'/NACH P.W.H.T.+NACH 'STRAIN AGEING'

L/T = L:LONGITUDINAL/LAENGS FEHLER
T:TRANSVERSAL/QUER FEHLER

Tipo = Rec:RECTANGULAR/RECHTECKIG
Seg:TUBOLAR STRIP/TUBOLAR-Csegment
Rs = YIELD STRENGTH/STRECKGRENZE

C11:ROUND/ZYLINDERFÖRMIG
Tu :TUBULAR/TUBOLAR
Rm = TENSILE STRENGTH/ZUGFESTIGKEIT

IMPACT TEST/KERBSCHLAGZ

Note/Note: KCV LONG - 020 C JOULE

Test/Probe	Heat/Schm.	T	P	°C	L/T	Test spec./Probest. mm		U.M. JOULE 1°	2°	3°	Avg./Dur. (Min. 18,9 / 27,0)
P2596	936603		E	- 20,0	L	10	10,00	235,0	232,0	269,0	245,3

Note/Note: KCV LONG - 020 C JOULE

Test/Probe	Heat/Schm.	T	P	°C	L/T	Test spec./Probest. mm		U.M. JOULE 1°	2°	3°	Avg./Dur. (Min. 18,9 / 27,0)
P2597	935420		E	- 20,0	L	10	10,00	239,0	254,0	258,0	250,3

T = 1:AFTER P.W.H.T./NACH P.W.H.T.
2:AFTER 'STRAIN AGEING'/NACH 'STRAIN AGEING'
3:AFTER P.W.H.T.+AFTER 'STRAIN AGEING'/NACH P.W.H.T.+NACH 'STRAIN AGEING'

L/T = L:LONGITUDINAL/LAENGS FEHLER
T:TRANSVERSAL/QUER FEHLER

P = I:INSIDE/INNER
C:MIDWALL/MITTE
E:OUTSIDE/AUSSEN

TECHNOL. TESTS/RINGPRUEFUNGEN

Test/Probe	Heat/Schm.	T	Ring tens. Test/Ringzugver. E	Q	Num.
			1	2	1
P2596	936603		Test ok/Test ok		
P2597	935420		Test ok/Test ok		

T = 1:AFTER P.W.H.T./NACH P.W.H.T.
2:AFTER 'STRAIN AGEING'/NACH 'STRAIN AGEING'
3:AFTER P.W.H.T.+AFTER 'STRAIN AGEING'/NACH P.W.H.T.+NACH 'STRAIN AGEING'

E = 1:AT ONE END/AN EINEM ENDE
2:AT BOTH ENDS/ALLE ENDEN

Q = 1:EACH PIPE/JEDEN ROHRES
2:'n' PIPE OF THE LOT/'n' ROHR JE LOS GEPRUEFT
3:'%' PIPE OF THE LOT/'%' ROHR JE LOS GEPRUEFT

TenarisDalmine

Dalmine plant
Piazza Caduti 6 luglio 1944, 1
24044 Dalmine - Italy
39 035 560 111 tel
39 035 560 3827 fax

INSPECTION CERTIFICATE
ABNAHMEPRUEFZEUGNIS
(UNI EN 10204 3.1.B / ISO 10474 3.1.B)

N/N: 04/00493 Pag/Seite: 002/002
Date/Datum: 13/01/2004

Customer/Kunde	Town/Stadt	Customer's order/Bestellung	Customer's Ref./Position Kunde	Our order/Unsere Auftragsbestätigung
STINNES ROHRUNION GMBH		59014234.00		1250371/017

Address/Anschrift	Town/Stadt	Country/Nation	Job Number/Job Nummer	Shipping Note/Versandanzeige
AM INDUSTRIEPARK 2	46562	D..	E/370368/17	00001071 - 13/01/2004

Product/Produkt
SEAMLESS HOT ROLLED STEEL PIPES ACCORDING TO DIN 1629, EN 10210 ADW4 STEEL ST. 52.0 DIN 1629 AND S355J2H EN 10210-1 NORMALISED BLACK PLAIN ENDS.
NAHTL. STAHLROHRE, DIN 1629, EN 10210 AD-MERK-BLATT W4, STAHL ST 52.0 DIN 1629 UND S355J2H EN 10210-1 NORMALGEGLUEHT, ROHSCHWARZ, ENDEN GLATT.

Dimensions/Abmessungen

Lg. From/Lg. Von	Lg. To/Lg Bis	O.D. mm/AD mm	W.T. mm/WD mm	Quantity/Menge Pieces/Stueck	Mt/Mt	Kg/Kg	Feet/Feet	Lb/Lb
10000	13000	323,900	28,000	10	121,66	25553	399 ' 2"	56334,6

CHEMICAL COMPOSITION/CHEMISCHE ZUSAMMENSETZUNG

Heat/Schmelze			C	Si	Mn	P	S	Ni	Cr	Mo	V	Cu	Al	Ti	Nb	N	B	Ce Fl	F1
			x100			x1000		x100					x1000			x10000		x100	
	H	Max	22	55	160	35	35						40					47	99,999
		Min											20						02,000
935420	H		13	24	134	23	2	17	18	9	5	17	32	4	22	74	2	44	4,3243
936603	H		12	24	132	12	4	10	13	5	6	15	29	3	29	79	2	40	3,6709

Ce Fl = L.F./L.F. (C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15)
F1 = Al/N

"Im Einverneham mit dem TUV Bayern Januar 75"
"Laut schreiben des TUV Bayern von 4.4.1978 wird auf die Gegenzeichnung verzichtet"

REMARKS/ANMERKUNG

DIE ROHREN SIND 90 MINS,BEI 920^C NORMALISIERT WORDEN.
MARKIERUNG: D St.52.0 SCHMELZE QD.
DIE ROHRE WURDEN ELEKTROMAGNETISCH ZERSTOERUNGSFREI (STREUFLUSSVER- FAHREN) GEPRUEFT GEM. SEP 1925. MIT ZUFRIEDENSTELLENDEN ERGEBNISSE.

STANDARD EDITION/AUSGABE NACH

Standard/Nach	Year/Jahr	Revision/Überarbeitung	Year/Jahr
DIN 1629	1984		
EN 10210/1	1994		

VISUAL AND DIMENSIONAL CONTROL HAS BEEN CARRIED OUT WITH SATISFACTORY RESULT
BESICHTIGUNG UND MASSKONTROLLE WURDE OHNE BEANSTANDUNGEN DURCHGEFUEHRT

STEEL IS FULLY KILLED AND PRODUCED BY ELECTRIC FURNACE TO A FINE GRAIN PRACTICE
BERUHIGTER STAHL, AUS FEINKORN; IM ELEKTROOFEN GEFERTIGT

Quality System Certified
n.110950

SIGNATURE/UNTERSCHRIFT

QUALITY CERTIFICATION DPT
QUALITAETSZERTIFIZIERUNGSABTEILUNG
Luigi DONADONI

CHIEF OF QUALITY CERTIFICATION DPT
VERANTWORTLICHER DER QUALITAETSZERTIFIERUNGS
Marco BELLOLI

ASCOMETAL

Usine des Dunes
Boîte postale 41
59620 Rosendaël Cedex 2

LUCCHINI

TEST CERTIFICATE 3-1-B/EN 10204

CERTIFICATE Nr	CUSTOMER	CUSTOMER ORDER
3/65676	SMITH STAL VEST AS	6262187/6806
WORKS ORDER 219/1099 /02-01		CAST No A3352
DESCRIPTION SIZES WEIGHTS	7 rd 210 x12,050/12,200 m =22,865 T	
GRADE	S355J2G3N-EN10025	

CHEMICAL COMPOSITION 10-3%

C	Mn	Si	S	P	Ni	Cr	Mo	Va	Cu	Ti	Nb	N2
140	1208	336	32	12	90	248	27	83	113	11	28	ppm 66

MECHANICAL PROPERTIES

* TC PR	HEAT TREATMENT	* LT	Re N/mm2	Rm	A %	Z %	* LT	Temp. DEG C	IMPACT KV JOULES	HARDNESS HB
PR	Normalized	L	331	527	25.5	57.1	L	- 20	24.0- 40.0- 24.3	156/ 159

* CHECKED ON => TC=TEST COUPON PR=PRODUCT AS DELIVERED L=LONGITUD. T=TRANSVER.

OTHER RESULTS

CEC = 426 (<= 450)
Ultrasonic testing satisfactory

BRØDR. BAUER-NILSEN AS
QUALITY CONTROL
DATE: 27.10.03 SIGN: T DH

Acier exempt de radioactivité anormale - Steel free from abnormal radioactivity - Stahl Frei von anormaler Radioaktivität

I HEREBY CERTIFY THAT THE ABOVE-MENTIONED PRODUCTS COMPLY WITH THE ORDER REQUIREMENTS

DATE 30/09/03

STAMP OF INSPECTION SUPERVISOR

G. GIROUD GG

MG / 095

CLASSIFICATION DOCUMENTS

HYDRAULIC CYLINDERS SUPPLIED FOR

Dreggen Crane AS

31945

ORDRE NO.

10915

Art. No

MS 1578 S10.2 BDD ø280/ 200 - 2890

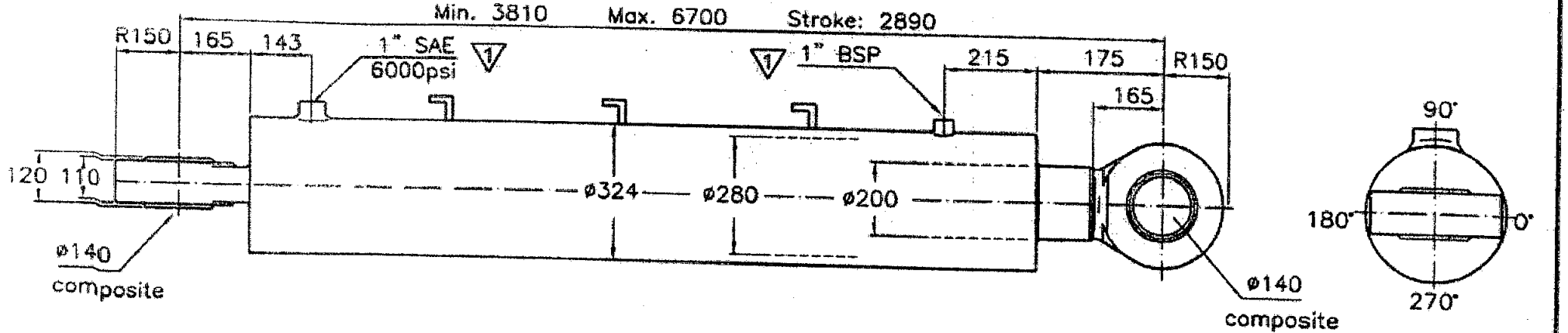
OBJECT

Design pressure: 250 bar

BAUER
HYDRAULICS
GREGR. BAUER-NILSEN AS

1B

BUCKLING LOAD VARI) S: 324-280-200-0-6700-3635-0.) 40-495-0.20-355-2890



Brackets for Ø20 pipe.

TECHNICAL DATA

Push (spes.)	6.1572 kN/ 1 bar
Pull (spes.)	3.0159 kN/ 1 bar
Buckling load	4313.5 kN
Weight	2295 kg

MATERIALS

Cylinder tube	S355J2H
Piston Rod	S355J2G3 w/80my Cr

Design pressure	250 bar
Test pressure	400 bar
Working pressure	250 bar
Flow	150 l/min
Grease nipples	M10x1.0

ART.NO: 502309

PRESERVATION: Sandblasted sa 2.5 + 50 my Zinc
150 my Hempadur mastic 4588

CLASSIFICATION: URS

	FULL BORE SIDE	ANNULAR SIDE
PORTS	Pos. 90°	Pos. 90°
BLEEDERS	NO!	NO!

PART: HYDRAULIC CYLINDER 2 off

PROJECT: 60338 O.No: 31945

CUSTOMER: DREGGEN CRANE AS

Rev.	Alteration	Date	By	Drawn	Checked	Approved
		Date				
		By				
1	1" SAE + 1" BSP	Date	190105			
		By	gtk			

Date: 180898 | Drawn by: K.S | Traced: | Scale: --
Checked by: | Approved by: | Projection:

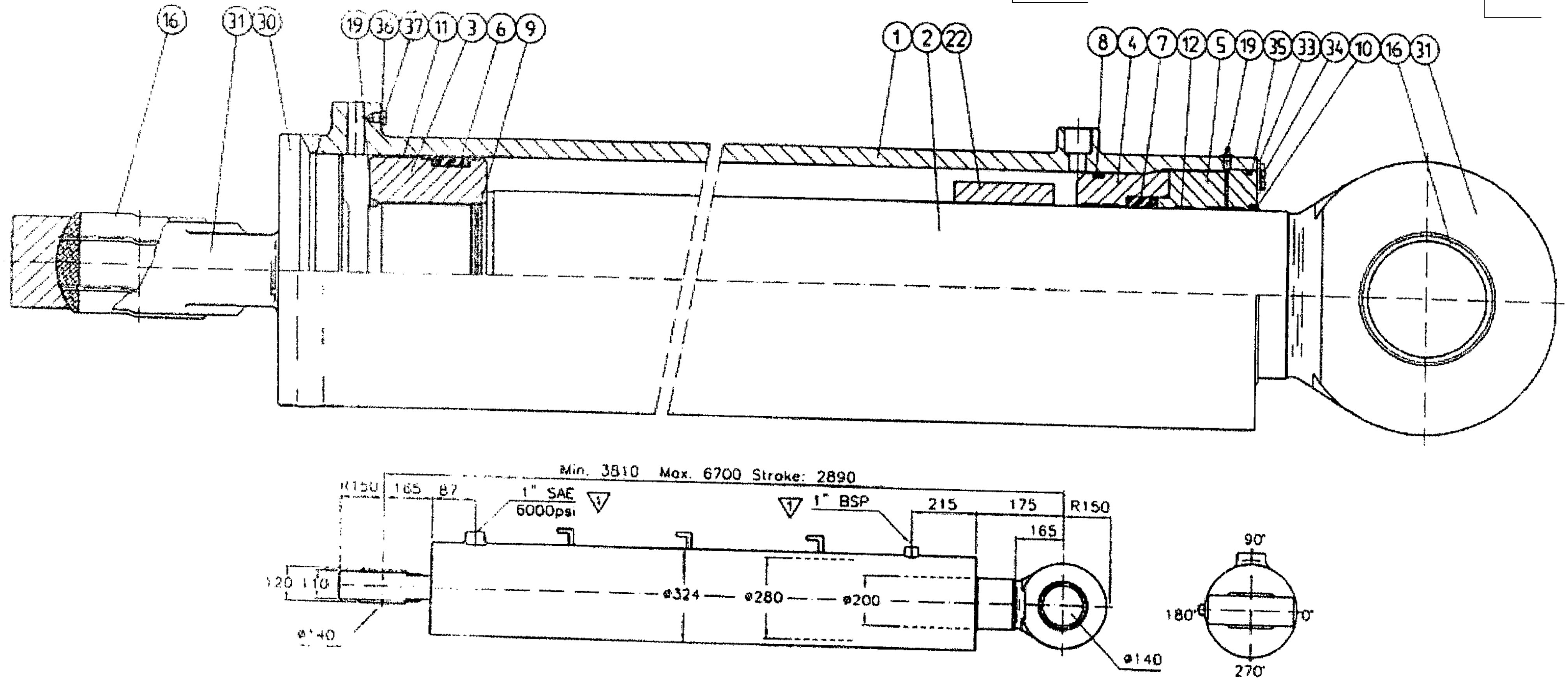
BAUER hydraulics
HAUGESUND NORWAY

HYDRAULIC CYLINDER

Replaces: | Replaced by:
Drawing no.: AS280 BDD | Rev.: 1

Reference to: HS 1578 S10.2 | Calculation:

BRØDR. BAUER-NILSEN AS



Seal Kit. 203746

POS.	QTY	PART		ART.NO	POS.	QTY	PART		ART.NO	POS.	QTY	PART		ART.NO
										37	1	PLUG	1/4" BSP	300478
9	1	O-RING		301960						36	1	BONDED SEAL	1/4"	302153
[illegible]	1	O-RING W/S RING		301920 302681						35	1	O-RING		302093
[illegible]	1	PACKING		301647						34	4	SCREW	M6x12 DIN 912 SS	300227
[illegible]	1	PACKING		301699						33	1	LOCK PLATE		
[illegible]	1	STUFFING BOX	SG 200 DAC	201604	16	2	SPHERICAL BEARING	SL 140 DAC	304235	31	2	END EYES	SA 140 DAR	200395
[illegible]	1	GLAND	SB200 DAP	202142						30	1	CYLINDER END	SE 280 DAB	201935
[illegible]	1	PISTON HEAD	SH 280 DAB	200107	12	5	GUIDING RING		302887	22	1	DISTANCE RING	SD 200 DAA	207479
[illegible]	1	PISTON ROD	ST 200 DAF	207478	11	2	GUIDING RING		302837	19	3	SCREW	M8x10 DIN 916	300440
[illegible]	1	CYLINDER TUBE	SR 280 DBK	207477	10	1	DIRT WIPER		302224	18	1	GREASE NIPPLE	1/4" BSP	301501

CYLINDER TUBE ø280
PISTON ROD ø200

Rev.	Alteration	Date By	Drawn	Checked	Approved

Date: 190105
Drawn by: asto/gtk
Scale: 1 35

BAUER hydraulics
HAUGESUND NORWAY

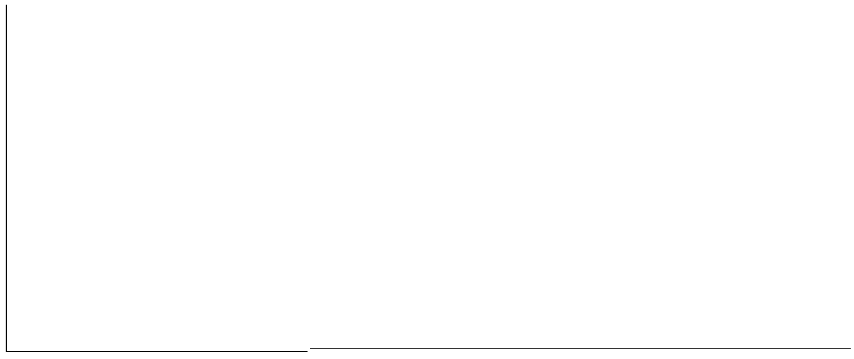
HYDRAULIC CYLINDER

Reference to: 502309

Drawing no: HS 1578 S10.2 BDD

BRØDR. BAUER-NILSEN AS

CALCULATION OF CYLINDER TUBE ACCORDING TO PD 5500:2003



Material: S355J2H R_e = 355 N/mm² R_m = 490 N/mm²

Variables used in calclations:

Design pressure :	p	25.0	N/mm²	Nominal design stress		
Innside dia. of tube :	Di	280	mm	given in table 2.3(a) : f	208	N/mm²
Outer dia.:	Do	324	mm			

Minimum thickness of cylindrical shell:

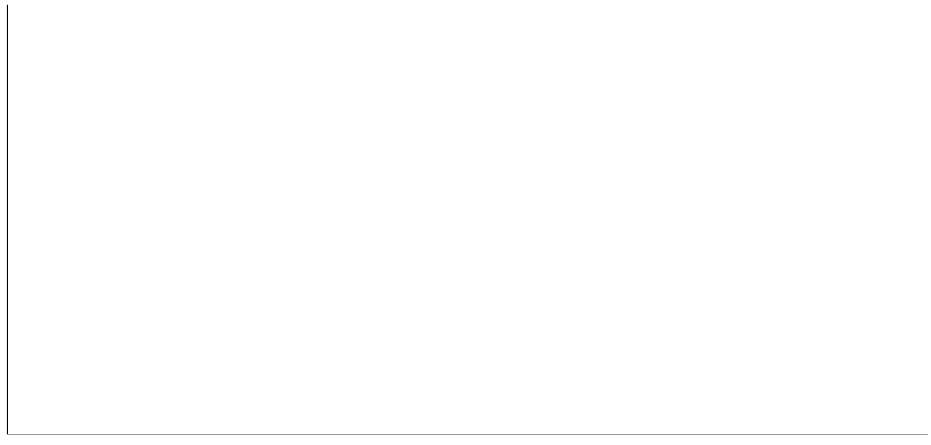
Formulae to be used ref. PD 5500 3.5.1 :

$$e \quad \frac{p \cdot Di}{2 \cdot f \quad p} \quad 1 \quad mm \qquad e = 18.9 \quad mm$$

Thickness of cylindrical shell is:

$$e_{cyl} \quad \frac{Do \quad Di}{2} \quad mm \qquad e_{cyl} = 22 \quad mm$$

CALCULATION OF CYLINDER TUBE



Material: S355J2H Re = 355 N/mm² Rm = 490 N/mm²

Variables used in calculations:

Pressure in tube:	p	250	bar	Inner dia.:	D	280	mm	Length	L	66	mm
Outer dia.:	A	324	mm	Threads dia:	T	292	mm	Pitch:	Q	4	mm

Note! Thread dia. = Top dia. of thread.

Force on threads: $F \quad D^2 \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N F = 1539380 N

Pos. 1 Tensile stress in tube:

$$\sigma \quad \frac{A^2 \cdot D^2}{A^2 \quad D^2} \cdot \frac{p}{10}$$ N/mm² σ = 172.5 N/mm²

Pos. 2 Tensile stress in weld

$$\sigma \quad \frac{F}{A^2 \quad D^2 \quad \pi}{4}$$ N/mm² σ = 73.8 N/mm²

Pos. 3 Shear stress in threads

$$\tau \quad \frac{F}{(T \quad Q)\ 0.6\ L\ \pi}$$ N/mm² τ = 43 N/mm²

CALCULATION OF PISTON ROD

Material: S355J2G3 Re=355 N/mm² Rm=490 N/mm²

Variables used in calculations:

Design pressure :	p	250	bar	Rod diameter :	d	200	mm	Length:	L	106	mm
Cylinder bore :	D	280	mm	Thread dia.:	T	168	mm	Pitch:	Q	4	mm

NOTE! Thread dia. = Top dia. of threads.

Force on threads: $F \quad D^2 \quad d^2 \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N F = 753982 N

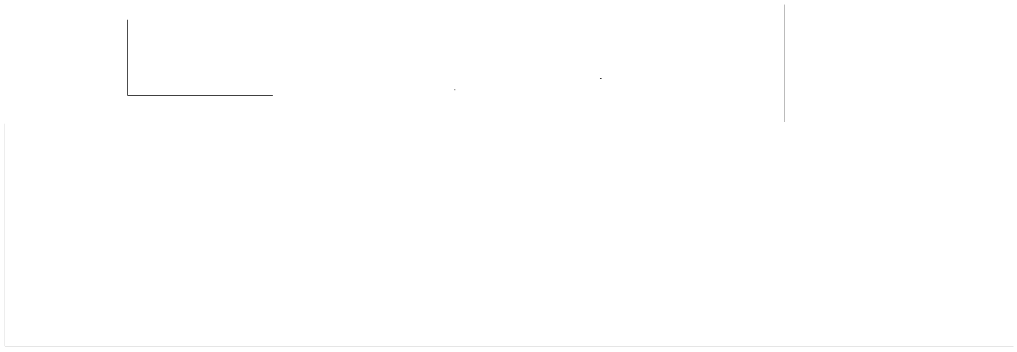
Pos. 1 Shear stress in threads:

$$\tau \quad \frac{F}{(T \quad Q) \cdot \pi \cdot L \cdot 0.6} \quad \text{N/mm}^2 \qquad \tau = 23 \quad \text{N/mm}^2$$

Pos. 2 Compressive stress in weld:
See "CALCULATION OF END EYES",
Pos. 2 "Compressive stress in weld"

Tensile stress in end eye:
See "CALCULATION OF END EYES",
Pos. 1 "Tensile stress in end eye"

CALCULATION OF CYLINDER END ACCORDING TO PD 5500:2003



Materials S355J2G3 Re = 355 N/mm² Rm = 490 N/mm²

Variables used in formulae:

Outside diameter :	Do	324	mm	Min. thickness of cylindrical shell derived from formulae 3.5.1.2 :	ecylo	18.9	mm
Inside diameter :	Di	280	mm				
Thickness of cylindrical shell :	ecyl	22	mm	Design pressure :	p	25.0	N/mm²
Thickness of cylinder end :	eend	85	mm	Nominal design stress given in table 2.3(a) :	f	208	N/mm²

Formulae to be used according to PD 5500

Min. thickness of cylinder end:

$$e = C \cdot D \cdot SQR(p/f)$$

C is determined from fig. 3.5.5(3). With the expressions $\frac{p}{f} = 0.1$ and $\frac{ecyl}{ecylo} = 1.2$ used in the diagram, the high values of these expression gives the value C 0.41

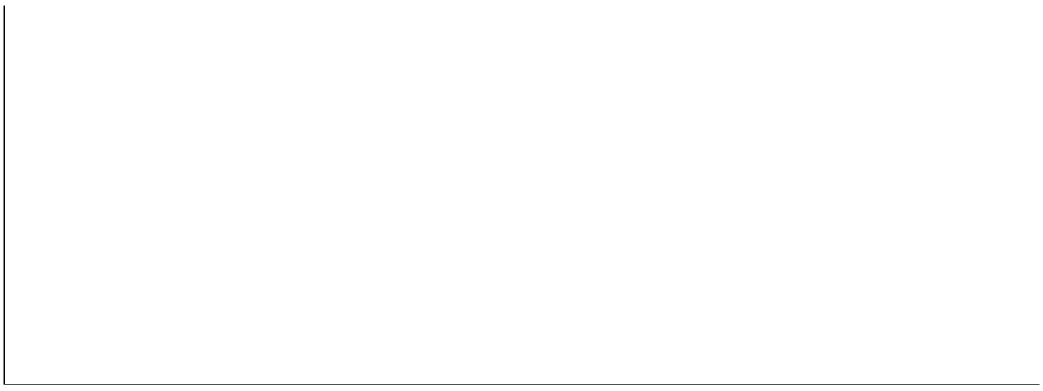
The value of D is given as $D = Di + \frac{Do - Di}{2}$ mm.

Min. thickness of cylinder end will be

$e = C \cdot D \cdot \sqrt{\frac{p}{f}}$ mm $\quad e = 42.9$ mm

Thickness of cylinder end eend = 85 mm

CALCULATION OF CYLINDER END



Material: S355J2G3 Re=355 N/mm² Rm=490 N/mm²

Variables used in calculations:

Designe pressure: p 250 bar
Cylinder bore: D 280 mm

Outer dia.: A 324 mm
Thickness of cylider end: T 85 mm
NOTE! Thread dia. = Top dia. of thread.

Pushing Force: $F = D^2 \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N

F = 1539380.4 N

Pos. 1 Tensile stress in weld:

$$\sigma = \frac{F \cdot 4}{A^2 \quad D^2 \cdot \pi}$$ N/mm²

σ = 73.8 N/mm²

CALCULATION OF BUFFER

Material: S355J2G3 Re=355 N/mm² Rm=490 N/mm²

Variables used in calculations:

Design pressure :	p	250	bar	Thread dia.:	T	292	mm	Length:	L	66 mm
Cylinder bore :	D	280	mm	Pitch:	Q	4	mm			

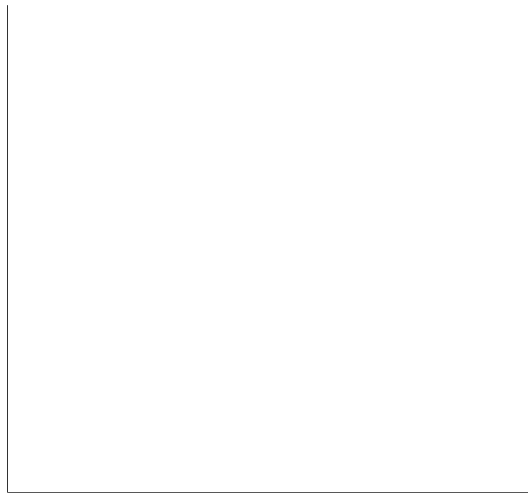
NOTE! Thread dia. = Top dia. of threads.

Force on threads: $F = \frac{D^2 \cdot \pi}{4} \cdot \frac{p}{10}$ N F = 1539380 N

Pos. 1 Shear stress in threads.

$$\tau = \frac{F}{(T - Q) \cdot L \cdot \pi \cdot 0.6}$$ N/mm² τ = 43 N/mm²

CALCULATION OF PISTON HEAD



Material: S355J2G3 Re=355 N/mm² Rm=490 N/mm²

Variables used in calculations:

Design pressure : p = 250 bar
Cylinder bore : D = 280 mm
Rod diameter : d = 200 mm

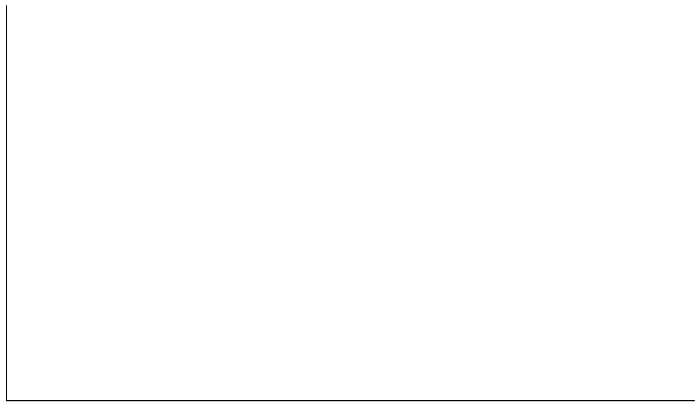
Thread dia.: T = 168 mm Length: L = 106 mm
Pitch: Q = 4 mm
NOTE! Thread dia. = Top dia. of threads.

Force on threads : $F = (D^2 - d^2) \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N $\quad F = 753982$ N

Pos. 1 Shear stress in threads:

$$\tau = \frac{F}{(T - Q) \cdot \pi \cdot L \cdot 0.6} \text{ N/mm}^2 \qquad \tau = 23 \text{ N/mm}^2$$

CALCULATION OF END EYES



Material: S355J2G3 Re=355 N/mm² Rm=490 N/mm²

Variables used in calculations:

Design pressure :	p	250	bar	Length:	C	155	mm	Radius:	R	150 mm
Cylinder bore :	B	280	mm	Dia :	D	194	mm	Width:	W1	110 mm
Rod diameter :	d	200	mm					Width:	W2	85 mm

Pushing force : F1 $B^2 \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N F1 = 1539380 N

Pulling force : F2 $B^2 - d^2 \cdot \frac{\pi}{4} \cdot \frac{p}{10}$ N F2 = 753982 N

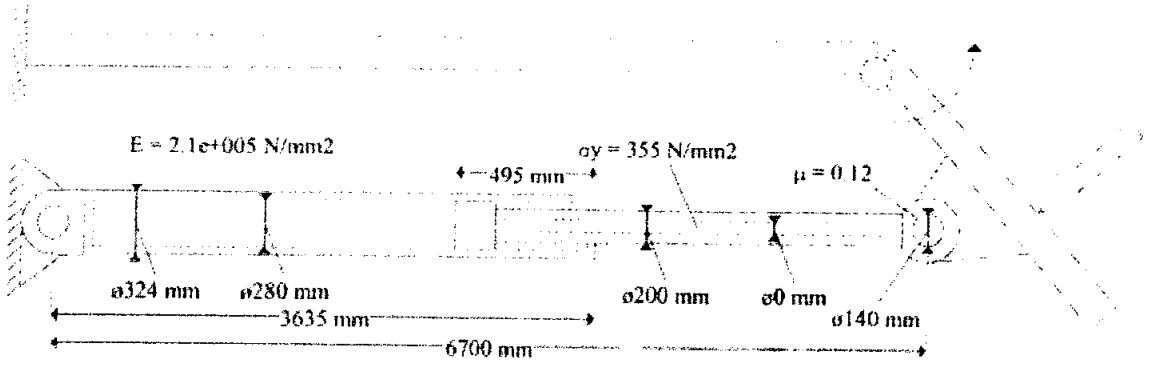
Pos 1 Tensile stress:

$$\sigma = \frac{F2}{(2R - D)\,W1} \text{ N/mm}^2 \qquad \sigma = 64.7 \text{ N/mm}^2$$

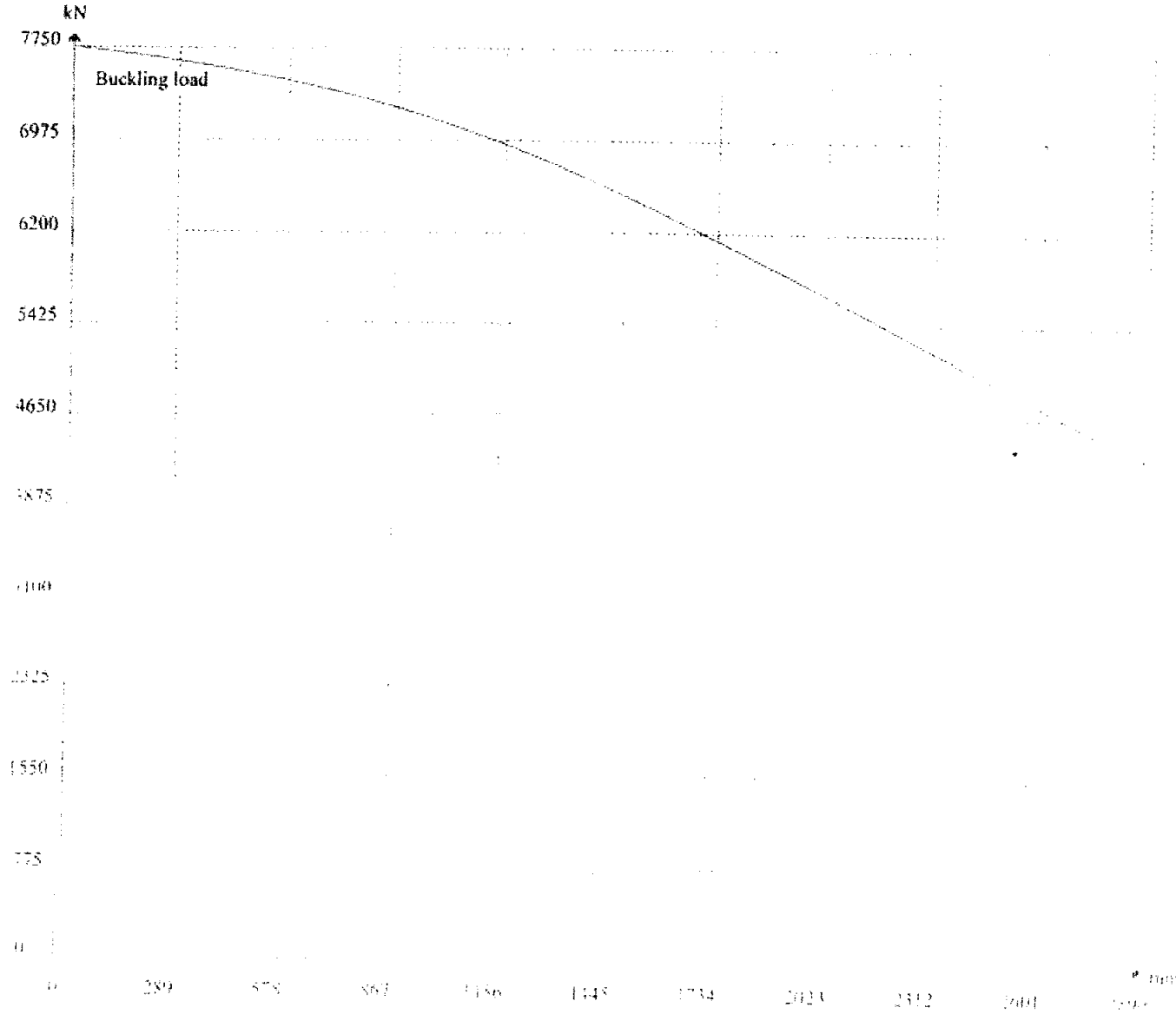
Pos 2 Compressive stress in weld

$$\sigma = \frac{F1}{C \cdot W2} \text{ N/mm}^2 \qquad \sigma = 116.8 \text{ N/mm}^2$$

Manufacturer :	Brødrene Bauer Nilsen
Cylinder Id :	280/200x2890 - AS280BDD
Yard :	Dreggen Crane AS
Date :	2005.11.25



Results from calculation:
Buckling load Lmax = 4313.49 kN, λ at Lmax= 107.81



10.3 Slewing, hydraulic motor art.no. 13266

SERVI

CERTIFICATE OF CONFORMITY

This is to certify that the following component:

Description: Eaton Hydraulics Inc. Gerolermotor

Customer: Dreggen Crane AS

Customer ref.: 31972 # 60338/51 - Kenneth Låstad – DØ

Our ref.: S6082654 – Torill Apelthun

to our knowledge, has been manufactured, assembled and tested in accordance with the drawings and standards, as well as good workmanship and skilled labour of the manufacturer:

Technical info:	104-1471-006 M0206H23G00A0F Char Lynn 2000 Series Motor 101,6ccm 32mm keyed shaft 4 bolt std. flange manifold mount.
	Dreggen Item No.: 13266

During our handling of the component, we have not discovered any sign of failure.

Servi Motion Control AS

Place: Bergen, Date: 07.09.2005

Torill Apelthun

Sign.: Torill Apelthun

Servi Motion Control AS

Ski (hovedkontor/headoffice)

Haugenveien 2
Postboks 3230
N-1402 Ski
Tlf +47 64 97 97 97
Fax +47 64 97 98 99

Org.nr. 936 370 446
e-mail: servi@servi.no
www.servi.no
ISO 9001- sertifisert

Bergen Tlf +47 55 10 82 20

Ulsteinvik Tlf +47 70 01 85 80

Trondheim Tlf +47 73 80 10 00

Rissa Tlf +47 73 85 05 00

10.4 Winch, hydraulic motor art.no. 14222

Art.no. 14222

CERTIFICATE OF CONFORMANCE
Bekreftelsessertifikat

MANUFACTURER: Produsent:	Sauer-Danfoss GmbH & Co. D-24531 Neumünster GERMANY

CUSTOMER: Kunde: Dreggen Crane A/S	CUSTOMER NO.: Kundenr.: 54458
CUSTOMERS PURCHASING NO.: 32099/K Låstad Kundens bestillingsnr.:32099/K Låstad	

SAUER-DANFOSS ORDER NO.: 642234 Sauer-Danfoss ordrenr.:642234	POS.NO.:
DESCRIPTION: Beskrivelse: Hydraulic variable motor type 51V160 51V160 RF1N N2NN 0NA0 NNN 160 AANN 0000 Art.nr:192G6540AA	QUANTITY: Antall: 1

CONDITION OF MATERIAL AS DESPATCHED: Varetilstand ved levering: Montert - ulakkert
APPLICABLE SPESIFICATION/STANDARD OR TYPE APPROVAL: Anvendt spesifikasjon/standard eller typegodkjennelse: ISO 9001
REMARKS: Anmerkninger:

Sauer-Danfoss AS Årenga 2 NO-1340 Skui	Telefon: +47 67 17 73 73 Telefax: +47 67 13 68 50
Sign: Tim Gundersrud	Date: 28. oktober 2005

10.5 Wire rope art.no. 14240

10.6 Hook art.no. 12971

10.7 Shackle art.no. 13525

60338

BALMORAL NORGE AS
SAKKYNDIG VIRKSOMHET

FORM No. 5

Kunde (client) : Dreggen Crane A/S		*SERTIFIKAT Nr. / Certificate No.:*	Sertifikat nr. SV047
Ref : 32521	BN ref : 52361	BN2-6038 / 2005	

Sertifikat for prøving og undersøkelse av ståltau (wire) før det tas i bruk

Certificate of Test and Examination of steel wire rope before taken into use

Navn og adresse på fabrikant eller forhandler av tauet. *Name and address of the maker or supplier of the rope*	Balmoral Norge AS, P.O. Box 5006, Tangen II N-4004 Stavanger, NORWAY
Omkretsen (diameter) av tauet i mm. *Circumference of rope in mm.*	26 mm
Antall kordeller *Number of strands*	Flexpack
Antall tråder i hver kordell *Number of wires per strand*	Flexpack
Slåing (trosse, kabel, høyre, venstre) *Lay (hawser, cable, right, left).*	Right Lang Lay
Materialsort i trådene. *Quality of wire*	2160 N / mm²
Datum da tauprøven ble utført. *Date of test of sample of rope.*	11.01.05
Minimum bruddlast. *Minimum breaking load* Faktisk bruddlast. *Actual breaking load*	64,77 tonn tonn
Tillatt arbeidsbelastning med angivelse av enhver gitt betingelse for denne, som f.eks. en minste skivediameter, en direkte belastning etc. *Safe working load subject to any qualifying conditions such as minimum sheave diameter, direct tensile etc.*	20% av bruddbelastning / *20% of min. breaking load* W.L.L. 12,95 tonn. Sikkerhetsfaktor / *Safety factor* 5 : 1
Navn og adresse på den institusjon, det selskap eller firma eller den person som utførte prøven. *(Name and address of manufacturer, company, association or distributor that performed the test and examination)*	Balmoral Norge A/S P.O. Box 5006, Tangen II N-4004 Stavanger, NORWAY
Den ansvarshavendes navn og stilling i ovennevnte institusjon, Sakkyndig Virksomhet som utførte prøven og undersøkelsen *The responsible persons name and position in the institution that performed test and examination.*	TROND EGIL WATLAND *FAGLIG LEDER, SAKKYNDIG VIRKSOMHET* *(Competent person)*
Ståltauets utførelse etter standard *Steel wire rope construction as per standard*	Må ikke varmebehandles (Do not heattreat)

1 x 45,5 mtr 26 mm dia Flexpack non rotation wire rope w/open spelter socket on innerend Fused other end.
Original certificate on wire : 15270/04.004 Original certificate on spelter socket : R051023

Undertegnende attesterer at ovennevnte oppgaver er riktig og at prøven er utført etter bestemmelsene i Forskrifter Best. nr. 522 Vedlegg I Maskiner, og at prøven ble utført under oppsyn av en Sakkyndig Virksomhet.
The signatory confirms that the above mentioned information is correct and the test carried out in accordance with Forskrifter Best. nr. 522 Vedlegg I Maskiner under supervision of Sakkyndig Virksomhet (authorised company).

Sted og Dato : Kristiansund N. 01.11.2005 *(Place and Date)*	Underskrift : *(Signature)* Arvid Morken

60338

BALMORAL NORGE AS

SAKKYNDIG VIRKSOMHET

FORM No. 4

Kunde (client) : Dreggen Crane AS		*SERTIFIKAT Nr. / Certificate No.:*	NORSK SERTIFISERING AS Sertifikat nr. SV047
Ref : 33153	BN ref : 62016	BN2-6140 / 2006	

Sertifikat for prøving og undersøkelse av kjettinger, ringer, kroker, sjakler, svivler,blokker og andre løfteredskaper [1]

Certificate of Test and Examination of Chains, Rings, Hooks, Shackles, Swivels, Pulley blocks and other lifting accessories

Kjenningsnr. *Distinguishing no* (1)	Angivelse av det som er prøvet med oppgave over materiale og dimensjoner *Description of item* (2)	Antall av det som er prøvet *Number tested* (3)	Datum da prøven ble utført *Date of test* (4)	Anvendt prøvevekt (last) *Proof load applied* (5)	Tillatt arbeids-belastning *Working load limit* (6)
				Tonn	Tonn
FB 2 ED 39 FA 1	Gunnebo safety hook type BKLK-18/20-8. WLL 12,5 Tonn Sikkerhetsfaktor : 4 : 1 i.h.t. standard : NS-EN 1677	1	140206	33.6	12,5

Må ikke varmebehandles
(Do not heattreat)

(7)	Ble redskapene undersøkt av en sakkyndig virksomhet etter prøvebelastningen og funnet å ha utholdt belastningen uten deformasjon og å være fri for brudd, brist eller andre feil? (*Was the above gear examined by a competent person and found to have withstood the proof load without damage or deformation, and no fraction, cracks etc detected.*)	JA (*YES*)
(8)	Navn og adresse til fabrikanten eller forhandleren (*Name and address of manufacturer or distributor*)	Viking Moorings, Postboks 5006, Tangen II NorSea Base Dusavik, 4084 STAVANGER
(9)	Navn og adresse på sakkyndig virksomhet som utførte prøven og undersøkelsen. (*Name and address of manufacturer, company, association or distributor that performed the test and examination*)	Viking Moorings Postboks 5006, Tangen II NorSea Base Dusavik, 4084 STAVANGER
(10)	Den ansvarshavendes navn og stilling i ovennevnte institusjon, Sakkyndig Virksomhet som utførte prøven og undersøkelsen. (*Position of signatory that performed test and examination*)	TROND EGIL WATLAND *FAGLIG LEDER, SAKKYNDIG VIRKSOMHET (Competent person)*

Jeg attesterer herved på vegne av dem som er nevnt under ovenstående nr. 8*/9*) at de ovennevnte oppgaver er riktige og tilfredsstiller krav gitt i Forskrift best. nr. 522 Maskiner og best. nr. 555 Bruk av arbeidsutstyr og at produktet er produsert i samsvar med bestemmelsene i forskrift om maskiner best. nr. 522, som gjennomfører europeisk lovgivning om maskiner gitt i Rådsdirektiv 89/393/EØF av 14. juni 1989, endret ved Rådsdirektiv 91/368/EØF av 20. juni 1991.

(I certify on behalf of thoose mention above under no. 8/9*) that information given above are correct and are in compliance with rules and regulations given in Forskrift best. nr. 522 Machinery and best. nr. 555 Use of Working Equipment*

Sted og Dato : Stavanger 14.02.2006 (*Place and Date*)	Underskrift : Trond Egil Watland (*Signature*)

BALMORAL MARINE
SAKKYNDIG VIRKSOMHET

FORM No. 4

Kunde (client) : Dreggen Crane AS		***SERTIFIKAT Nr. / Certificate No.:***	Sertifikat nr. SV047
Ref : 32914	**BN ref :** **52408**	**BN2-6106 / 2005**	

Sertifikat for prøving og undersøkelse av kjettinger, ringer, kroker, sjakler, svivler,blokker og andre løfteredskaper [1)]

Certificate of Test and Examination of Chains, Rings, Hooks, Shackles, Swivels, Pulley blocks and other lifting accessories

Kjenningsnr. *Distinguishing no* (1)	**Angivelse av det som er prøvet med oppgave over materiale og dimensjoner** *Description of Item* (2)	**Antall av det som er prøvet** *Number tested* (3)	**Datum da prøven ble utført** *Date of test* (4)	**Anvendt prøvevekt (last)** *Proof load applied* (5)	**Tillatt arbeids-belastning** *Working load limit* (6)
				Tonn	Tonn
T5	Baoli safety bow shackle, WLL 12,0 tonn Sikkerhetsfaktor 6 : 1 Overført fra original sertifikat : SC YB-23042 I.h.t. standard :	6	080204	24,0	12,0

Må ikke varmebehandles (Do not heattreat)

(7)	Ble redskapene undersøkt av en sakkyndig virksomhet etter prøvebelastningen og funnet å ha utholdt belastningen uten deformasjon og å være fri for brudd, brist eller andre feil? *(Was the above gear examined by a competent person and found to have withstood the proof load without damage or deformation, and no fraction, cracks etc detected.)*	**JA** *(YES)*
(8)	Navn og adresse til fabrikanten eller forhandleren *(Name and address of manufacturer or distributor)*	**Balmoral Norge AS, Postboks 5006, Tangen 11 NorSea Base Dusavik, 4084 STAVANGER**
(9)	Navn og adresse på sakkyndig virksomhet som utførte prøven og undersøkelsen. *(Name and address of manufacturer, company, association or distributor that performed the test and examination)*	**Balmoral Norge AS, Postboks 5006, Tangen 11 NorSea Base Dusavik, 4084 STAVANGER**
(10)	Den ansvarshavendes navn og stilling i ovennevnte institusjon, Sakkyndig Virksomhet som utførte prøven og undersøkelsen. *(Position of signatory that performed test and examination)*	**TROND EGIL WATLAND** *FAGLIG LEDER, SAKKYNDIG VIRKSOMHET (Competent person)*

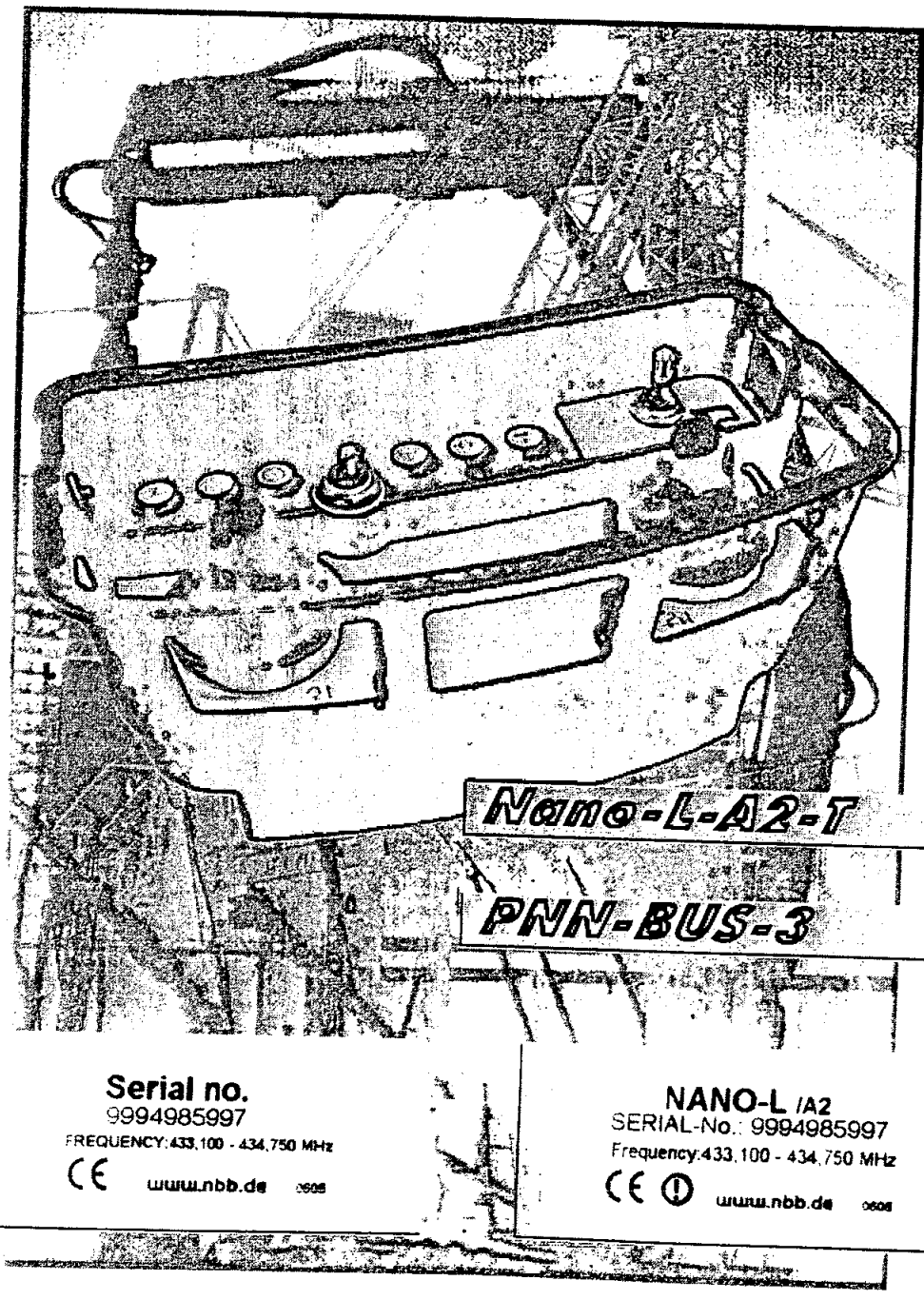
Jeg attesterer herved på vegne av dem som er nevnt under ovenstående nr. 8*/9*) at de ovennevnte oppgaver er riktige og tilfredsstiller krav gitt i **Forskrift best. nr. 522 Maskiner og best. nr. 555 Bruk av arbeidsutstyr** og at produktet er produsert i samsvar med bestemmelsene i forskrift om maskiner best. nr. 522, som gjennomfører europeisk lovgivning om maskiner gitt i Rådsdirektiv 89/393/EØF av 14. Juni 1989, endret ved Rådsdirektiv 91/368/EØF av 20. Juni 1991.

(I certify on behalf of thoose mention above under no. 8/9*) that information given above are correct and are in compliance with rules and regulations given in* ***Forskrift best. nr. 522 Machinery and best. nr. 555 Use of Working Equipment***

Sted og Dato : Stavanger 19.12.2005 *(Place and Date)*	**Underskrift :** *(Signature)* Trond Egil Watland

10.8 Radio control art. no. 13973

OPERATING INSTRUCTIONS



1. STANDARD SPECIFICATION

- Portable transmitter with two replaceable 7,2 volt NiCd batteries, neck and waist straps.
- Receiver with NBB adapter plate for fastening purposes (PNN-BUS-3), receiver with 4 fixing angles (PNN-BUS-5) or with integrated mounting holes (R-16, R-CAN, Compact-M and Compact-V).
- Multi-pin connecting cable for the receiver according to your specifications.
- Automatic battery charger with charging adapter (rapid charging in three hours).

The actual delivery specification is as detailed on the confirmation of order or the delivery note accompanying the goods!

2. SAFETY PRECAUTIONS

Even if you are accustomed to working with radio control systems, read these operating instructions carefully before using this equipment. Only this document contains the latest information relating to your NBB radio control system.

For explanatory notes on obtaining an operating permit please refer to registration documents enclosed in the appendix of this operating instruction. Observe all applicable work-safety and accident prevention regulations carefully. Only fully trained, authorized personnel may use the NBB radio control equipment. Components, etc. built into the NBB equipment for safety purposes must be regularly inspected.

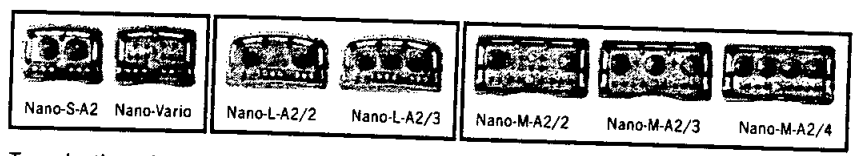
If the NBB radio control unit develops a fault, it must be shut down immediately. The transmitter should be switched off with the EMERGENCY STOP switch. The connecting cable must be disconnected at the receiver from the connecting socket (terminal) of the unit to be controlled. The repair of the equipment must not be carried out other than by NBB or an NBB authorized technician.

Failure to observe these recommendations will put both you yourself and others at risk. Under these circumstances, NBB rescinds the guarantee and any other form of liability. This radio control unit is designed exclusively for the control of construction machines and industrial plants. Only under these conditions are the safety systems (EMERGENCY STOP, zero setting) fully effective. No other form of use is permitted.

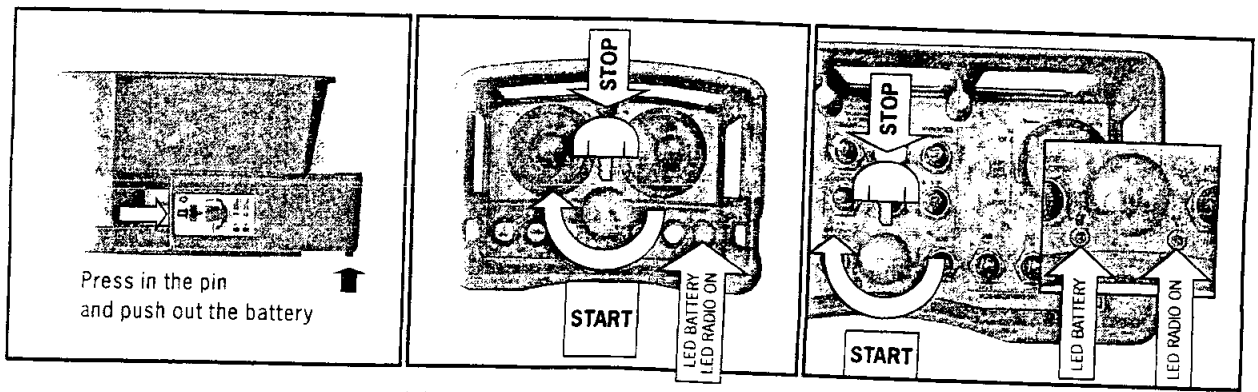
Any non-observance of this condition will relieve NBB of all liability.

3. TRANSMITTER

Nano, Nano-L, Nano-M



To make the unit ready for use, insert the battery into the battery compartment. To remove the battery, press in the pin and push out the battery. The power supply to the transmitter is activated with the EMERGENCY STOP switch. (When pressed, the EMERGENCY STOP switch can also be secured by removing the key cap). The green LED on the transmitter control panel must flash regularly. Commands can now be put in by means of the controls. The operating period with a charged battery is approximately 8 hours with the transmitter in continuous use.

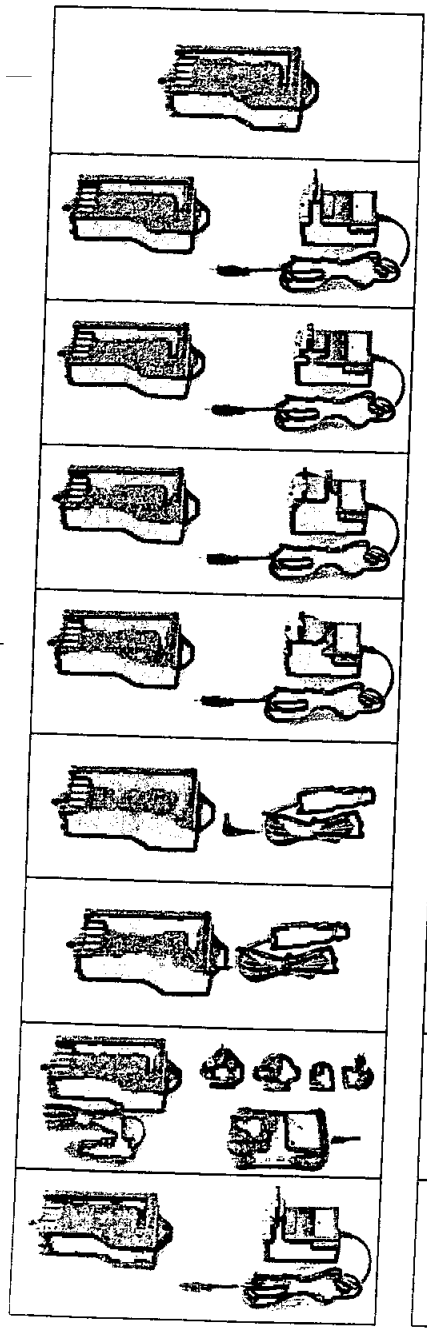


When the red "Battery" indicator lamp lights up, the battery is nearly empty. The transmitter can be operated for approximately 15 minutes more in this condition. During this time, bring the unit to be controlled to a safe position and install a new battery. Removal of the battery interrupts the radio link. As a result, the master switch for the unit to be controlled must be switched on again. Charge the discharged battery with the charger supplied.

4. BATTERY CHARGER L-AD72A2

For charging NiCd and NiMH batteries (7,2V).

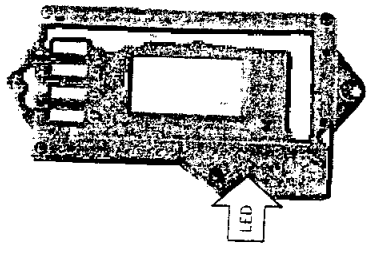
Optional: Integrated battery charger if DC-supply: In the receivers R-16, R-CAN, Compact-M and Compact-V rapid charging in about 1 hour. In PNN-BUS-3 about 3 hours. Use this battery charger only in closed rooms.



2.250.1449	Universal-charger (without cable), black (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.250.1450	Universal-charger set with 2m cable, black, pluggable with plug Europe and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.251.1450	Universal-charger set with 2m cable, black, pluggable with plug USA/Japan and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.252.1450	Universal-charger set with 2m cable, black, pluggable with plug GB and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.253.1450	Universal-charger set with 2m cable, black, pluggable with plug Australia and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.250.1451	Universal-charger set with 2m cable, black, pluggable at the charger, with car charger (cigarette lighter), (12V/24V DC)
2.250.1452	Universal-charger set with 2m cable, black, only for car charger (not pluggable at the charger) (12V/24V DC)
2.250.1453	Universal-charger set, black, included: car charger (cigarette lighter), interchangeable ac plugs (GB, Australia, USA/Japan, Europe) and power supply. (AC-DC changer 100/240V AC / 12V DC)
2.250.1455	Universal-charger set EX with 2m cable, black, pluggable with plug Europe and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC) **Only to be used outside the potentially explosive area!**

Operating instructions

Display of the charging process via a DUO-LED:



Green LED - Steady light: STANDBY. The battery charger is ready for use. Place the battery in the charger.

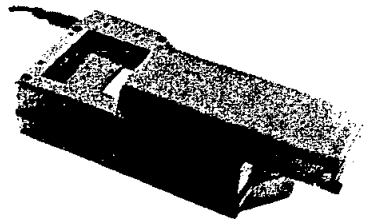
Orange LED - Steady light: CHARGING. The battery will now be charged.

Orange LED - *Quickly flashing*: The charging process is finished.

Orange LED - Slowly flashing: The battery is totally discharged or the ambient temperature is to low for quick charging. A regeneration respectively a warm-up stage occurs with a reduced charging current until it proceeds to the actual quick charging stage.

No harm will come to the battery if it is left in the charger beyond the required charging time. Use this battery charger only in closed and dry rooms!

Battery



The battery reaches the maximum energy storage capacity only after at least 5 times charging and discharging completely!
Never use an uncharged battery. This will destroy the battery. Discharge the battery completely in the operating unit before charging once more. The charging time depends on the type of battery.
It is normal that the battery warms up during charging or longer use. Charge the battery in an ambient temperature range of 10°C up to 35°C.
To avoid deep discharging the battery should be charged frequently once a month.
No legal liability for follow-up damages.
Deep discharging and extreme temperature damages the battery. Especially heat reduces the efficiency. If the temperature of the battery is too high or too low the charging process will not start to prolong the durability of the battery.
Keep the battery in the charged state in a cool and dry place.

Caution

Only completely discharged batteries should be charged! Therefore please work with your control until the capacity of the battery is totally exhausted.

Safety precautions

Do not open, modify or burn the battery. Do not drop the battery and don't expose it to blows or knocks. Protect the battery against rain, wetness or extreme temperature. Keep the contacts clean and don't get the battery in touch with metal objects (aluminium foil etc.). Do not short-circuit the battery.

A charged battery is a concentrated energy source. Never store a charged battery in a toolbox or similar where it could be short-circuited by metal components (even a key in your trouser pocket can cause a short circuit).

Waste disposal

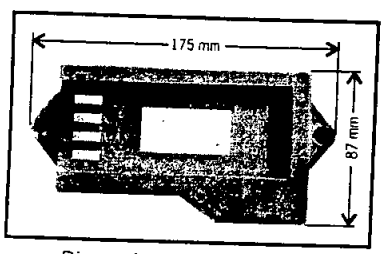
Do not drop used up batteries into the domestic waste. Hand over the batteries to collective point.

Warranty

By damages, defects or premature wear caused by non-observance of the above described operating and safety instructions all warranty claims expire.

Technical data

Power supply via 12V / 24V on board or external power supply.
Range of voltage: 9V - 32VDC (Note: Below 10V the charging process takes longer).
Power supply via hollow plug (Outside diameter = 5,5mm, inside diam. - = 2,1mm)
The parameters of specific accumulators can be adjusted (Delta Peak, dT/dt, charging current, timeout)
AD-changer: 10Bit resolution



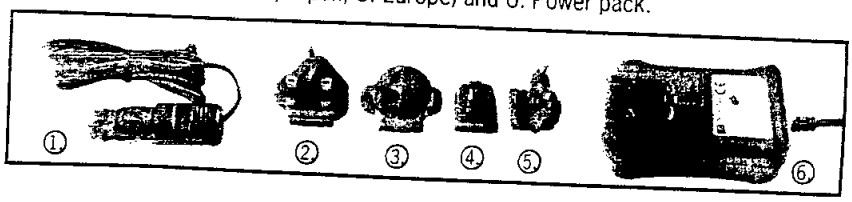
Dimensions: 175 x 87 x 43 mm

Identification of charging stop by:
Delta Peak (minus Delta U to maximum voltage)
dT/dt (Velocity of rise in temperature)
Timeout (shut down of time of charging)

Identification and evaluation of the following starting states:
Undervoltage: Pre-charging with reduced charging current
Untertemperatur: Pre-charging with reduced charging current (warm-up)
Overvoltage: No starting of the charging prosess
Shut down after reaching the maximum of temperatur.
Error memory to collect data of abort of charging.

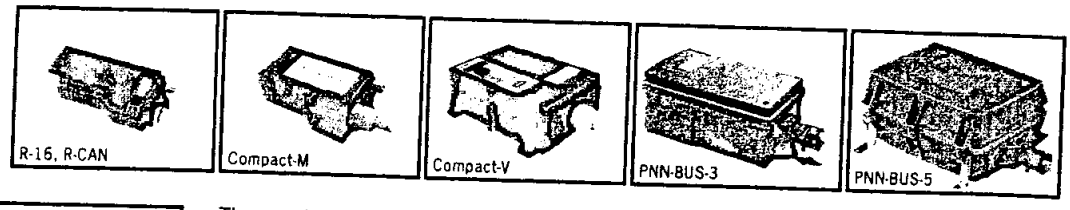
Components:

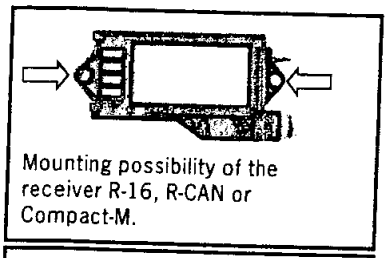
1. Car charger (cigarette lighter), interchangeable ac plugs
(2. GB, 3. Australia, 4. USA/Japan, 5. Europe) and 6. Power pack.



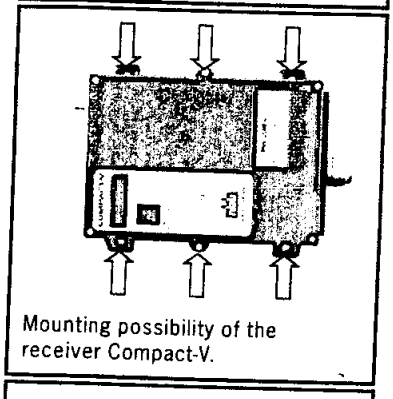
5. RECEIVER

R-16, R-CAN
Compact-M,
Compact-V,
PNN-BUS-3, -5

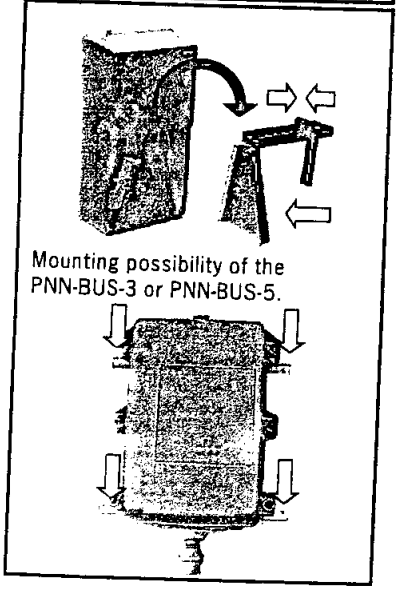




Mounting possibility of the receiver R-16, R-CAN or Compact-M.



Mounting possibility of the receiver Compact-V.

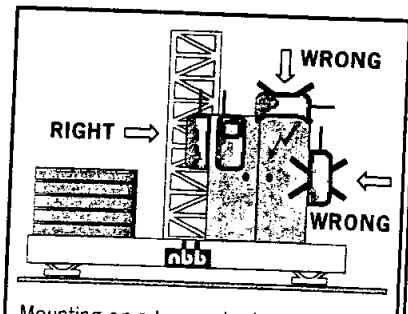


Mounting possibility of the PNN-BUS-3 or PNN-BUS-5.

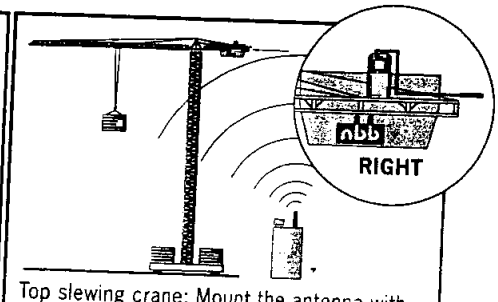
The receiver is connected to the unit to be controlled with the multi-pin connecting cable supplied. Please observe the instructions issued by the manufacturer of the unit to be controlled! **We recommend urgently to realize this connection via a central, well accessible, multi-pin plug connector (for example HTS-plug connector series HE/HB/HN/HA or comparable ones of other manufacturers) to make possible a quick and clear fault diagnosis in the service case and to take off the receiver without an expenditure of assembly.**

The power supply of the receiver is generally effected by the connecting cable.

- **In general, an earth lead is required in case the units to be controlled have not previously been operated by radio control. Failing this, the receiver electronic circuit will not receive any power supply. Ensure that the operating voltage of the receiver complies with the electrical specifications of the unit to be controlled. The applicable operating voltage is specified in the supplement.**
- **Never expose the receiver to a high pressure cleaning jet. This applies to the transmitter also.**
- **The receiver should always be fixed vertically at the outside panel of the switching cabinet. (The antenna should always reach over the top of the panel.)**
- **You have to make sure that the antenna is not shielded by metal parts totally or partly.**
- **Mounting the receiver in a cabine or in a switching cabinet the antenna should be layed with an extension cable to the outside and be attached with the fastening strapping as horizontally as possible with distance to the shielding metal parts.**
- **In general the antenna should always be mounted in such a way so that the antenna is still visible with each change of position of the transmitter.**



Mounting on a tower slewing crane.



Top slewing crane: Mount the antenna with extension cable horizontally.

6. OPERATING THE UNIT

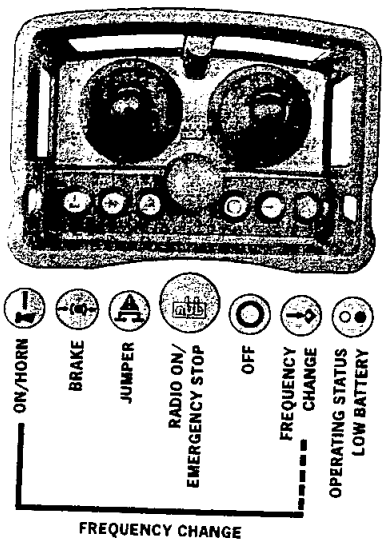
Safety equipment in the NBB-radio remote control:

In the transmitter, this comprises mainly:

- EMERGENCY STOP with automatic disconnection of the power supply.
- Automatic zero positioning.

In the receiver:

- Two diversity units for evaluation of the EMERGENCY STOP signal.
- Automatic zero setting when switching back on after radio interruption.
- Locking of the radio commands at relay level in the event of a defective EMERGENCY STOP circuit.



To ensure fault-free operation, please follow precisely the following rules for operation: The unit to be controlled can only be switched on - it is assumed that the transmitter is ready to operate - when no command unit is actuated. The command necessary to do so is triggered by the key "ON/HORN". This triggers a horn signal in the unit to be controlled. After switch-on of the facility to be controlled, this key is used for repeated emission of the horn signal in accordance with working regulations.

If the NBB radio remote control is not used for a long period, it is urgently recommended that the batteries be charged now and again (about every 4 weeks). This prevents deep discharges of the batteries and prolongs their useful life. If you shut down the NBB radio remote control for a long period, we recommend you take the battery out of the transmitter.

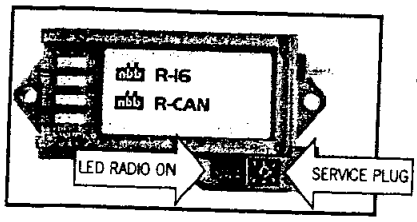
Frequency change:

To change the frequency, keep the "ON/HORN" key pressed down. Then operate the "FREQUENCY CHANGE" key. If the receiver locks into the new frequency, a horn signal is given (if present) and the unit to be controlled is ready for operation.
(Please observe the particular postal approval regulations of the concerned country.)

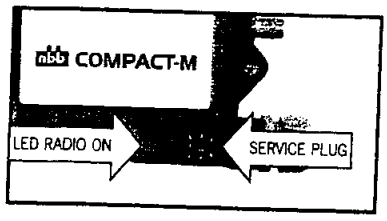
7. FUNCTION CHECK

To maintain operational safety, a regular function check of the NBB radio remote control is necessary. In single-shift day-to-day operation, we recommend performing this check at least once a week. Checking is possible using the display lights provided on the receiver. To do so, the transmitter must be set to the ready-to-operate state.

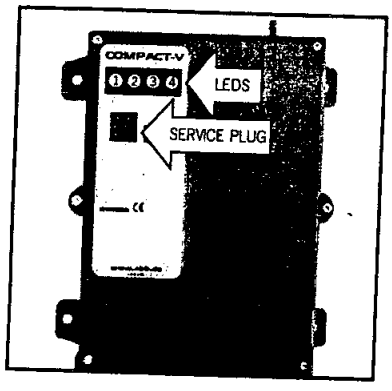
- First connect just the receiver - the transmitter remains switched off.
- Activate the transmitter by unlocking the EMERGENCY STOP switch.
- Now check the commands (always start with the lowest stage) and check for correct reaction of the unit to be controlled.
- Ensure in particular that there is nobody in the danger area.
  ACCIDENT RISK!
- **EMERGENCY STOP check**. Press the EMERGENCY STOP switch at the transmitter until the switch engages. Then observe if the unit to be controlled is switched off (time to switch off according to the application).



Checking the LED display at the receiver R-16 and R-CAN:
(Optional with integrated charger)
The green LED flashes: RADIO PRESENT.
If the LED fails to come on:
1. Check that the transmitter is on.
2. Check the power supply of the receiver.
3. (Optional) Irregular flashing of the LED:
Check or change the current radio channel.



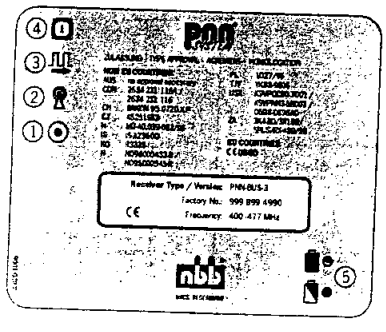
Checking the LED display at the receiver Compact-M:
(Without integrated charger)
The green LED flashes: RADIO PRESENT.
If the LED fails to come on:
1. Check that the transmitter is on.
2. Check the power supply of the receiver.
3. (Optional) Irregular flashing of the LED:
Check or change the current radio channel.



Checking the LED's at the receiver Compact-V:

- **LED 1 green:** POWER ON. If LED fails to come on, check the power supply. If the power lead is OK, call in the after-sales service.
- **LED 2 yellow:** HF PRESENT. Steady light when transmitter is switched on (insignificant for scanner operation).
- **LED 3 green:** Flashes evenly during fault-free operation. Irregular flashing means that the HF channel is probably at fault - please set another channel.
- **LED 4 red:** If this LED flashes, the HF channel is at fault (not in the scanner operation). Steady light notifies the operator that an output function is critical due to over current.

Service plug: **For NBB service only.**



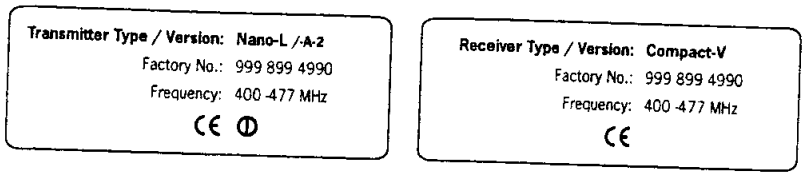
Checking the LED's at the receiver PNN-BUS-3:

- **LED1:** POWER ON. If LED fails to come on, check the power supply. If the power lead is OK, call in the after-sales service.
- **LED2:** HF PRESENT. Steady light when transmitter is switched on (insignificant for scanner operation).
- **LED3:** Flashes evenly during fault-free operation. Irregular flashing means that the HF channel is probably at fault - please set another channel.
- **LED4:** If this LED comes on, the HF channel is at fault.
- **LED5:** Charge condition display of battery (only present when charger is integrated). Steady light when charging a battery. LED flashes: The battery is charged, the charging process is finished.

8. RATING PLATES

The rating plates state the type of transmitter or receiver, the factory number, the frequency range and the approval number for non EU countries.
Always state the factory number in all your queries.

Example:



9. MAINTENANCE

Your NBB radio remote control is largely maintenance-free. Nevertheless, please bear in mind the following points:

- EMERGENCY STOP switch must be easy to move.
- Remove any leftover building materials!
- During electro-welding work on the unit to be controlled, disconnect the receiver from the current supply! Otherwise there is a risk of damage to the receiver's electronic system!
- Check wear and tear parts like dust shield tops regular!

10. WARRANTY

We grant a function warranty for 12 months after the sale date for all NBB radio remote controls (transmitter, receiver, charger). The warranty covers working time and material used. Shipping costs shall be charged to the customer. The warranty shall not cover: wear and tear parts, relays and batteries. The function warranty shall be invalidated in the case of damage, accident damage, negligence, incorrect use, non-compliance with operating conditions, non-compliance with operating, testing and maintenance instructions, and repairs or unit modifications not authorised by NBB. NBB shall not be liable for indirect damage and reserves the right to decide on repair or replacement.

11. IN CASE OF DEFECTS

Do not attempt to continue working with a defective NBB radio remote control. Even initially minor defects might be the start of a more extensive defect.
Do not try to repair the NBB radio remote control yourself. If there is any fault please contact your dealer or our company.

TEACH-IN: Individual Setting of Analog Channels (Basic Setting) at Nano Transmitter*.
The output signals of the analog channels can be individually programmed by the transmitter.

Activate programming mode

Select analog function

Save "contact point"

Save maximum speed

Program opposite direction ?

No / Yes

Programming of next function ?

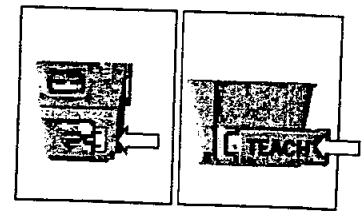
No / Yes

Check the programmed values

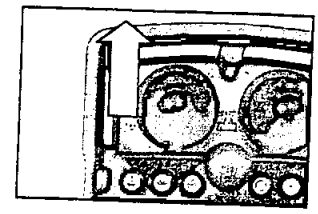
Shut down the programming mode

The control is ready to operate.

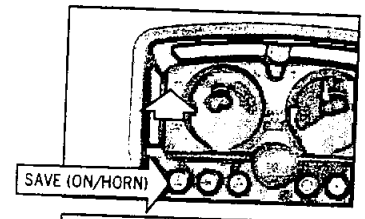
1 Set all analog channels to zero position. (potentiometer without automatic release). Insert the TEACH-battery into the battery compartment or turn on the programming switch*, release the EMERGENCY-OFF switch and press the "ON/HORN" key.
Now the programming mode is activated.



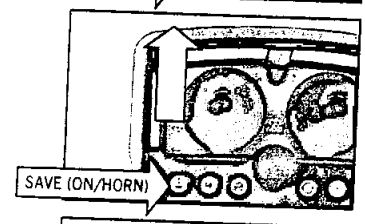
2 To determine which analog function is to be programmed, it is sufficient to turn briefly the appropriate master switch fully in the direction of this function.



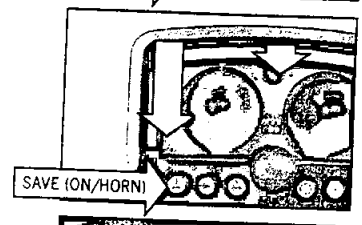
3 Now the "50%/100%" switch has to be turned into the "50%" position.
The master switch is now turned until the required "contact point" is reached.
To save this value, the "SAVE" ("ON/HORN") key must be pressed at this position.



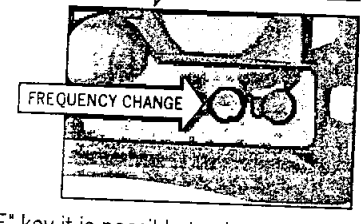
4 The "50%/100%" switch has to be turned into the "100%" position.
The upper initial value is saved by turning the master switch until the maximum speed of the function is reached then pressing again the "SAVE" ("ON/ HORN") key.



5 The opposite direction of this function can then be programmed the same way immediately afterwards.
See point **3** and **4** .



6 When programming several analog channels consecutively, the "FREQUENCY CHANGE" key must be pressed once after saving a function.
Continue point **2** .



7 By pressing and holding the "FREQUENCY CHANGE" key it is possible to change to the working mode to check the programmed values.
As soon as the key is released, the programming mode can be commenced, as described above. (Point **2** to **5** .)

8 Press the EMERGENCY STOP switch, turn off the programming switch* and pull out the key (to avoid unintentional programming),
or change the TEACH battery with the normal working battery, release the EMERGENCY STOP switch again and prepare the control to operate by pressing the "ON/HORN" key.

Please note:
In the programming mode all functions are locked, except "ON/HORN" and each selected function.

* Please refer to the scope of supply of your radio remote control.

TEACH-IN: Individual Setting of Analog Channels (Basic Setting) at Nano Transmitter with Potentiometer Control. (Optional, only proportional units*)

The output signals of the analog channels can be individually programmed by the transmitter.

Activate programming mode

Select analog function

Save "contact point"

Save maximum speed

Programming of next function ?

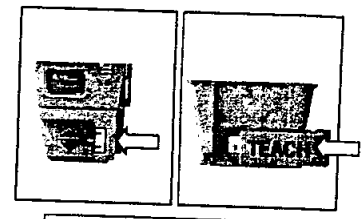
No / Yes

Check the programmed values

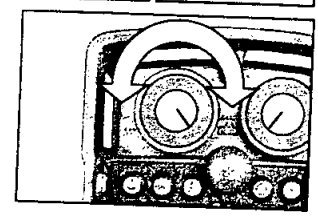
Shut down the programming mode

The control is ready to operate.

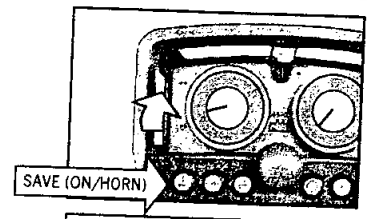
1 Set all analog channels to zero position. (potentiometer without automatic release). Insert the TEACH-battery into the battery compartment or turn on the programming switch*, release the EMERGENCY-OFF switch and press the "ON/HORN" key. Now the programming mode is activated.



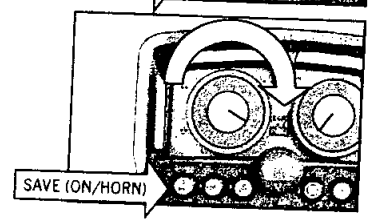
2 To determine which analog function is to be programmed, it is sufficient to turn briefly the appropriate potentiometer fully in the direction of this function.



3 Now the "50%/100%" switch has to be turned into the "50%" position. The potentiometer is now turned until the required "contact point" is reached. To save this value, the "SAVE" ("ON/HORN") key must be pressed at this position.

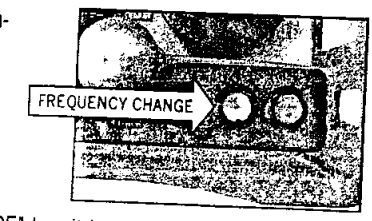


4 The "50%/100%" switch has to be turned into the "100%" position. The upper initial value is saved by turning the potentiometer until the maximum speed of the function is reached then pressing again the "SAVE" ("ON/ HORN") key.



5 No opposite direction.

6 When programming several analog channels consecutively, the "FREQUENCY CHANGE" key must be pressed once after saving a function. Continue point **2** .



7 By pressing and holding the "FREQUENCY CHANGE" key it is possible to change to the working mode to check the programmed values. As soon as the key is released, the programming mode can be commenced, as described above. (Point **2** to **5** .)

8 Press the EMERGENCY STOP switch, turn off the programming switch* and pull out the key (to avoid unintentional programming), or change the TEACH battery with the normal working battery, release the EMERGENCY STOP switch again and prepare the control to operate by pressing the "ON/HORN" key.

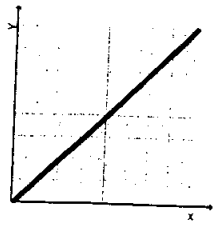
Please note:
In the programming mode all functions are locked, except "ON/HORN" and each selected function.

* Please refer to the scope of supply of your radio remote control.

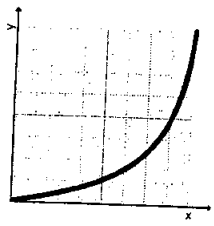
TECHNICAL SUPPLEMENT

NANO: Board E-AN04A2V1/1 TEACH-IN
(Optional, only proportional units*)

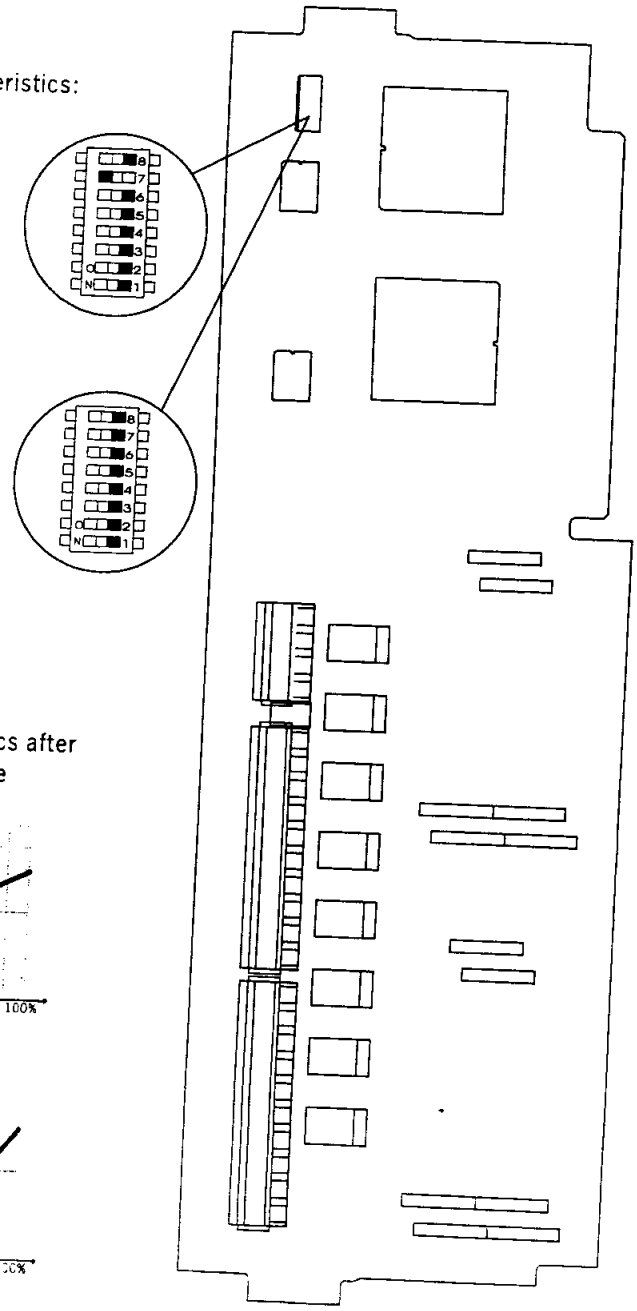
DIL switch (SW2) for setting various transmission characteristics:



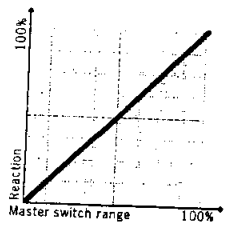
Setting for linear characteristic



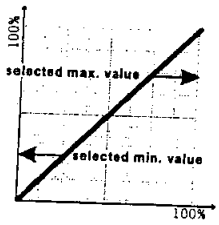
Setting for non-linear characteristic



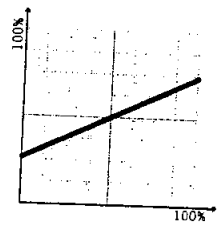
Characteristics linear or non-linear

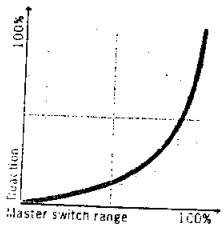


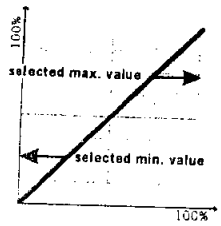
Characteristics in Teach-In mode

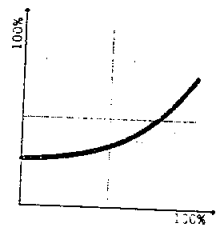


Characteristics after Teach-In mode









DIL switch no. 8 : OFF: 50% switching variable
ON : 50% switching fixed

* Please refer to the scope of supply of your radio remote control.

TECHNICAL DATA

Operating ambient temperature	-20 to +65 °C
Insulation class - Protection	IP 65

TRANSMITTER

Pocket, Nano, Nano-L, Nano-M

Transmission frequency range	400 - 477 MHz, 25 mW FM

The use of synthesizer technology permits frequencies to be selected in accordance with the appropriate waveband for the country of use.

Low frequency modulation	FSK signal to CCITT V.23
Data repetition rate	about 60 ms
Baud rate	1200 baud (bits per sec.)
Range	300 up to 1000 m
Power input	60 - 100 mA
RF ouput	≤ 10 mW

	Weight (without battery)	Size (L x W x H)
Pocket-A	0,2 kg	14 x 8,7 x 3,5 cm
Pocket-B	0,2 kg	17 x 8,7 x 3,5 cm
Pocket-D/-F/-S/-V	0,2 kg	18 x 8,7 x 3,5 cm
Pocket-V-3/-9	0,4 kg	18 x 8,7 x 6,2 cm
Nano	0,7 kg	17,5 x 12,6 x 12,2 cm
Nano-L	1,0 kg	24,7 x 13,9 x 11,7 cm
Nano-M	1,5 kg	28,3 x 14,4 x 14,5 cm

RECEIVER

R-16, R-CAN, Compact-M, Compact-V, PNN-BUS-3, PNN-BUS-5

Reception frequency range	400 - 477 MHz

Data security:
Generates a CRC code with a Hamming distance = 4. Generates a neutral position.
Addressing of each transmitter with its own, unique combination (max. 2^{16} possible combinations).

Data reception security: Diversitary evaluators, CRC, EMERGENCY STOP and neutral position bits.

Restart inhibitor if EMERGENCY STOP relay defective. (PNN-BUS-3, PNN-BUS-5)

Contact loading for EMERGENCY STOP and commands. (PNN-BUS-3, PNN-BUS-5)

max. switching voltage	250V AC (12V / 24V DC - R-16, R-CAN, Compact-M, Compact-V)
max. switching current	4A AC (3A DC at 12V / 24V - R-16, R-CAN, Compact-M, Compact-V)
max. switching power	1000 VA

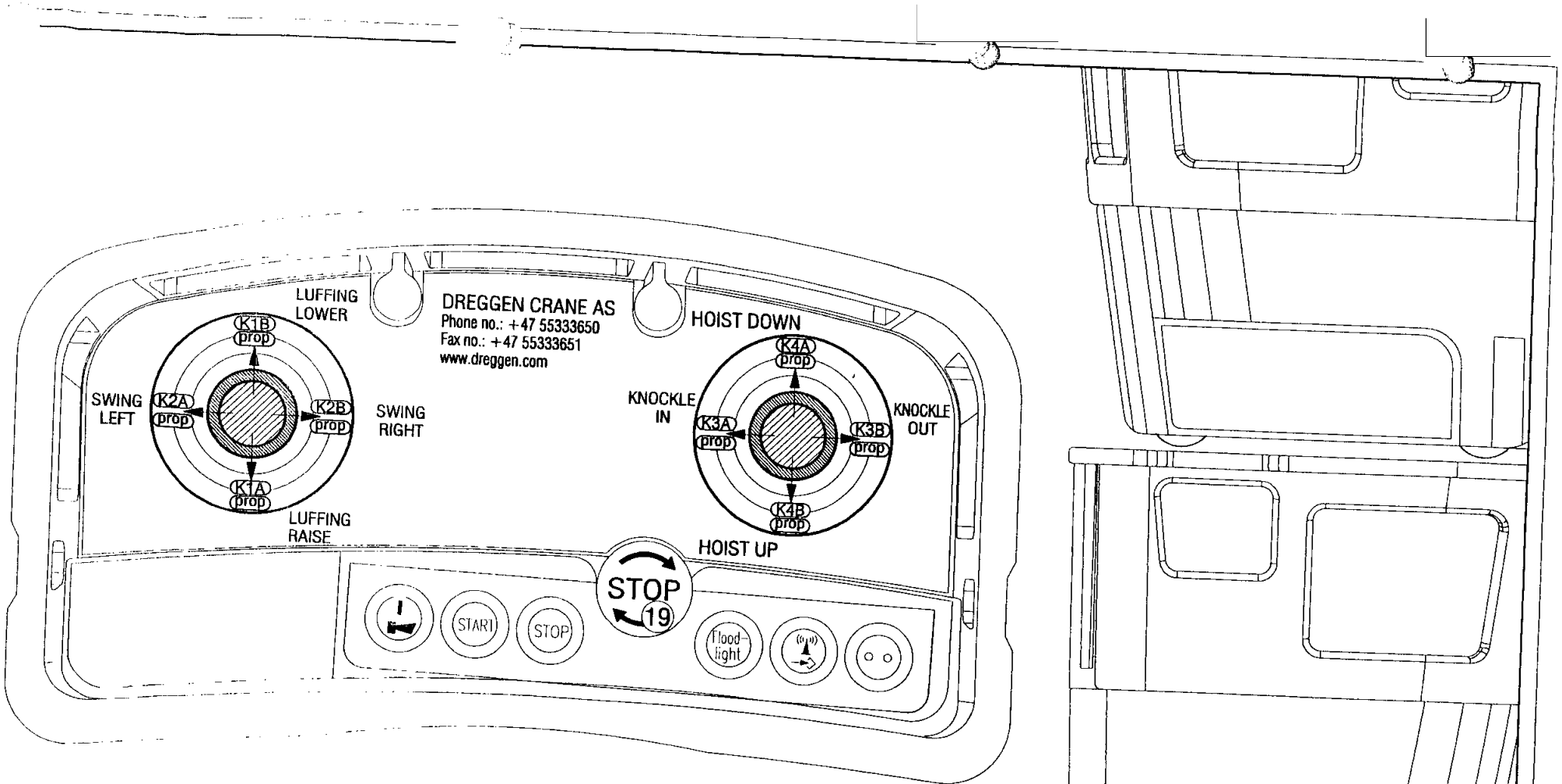
	Weight	Size (L x W x H)
R-16, R-CAN (potted)	640 g 800 g	18 x 9,7 x 4,4 cm
Compact-M (potted)	640 g 800 g	18 x 9 x 7 cm
Compact-V (potted)	1,5 kg	21,5 x 16 x 6,5 cm
PNN-BUS-3	3,0 kg	30,6 x 18,1 x 13 cm
PNN-BUS-5	4,7 kg	36,4 x 28,3 x 15,2 cm

BATTERY

7,2V / 1000mAh

CHARGING UNIT

Operating voltage / external charging unit	12V/24V DC, AC-DC changer 100/240V AC / 12V DC
Operating voltage / PNN-BUS-3 / PNN-BUS-5	40V-230V AC, 8V-32V DC, 12V / 24V DC
Operating voltage / R-16, R-CAN / Compact	12V / 24V DC



No.:	Description:	Order-No.:	No.:	Description:	Order-No.:
1	Key switch 0-ON	3.740.1001	10	Rotary switch Gray-Code 3 steps	3.740.1041
2	Key switch 0-MOM	3.740.1011	11	Rotary switch BCD-Code 10 steps	3.740.1026
3	Toggle switch 0-ON	3.740.1016	12	Rotary switch BCD-Code 12 steps	3.740.1027
4	Toggle switch MOM-0-MOM	3.740.1017	13	Rotary switch Gray-Code 12 steps	3.740.1029
5	Toggle switch ON-0-ON	3.740.1018	14	Rotary switch BCD-Code 16 steps	3.740.1025
6	Toggle switch ON-0-MOM	3.740.1019	15	Potentiometer 5k + Contr.knob ϕ16	3.980.1156
7	Toggle switch lever lock ON-0-ON	3.740.1028	16	Control knob ϕ17mm	3.930.1002
8	Pushbutton switch APR 0-MOM	3.740.1020	17	Control knob ϕ20mm	3.930.1003
9	Rotary switch ON-0-ON	3.740.1022	18	Control knob ϕ24mm	3.930.1004
22	Toggle switch 0-MOM	3.740.1043	19	Emergency Stop Switch with Key 0-On reed	3.740.1000
23	Miniature pushbutton switch 0-MOM	3.740.1030	20	Emergency Stop Switch 0-On reed	3.740.1014
24	Toggle switch lever lock, ON-0	3.740.1045	21	Emergency Stop Switch 0-On black	3.740.1004

Serial no.:	Ref.: 999 498 5997		
Model:			
Customer:	Dreggen Crane AS		
Date:	2005.09.14		
Name:	K. Hanig		
Modification:			
Actel:	SNL48786/FM		
Colour: Face Blade:	silver	3.720.1036	
Upper part:	black	3.300.1057	
Lower part:	black	2.250.1055	

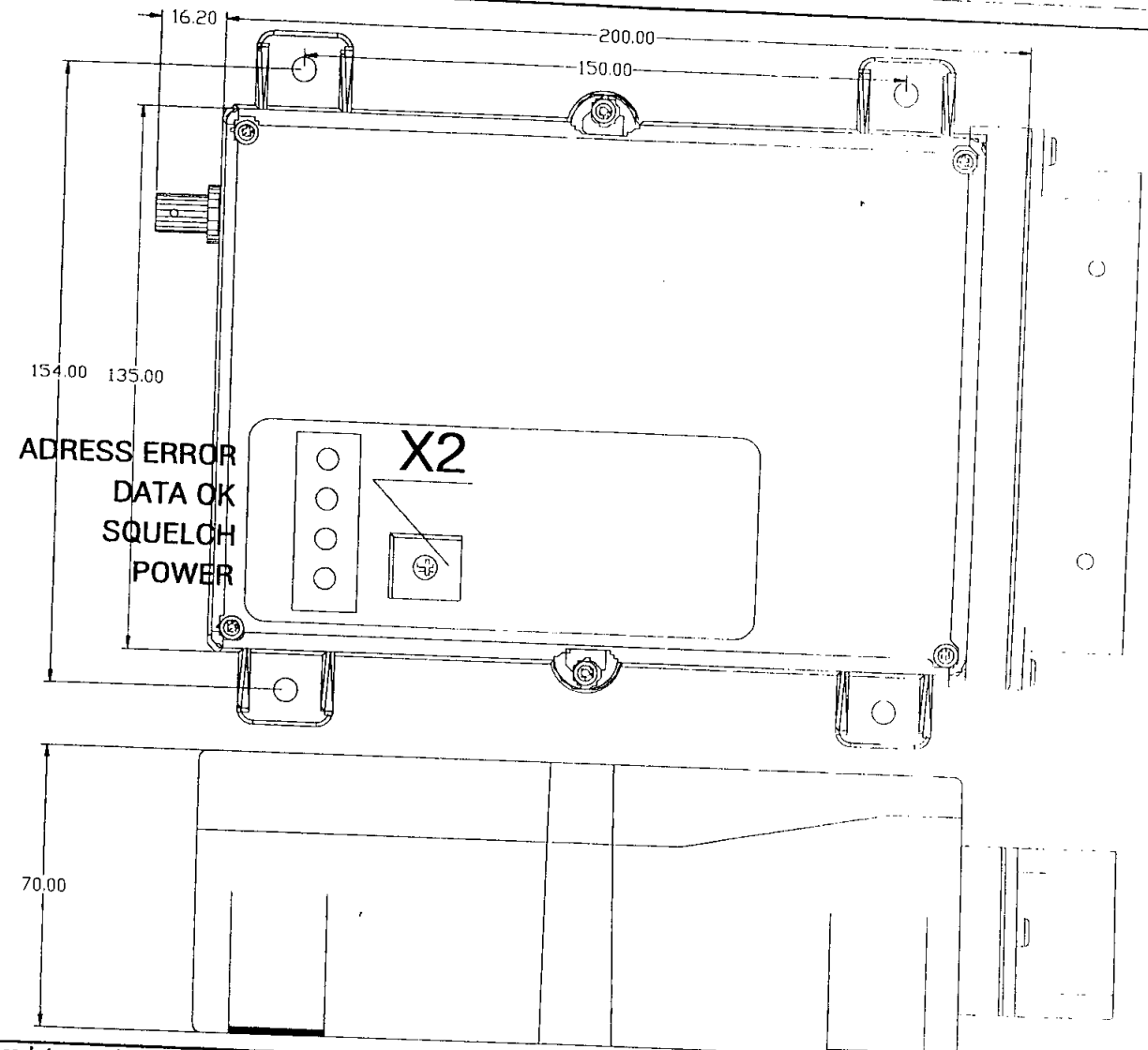
TRANSMITTER
NANO-L

TRANSMITTER-CODE

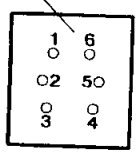
Approbation:

Date:

Signature stamp:



X2

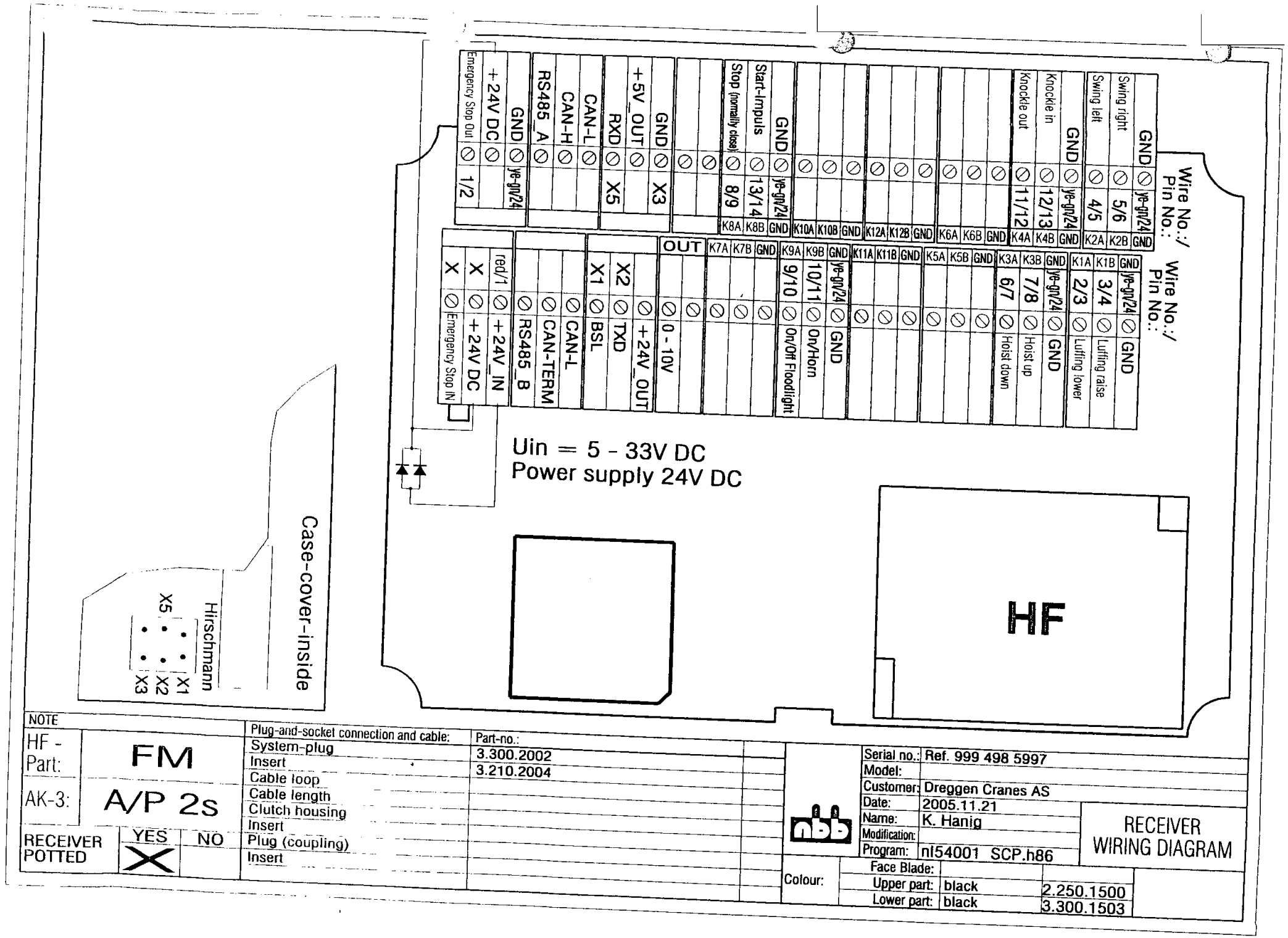


PROG.-CONNECTION

NOTE				
HF - Part:	FM	Plug-and-socket connection and cable:	Part-no.:	
AK-3:	A/P 2s	System-plug	3.300.2002	
		Insert	3.210.2004	
		Cable loop		
		Cable length		
		Clutch housing		
		Insert		
RECEIVER POTTED	YES X / NO	Plug (coupling)		
		Insert		

Serial no.:	Ref. 999 498 5997		
Model:			
Customer:	Dreggen Crane AS		
Date:	2006.01.18		
Name:	K. Hanig		
Modification:			
Program:	nl54001 SCP.h86/FM		
Colour:	Face Blade:		
	Upper part:	black	2.250.1500
	Lower part:	black	3.300.1503

RECEIVER WIRING DIAGRAM



NOTE						
HF - Part:	FM	Plug-and-socket connection and cable:	Part-no.:		Serial no.:	Ref. 999 498 5997
AK-3:	A/P 2s	System-plug	3.300.2002		Model:	
		Insert	3.210.2004		Customer:	Dreggen Cranes AS
		Cable loop			Date:	2005.11.21
		Cable length			Name:	K. Hanig
		Clutch housing			Modification:	
		Insert			Program:	nl54001 SCP.h86
RECEIVER POTTED	YES X / NO	Plug (coupling)				
		Insert				

RECEIVER WIRING DIAGRAM

Colour:			
	Face Blade:		
	Upper part:	black	2.250.1500
	Lower part:	black	3.300.1503

CONNECTING PLAN

Serial no.:	**Ref.: 999 498 5997**	Cable length.:	
Model:		Cable loop-no.:	
Wiring diagram no.:	—	System-plug-no.:	**Internal Conection**
Producer:	**Dreggen Crane AS**	Insert-no.:	**3.300.2002**
Date:	**2005.09.14**	Clutch housing-no.:	
Name:	**K. Hanig**	Insert-no.:	
Relay board code:		Plug-no.:	
Program-Code:	**NL54001.H86/FM**	Insert-no.:	

RECEIVER		CONTROL CABLE			SYSTEM
Terminal strip no .:		Function:		Wire-No.:/Pin-No.:	Terminal strip: / or plug socket:
5-33VDC / 8V DC	red	**Power Supply 24V DC**		red / 1	
	ye/gn	**Power Supply 0V DC**		ye /gn / 24	
		Common		— / —	—
Emergency stop		1	**Emergency Stop** (set /reset)	1 / 2	
		Common		/	—
Out 1A	K1B	2	**Luffing Lower (PWM)**	2 / 3	
Out 1B	K1A	3	**Luffing Raise (PWM)**	3 / 4	
Out 2A	K2A	4	**Swing Left (PWM)**	4 / 5	
Out 2B	K2B	5	**Swing Right (PWM)**	5 / 6	
Out 3A	K4A	6	**Hoist Down (PWM)**	6 / 7	
Out 3B	K4B	7	**Hoist Up (PWM)**	7 / 8	
Out 4A	K3B	11	**Knockle Out (PWM)**	11 / 12	
Out 4B	K3A	12	**Knockle In (PWM)**	12 / 13	
Out 5A				/	
Out 5B				/	
Out 6A				/	
Out 6B				/	
Out 7A				/	
Out 7B				/	
Out 8A		8	**Stop (normally close/open when Stop is activated)**	8 / 9	
Out 8B		13	**Start-Impuls**	13 / 14	
Out 9A		9	**On/Off Floodlight (set/reset)**	9 / 10	
Out 9B		10	**On/Horn**	10 / 11	
Out 10A				/	
Out 10B				/	
Out 11A				/	
Out 11B				/	
Out 12A				/	
Out 12B				/	
Out AN0				/	
Out SWI				/	

APPROVALS AND CERTIFICATES

Approvals EU countries: CE

Enclosure:

EC Declaration of Conformity

Obtainable at demand:

M-Zert mbH
Certificate DIN EN ISO 9001:2000-12 No. 03022
NBB Controls & Components AG 15.07.2003

© NBB Controls & Components AG
Otto-Hahn-Straße 1-3
D-75248 Ölbronn-Dürrn
Tel.: 0 72 37 / 9 99 - 0
Fax: 0 72 37 / 9 99 - 1 99
eMail: sales@nbb.de
http://www.nbb.de

Bedienungsanleitung Nano-S, -V, -L, -M, R-16, R-CAN, Compact-M, -V, PNN-BUS-3, -5,
Englisch, Teile-Nr. 3.150.1051, Stand 01.06

10.9 Electro motor art.no 14215

S.E.I.P.E.E. S.p.A. Via Archimede 55/61 – 41010 Limidi di Soliera (MO) ITALY – **www.seipee.com**
Tel.: +39 059 850108 Fax: +39 059 850128 P.IVA - *VAT code:* IT 00185010360
Iscr.Reg.Imp.Mo n° 6647 – R.E.A. n° 152011 del 23/12/72 N. Mecc.: Mo 002996
Capitale Sociale - *Company's Capital:* Euro 120.000 i.v.

seipee S.p.A. MOTORI ELETTRICI

DICHIARAZIONE DI CONFORMITA' CE *CONFORMITY STATEMENT*

Il legale rappresentante della ditta S.E.I.P.E.E. S.p.A., sotto la propria responsabilità, **DICHIARA** che i motori elettrici asincroni a gabbia, serie:

The legal chairperson of S.E.I.P.E.E. S.p.A., under his own responsability, ***STATES*** *that the asynchronous motors with squirrel-cage rotor, series:*

ZK, ZKM, ZKF, ZKV(*), ZKZ(*), A, AX, AM, AZ(*), TKE, TKE QB AC, TKE QB DC(*), TKE QB LDC(*), JM, GM, GMM, APE, APEM, HPE, HPEM, HPEV(*), HPVM(*),

sono conformi alle leggi nazionali che recepiscono le seguenti Direttive Comunitarie:

- Dir. "**Bassa Tensione**" 73/23/CEE modificata da 93/68/CEE (anno in cui è stata apposta la marcatura CE: 1997);
- Dir. "**Compatibilità Elettromagnetica**" 89/336/CEE e successivi aggiornamenti.

comply with the requirements of the following European Community Directives:

- *"**Low Voltage**" directive 73/23/EEC modified by 93/68/EEC (year of CE marking: 1997);*
- *"**Electromagnetic Compatibility**" directive 89/336/EEC and following updatings.*

PRINCIPALI NORME TECNICHE APPLICATE / ***MAIN TECHNICAL STANDARDS APPLIED***

Oggetto / *Subject*	Europee armonizzate / *European harmonized*	Riferimento internaz. / *International reference*	Classificaz. italiana / *Italian classification*
Caratteristiche nominali e di funzionamento / ***Rating and performance***	**EN 60034-1**	IEC 60034-1	CEI 2-3
Gradi protezione involucri macchine rotanti (IP) / *Protection-degrees of enclosures (IP)*	EN 60034-5	IEC 60034-5	CEI 2-16
Metodi di raffreddamento (codice IC) / *Methods of cooling (IC code)*	EN 60034-6	IEC 60034-6	CEI 2-7
Forme costruttive e tipi di installazione (IM) / *Types of construction and mounting (IM)*	EN 60034-7	IEC 60034-7	CEI 2-14
Marcatura terminali e senso di rotazione / *Terminal markings and direction of rotation*	CENELEC HD 53.8	IEC 60034-8	CEI 2-8
Limiti di rumore / *Noise limits*	EN 60034-9	IEC 60034-9	CEI 2-24
Vibrazioni meccaniche / *Mechanical vibration*	EN 60034-14	IEC 60034-14	CEI 2-23
Dimensioni e potenze normalizzate [1] / ***Standard dimensions and outputs*** [1]	**EN 50347**	IEC 72-1	CEI 2-31
Flange di attacco / *Fixing flanges*			CEI 2-31 CNR-CEI unel 13501
Estremità d'albero cilindriche / *Cylindrical shaft-ends*			CEI 2-31 UNI-ISO 775
Linguetta e cava della linguetta / *Key and Keyway*			CEI 2-31 UNI 6604
Foro filettato in testa d'albero / *Shaft-head threaded centre-hole*			CEI 2-31 UNI 9321
Sicurezza del macchinario, equipaggiamento elettrico delle macchine / *Safety of machinery, electrical equipment of machines*	**EN 60204-1**	IEC 60204-1	CEI 44-5
EMC — Immunità* - Emissione* / *Immunity* - Emission**	**EN 60034-1/A11** Sezione-*Section* 12	--	CEI 2-3; V1 Sezione-*Section* 12

(1) Ad eccezione delle serie APE, APEM, HPE, HPEM che presentano una carcassa estrusa in alluminio con dimensioni d'ingombro ridotte.
(*) Equipaggiati con condensatore AC 440 V - 0,22 μF - classe X2 secondo EN 132400, in parallelo all'alimentazione alternata del raddrizzatore.

(1) *Exception made for series APE, APEM, HPE, HPEM which have an aluminium extruded frame with reduced overall dimensions.*
(*) *Equipped with capacitor AC 440 V - 0,22 μF - X2 class according to EN 132400. Connect this capacitor in parallel to the AC rectifier supply.*

Per l' **INCORPORAZIONE** inoltre DICHIARA:
il motore elettrico è un componente che NON deve essere posto in servizio prima di essere installato in una macchina (o sistema completo) resa e dichiarata conforme alle disposizioni della Direttiva "Macchine" 98/37/CE.

For ***INCORPORATION*** *the legal chairperson also STATES:*
electric motors are components which shall NOT be started for duty unless installed in a machine (or complete system) which must comply and must be declared to comply to the "Machine" directive 98/37/EC.

Limidi, 19-10-2004

IL LEGALE RAPPRESENTANTE - *THE LEGAL CHAIRPERSON*

Gianfranco Casarini

10.10Bolts 10.9 quality

60338

TEXTRON Fastening Systems

Peiner Umformtechnik GmbH · Woltorfer Straße 20-24 · D-31224 Peine

ARVID NILSSON NORGE AS
VINJARMOEN

N-2870 DOKKA

Peiner Umformtechnik GmbH
Woltorfer Straße 20-24
D-31224 Peine
Postfach 16 49
D-31221 Peine
Germany

T: +49 (0) 5171 545-0
F: +49 (0) 5171 545-180
www.textronfasteningsystems.com

Abnahmeprüfzeugnis / Report, based on Quality Control EN 10 204 - 3.1
Zeugnis-Nr.: 052996 Datum/Date: 29.07.2005

Ihre Bestellung vom Your Order-No./dated	Ihre Auftrags-Nr. Your Order-No.	Unsere Auftrags-Nr. Our Order-No.	Unser Zeichen Our dept. reference	Telefon-Durchwahl Phone: - 545253 FAX: - 545296
12.07.2005	ML 68914	1505061	TQ - yi	

Artikel (Product): 6kt-Muttern/Nuts, DIN 6915/10
Unsere/Ihre Art.Nr. (Our/Your Product-No.): 0441130000
Abmessung (Dimension): M 30
Kennzeichnung (Mark) / Serie (Serial): PEINER HV 10 / 40
Pos.Nr. (Item No.) / Stück (Quantity): 60 / 400
Betriebsauftrag (Order): 765427

Mechanische Eigenschaften (Mechanical properties)	**IST**	**SOLL**	
Härte (Hardness)	283	272 ... 353	HV30

Werkstoff: C45+CR
Wärmebehandlung (heat treatmant): 900°C/Öl, 600°C/Öl
Besichtigungs- und Maßkontrolle (Stichprobe): o.B. (visual and dimensional Inspection: o.k.),
Oberflächenrißprüfung (Stichprobe): o.B. (surface crack Inspection: o.k.)

Vorschrift (Requirements): DIN 6915, EN 20898-2
Die gestellten Anforderungen sind erfüllt. The requirements are fulfilled.

Analyse (Chemical Composition)

Pos.-Nr. (Item-No.)	C %	Si %	Mn %	P %	S %	Cr %	Mo %	Ni %	Al %	B %	Cu %	%	Schmelze-Nr. (Cast-Nr.)
60	0.470	0.280	0.760	0.009	0.026	0.280	0.030	0.110	0.030		0.190		6-6052

Textron Fastening Systems
Peine Operations
Qualitätswesen
Weber (Leiter Qualitätswesen)

Dieses Dokument wurde per Computer erstellt.
Es ist auch ohne Unterschrift gültig !
This document was created via computer.
It's valid without signature !

DOKKA FASTENERS
Arvid Nilsson Gruppen

Vår ref / Our ref	Dato / Date	Sertifikatnr. / Certificate No.
Lise Dalbakk	21. Juli 2004	**571432**
Kunde / Customer ARVID NILSSON NORGE AS VINJARMOEN 2870 DOKKA **NORGE**	Produksjonsordrenr / Production Order no. 571432 Kundens ref./ Customers ref. ML 11824 Kundens tegning / Customer drawing DFS 1317	Salg-eksp.-no Sales-exp. no 121559

Kund.det.nr./ Customer part no.	Artikkelnr., benevning / Part no., part name
	1008 pcs. hexagon head bolts, M30x 180, cl. 10.9 U DFS 1317

Omfang / extent

INSPECTION CERTIFICATE EN 10204 - 3.1.B

We hereby certify that the studs in question are made acc. to:
Product standard DFS 1317
Mechanical properties: DNV Rules for certification of lifting appliances: Table D3
ISO 898 - 1, Cl. 10.9
Threads: M. tol. cl. 6g. F- SP- 693 – 42, DIN 2510 / 2
Min 48 h between hardening and MPI
Product marked: 52

Foreskrevet materiale / Prescribed material	Levert materiale / Supplied material
acc. to. ISO 898/1	FUNDIA 9270

MATERIALANALYSE / CHEMICAL COMPOSITION

Charge nr.	C	Si	Mn	P	S	Cr	B	Ni	Al
6 – 8969	.27	.27	1.06	.015	.022	.48	.0032		
Analysekrav/ min	.25	.15	1.0			.40			
Specification max	.30	.35	1.40	.035	.035	.60	.003		

VARMEBEHANDLING / HEAT TREATMENT

Hardened and tempered

MEKANISKE EGENSKAPER / MECHANICAL PROPERTIES

Prøve på ferdig produkt / test on manufactured product	Krav / Specification Min.	! Max	Prøveres. / Test results Min.	! Max	Prøveantall / Number .of sample	Anmerking / Note
Zn belegg / Zn coating µm	40					
Strekkfasthet/Tensile strength **Rm N/mm²**						
$Rp_{0.2}$ på hel bolt / $Rp_{0.2}$ on full size bolt **N/mm²**						
Hardhet / Hardness **HB**	304	361	327	330	8	Average 329
Spesiell strekkprøving / Special tensile test Strekkfasthet/Tensile strength **Rm N/mm²**			1097	1105	3	Prøvestaver / Test pieces: Ø 24 A5 1100
Flytegrense / Yield stress **$Rp_{0.2}$ N/mm²**			1053	1061	3	1056
Forlengelse / Elongation **A_5 %**	9		14	15	3	14
Kontraksjon **Z %**						
Skårslagprøve / Impact test **KV 300 Joule**						Prøvestaver iflg. / Test pieces acc to 10x10x55
Slagseighet / Impact strength **Joule**	42		67	73		Single value 73-67-72
Prøvetemperatur / Test temp. °C	- 20C					

Kvalitetskontrollavdeling / Quality Control Department

Lise Dalbakk

Phone: 61 11 30 30 Fax: 61 11 30 03

DOKKA FASTENERS
Arvid Nilsson Gruppen

Vår ref / Our ref	Dato / Date	Sertifikatnr. / Certificate No.
Eivind Larsen/Lise Dalbakk	30. August 2004	571993
ARVID NILSSON NORGE AS VINJARMOEN	Kontrollnr / Inspection no. 571993	Salgsekspnr Sales exp. no 122294
2870 DOKKA	Kundens ref./ Customers ref. 66699	
NORGE	Kundens tegning / Customer drawing DFS-1317, pos 3	
Kund.def.nr./ Customer part no.	Artikkelnr., benevning / Part no., part name 295 pcs. hexagon head bolts, M30 x 190, class 10.9, U, DFS –1317, pos. 3	

Omfang / extent

INSPECTION CERTIFICATE EN 10204 - 3.1.B

We hereby certify that the bolts / screws are made acc. to:
Product standard DFS 1317., pos. 3
Mechanical properties: DNV Rules for certification of lifting appliances: Table D3
ISO 898 – 1, CL. 10.9
Threads: M. tol. cl. 6g. F-SP-693 - 2
Min 48 h between hardening and MP1
Product marked on head: "DOKKA 10.9 M 65"

Foreskrevet materiale / Prescribed material	Levert materiale / Supplied material
acc. to. ISO 898-1	FUNDIA 9270

MATERIALANALYSE / CHEMICAL COMPOSITION

Charge nr.	C	Si	Mn	P	S	Cr	B	Ni	Al
6 – 8693	.26	.20	1.35	.011	.018	.43	.003		
Analysekrav / min	.25	.15	1.00			.40			
Specification max	.30	.35	1.40	.035	.035	.60	.003		

VARMEBEHANDLING / HEAT TREATMENT

Hardened and tempered

MEKANISKE EGENSKAPER / MECHANICAL PROPERTIES

Prøve på ferdig produkt / test on manufactured product	Krav / Specification Min.	Krav / Specification Max	Prøveres. / Test results Min.	Prøveres. / Test results Max	Prøvemantal / Number of samples	Anmerkning / Note
Zn belegg/Zn coating µm						
Strekkfasthet/Tensile strength Rm N/mm²						
Flytegrense / Yield stress on full size bolts $Rp_{0,2}$ N/mm²						
Hardhet / Hardness HB	304	361	323	327	5	Average 325
Spesiell strekkprøving / Special tensile test Strekkfasthet/Tensile strength Rm N/mm²	1040		1037	1060	2	Prøvestaver iflg. / Test pieces acc to Test pieces: Ø24 A5
Flytegrense / Yield stress Rel $Rp_{0,2}$ N/mm²	940		972	1002	2	
Forlengelse / Elongation A_5 %	14		14	16	2	A_5 is short to A_5
Kontraksjon Z %						
Skårslagprøve / Impact test KV 300 Joule						Prøvestaver iflg. / Test pieces acc to EN 10045-1
Slagseighet / Impact strength Joule	42		56	68	3	Test pieces dim 10x10x55 mm Single value: 56 – 68 – 59 J
Prøvetemperatur / Test temp. °C	-20°					

Kvalitetssjef / Qc manager

For Eivind Larsen
Lise Dalbakk

Phone: 61 11 30 30 Fax: 61 11 30 03

DOKKA FASTENERS
Arvid Nilsson Gruppen

Vår ref / Our ref	Dato / Date	Sertifikatnr. / Certificate No.
Eivind Larsen/Lise Dalbakk	31. August 2004	571523
ARVID NILSSON AS VINJARMOEN 2870 DOKKA	Kontrollnr / Inspection no. 571523	Salg-eksp.-no Sales-exp. no. 122294
	Kundens ref/ Customers ref. 66699	
NORGE	Kundens tegning / Customer drawing DFS -1317.	

Kund.det.nr / Customer part no.	Artikkelnr., benevning / Part no., part name
	345 pcs. hexagon head bolts, M30 x 190, cl. 10.9, U, DFS-1317

Omfang / extent

INSPECTION CERTIFICATE EN 10204 - 3.1.B

We hereby certify that the studs in question are made acc. to:
Product standard DFS 1317
Mechanical properties: DNV Rules for certification of lifting appliances: Table D3
ISO 898 - 1, Cl. 10.9
Threads: M. tol. cl. 6g. F- SP- 693 – 42, DIN 2510 / 2
Min 48 h between hardening and MPI

Foreskrevet materiale / Prescribed material	Levert materiale / Supplied material
acc. to. ISO 898-1	FUNDIA 9270

MATERIALANALYSE / CHEMICAL COMPOSITION

Charge nr.	C	Si	Mn	P	S	Cr	B	Ni	Al
6 - 8694	.26	.26	1.11	.012	.019	.47	.003		
Analysekrav / min	.25	.15	1.00			.40			
Specification max	.30	.35	1.40	.035	.035	.60	.003		

VARMEBEHANDLING / HEAT TREATMENT

Herdet ved 840 °C. Anløpt ved 575°C, i 3,5timer

MEKANISKE EGENSKAPER / MECHANICAL PROPERTIES

Prøve på ferdig produkt / test on manufactured product	Krav / Specification Min.	Max	Prøveres. / Test results Min.	Max	Prøvemantall / Number of samples	Anmerkning / Note
Zn belegg / Zn coating µm						Average
Strekkfasthet/Tensile strength Rm N/mm²						
$Rp_{0.2}$ på hel bolt / $Rp_{0.2}$ on full size bolt N/mm²						
Hardhet / Hardness HB	304	361	324	331	5	Average 328
Spesiell strekkprøving / Special tensile test Strekkfasthet/Tensile strength Rm N/mm²	1000	1200	1047	1048	2	Prøvestaver / Test pieces Ø24 A5
Flytegrense / Yield stress $Rp_{0.2}$ N/mm²	900		997	997	2	
Forlengelse / Elongation A_5 %	14		14	15	2	
Kontraksjon Z %						
Skårslagprøve / Impact test kV 300 Joule						Prøvestaver iflg. / Test pieces acc to EN 10045-1
Slagseighet / Impact strength Joule	42		67	69	3	Test pieces dim 10x10x55 mm Single value: 69 – 67 – 69 Joule
Prøvetemperatur / Test temp. °C	-20°					

Kvalitetskontrollavdeling / Quality Control Department

For Eivind Larsen
Lise Dalbakk Phone: 61 11 30 30 Fax: 61 11 30 03 Vemund Midthus DnV

WINCH REF. DWG. B92-04

HP A B DR1 DR2 LIMIT UP LIMIT DOWN

LUFFING

EMERGENCY LOOWERING JIB
NORMALLY CLOSED

FOLDING

Brake release
emgency slewing
NORMALLY OPEN

SLEWING

Bypass valve
emgency slewing
NORMALLY CLOSED

109kW-S6-40%
400V-3PH-50HZ

OIL TANK

Pump: Anti clockwise rotation

Q=192 l/min

EMERGENCY STOP
NORMALLY CLOSED

P R LS A B LSb LSa A B A B A B A B

120 bar 240bar 100 bar 220bar 200bar 200bar 200bar 200bar

MAIN VALVE HOIST LUFFING FOLDING SLEWING

To be connected to Item 15

To be connected to Item 45

Hand operated emergency pump (Common for all cranes one ship)

A - U low pressure
B - W high pressure

Index	Date	Revisions	Sign
04	5/1-06	Revised slewing Moved winch to B92-04	MT
03	13/10-05	Pump rotation indicated	JØ
02	5/9-05	Revised	MT
01	24/8-05	Issued for approval	MT

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Coating: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Title:

DKF220 12T-16M
HYDRAULIC DIAGRAM

Customer / Vendor:

Item	Qty	Article/Name/Type	Weight	Material/DWG no.	Art no.
1	1	Parts list		P723-1013	

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Calculations:

Cad file : L723\00010882

Plot Date:

Date: 24/08-2005 | Drawn: MT | Scale:
Checked: | Verified: | Format: A2
Replacement for: | Replaced by: | Prof.

DRAWING NO.: C723-1013 | REVISION: 04

Page: 1/5	NS-ISO 2768-1 Medium			Date: 24/08-2005	Drawn: MT	Scale:
Grading: ☐Open ☐Internal ☒Confidential ☐Strictly confidential				Checked:	Verified:	Format: A4
Title: DKF220 12T-16M Hydraulic parts list				Replacement for:	Replaced by:	Proj.
				DRAWING NO.: P723-1013		REVISION: 02

Customer / Vendor :

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
		WINCH REF. DWG. B92-04		
11	1	Test point Minimess 620	01.204.11	10968
12	3	Ball valve	BKH-3/8"	10967
13				
14				
15	1	QUICK CONNECTION, male snaptite	SVHN-4-4RP	10969
17	1	Hydraulic cylinder	ø280/ø200x2890	14040
18	1	Load contr. valve Flangeable	08.45.38.13.73.35	12933
19	1	Valve restr. check Hawe	BC1-04-F	10729
20	1	Hydraulic cylinder	ø280/ø200x2890	14040
21	1	Load contr. valve Flangeable		14055
22				
23				
02 24	1	Hydraulic motor	H1C90-S-VM2R	21545
02 25	0	Gear w/break,	RPR3255/140/..	14235
02 26	1	Valve Load Control	VCD\B3	13505
27	1	Test point Minimess 620	PA-09-1/4"-316	12621
02 28	1	Quick connection, mail snaptite	SVHN-4-4RP	10969
02 29				
30	1	Main valve	PSL6/5	21366
31	1	Ball valve	BKH-3/8"	10967

Page: 2/5	NS-ISO 2768-1 Medium
Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential	

Title:

DKF220 12T-16M
Hydraulic parts list

Customer / Vendor :

Date: 24/08-2005	Drawn: MT	Scale:
Checked:	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P723-1013 | REVISION: 02

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
32				
33				-
34	1	Filter breather	UCC SPA 7121	10767
35	1	Retur filter	MPF 400-3-G2-P10-H-BUR-V1	12118
36	1	Quick connection, male	BVHN-12-12RP	10971
37	1	Quick connection, female	BVHC 12-12-RP	13362
38	1	Fluid level/temp guage UCC	UCFLT 321	10697
39	1	Pluge for valve pos.40	704-12	13439
40	1	Ball valve Mercury 3/4"	T-115-12RP	10973
41	1	Hydraulic pump	R1A6137N5AIA	12346
42	0	Kardang shaft	5-C Lc=355mm	12113
43	0	Electro motor 400V-3PH-50Hz	97kW	
44	1	Valve non-return GS Hydro	NRSF- 1.1/4R	12764
45	1	Quick connection, mail - manual pump	BVHN-08-08RP	10972
46	1	Manual operated hand pump	HP50	13996
47	1	Quick connection, femail	SVHC4-4RP	10975
48	1	Quick connection, female	BVHC8-8RP	10974
49	1	HP FILTER	FMP 320-3-BA-G2-A10N-V7	14052
60	36m	Pipe ø30x3	AISI 316l	12121
61	12m	Pipe ø12x1,5	AISI 316L	10995
62	36m	Pipe ø10 x1,5	AISI 316L	13546

02

02

Page: 3/5	NS-ISO 2768-1 Medium		
Grading: ☐Open ☐Internal ☒Confidential ☐Strictly confidential			
Title: DKF220 12T-16M Hydraulic parts list	Customer / Vendor :	Date: 24/08-2005	Drawn: MT
		Checked:	Verified:
		Replacement for:	Replaced by:
		DRAWING NO.: P723-1013	REVISION: 02
		Scale:	
		Format: A4	
		Proj.	

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
		HOSES HOIST		
50	1	HP-hose 4SP16-1500mm /313-21-16/316-21-16	250/370 bar	
51	1	HP-hose 4SP16-1500mm /313-21-16/316-21-16	250/370 bar	
52	1	HP-hose 4SP16-2400mm /313-21-16/313-21-16	250/370 bar	
53	1	HP-hose 4SP16-2400mm /313-21-16/313-21-16	250/370 bar	
54	1	HP-hose 4SP16-1800mm /313-21-16/313-26-16	250/370 bar	
55	1	HP-hose 4SP16-1800mm /313-21-16/313-26-16	250/370 bar	
56	1	HP-hose 4SP16-1600mm /313-26-16/313-26-16	250/370 bar	
57	1	HP-hose 4SP16-1600mm /313-26-16/313-26-16	250/370 bar	
56A	1	HP-hose 4SP16-1000mm /316-21-16/313-26-16	250/370 bar	
57A	1	HP-hose 4SP16-850mm /316-21-16/313-26-16	250/370 bar	
58	1	HP-hose 2SN04- 1600mm /313-09-04/313-09-04	250/370 bar	
58A	1	HP-hose 2SN04- 700mm /313-09-04/316-09-04	250/370 bar	
59	1	HP-hose 2SN04- 450mm /313-09-04/316-09-04	250/370 bar	
60	1	HP-hose 2SN04- 1000mm /313-09-04/316-09-04	250/370 bar	
61	1	HP-hose 2SN04- 1000mm /313-09-04/316-09-04	250/370 bar	
62	1	HP-hose 2SN04- 900mm /313-09-04/316-09-04	250/370 bar	
64	1	HP-hose 2SN04- 1800mm /313-09-04/313-09-04	250/370 bar	
64A	1	HP-hose 2SN04- 1600mm /313-09-04/313-09-04	250/370 bar	
65	1	HP-hose 2SN04- 1800mm /313-09-04/313-09-04	250/370 bar	
65A	1	HP-hose 2SN04- 1600mm /313-09-04/313-09-04	250/370 bar	
66	1	HP-hose 2SN06- 600mm /313-12-06/316-12-06	250/370 bar	
66A	1	HP-hose 2SN06- 800mm /313-12-06/316-12-06	250/370 bar	
67	1	HP-hose 2SN04- 2100mm /313-09-04/313-09-04	250/370 bar	
68	1	HP-hose 2SN04- 2100mm /313-09-04/313-09-04	250/370 bar	
69	1	HP-hose 2SN04- 720mm /313-09-04/316-09-04	250/370 bar	
70	1	HP-hose 2SN04- 720mm /313-09-04/316-09-04	250/370 bar	

Page: 4/5	NS-ISO 2768-1 Medium	Date: 24/08-2005	Drawn: MT	Scale:
Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential		Checked:	Verified:	Format: A4
Title: DKF220 12T-16M Hydraulic parts list		Replacement for:	Replaced by:	Proj:
		DRAWING NO.: P723-1013		REVISION: 02

Customer / Vendor :

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
		HOSES LUFFING		
72	1	HP-hose 4SP16- 1400mm /313-21-16/316-21-16	250/370 bar	
73	1	HP-hose 4SP16-1400mm /313-21-16/316-21-16	250/370 bar	
74	1	HP-hose 4SP16- 1500mm /313-21-16/313-21-16	250/370 bar	
75	1	HP-hose 4SP16- 1500mm /313-21-16/313-21-16	250/370 bar	
76	1	HP-hose 4SP16- 1500mm /313-21-16/316-21-16	250/370 bar	
77	1	HP-hose 4SP16-1800 mm /313-21-16/316-21-16	250/370 bar	
78	1	HP-hose 2SN04-500 mm /313-09-04/316-09-04	250/370 bar	
79	1	HP-hose 2SN04-1000 mm /313-09-04/316-09-04	250/370 bar	
		HOSES FOLDING		
90	1	HP-hose 4SP16- 1400mm /313-21-16/316-21-16	250/370 bar	
91	1	HP-hose 4SP16- 1400mm /313-21-16/316-21-16	250/370 bar	
92	1	HP-hose 4SP16- 2400mm /313-21-16/313-21-16	250/370 bar	
93	1	HP-hose 4SP16- 2400mm /313-21-16/313-21-16	250/370 bar	
94	1	HP-hose 4SP16- 1800mm /313-21-16/313-26-16	250/370 bar	
95	1	HP-hose 4SP16- 1800mm /313-21-16/313-26-16	250/370 bar	
96	1	HP-hose 4SP16- 900mm /313-26-16/316-21-16	250/370 bar	
97	1	HP-hose 4SP16- 1200 /313-26-16/316-21-16	250/370 bar	
		HOSES SLEWING		
80	1	HP-hose 4SP16- 1300mm /313-21-16/316-21-16	250/370 bar	
81	1	HP-hose 4SP16- 1300mm /313-21-16/316-21-16	250/370 bar	
82	1	HP-hose 4SP16- 1400 /313-21-16/313-21-16	250/370 bar	
83	1	HP-hose 4SP16- 1700 /313-21-16/313-21-16	250/370 bar	
84	1	HP-hose 4SP16- 700 /313-21-16/316-21-16	250/370 bar	
85	1	HP-hose 4SP16- 1000 /313-21-16/316-21-16	250/370 bar	
86	1	HP-hose 2SN06-550 mm /313-12-06/316-12-06	250/370 bar	
87				
88				
89	1		250/370 bar	

Page: 5/5	NS-ISO 2768-1 Medium		
Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential			
Title: DKF220 12T-16M Hydraulic parts list	Customer / Vendor :	Date: 24/08-2005	Drawn: MT
		Checked:	Verified:
		Replacement for:	Replaced by:

Scale:	
Format:	A4
Proj.	
DRAWING NO.:	P723-1013
REVISION:	02

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013
Calculations:
Cad file : L723\00010883
Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
106	1	2SN06- 1600mm 313-12-06 / 313-12-06		
107	1	2SN06- 1800mm 313-12-06 / 313-12-06		
108	1	HP-hose 2SN04- 1200mm /313-09-04/316-09-04	250/370 bar	

HOSES POWER PACK/RETURN

110	1	HP-hose 4SH20-1100 mm /513-26-20/544-24-20+943-24	250/370 bar	
111	1	HP-hose 4SH20- 700mm /513-26-20/516-26-20	250/370 bar	
112	1	HP-hose 4SH20-1350mm /513-26-20/517-26-20	250/370 bar	
113				
114				
115	1	LP-hose 2SN20-2050 mm /313-26-20/316-26-20	250/370 bar	
116	1	HP-hose 2SN04-1800 mm /313-09-04/316-09-04	250/370 bar	
117	1	HP-hose 2SN04- 1200mm /313-09-04/316-09-04	250/370 bar	

HOSES EMERGENCY PUMP

120	1	HP-hose 2SN06- 1200mm /313-12-06/313-12-06	250/370 bar	
121	1	HP-hose 2SN04- 5000mm /313-09-04/313-09-04	250/370 bar	

DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 11 in the Equipment User Manual – Drawings and Part lists

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

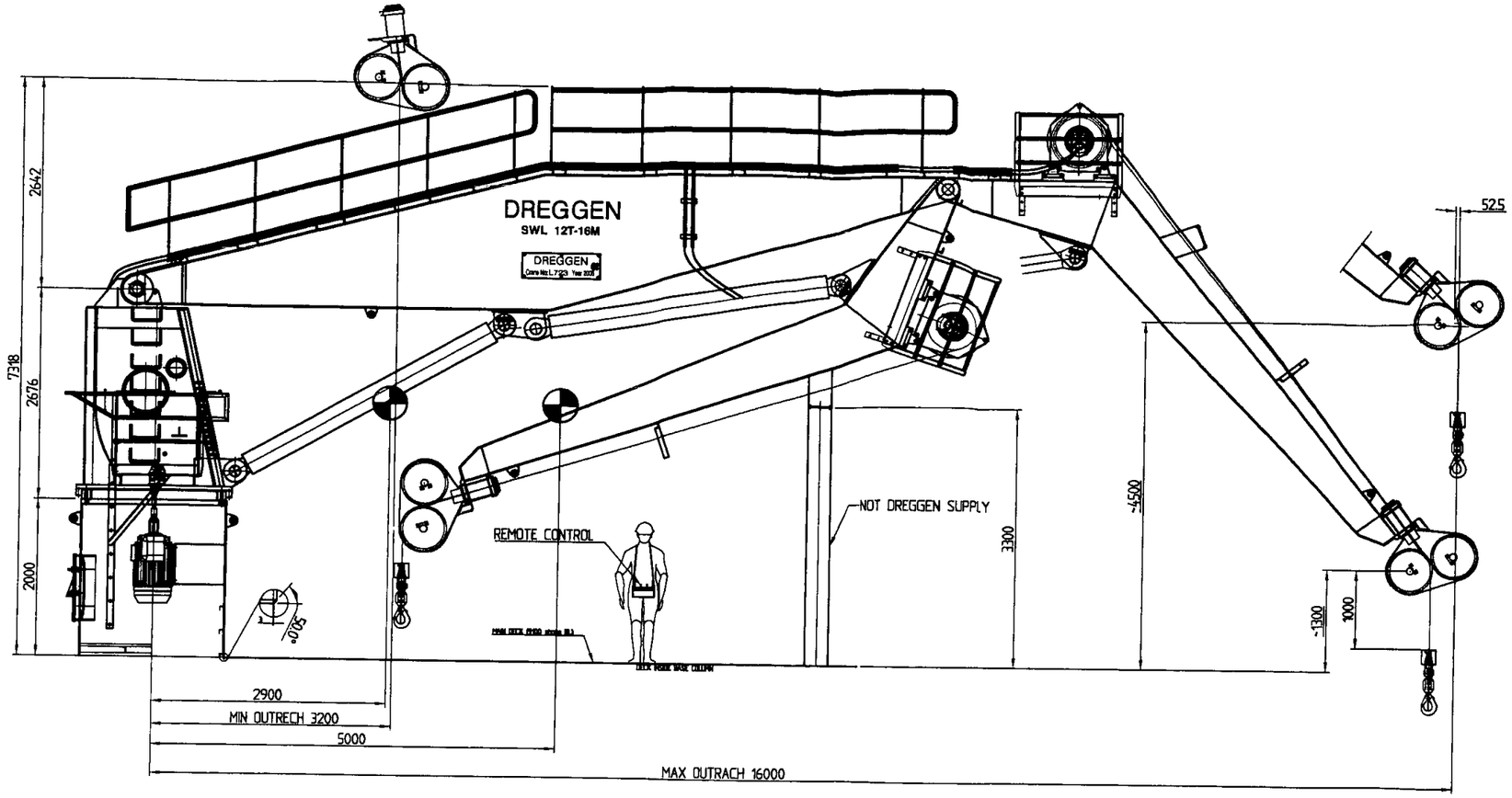
Document title:
DRAWINGS AND PART LISTS

Client Doc no:			Rev.	
Proj.no. Disc. Prod.kode	Doc. kode Seq.no		Rev.	Total no. of pages
60338			**01**	**3**

11 DRAWINGS AND PART LISTS

11.1 Drawings and Part lists

Drawing no.:		Drawing name:	Cad no.:
C723	01	General arrangement	T.W/L723-60338
P723-1	01	Parts list	T.W/L723-60338
D723-1	01	General assembly drawing	T.W/L723-60338
C723-106	01	Operation platform	T.W/L723-60338
P80-125	03	Winch SWL 12T	L_721\80-125 sh 2
C80-125	02	Winch GA, SWL 12T	L_721\80-125 sh 1
B74-13	01	Hoist limit switch PCD165	L_74\00007289
P74-13	01	Hoist limit switch	L_74\00007290
B721-105	01	Jib head assembly	T.W/L723-60338
B240-302	03	Jib hinge assembly	L_240\00001592
P59-91	03	Hook with weight SWL 12T	S_59\00006023
A59-91	03	Partlist hook with weight SWL 12T	S_59\00006024
Hydraulic Draw.			
C723-1013	03	Hydraulic diagram	L723\00010882
P723-1013	01	Part list hydraulic diagram	L723\00010883
P723-80	01	Electro Drawings	



VERTICAL LOADS:

SWL	12 T
CRANE	20 T
TOT. STATIC LOAD	32 T
40% DYN.ADD	4.8 T
TOTAL:	36.8 T

MOMENTS:

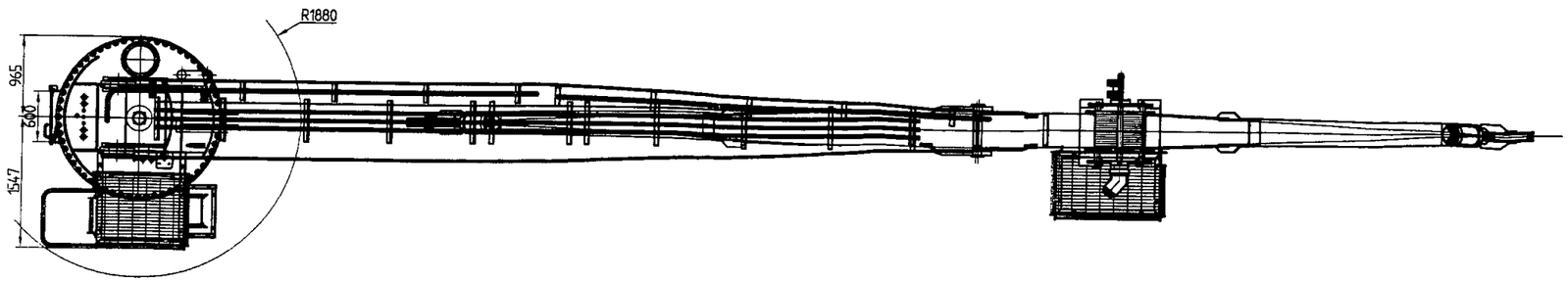
SWL	192 TM
CRANE	100 TM
TOT. STATIC MOM	292 TM
40% DYN.ADD	76.8 TM
TOTAL:	368.8 TM

Slewing Moment = 35 TM

TECHNICAL SPECIFICATION

SWL AT MAX OUTREACH:	12T-16M
MIN. OUTREACH:	3.2 M
MAX OUTREACH:	16 M
HOOK TRAVEL:	30 M
HOOK SPEED, FULL LOAD:	0-20 M/MIN
HOOK SPEED, 2%:	0-20 M/MIN
SLEWING SECTOR, CONTINUOUSLY:	360 DEG
SLEWING SPEED, EVEN KEEL:	0-1.0 RPM
LUFFING TIME, AVERAGE UP/DOWN:	60 SEC
HEEL/TRIM:	5/2 DEGR
WEIGHT OF CRANE:	20 TON
POWER CONSUMPTION SL:	97 KW
POWER SUPPLY:	400V/50HZ/3PH
ELECTRIC STARTER:	DELTA

NOTE! SPEEDS, WEIGHT AND POWER CONSUMPTION ARE APPROXIMATE WITHIN +/- 5%



Paint spec:

SURFACE TREATMENT CRANE:
SANDBLASTED TO Sa2.5 AND PAINTED:
- 1 COAT HEMPADUR ZINC 1536 40 my
- 1 COAT HEMPADUR 4515 150 my
- 1 COAT HEMPATEX ENAMEL 5636 50 my
TOT. PAINT THICKNESS: 240 my
FINISH COLOUR: Delivered upon request
PAINT MAKER IFA HEMPEL.

INTERIOR HYDRAULIC OIL TANK
1. ABRASIVE BLASTCLEAN OF ALL SURFACES TO Sa2,5
2. VACUM CLEAN
3. TO BE WASHED WITH HYRAULIC OIL

Index	Date	Revisions	Sign
02	05.09.2005	Rev Power Cons.-> 97kw	EGA
01	26.08.2005	Issued for Approval	EGA

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Customer / Vendor:

Calculations:

Plot Date: 28.10.2005

Cad file: 723.dwg

DREGGEN

HEGREMESVEIEN 17a
P.O. BOX 3434
PHONE: +47 55 33 36 50
FAX: +47 55 33 36 51/52
5915 BERGEN, NORWAY

Title:
KNUCKLE BOOM DECK CRANE
DKF220-12T-16M
GENERAL ARRANGEMENT

Date: 26.08.2005	Drawn: EGA	Scale: 1:50	
Checked: HR	Verified:	Format:	
Replacement for:	Replaced by:	Proj.	
DRAWING NO.: C723		REVISION: 2	

Page: 1/3 | Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B

Title:

Main Partslist

Customer / Vendor :

Date:	Drawn:	Scale:
28.09.2005	EGA	/
Checked:	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P723-1 | REVISION: 04

Index	Date	Revisions	Sign
04	03.11.2005	Ch. It.8 to L.H.-made Handrail	
03	17/10-05	New dwg. item 60 add item M16	
02	13.10.2005	Issued new drwg for It.5	EGA
01	28.09.2005	Issued for Production	EGA

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: D723-1

Calculations:

Cad file : 723-002

Plot Date: 28.09.2005

Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.)/DWG no	Art no
1	1	Base Column	1733	D723-101	
2	1	Slewing column	2605	D723-102	
3	1	Inner jib	4002	D723-103	
4	1	outer jib	1695	D723-104	
5	1	Operation platform	101	C723-106	
6	1	Ladder for operation platform	31	A703-10501	
7	1	Stiffener	4	A287-305	
8	1	Handrail on jib No.: 1	72	C703-502 (L.H.-made)	
9	1	Handrail on jib No.: 2	67	C723-105	
10	1	Winch G.A	968	P80-125	
11	1	Hook with weight SWL 12T	66	P59-94	
12	1	Wire Φ26 L= 45,5 m (Flexpack)	149	Min br.l =613 kN	
13	1	Jibhinge assembly	57	B240-302	
14	2	Stay for collector	12	A732-1011	
15	2	Bracket for collector	2	A703-1012	
16	4	Angle for slipring	8	A703-1013	
17	2	Hydraulic cylinder	~4590	See hydr. main partlist	10915
18	1	Main valve	~20	See hydr. main partlist	21366
19	1	Sign plate	1	B44-71	
20	1	Bracket for collector	1,4	A718-1015	
21	1	Service platform on jib	90	B726-403	
22	1	Grating 30x3 - 30x44 L=705x1154	20		10229
23	1	Grating 30x3-30x44 L=980x800	20		10229
24	1	Retur filter MPF 400	-	See hydr. main partlist	12118
25	1	HP filter	-	See hydr. main partlist	12106
26	1	Fluid level/temp guage UCFT 321	-	See hydr. main partlist	10697
27	1	Filter breather UCC SPA 7121	-	See hydr. main partlist	10767
28	1	Hydraulic motor	20	See hydr. main partlist	21269
29	1	Slewing gear	~125	See hydr. main partlist	14235
30	1	Hydraulic pump	~30	See hydr. main partlist	12346

Page: 2/3 | Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B

Title:

Main Partslist

Customer / Vendor :

Date:	Drawn:	Scale:
28.09.2005	EGA	/
Checked:	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P723-1 | REVISION: 04

Index	Date	Revisions	Sign
04	03.11.2005	Ch. It.8 to L.H.-made Handrail	
03	17/10-05	New dwg. item 60 add item M16	
02	13.10.2005	Issued new drwg for It.5	EGA
01	28.09.2005	Issued for Production	EGA

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: D723-1

Calculations:

Cad file : 723-002

Plot Date: 28.09.2005

Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.)/DWG no	Art no
31	1	El. motor	~515	See el. main partlist	14215
32	1	Slipring	-	See el. main partlist	
33	1	Axle ø120 x 619	75	A38-11 (U016)	
34	2	Jib hinge bearing	6	A40-08 (U010)	14148
35	4	Axle Φ140x230	54	A38-5 (U0123)	
36	8	Hex.head screw M24x80	-	Din 931-8.8 FZV	10411
37	6	Hex.haed screw M30x140	-	Din 6914-10.9	13512
38	54	Hex.head screw M30x190	-	Din 6914-10.9	21404
39	54	Nut M30	-	Din 6915-10	11080
40	174	Washer Φ31/55x5	-	Din 6916-10	11079
41	60	Hex.head screw M30x180	-	Din 6914-10.9	13521
42	24	Hex.head screw M20x110	-	Din 931-8.8 FZV	
43	24	Washer Φ21/37x3	-	DIN 125 HB200 FZV	
45	4	Spacer pipe/ Spacer ring	1	L40-40-1 (U0289)	
46	4	Hex.head screw M22x100	-	Din 931-8.8. FZV	
47	4	Nut M22	-	Din 984-8 FZV	
48	8	Washer Φ23/39x3	-	Din 125 8.8 FZV	
49	4	Hex.head screw M10x90	-	Din 931-A4	21011
50	24	Washer Φ10.5/21x2	-	Din 125 A4	21032
51	8	Hex.head screw M10x25	-	Din 933-80 A4	21002
52	6	Washer Φ17/30x3		DIN 125 FZV	21046
53	6	Screw hex M16x40		DIN 933-80 FZV	21077
54	3	Retainer	2	A39-2 (U04)	
55	52	Washer Φ13/Φ24x2		DIN125 HB200 FZV	21031
56	8	Washer Φ8.4/17x1.6	-	Din 125 A4	11383
57	2	Lub. niple 1/8"		Stain less	10535
58	1	Jib head '	485	B721-105 (Inv.)	
59	1	Sign plate Max hook	-	A44-08 U032	10285
60	1	Deck crane-folding jib sign plate	-	A44-70	
61	1	Sign plate for emc lowering	-	B44-07	12718

Page: 3/3 | Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B

Title:

Main Partslist

Customer / Vendor :

Date:	Drawn:	Scale:
28.09.2005	EGA	/
Checked:	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P723-1 REVISION: 04

Index	Date	Revisions	Sign
04	03.11.2005	Ch. lt.8 to L.H.-made Handrail	
03	17/10-05	New dwg. item 60 add item M16	
02	13.10.2005	Issued new drwg for lt.5	EGA
01	28.09.2005	Issued for Production	EGA

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: D723-1

Calculations:

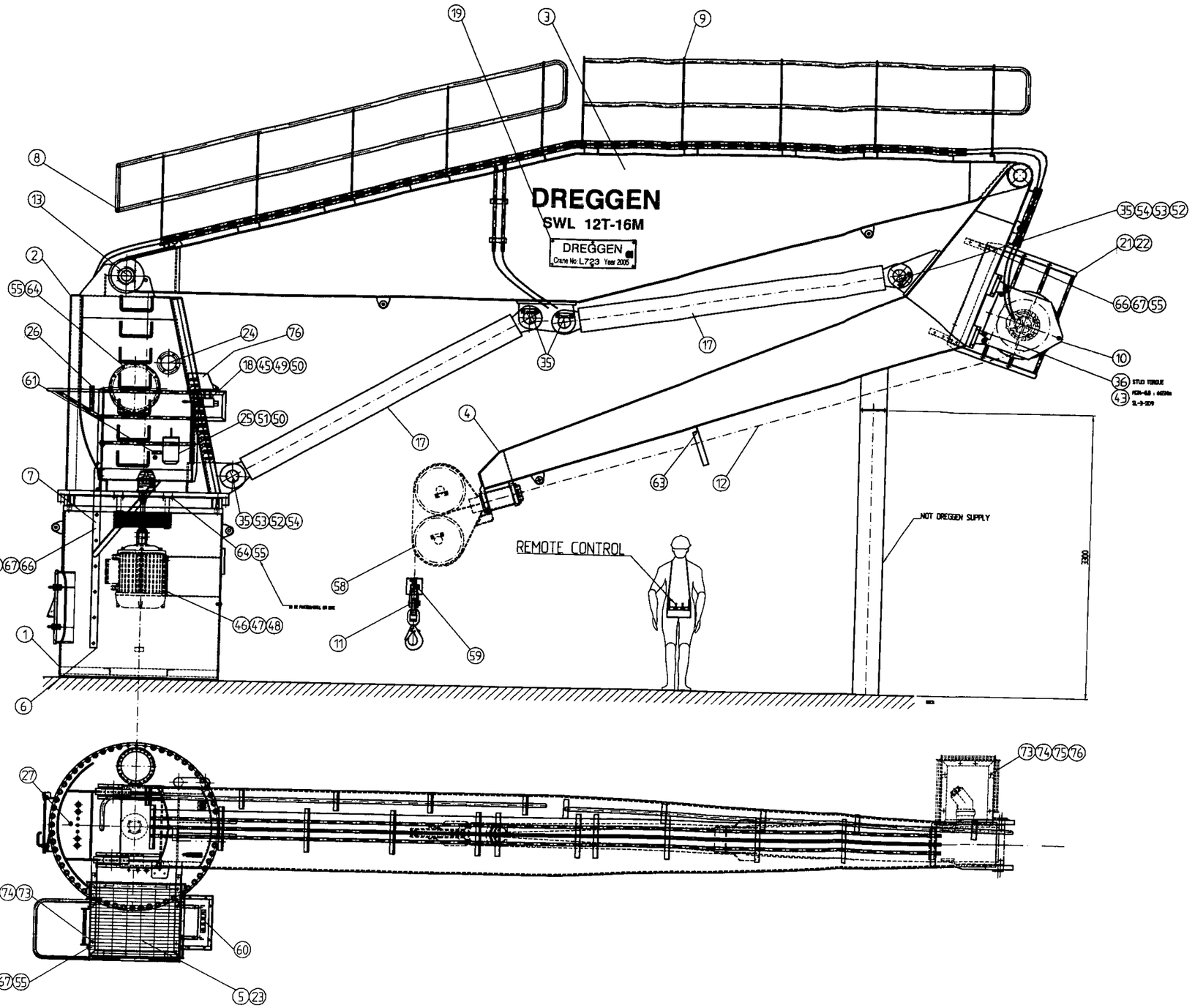
Cad file : 723-002

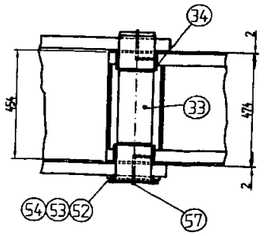
Plot Date: 03.11.2005

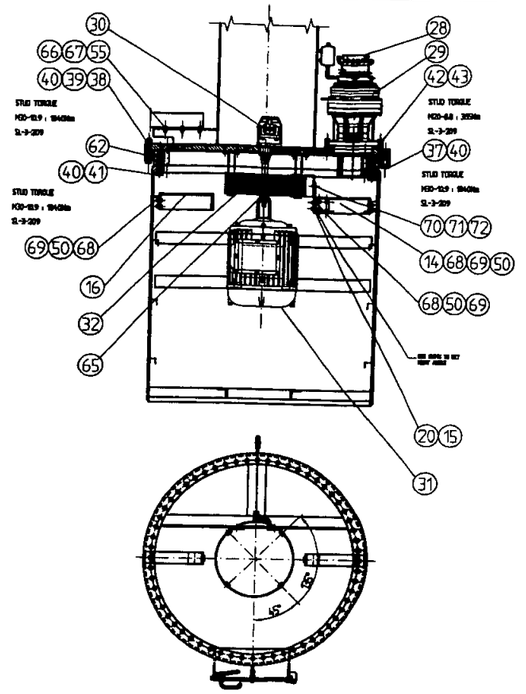
Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.)/DWG no	Art no
62	1	Slewing ring	700	062.40.1773.001.49.1522	21560
63	1	Guide bar			13078
64	20	Hex.head screw M12x25	-	Din 933-8.8 FZV	21016
65	1	Kardang shaft 5C	~5	Lc355-Ø75/1 1/2"	12113
66	20	Hex.head screw M12x45	-	Din 933-8.8 FZV	21055
67	20	Nut M12	-	Din 984-8. FZV	21026
68	14	Hex.head screw M10x40	-	Din 933-8.8 FZV	11367
69	8	Nut M10	-	Din 984-8. FZV	21086
70	2	Hex.head screw M5x30	-	Din 933-80 A4	10474
71	2	Nut M5	-	Din 984-80 A4	10146
72	4	Washer Ø5.3/10x1	-	Din 125 A4	21070
73	8	Clamp for grating	-		10231
74	8	Screw counter sunk M8x80	-	Din 963-80 A4	10230
75	8	Nut M8	-	Din 934-80 A4	21028
76	1	Cover for main valve	8	B703-504	

03

Total Weight: 19000kg







Item	Qty	Main Parts List / Article/Name/Type	~19000	P723-1 / Weight	Material (as spec. or equiv.) / DWG no.	Art no.
	1					

Index	Date	Revisions	Sign
03	03.11.2005	Changed lt.8 to (L.H.-mode)	EGA
02	16.10.2005	Revised	MT
01	28.09.2005	ISSUED FOR PRODUCTION	EGA

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

According to international laws this drawing is the property of DREGGEN. The drawing and contents can not be made public, copied or otherwise used, without our written consent.

Customer / Vendor:

Calculation:

Part date: 03.11.2005

723-001.dwg

DREGGEN

Main Assembly 2
DKF 220-12T-16M

Date	Drawn	Scale
23.09.2005	EGA	1:25
Checked	Verified	Format
MAP		A1
Replacement for:	Replaced by:	Proj.

Drawing no.: D723-1 | Revision: 3

POS 13, 14 & 15 WELDED ON POS 12
AND DELIVER AS COMPLETE LOOS ITEM

DETAIL A

(General when not else stated)

TYP. FOR POS 4 & 5

DETAIL A

Scale 1:25

Total weight: ~101 kg.

Item	Qty	Article/Name/Type	Weight	Material (as spec. or egviv.) / DWG no.	Art no.
20	2	Angle 40x40x5 L=344	2	S235JRG2	
19	4	Angle 40x40x5 L=340	4	S235JRG2	
17	2	Angel 50x50x5 L=700	6	S235JRG2	
15	1	Plate 3x15x382	1	S235JRG2	
14	2	Plate 3x15x205	1	S235JRG2	
13	2	Plate 5x30x40	1	S235JRG2	
12	1	Plate 5x360x610	7	S235JRG2	
11	1	Angle40x40x5 L=540	2	S235JRG2	
10	3	Pipe 2,65 x Ø33,7 L=1020	3	S235JRG2	
9	1	Pipe 2,65 x Ø33,7 L=610	1	S235JRG2	
8	1	Pipe 2,65 x Ø33,7 L=1795	2	S235JRG2	
7	3	Pipe 2,65 x Ø33,7 L=194	2	S235JRG2	
6	3	Pipe 2,65 x Ø33,7 L=845	5	S235JRG2	
5	3	Fl.bar50x5 L=1015	6	S235JRG2	
4	2	Angle 50x50x5 L=1050	8	S235JRG2	
3	1	Angle 130x65x8 L=1009	12	S235JRG2	
2	1	Angle 130x65x8 L=1025	12	S235JRG2	
1	2	Angle 130x65x8 L=950	23	S235JRG2	

Index	Date	Revisions	Sign
01	28.02.2005	ISSUED FOR PRODUCTION	EGA

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13820 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Customer / Vendor:

Calculations:

Plot Date: 28.10.2005

Cad file: 723-001-06.dwg

DREGGEN
HEGREMESVEIEN 17a
P.O. BOX 3434
PHONE: +47 55 33 36 50
FAX: +47 55 33 36 51/52
5915 BJØRDAL, NORWAY

Title: OPERATION PLATFORM

Date:	Drawn:	Scale:
13.10.2005	EGA	1:10
Checked: MT	Verified:	Format: A2
Replacement for:	Replaced by:	Proj.

DRAWING NO.: C723-106 REVISION: 1

Sheet No: 2/2	Grading: ☐ Open ☐ Internal ☒ Confidetial ☐ Strictly confidential		
General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B			
Title:	Date: 30.08.2005	Drawn: BF	Scale: 1:5
	Checked: MAP	Verified:	Format: A4
	Replacement for:	Replaced by:	Proj.

C80-12T
Winch assembly

Drawing no.	Revision
P80-125	01

Index	Date	Revisions	Sign
01	22.09.05	Issued for production	MAP

DREGGEN

Parts list to dwg no.:

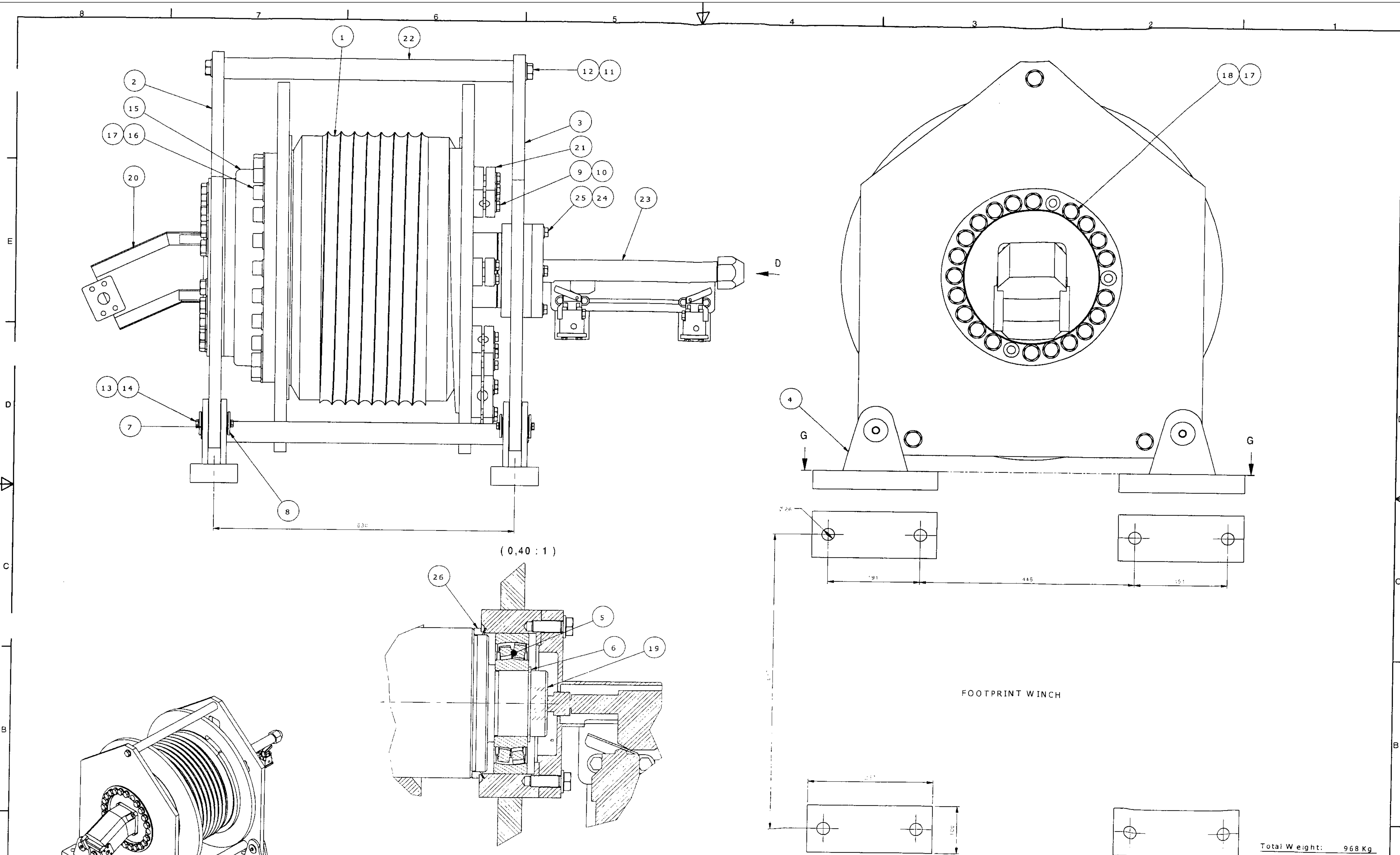
Calculations:

CAD file: C:\Inventor\721\80-125.idw

Plot Date:

Item	Qty	Article / Name / Type	Weight	Spec./DWG no	Art no
1	1	DrumAssy	377,2	D80-12501	
2	1	End Plate Gear Side Assy.	88,9	B80-11301	
3	1	End Plate Brg Side Assy.	99,9	B80-4202	
4	4	Foot Bracket	40,0	A80-2104	
5	1	Spherical Roller 21314 CC	2,7		12906
6	1	CIRCLIP, EXTERNAL	0,0	A 70 DIN471 A4	11036
7	4	Shaft	1,6	A38-9(U05)	
8	8	Lock Washer	0,8	L39-4-03(U05)	
9	16	SCREW HEX	0,9	M12* 45 DIN933-80 A4	10867
10	16	WASHER HB200 FZV	0,1	Ø13/24*2 DIN125 FZV	21031
11	6	WASHER HB200 FZV	0,1	Ø21/36*3 DIN125 8,8 FZV	11834
12	6	SCREW HEX	0,2	M20* 60 DIN933-8,8 FZV	21041
13	8	WASHER	0,0	Ø 8,4/17*1,6 DIN125 A4	11383
14	8	SCREW HEX	0,1	M 8* 20 DIN933-80 A4	21005
15	1	Gear	270,0		21307
16	24	SCREW CYL	0,8	M20* 70 DIN912-8,8 A4	12960
17	45	Washer	0,8	Ø21/36*3 DIN125 A4-80	13944
18	21	SCREW HEX	5,2	M20* 70 DIN931-8,8 FZV	21082
19	2	SCREW SET	0,0	M 4* 10 DIN913-80 A4	21102
20	1	Motor, hydraulic.	39,9		13266
21	4	Friction Block Top	3,2	A80-12502	
22	3	Stay	22,5	A80-103 (U054)	
23	1	Hoist limit switch	12,9	B74-13	
24	4	WASHER HB200 A4	0,0	Ø13/24*2,5 DIN125 A4	10861
25	4	SCREW HEX	0,0	M12* 35 DIN933-80 A4	10869
26	1	V-RING	0,0	V-150A	12907

Total Weight: 968 Kg



Total Weight: 968 Kg

Item	Qty	Article / Name / Type	Weight	Spec./DWG no	Art no
1	1	Partlist		See sheet 2	

Index	Date	Revisions	Sign
01	22.09.05	Issued for production	MAP

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

According to international laws this drawing is the property of DREGGEN. The drawing and contents can not be made public, copied or otherwise used, without our written consent.

CAD file: C:\Inventor\23\180-125.idw

DREGGEN

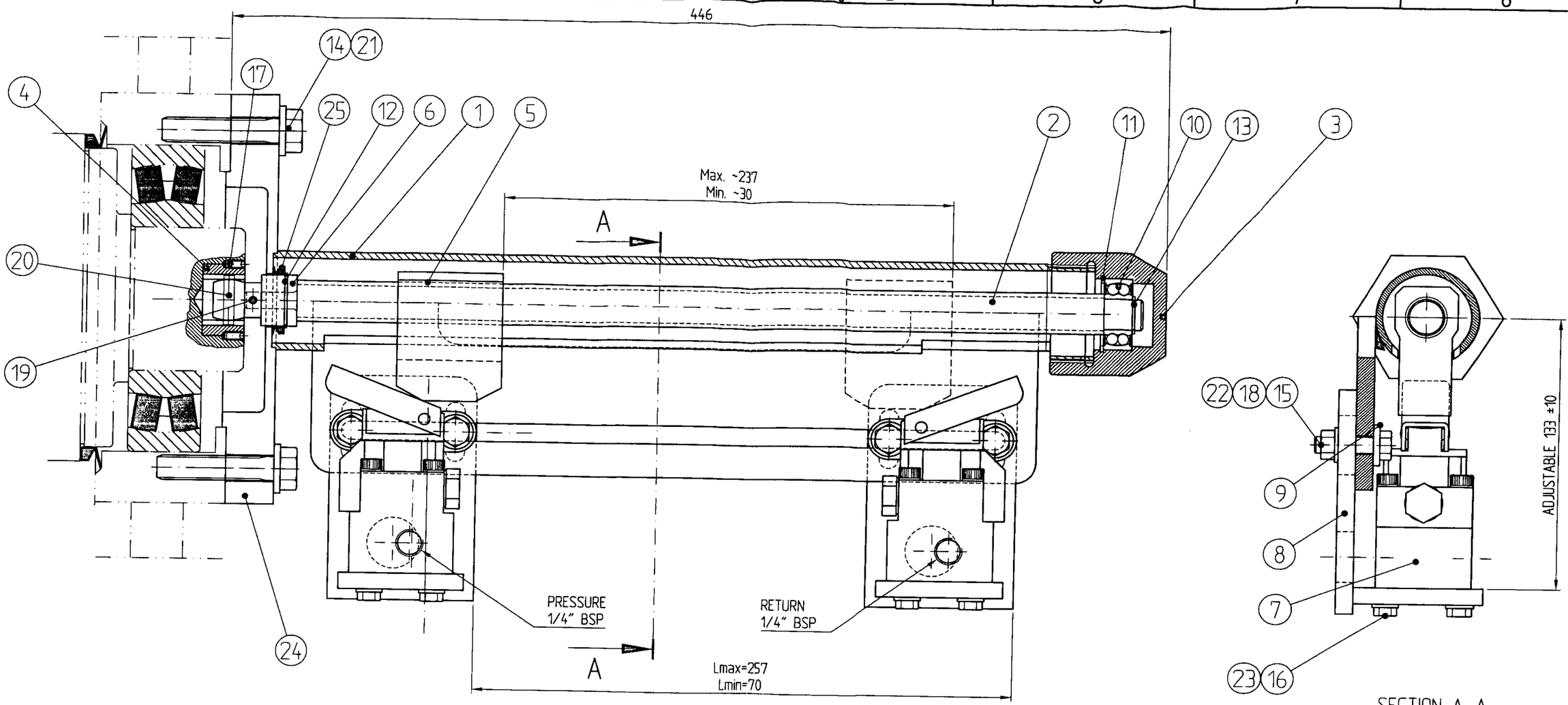
Nedre Nesveien 1?, P.O. Box 5454, 5815 Bergen Norway

Date: 30.08.2005 | Drawn: RF | Scale: 1:5

Checked: MAP | Format: A2

Title: C80-12T Winch assembly

Drawing no: C80-125 | Revision: 01 | Sheet No: 1/2



Drill & tap for Item 17 on assembly.
Lmax. 257 mm
Lmin. 70 mm
Travel of nut (Item 5):
237 mm. max, 30 mm. min.
Drum rotations: Min. appr. 12 Max appr. 95

Item	Qty	Parts list / Article/Name/Type	~12 / Weight	P74-13 / Material (as spec. or eqviv.) / DWG no.	Art no.

Index	Date	Revisions	Sign

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Title:

HOIST LIMIT SWITCH PCD165
HAWE VALVES

Customer / Vendor:

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Calculations:

Cad file : L_74\00007289

Plot Date:

Date:	Drawn:	Scale:
15/10-01	TB	1:2
Checked:	Verified:	Format: A3
Replacement for:	Replaced by:	Proj.

DRAWING NO.: B 74-13

REVISION:

Page: 1/1	Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential				
General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B					
Title: HOIST LIMIT SWITCH HAWE valve ø165 PCD			Customer / Vendor :	Date: 15/10-01	Drawn: TB
				Checked:	Verified:
				Replacement for:	Replaced by:
				DRAWING NO.: P 74-13	REVISION:
				Scale: 1:1	Format: A4
				Proj.	

Index	Date	Revisions	Sign

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: B 74-13

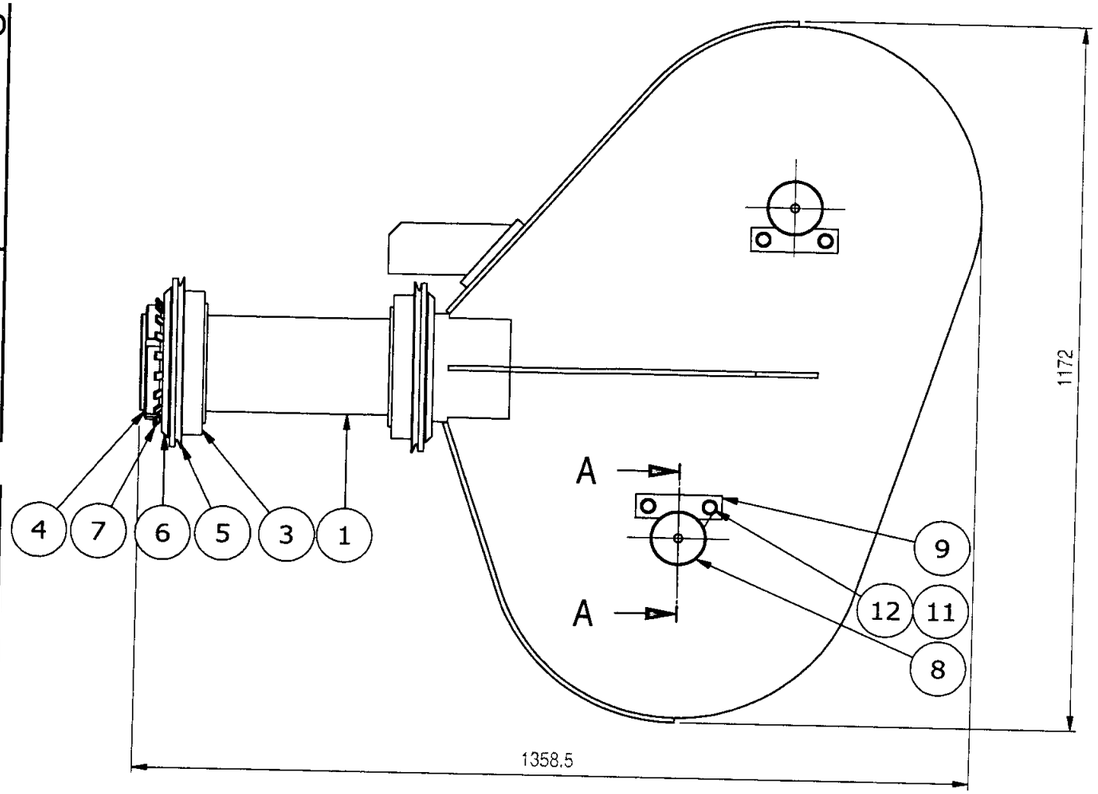
Calculations:

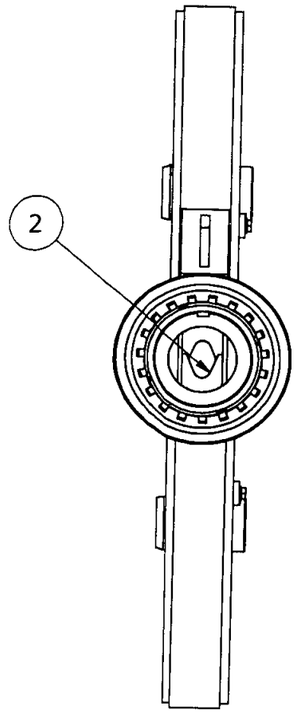
Cad file : L_74\00007290

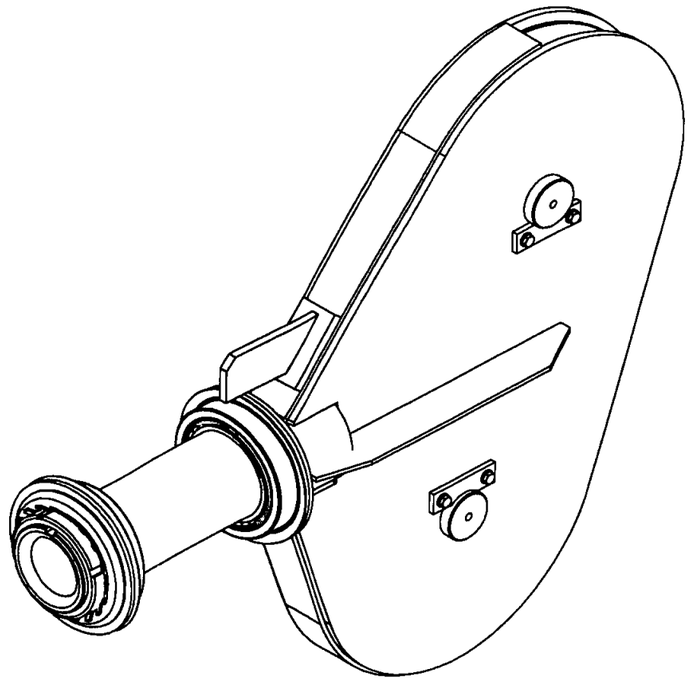
Plot Date: 2005.03.14

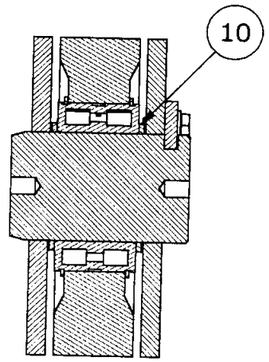
Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.)/DWG no	Art no
1	1	End cover	7,7	B74-1301	
2	1	Threaded rod	0,9	C74-602 (Item 1)	
3	1	Nut	0,5	C74-602 (Item 2)	
4	1	Sleeve	0,15	C74-602 (Item3)	
5	1	Nut	0,5	C74-602 (Item 4)	
6	1	Coupling	0,1	C74-602 (Item 7)	
7	0	Valve HAWE		See Hydr. parts list	(13148)
8	2	Bracket for valve (HAWE)	1,2	A74-1302	
9	2	Spacer	0,1	A74-1303	
10	1	Ball Bearing Spherical		2202E-2RS1	10951
11	1	Circlip I 35 (Int.)		DIN 472 Stainless	10954
12	1	Circlip A 25 (Ext.)		DIN 471 A4	10953
13	1	Circlip A 15 (Ext.)		DIN 471 A4	10952
14	4	Screw hex. M12x55		DIN 933-80 FZV	12401
15	4	Screw hex. M8x30		DIN 933-80 A4	10226
16	8	Screw hex. M6x20		DIN 933-80 A4	21013
17	2	Setscrew M4x10		DIN 913-80 A4	21102
18	4	Nut hex. M8		DIN 934-80 A4	21028
19	1	Split cotter pin Ø3,2x25		DIN 94 A4	10956
20	1	Spring pin Ø5x26		DIN 1481 A2	10955
21	4	Washer Ø13/24x2		DIN 125 FZV	21031
22	4	Washer Ø8,4/17x1,6		DIN 125 A4	21034
23	8	Washer Ø6,4/12,5x1,6		DIN 125 A4	21035
24	1	Nipple grease 1/8" BSP		NS1178 A4	10535
25	1	V-ring		V-25A	21101

Weight appr. 11 kg.









A-A (1 : 5)

Total Weight: 485 Kg

Item	Qty	Article / Name / Type	Weight	Spec./DWG no	Art no
12	4	SCREW HEX	0,2	M12* 30 DIN933-8,8 FZV	21017
11	4	WASHER HB200 FZV	0,0	Ø13/24*2 DIN125 FZV	21031
10	4	Spacer ring	0,4	L40-4-01 (U0311)	
9	2	Retainer	0,8	A39-2 (U03)	
8	2	Axle	14,2	A38-5 (U0143)	
7	1	Locking plate	0,4	MBL32	25002
6	2	Support ring	6,8	A721-10503	
5	2	V-RING	2,6	V-250A	14120
4	1	LOCKING NUT	1,5	KML 32	25001
3	2	BEARING	15,6	32032X	21401
2	2	Wire Sheave Assy	212,8	A721-10502	
1	1	Jib head	229,7	B721-10501	

Index	Date	Revisions	Sign
01	21.09.05	Issued for production	MAP

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidetial ☐ Strictly confidential

Customer / Vendor:

Calculations:

CAD file: C:\Inventor\721\721-105.idw

Plot Date:

DREGGEN
HEGRENESVEIEN 17a
P.O. BOX 3434
PHONE: +47 55 33 36 50
FAX: +47 55 33 36 51/52
5815 BERGEN, NORWAY

Title: Jib head assembly

Date: 24.08.2005 | Drawn: RF | Scale: 1:10

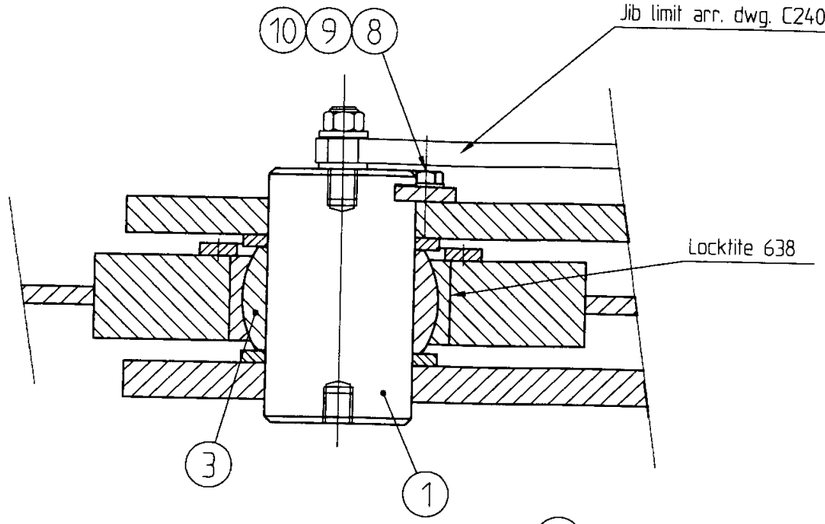
Checked: MAP | Verified: | Format: A3

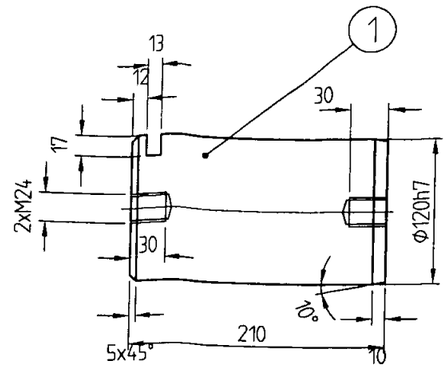
Replacement for: | Replaced by: | Proj:

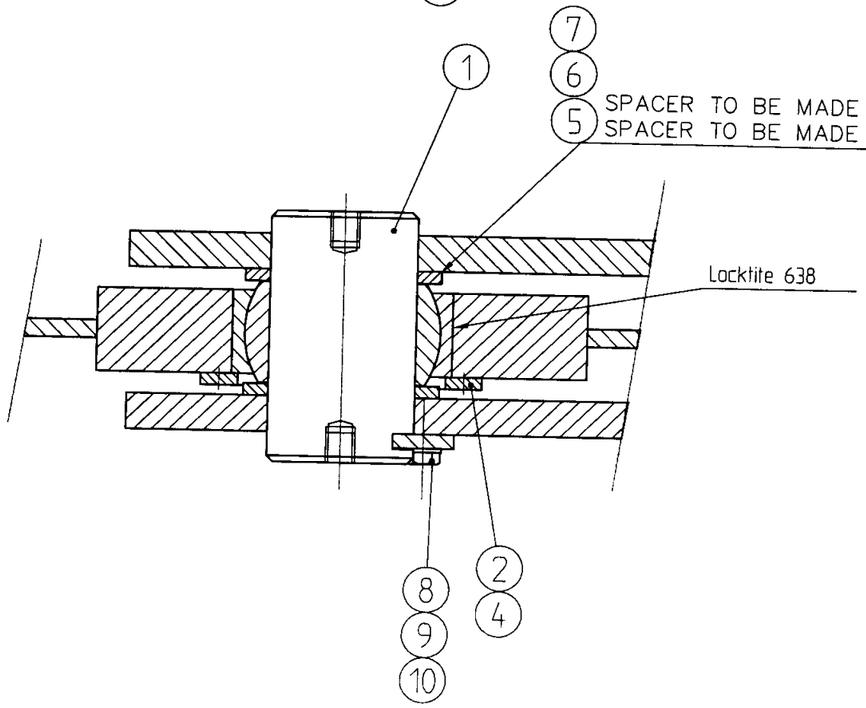
Drawing no. B721-105

Revision 01

Sheet No: 1







7 SPACER TO BE MADE AND FITTED WHEN ASSEMBLING OF CRANE
5 SPACER TO BE MADE BY 10 MM PLATE (THEORETICAL THICKNESS)

Weight 58 kg

Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.) / DWG no.	Art no.
10	4	Washer Φ17/30x3	-	Din 125 FZV	21046
9	4	Hex.head screw M16x40	-	Din 933-8.8 FZV	21077
8	2	Retainer	1	A39-2 U04	
7	6	Shimring Φ120,5/Φ145x2	0,5	Min. S235JR (St37-2)	
6	2	Shimring Φ120,5/Φ145x5	0,4	Min. S235JR (St37-2)	
5	2	Shimring Φ120,5/145x10	0,8	Min. S235JR (St37-2)	
4	12	Countersunk hd., M10x20		DIN7991 80A4	
3	2	Sph. bearing GE120UK-2RS	16	ELGES	
2	2	Support ring	3,0	A240-30201	
1	2	Axle Φ120x210	36	NS14240 (x4CrNiMo165)	

Index	Date	Revisions	Sign.
03	14.03.05	Add pos 8,9 &10	FTU
02	3/12-97	Added item 5,6,7	SØ
01	21/8-97	Revised	SØ

Project:

Detail: JIB HINGE ASSEMBLY

DREGGEN

P.B. 3434, ytre SANDVIKEN
N - 5035 BERGEN
TLF. 55 95 03 00 - FAX 55 95 18 00

NS-ISO 2768-1 MEDIUM

Scale	Drawn	Date
1:5	KHU	
Proj.	Checked: RR	Date: 281196
	Verified	Date

Replacement for: | Replaced by:

Draw. No. B240-302

PLOT DATE 3/12-97 | CAD FILE L240/00001592 | FORMAT A3

Page:	Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential		
General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B			
Title: Hook with weight SWL 10T, 12T		Customer / Vendor	

Date: 2001.11.01	Drawn: NRS	Scale: 1:5
Checked: TB 15/9-00	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.
DRAWING NO.: A59-94		REVISION: 03

Index	Date	Revisions	Sign
04	22.09.05	Updated title	RF
03	11.02.2002	Item 6 added	HNV
02	01/11/01	Note added	HNV
01	15/9-00	Issued for production	TB

DREGGEN

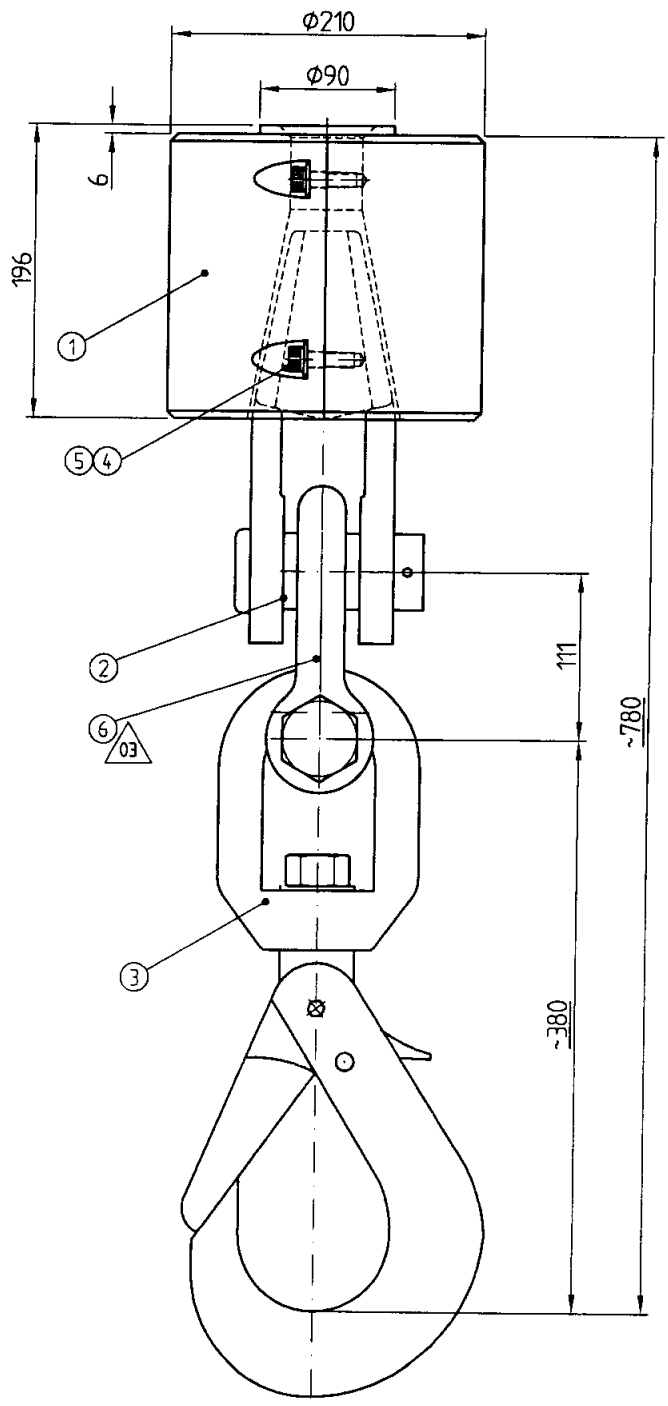
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: P59- 94

Calculations:

Cad file : S 59\00006023

Plot Date: 2005.09.22



Page: | Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

General Tolerances: NS-EN-ISO 2768-1 Medium/NS-EN-ISO 13920 Class B

Title:

Partlist
Hook with weight SWL 10T, 12T

Customer / Vendor

Date:	Drawn:	Scale:
04.09.00	NRS	//
Checked: TB 14/9-00	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P59-94 | REVISION: 03

Index	Date	Revisions	Sign
04	22.09.05	Updated title	RF
03	06.02.2002	Revised, item #6 added	HNV
02	01/11/01	Note added	HNV
01	15/9-00	Issued for production	TB

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: A59-94

Calculations:

Cad file : S 59\00006024

Plot Date: 2005.09.22

Item	Qty	Article/Name/Type	Weight	Material (as spec. or eqviv.)/DWG no	Art no
1	1	Weight	45	A59-9401	
2	1	Open cast socket (24-26mm wirerope)	9,75	Crosby G416-1039753	
3	1	Safety hook w/swivel	12	BKLK 12,5T	12971
4	4	Screw Cyl. int. hex M10x30		DIN912-A4	
5	4	Washer Φ10.5/Φ21x2		DIN125-A4 HB200	21032
03 6	1	Shackle 12T		W.Giertsen 3260030	

Total Weight 66 Kg

NOTE: Hook and swivel made spark proof by bronze coating.

RIGHT HAND CRANE

Limit sw. UP

Limit sw. DOWN

LUFFING

EMERGENCY LOOWERING JIB
NORMALLY CLOSED

FOLDING

Brake release
emgency slewing
NORMALLY OPEN

SLEWING

Bypass valve
emgency slewing
NORMALLY CLOSED

97kW-S6-40%
400V-3PH-50HZ
Pump: Anti clockwise rotation

OIL TANK

Q=192 l/min

EMERGENCY STOP
NORMALLY CLOSED

MAIN VALVE

P R LS

A 120 bar
B 200bar
LSb LSa
HOIST

A 100 bar
B 220bar
LUFFING

A 200bar
B 200bar
FOLDING

A 160bar
B 160bar
SLEWING

P1 T1

connected to item 15

To be connected to item 45

Hand operated emergency pump (Common for all cranes one ship)

A - U low pressure
B - W high pressure

Index	Date	Revisions	Sign
03	13/10-05	Pump rotation indicated	JØ
02	5/9-05	Revised	MT
01	24/8-05	Issued for approval	MT

General Tolerances: NS-EN-ISO 2768-1 Medium / NS-EN-ISO 13920 Class B

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Title:

DKF220 12T-16M
HYDRAULIC DIAGRAM

Customer / Vendor:

Item	Qty	Article/Name/Type	Weight	Material/DWG no.	Art no.
1	1	Parts list		P723-1013	

DREGGEN
PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Calculations:

Cad file: L723\00010882

Plot Date:

Date:	Drawn:	Scale:
24/08-2005	MT	
Checked:	Verified:	Format: A2
Replacement for:	Replaced by:	Proj.

DRAWING NO.: C723-1013

REVISION: 03

Page: 1/5 | NS-ISO 2768-1 Medium

Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential

Title:

DKF220 12T-16M
Hydraulic parts list

GeoWave Commander

Customer / Vendor :

Date:	Drawn:	Scale:
24/08-2005	MT	
Checked:	Verified:	Format: A4
Replacement for:	Replaced by:	Proj.

DRAWING NO.: P723-1013 | REVISION: 01

Index	Date	Revisions	Sign
01	24/08-05	Issued for approval	MT

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
1	1	Hydraulic motor 160cm^3	51V160	14222
2	0	Winch gear	713C3B	21307
3	0	Hydr. safety brake	On the gear	
4	1	Load contr. valve Flangeable on H1C-90	08.45.38.13.73.35	12933
5	1	Limit valve HOIST Hawe	FR2-1-1/4 Special	13148
6	1	Limit valve HOIST Hawe	FR2-1-1/4 SPECIAL	13148
7	1	Test point Minimess 620	PA-09-1/4"-316	12621
8	1	Brake control valve	1SB252-P-3W-6-377	12384
9	1	Valve shuttle	05.99.05.00.09	13549
10	2	Valve restr. check Hawe	BC1-04-F	10729
11	1	Test point Minimess 620	PA-09-1/4"-316	12621
12	3	Ball valve	BKH-3/8"	10967
13	1	Valve non-return GS Hydro	NRFS 3/8R	10979
14	1	Valve 2-way	BVG-1R-H	14046
15	1	QUICK CONNECTION, male snaptite	SVHN-4-4RP	10969
17	1	Hydraulic cylinder	ø280/ø200x2890	14040
18	1	Load contr. valve Flangeable	08.45.38.13.73.35	12933
19	1	Valve restr. check Hawe	BC1-04-F	10729
20	1	Hydraulic cylinder	ø280/ø200x2890	14040
21	1	Load contr. valve Flangeable		14055
22				
23				
24	1	Hydraulic motor	200-104-1471-006	13266
25	0	Gear w/break,	710 T3F	21329
26	2	Valve Load Control	CBV1-10S2K-,-...	13655
27	1	Test point Minimess 620	PA-09-1/4"-316	12621
28	1	Inermediate flange	A585-15	13691
29	2	O-ring	ø20,29x2,62	13694
30	1	Main valve	PSL6/5	21366
31	1	Ball valve	BKH-3/8"	10967

Page: 2/5	NS-ISO 2768-1 Medium			Date: 24/08-2005	Drawn: MT	Scale:
Grading: ☐ Open ☐ Internal ☒ Confidential ☐ Strictly confidential				Checked:	Verified:	Format: A4
Title: DKF220 12T-16M Hydraulic parts list GEARAVE COMMANDER				Replacement for:	Replaced by:	Proj.
				DRAWING NO.: P723-1013		REVISION: 02

Index	Date	Revisions	Sign
02	4/1-06	Rev. slew.motor+ qty pipe	MT
01	24/08-05	Issued for approval	MT

DREGGEN

PHONE: +47 55 33 36 50 - FAX: +47 55 33 36 51 / 52

Customer / Vendor

Parts list to dwg no.: C723-1013

Calculations:

Cad file : L723\00010883

Plot Date:

Item	Qty	Article/Name/Type	Material/DWG no	Art no
32				
33				-
34	1	Filter breather	UCC SPA 7121	10767
35	1	Retur filter	MPF 400-3-G2-P10-H-BUR-V1	12118
36	1	Quick connection, male	BVHN-12-12RP	10971
37	1	Quick connection, female	BVHC 12-12-RP	13362
38	1	Fluid level/temp guage UCC	UCFLT 321	10697
39	1	Pluge for valve pos.40	704-12	13439
40	1	Ball valve Mercury 3/4"	T-115-12RP	10973
41	1	Hydraulic pump	R1A6137N5AIA	12346
42	0	Kardang shaft	5-C Lc=355mm	12113
43	0	Electro motor 400V-3PH-50Hz	97kW	
44	1	Valve non-return GS Hydro	NRSF- 1.1/4R	12764
45	1	Quick connection, mail - manual pump	BVHN-08-08RP	10972
46	1	Manual operated hand pump	HP50	13996
47	1	Quick connection, femail	SVHC4-4RP	10975
48	1	Quick connection, female	BVHC8-8RP	10974
49	1	HP FILTER	FMP 320-3-BA-G2-A10N-V7	14052
02 60	36m	Pipe ø30x3	AISI 316l	12121
61	12m	Pipe ø12x1,5	AISI 316L	10995
02 62	36m	Pipe ø10 x1,5	AISI 316L	13546

PROJECT: DKF220-12T-16M		SHEET NO. 1 OF 6 SHEETS
DETAIL: ELECTRICAL PARTS LIST		P 723-80
		REVISION NO: 0
DREGGEN	CUSTOMER:	DRAWN: 19.08.05 R.E.
		CHECKED:
	FREIRE SY	

INDEX

60338/51	L723A	NB-600
PROJECT	CRANE	HULL

REVISION	DATE/SIGN.		

PROJECT:	DKF220-12T-16M	SHEET NO. 2 OF 6 SHEETS
DETAIL:	ELECTRICAL PARTS LIST	P 723-80
DREGGEN	CUSTOMER:	REVISION NO: 1
	FREIRE SY	DRAWN: 19.08.05 R.E.
		CHECKED:

CONTROL VOLTAGE: 230 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
14215	1	PUMP MOTOR, 97kW 400V, 50Hz, S6-40%	M1	CRANE		GM-280S4
10090	1	JUNCTION BOX	X10	CRANE		KL 1500
10059	9	TERMINAL		X10		WDU 2.5 102000
10093	2	CABLE GLAND, BRASS		X10		PG 16
	1	SLEWING UNIT	E11 D=600mm	CRANE		CONSISTING OF:
	9	SLIPRING	CU-OUT D=600mm	E11		081116-11 L=1.983m
	1	SLIPRING PE	CU-OUT D=600mm	E11		081116-12 L=1.983m
	10	POWER FEED CLAMP	3m CABLE	E11		081153C
12927	6	HANGER CLAMP		E11		081143-1x5x20
	6	HANGER CLAMP		E11		081143-1x6x20
	9	CURRENT COLLECTOR	3m CABLE	E11		081101-0011
	1	CURRENT COLLECTOR	PE 3m CABLE	E11		081101-0012
	1	COLL. SUPP. BRACKET		E11		081050-20x10
10090	1	JUNCTION BOX	X11	CRANE		KL 1500
10059	9	TERMINAL		X11		WDU 2.5 102000
10093	2	CABLE GLAND, BRASS		X11		PG 16

REVISION	DATE/SIGN.		
1: REVISED MOTOR POWER	02.09.05 R.E.		

PROJECT:	DKF220-12T-16M	SHEET NO. 3 OF 6 SHEETS
DETAIL:	ELECTRICAL PARTS LIST	P 723-80
DREGGEN	CUSTOMER:	REVISION NO: 0
	FREIRE SY	DRAWN: 19.08.05 R.E.
		CHECKED:

CONTROL VOLTAGE: 230 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
	1	STARTER PANEL	X1	CRANE		E 3056
	1	MAIN SWITCH	Q1 NS250N TM250D 250A	X1		31630
	1	HANDLE	Q1	X1		29336
	1	TRANSFORMER	T1 400VA	X1		SU1208-400230
14077	2	CONTACTOR	K1,K2	X1		LC1-D150P7
14074	1	CONTACTOR	K3	X1		LC1-D115P7
	1	TIME DELAY BLOCK	K1	X1		LAD-S2
67004	1	RELAY	K01	X1		CAD-32P7
10555	1	AUT.CIRC. BREAKER	F01 2-POLE 6A	X1		C60N/C6-2
10317	1	AUT.CIRC. BREAKER	F02 2-POLE 3A	X1		C60N/C3-2
12742	1	THERMISTOR RELAY	F2	X1		LT3-SA00M
10194	1	HEATER	R2 230V,20W	X1		SK 3106
	1	CURRENT TRANSF.	T2	X1		IBP 250/5A
	1	AMPERE METER	P1	X1		EQ72, 250/500/5A
	1	HOUR COUNTER	P2	X1		UWZ48, 230V, 50Hz

REVISION	DATE/SIGN.		

PROJECT:	DKF220-12T-16M	SHEET NO. 4 OF 6 SHEETS
DETAIL:	ELECTRICAL PARTS LIST	P 723-80
DREGGEN	CUSTOMER:	REVISION NO: 0
	FREIRE SY	DRAWN: 19.08.05 R.E.
		CHECKED:

CONTROL VOLTAGE: 230 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
13336	1	SIGNAL LAMP, WHITE	H3	X1		XB4-BVM1
13268	1	SIGNAL LAMP, GREEN	H4	X1		XB4-BVM3
30130	1	SIGNAL LAMP, BLUE	H5	X1		XB4 BVM6
11509	1	PUSH BUTTON, STOP	S1	X1		XB4-BA42
11510	1	PUSH BUTTON, START	S2	X1		XB4-BA31
	5	SIGN	H3,H4,H5,S1,S2	X1		DWG B 723-81 SH.7
13496	6	TERMINAL		X1		WDU 70/95
10059	20	TERMINAL		X1		WDU 2.5 102000
	0.2m	EARTH BAR		X1		Cu-BAR 20x10
14064	1	CABLE GLAND, BRASS		X1		M63x1.5
10445	2	CABLE GLAND, BRASS		X1		PG 36
10086	3	CABLE GLAND, BRASS		X1		PG 13.5
10093	1	CABLE GLAND, BRASS		X1		PG 16

REVISION	DATE/SIGN.		

PROJECT: DKF220-12T-16M			SHEET NO. 5 OF 6 SHEETS
DETAIL: ELECTRICAL PARTS LIST			P 723-80
			REVISION NO: 0
DREGGEN	CUSTOMER:		DRAWN: 19.08.05 R.E.
			CHECKED:
According to international laws this drawing is the property of OREGGEN. The drawing and contents can not be made public, copied or otherwise used, without our written consent.	FREIRE SY		

CONTROL VOLTAGE: 230/24 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
	1	PANEL	X2 STAINLESS	CRANE		AE 1010.600
11512	1	CONVERTER	U1 230VAC/24VDC	X2		24RC240C
12238	2	RELAY	K02,K03	X2		UF3-24VDC NFL
12137	3	RELAY	K04,K06,K07	X2		UF3-230VAC-NL
12141	5	SOCKET	K02,K03,K04,K06,K07	X2		Z 348
12140	5	SECURING SPRING	K02,K03,K04,K06,K07	X2		Z 434
10194	1	HEATER	R3 230V,20W	X2		SK 3106
13009	3	SIGNAL LAMP, RED	H6,H7,H8	X2		XB4-BVM4
11473	1	SELECTOR SWITCH	S6	X2		XB4-BD21
	4	SIGN	S6,H6,H7,H8	X2		DWG. B723-81 SH.8
13973	1	RADIO RECIEVER	U2	X2		NANO-L/COMPACT-V
13973	1	ANTENNA	U2 (CABLE=3m)	X2		INCL. IN ABOVE
	1	PLUG, HOUSE	E2	X2		HAN M. 09300240531
	1	PLUG, INSERT	E2	X2		HAN E. 09330242701
10119	1	CABLE GLAND		X2		PG 21
10059	33	TERMINAL		X2		WDU 2.5
10094	7	EARTH CLAMP		X2		ZB 4
10093	1	CABLE GLAND, BRASS		X2		PG 16
10086	2	CABLE GLAND, BRASS		X1		PG 13.5
11205	4	CABLE GLAND, BRASS		X2		PG 11

REVISION	DATE/SIGN.		

PROJECT: DKF220-12T-16M						SHEET NO. 6 OF 6 SHEETS
DETAIL: ELECTRICAL PARTS LIST						P 723-80
DREGGEN	CUSTOMER: FREIRE SY					REVISION NO: 0
						DRAWN: 19.08.05 R.E.
						CHECKED:

CONTROL VOLTAGE: 230/24 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
14101	1	COVER BOX	E1 IP66	CRANE		PK 9508
14085	1	PB. EMERGENCY		E1		ZB5-AS844
30101	1	CONTACT, ELEMENT		E1		ZBE-102
14102	1	PB. START, GREEN		E1		ZB5-AP3
13405	1	CONTACT, ELEMENT		E1		ZBE-101
14084	2	BRACKET		E1		ZB5-AZ009
14083	1	SIGN		E1		ZBY-9330
14103	1	SIGN HOLDER		E1		ZBZ-32
14104	1	SIGN		E1		ZBY-02803
13973	1	RADIO TRANSMITTER				NANO-L/COMPACT-V
13973	2	BATTERY				INCL. IN ABOVE DEL.
13973	1	BATTERY CHARGER	230V 50Hz			INCL. IN ABOVE DEL.
13502	1	SENSOR LOW LEVEL HIGH TEMP.	S25/S26 T=70°C	CRANE		IEG-N1F+T
14234	1	PRESSURE SWITCH	S8	CRANE		0166-408-03-1-031 -1-10NC
10065	10m	CABLE, FIXED		CRANE		MPRX 1kV 2x1.5+E
10087	10m	CABLE, FIXED		CRANE		MPRX 1kV 3x1.5+E
11491	10m	CABLE, FIXED		CRANE		MPRX 1kV 7x1.5
12660	20m	CABLE, FLEXIBLE		CRANE		H07RN-F 3G1
13375	1	GLAND, BRASS		CRANE		M32x1.5
13374	1	GLAND, BRASS		CRANE		M25x1.5

REVISION	DATE/SIGN.		

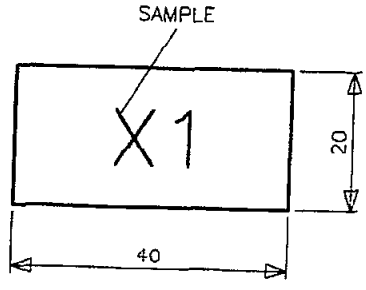
PROJECT: DKF220-12T-16M		SHEET NO. 1 OF 1 SHEETS
DETAIL: SPARE PARTS		P 723-90
DREGGEN	CUSTOMER:	REVISION NO: 0
		DRAWN: 19.08.05 R.E.
	FREIRE SY	CHECKED:

CONTROL VOLTAGE: 230/24 V. SUPPLY VOLTAGE: 400 V. FREQUENCY: 50 Hz.

ART.NO.	NOS.	ARTICLE	POS.	LOC.	MANUFACTURE	TYPE
14053	1	HP FILTER ELEMENT				HP320-3-A10-AN
12252	1	RETURN FILTER ELEM.				MF400-3-A-P10-M-B
12880	1	PRESS. GAUGE 400BAR INCL. HOSE/COUPL.				FIG. A Ø63 0-400 +PA-11-600-Y4

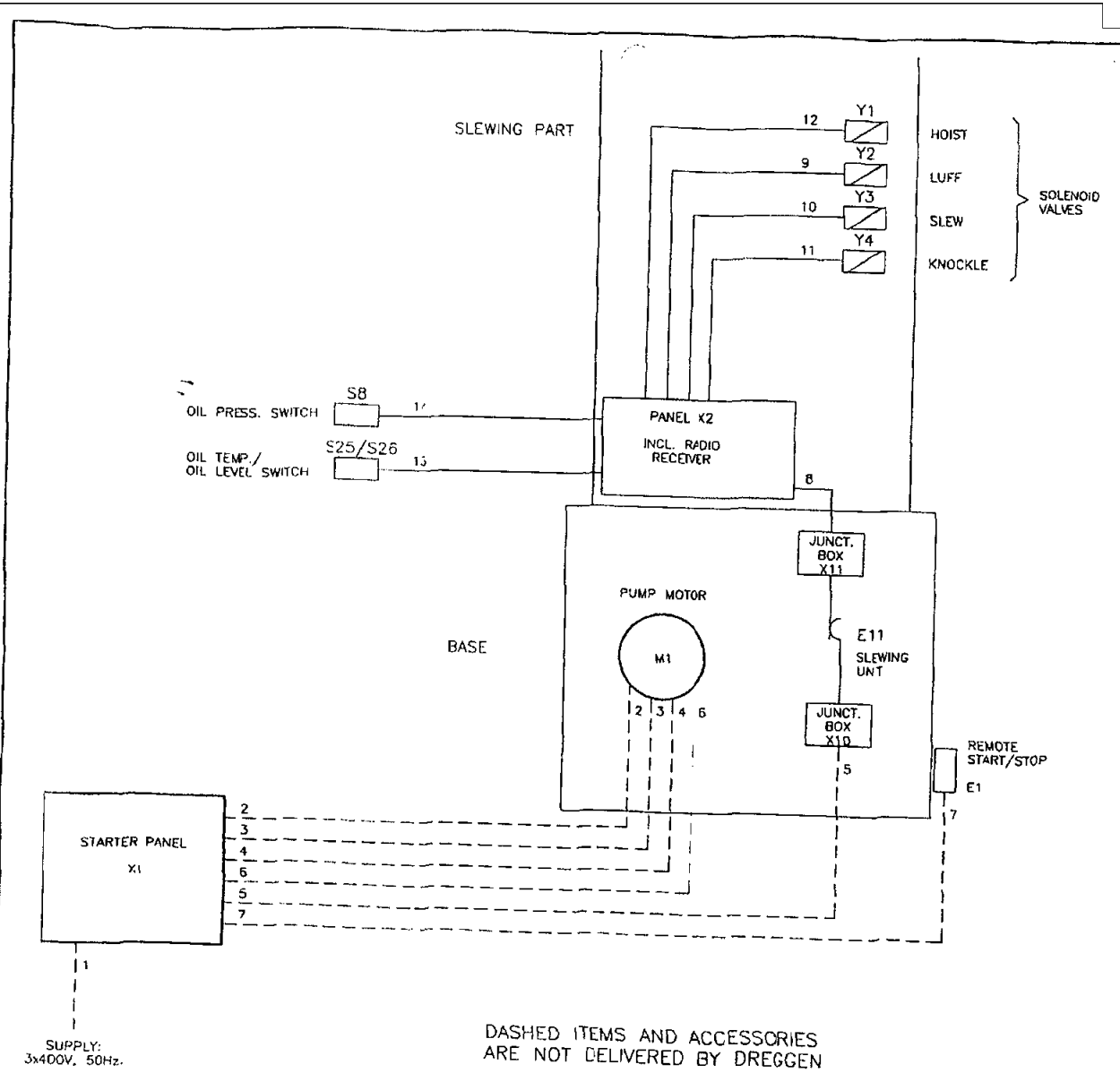
REVISION	DATE/SIGN.		

PROJECT: DKГ220 12T 16M	SHEET NO. 1 OF 1 SHEETS
DETAIL: SIGNS FOR EL.EQUIPMENT	P 723-92
DREGGEN	REVISION NO: 0
CUSTOMER: FREIRE SY	DRAWN: 19.08.05 R.E.
	CHECKED:



MATERIAL: GRAVOPLY WITH ADHESIVE
BACKGROUND: WHITE
TEXT: BLACK

TEXT	TEXT	TEXT	TEXT	TEXT
X1				
X2				
X10				
X11				
Y1				
Y2				
Y3				
Y4				
E11				
E1				
M1				
S8				
S25/S26				



DASHED ITEMS AND ACCESSORIES ARE NOT DELIVERED BY DREGGEN

CABLE LIST

CABLE NO.	TYPE	FROM / TO
1	3x95+E	SUPPLY/X1
2	3x50+E	X1/M1
3	3x50+E	X1/M1
4	2x1.5+E	X1/M1
5	7x1.5	X1/X10
6	2x1.5+E	X1/M1
7	4x1.5+E	X1/E1
8	MPRX 1kV 7x1.5	X2/X11
9	H07RN-F 3G1	X2/Y2
10	H07RN-F 3G1	X2/Y3
11	H07RN-F 3G1	X2/Y4
12	H07RN-F 3G1	X2/Y1
13	MPRX 1kV 3x1.5+E	X2/S25-S26
14	MPRX 1kV 2x1.5+E	X2/S8
15		
16		
17		
18		
19		
20		

REVISED	DATE/SIGN.		

FREIRE SY

DKF220-12T-16M

DRAWN

19.08.05 R.E.

CHECK:

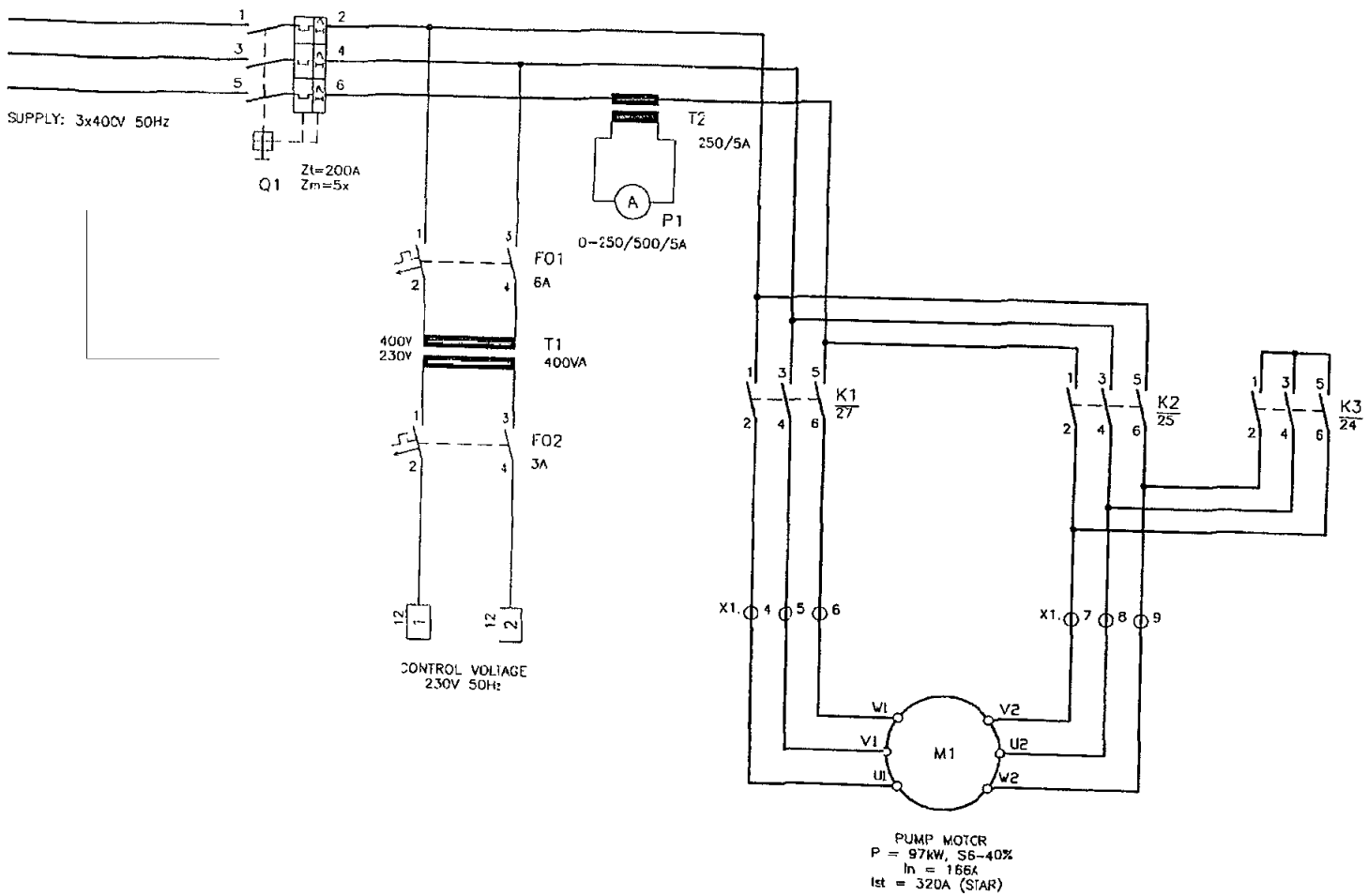
DREGGEN

SHEET NO. 1 OF 8

B 723-81

REVISION : 0

1	2	3	4	5	6	7	8	9	10	11
SUPPLY	MAIN SWITCH			HYDRAULIC PUMP MOTOR						
			AMP.METER	STAR/DELTA STARTER						



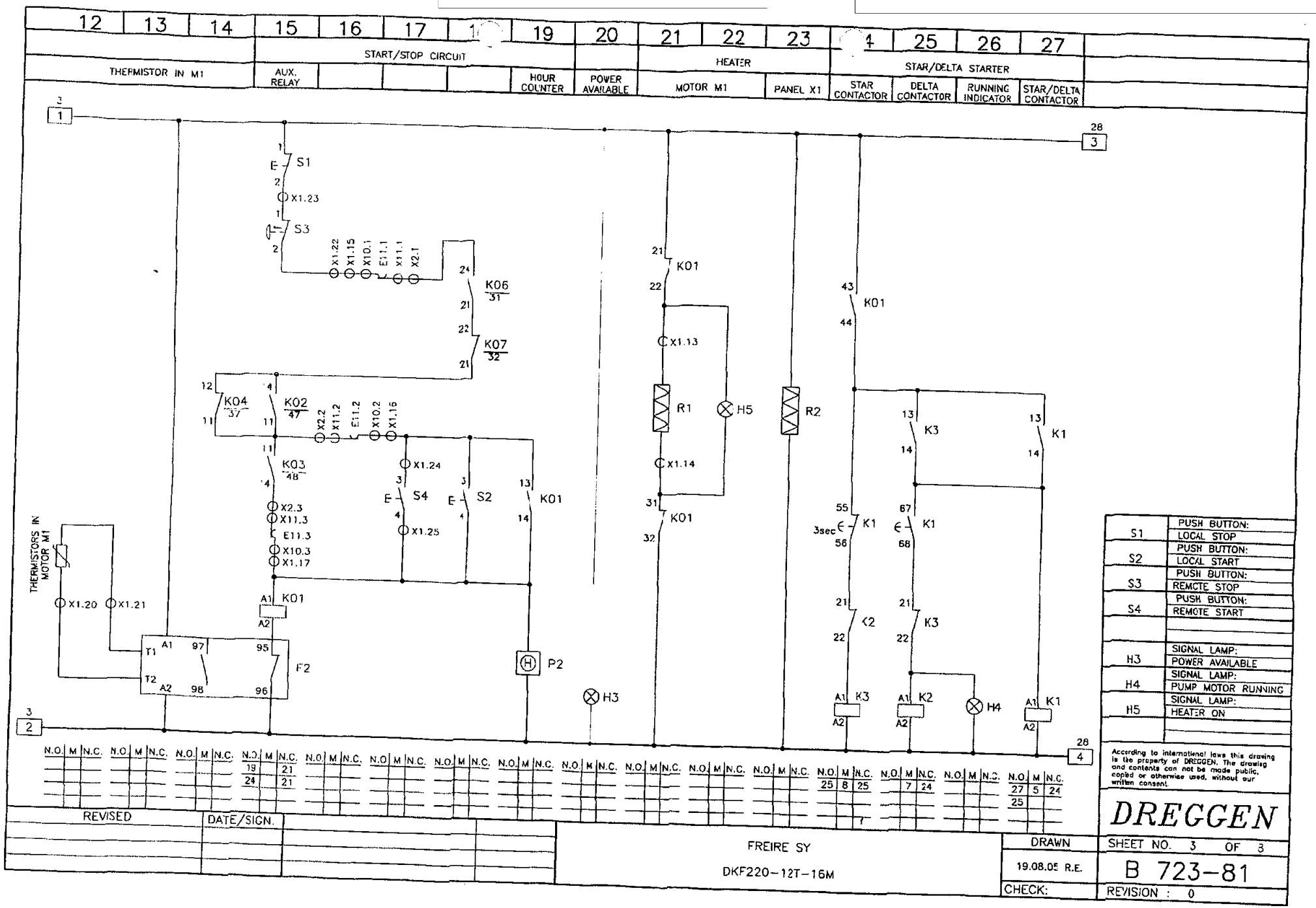
DREGGEN

REVISED	DATE/SIGN.
1: REVISED MOTOR DATA	02.09.05 R.E.

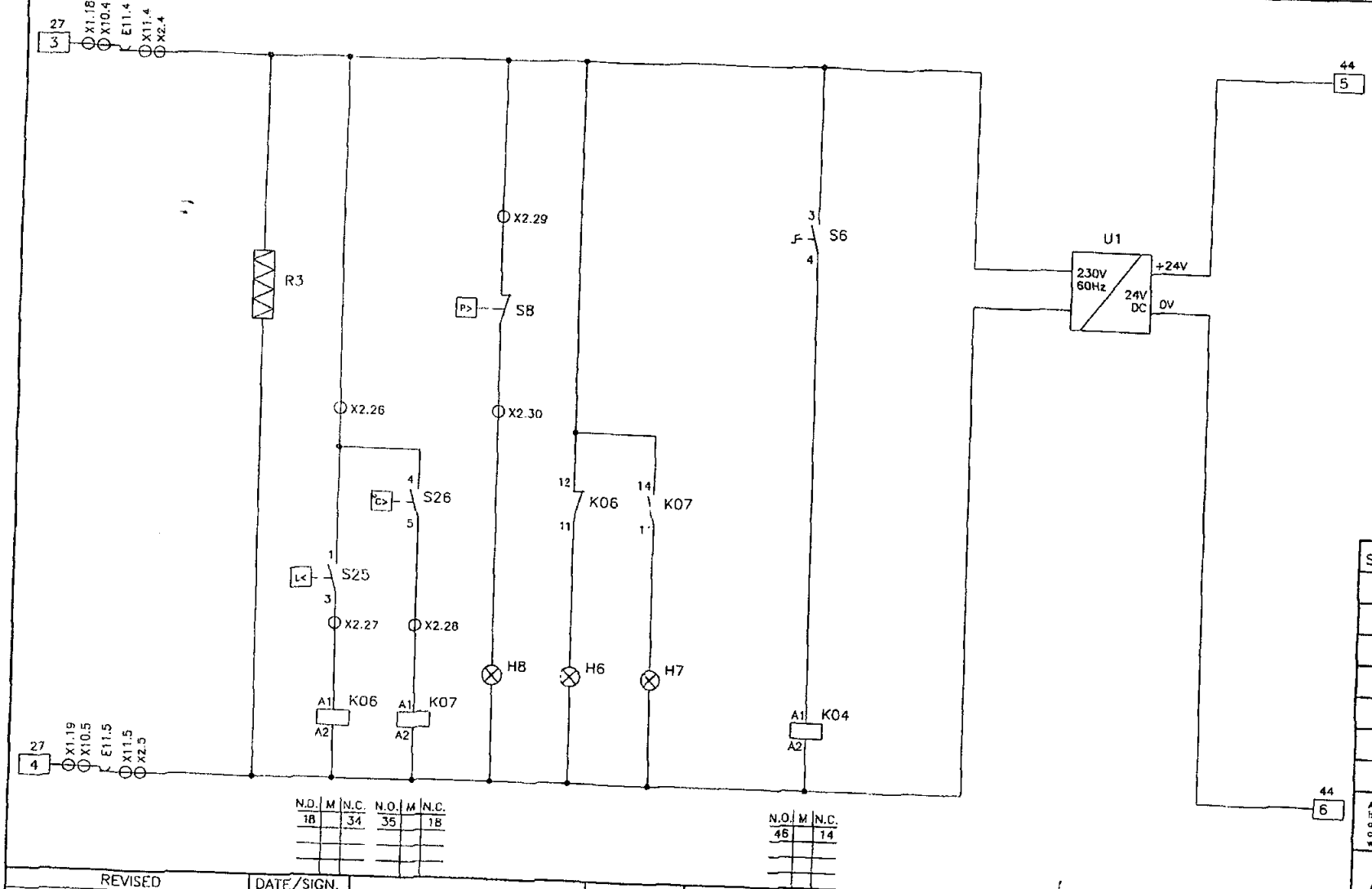
FREIRE SY

DKF220-12T-16M

DRAWN	SHEET NO. 2 OF 8
19.08.05 R.E.	B 723-81
CHECK:	REVISION : 1


12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
THERMISTOR IN M1
START/STOP CIRCUIT
AUX. RELAY
HOUR COUNTER
POWER AVAILABLE
HEATER
MOTOR M1
PANEL X1
STAR/DELTA STARTER
STAR CONTACTOR
DELTA CONTACTOR
RUNNING INDICATOR
STAR/DELTA CONTACTOR
S1
S3
S4
S2
K06
K07
K04
K02
K03
K01
R1
R2
H5
H3
H4
P2
F2
K1
K2
K3
THERMISTORS IN MOTOR M1
PUSH BUTTON: LOCAL STOP
PUSH BUTTON: LOCAL START
PUSH BUTTON: REMOTE STOP
PUSH BUTTON: REMOTE START
SIGNAL LAMP: POWER AVAILABLE
SIGNAL LAMP: PUMP MOTOR RUNNING
SIGNAL LAMP: HEATER ON
According to international laws this drawing is the property of DREGGEN. The drawing and contents can not be made public, copied or otherwise used, without our written consent.
DREGGEN
REVISED
DATE/SIGN.
FREIRE SY
DKF220-12T-16M
DRAWN
19.08.05 R.E.
CHECK:
SHEET NO. 3 OF 3
B 723-81
REVISION : 0

28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
		HEATER IN	SENSORS			SIGNAL LAMPS									
		PANEL X2	OIL LEVEL TOO LOW	OIL TEMP. TOO HIGH	OIL PRESS. TOO LOW	OIL LEVEL TOO LOW	OIL TEMP. TOO HIGH		RADIO MANUAL				CONVERTER 230V AC/ 24V DC		



S25/S26	SENSOR: OIL LEVEL/ OIL TEMPERATURE
S6	SELECTOR SWITCH: RADIO/MANUAL
H6	SIGNAL LAMP OIL LEVEL TOO LOW
H7	SIGNAL LAMP OIL TEMP. TOO HIGH
S8	SENSOR: OIL PRESS. TOO LOW
H8	SIGNAL LAMP OIL PRESS. TOO LOW

REVISED	DATE/SIGN.

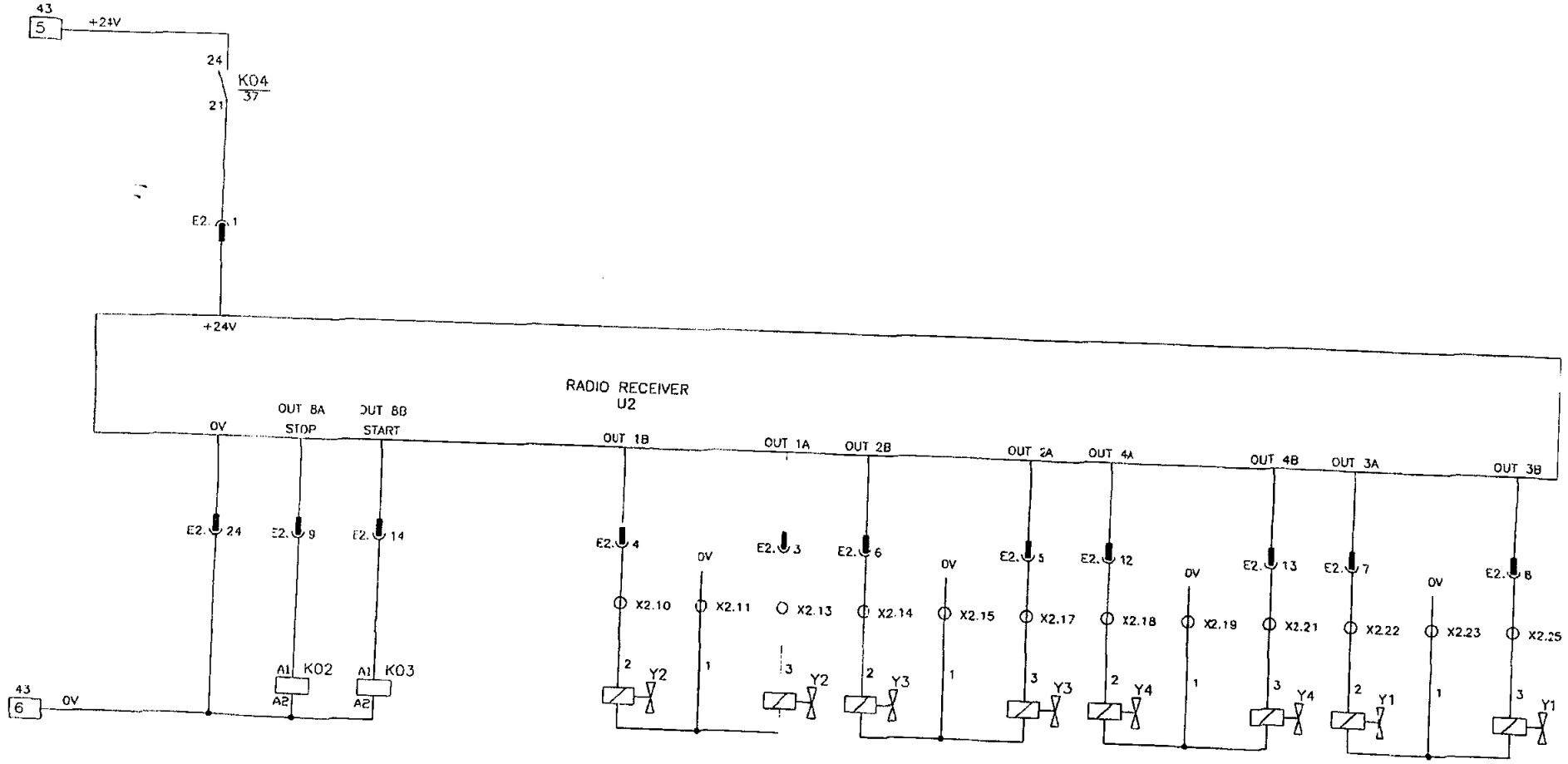
FREIRE SY

OKF220-12T-16M

DREGGEN

DRAWN	SHEET NO. 4 OF 8
19.08.05 R.E.	B 723-81
CHECK:	REVISION : 0

44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
RADIO CONTROL																		
			STOP PUMP	START PUMP			LUFFING RAISE		LUFTING LOWER	SLEWING RIGHT		SLEWING LEFT	KNOCKLE OUT		KNOCKLE IN	HOIST DOWN		HOIST UP



N.O.	M	N.C.	N.O.	M	N.C.
15			15		

REVISED	DATE/SIGN.		

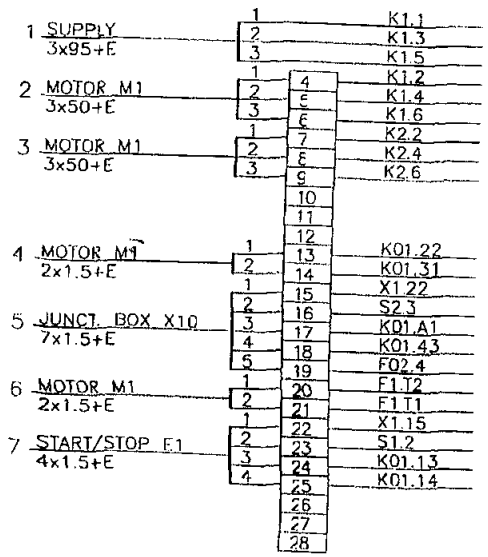
FREIRE SY

DKF220-12T-16M

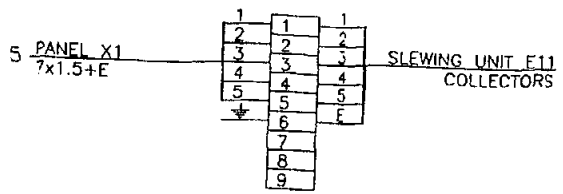
DREGGEN

DRAWN	SHEET NO. 5 OF 8
19.08.05 R.E.	B 723-81
CHECK:	REVISION : 0

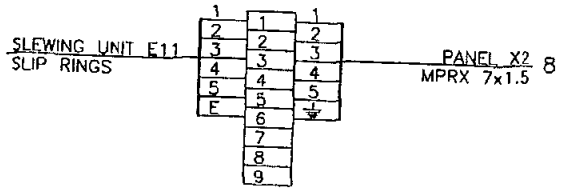
PANEL X1



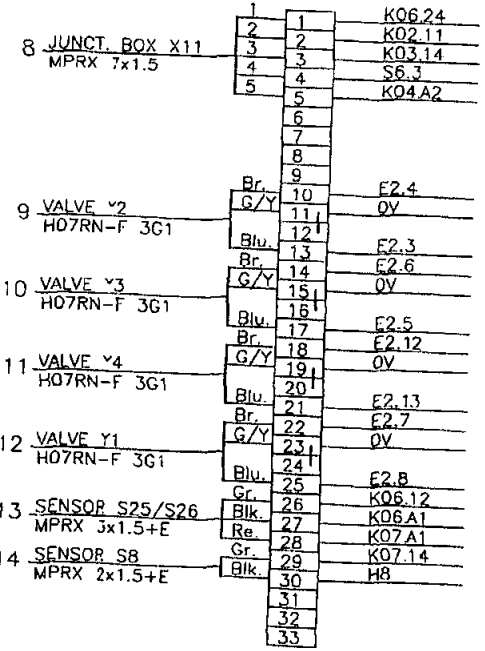
JUNCTION BOX X10



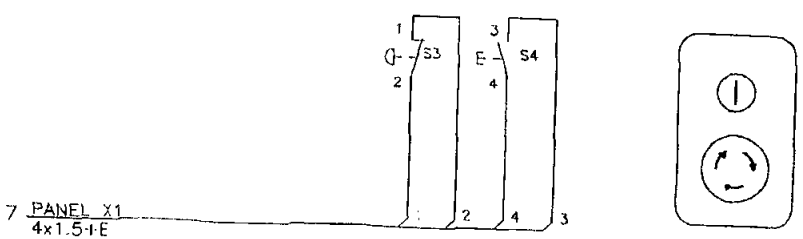
JUNCTION BCX X11



PANEL X2



REMOTE START/STOP E1



NB! ALL EARTH CONDUCTORS TO BE CONNECTED TO EARTH BAR

REVISED	DATE/SIGN.		

FREIRE SY

DKF220-12T-16M

DRAWN 19.08.05 R.E.

CHECK:

DREGGEN

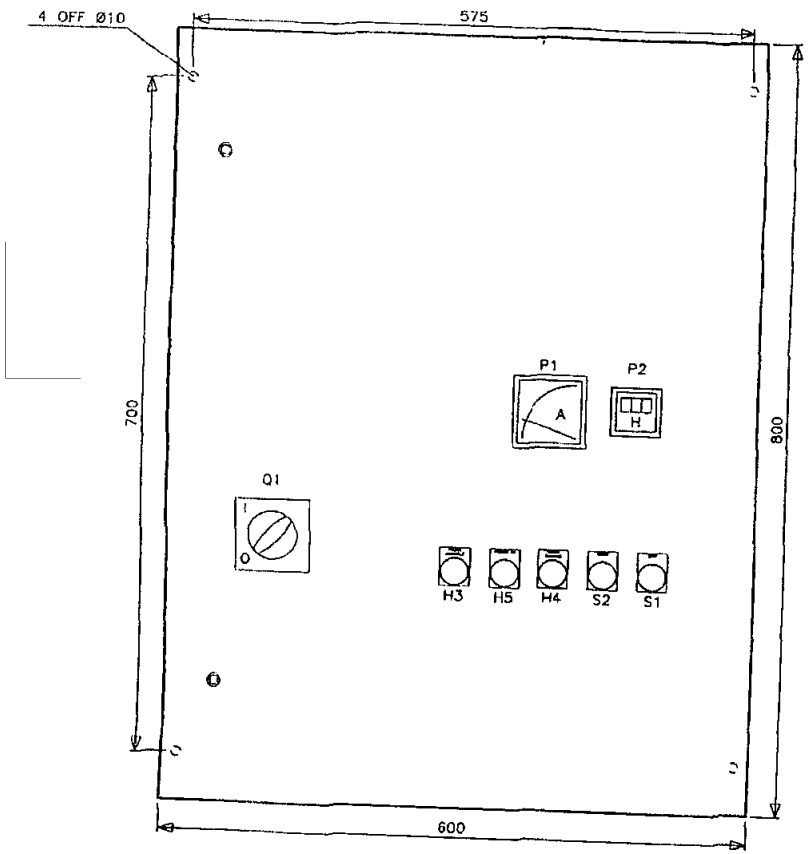
SHEET NO. 6 OF 8

B 723-81

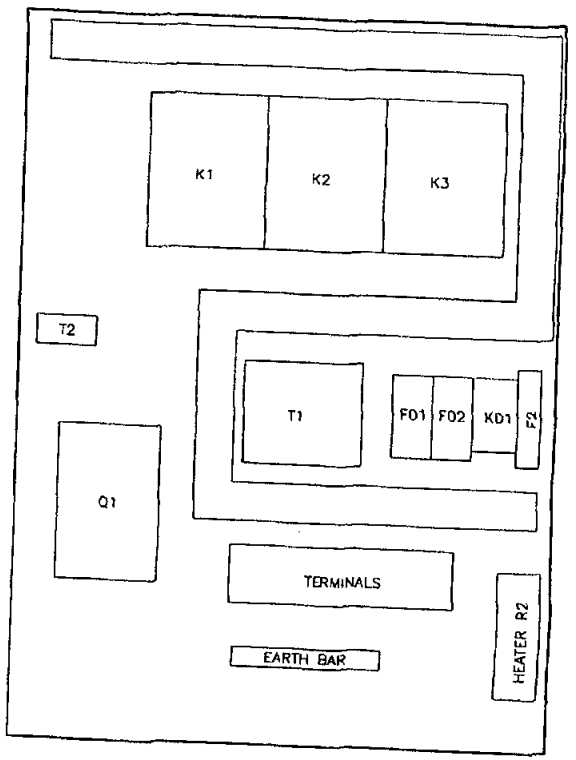
REVISION : 0

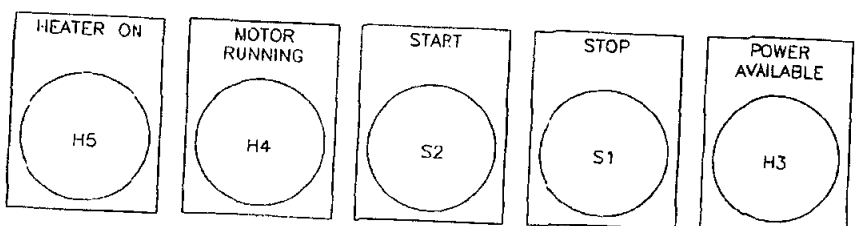
EQUIPMENT MOUNTED ON DOOR

PANEL X1



EQUIPMENT MOUNTED ON MOUNTING PLATE





SCALE = 1 : 1 (A3)

SCALE = 1 : 5 (A3)

DREGGEN

REVISED	DATE/SIGN.

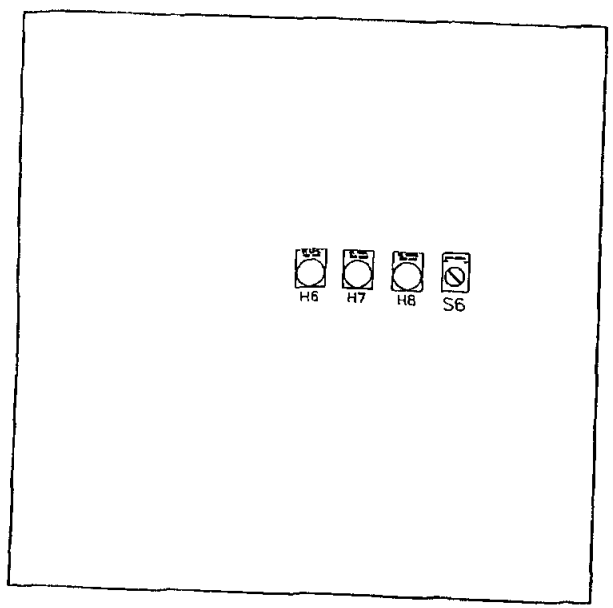
FREIRE SY

DKF220-12T-16M

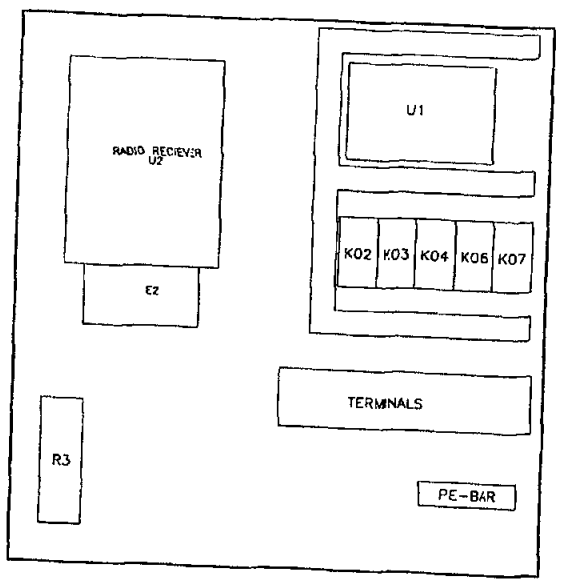
DRAWN	SHEET NO. 7 OF 8
19.08.05 R.E.	B 723-81
CHECK:	REVISION : 0

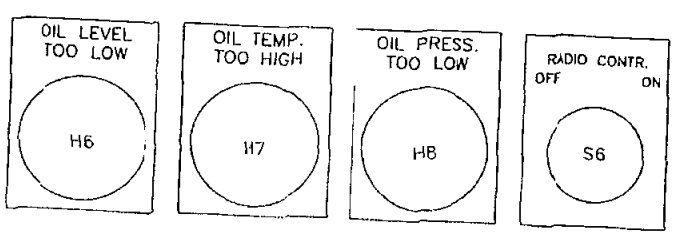
PANEL X2

EQUIPMENT MOUNTED ON DOOR



EQUIPMENT MOUNTED ON MOUNTING PLATE





SCALE = 1 : 1 (A3)

SCALE = 1 : 5 (A3)

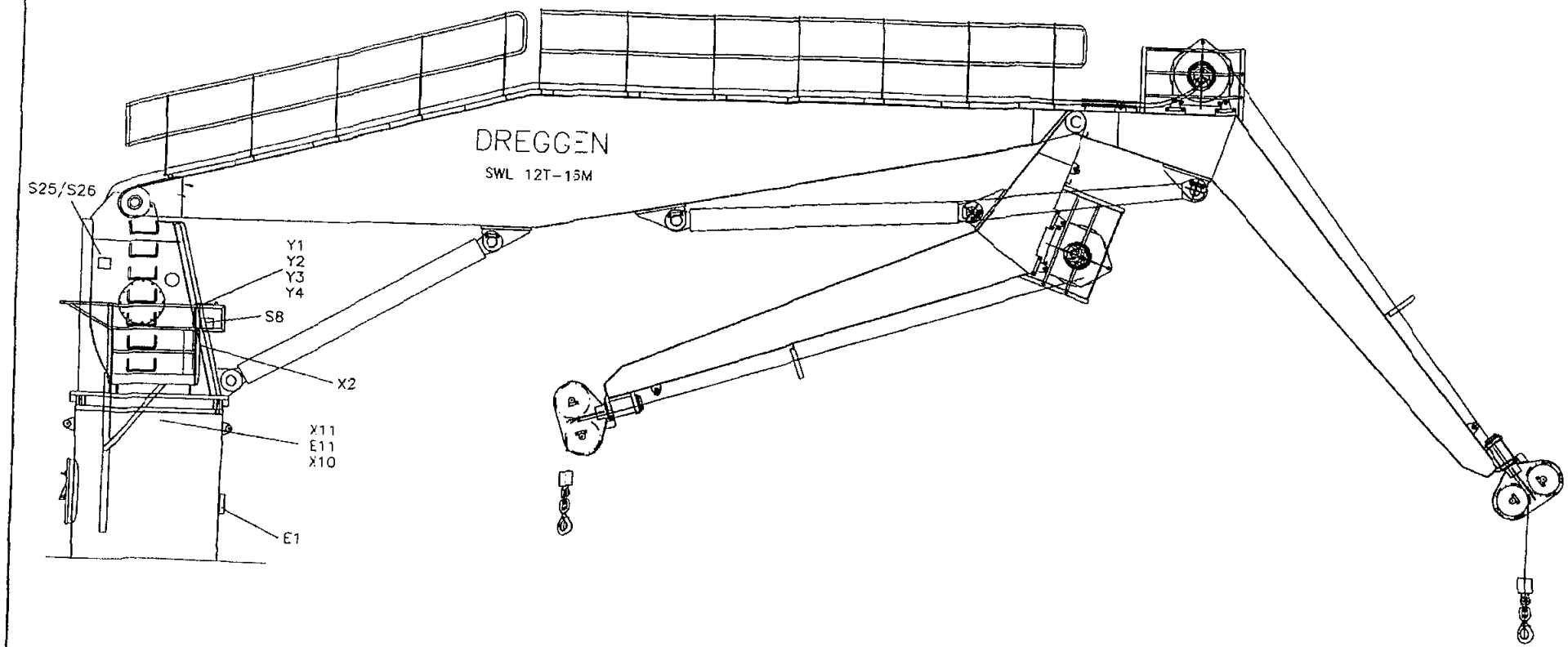
DREGGEN

REVISED	DATE/SIGN.

FREIRE SY

DKF220-12T-16M

DRAWN	SHEET NO. 8 OF 8
19.08.05 R.E.	B 723-81
CHECK:	REVISION : C



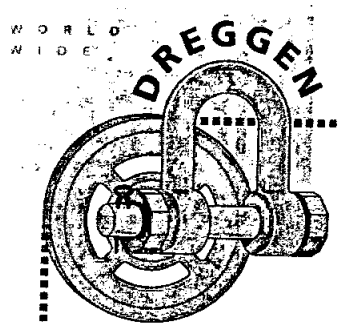
REVISED	DATE/SIGN.		

FREIRE SY

DKF220-12T-15M

DRAWN	SHEET NO. 1 OF 1
19.08.05 R.E.	B 723-82
CHECK:	REVISION : 0

DREGGEN



DREGGEN CRANE AS

PROJECT DOCUMENT

Content:
Chapter 12 in the Equipment User Manual – Components data sheets

01	Issued for Approval	27.10.2005	JØ		
Rev:	Reason for issue:	Date:	Author:	Chck:	Appr:

Client:
C. N. P. Freire. S.A.

Project:
ELECTRO HYDRAULIC KNUCKLE BOOM DECK CRANE

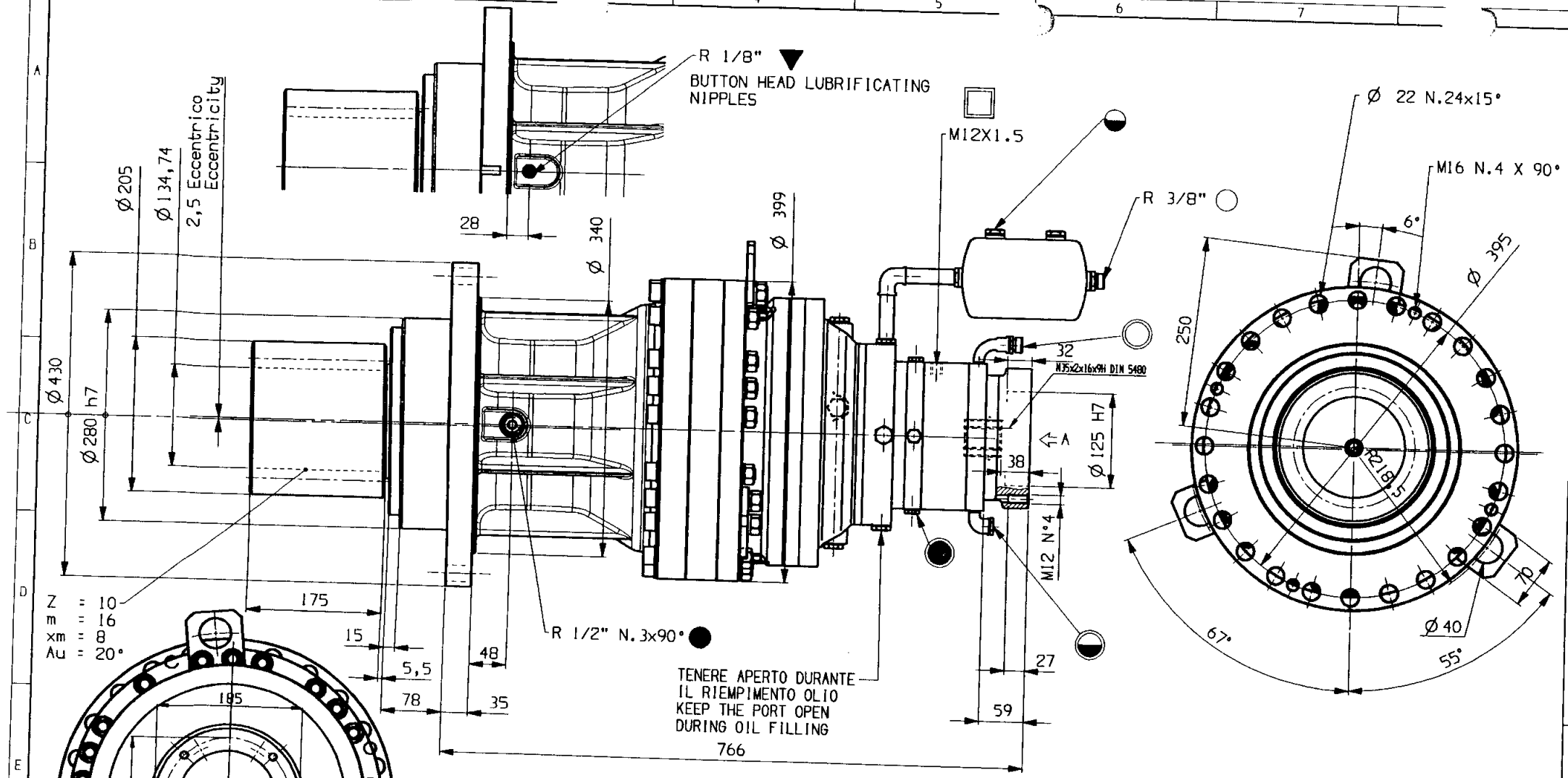
Equipment:	Eq. tag no:
DKF220-12T-16M	**L723A**

Document title:
COMPONENTS DATA SHEETS

Client Doc no:			Rev.	
Proj.no. Disc. Prod.kode	Doc. kode	Seq.no	Rev.	Total no. of pages
60338			**01**	**3**

12 COMPONENTS DATA SHEETS

12.1 Slewing gear art.no. 14235



TAPPI OLIO - OIL PLUGS

- TAPPO CARICO E SFIATO FILLING AND BREATHER PLUG
- TAPPO LIVELLO OIL LEVEL PLUG
- TAPPO MAGNETICO E SCARICO MAGNETIC AND DRAIN PLUG
- INGRASSATORE GREASING
- TAPPO CARICO/SFIATO OLIO FRENO BRAKE BREATHER PLUG
- TAPPO LIVELLO OLIO FRENO BRAKE OIL LEVEL PLUG
- TAPPO SCARICO OLIO FRENO BRAKE DRAIN PLUG
- ATTACCO COMANDO APERTURA FRENO BRAKE RELEASING PLUG

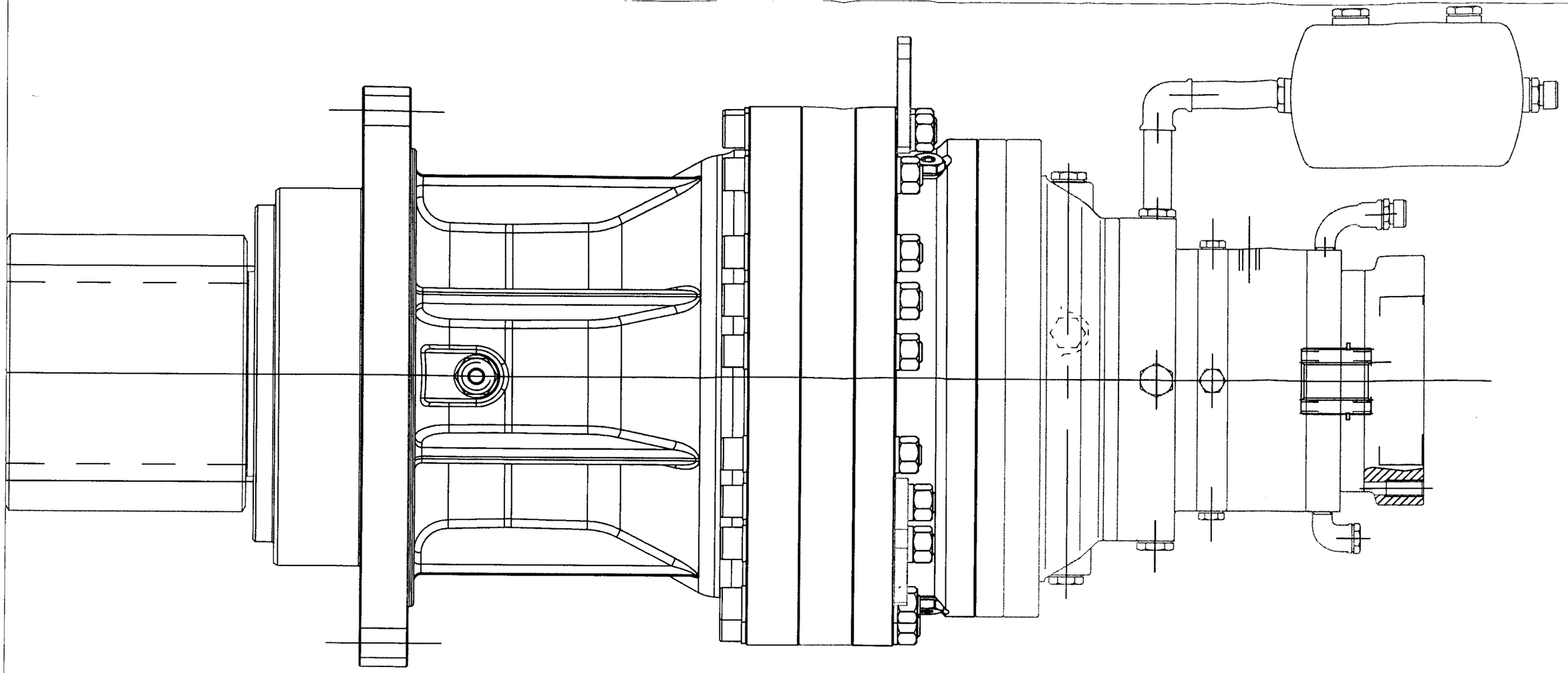
IND.	MODIFICA	DATA	FIRMA	CONTR.
A	Aggiunte piastre sollevamento e flanglat.motore(pp402)	16.11.00	M.F.	C.W.

DENOMINAZIONE :

RPR3255/335696/FL5"
CON ECCENTRICO
WITH ECCENTRICITY
PP 408

DISEGNATO :	MANDREOLI
CONTROLLATO :	LOMBARDI
SCALA : 1/5	DATA : 27/07/00
SOSTITUISCE IL :	
SOSTITUITO DA :	
DISEGNO N° :	SI011AR0702A103
Foglio	A3
Indice	A

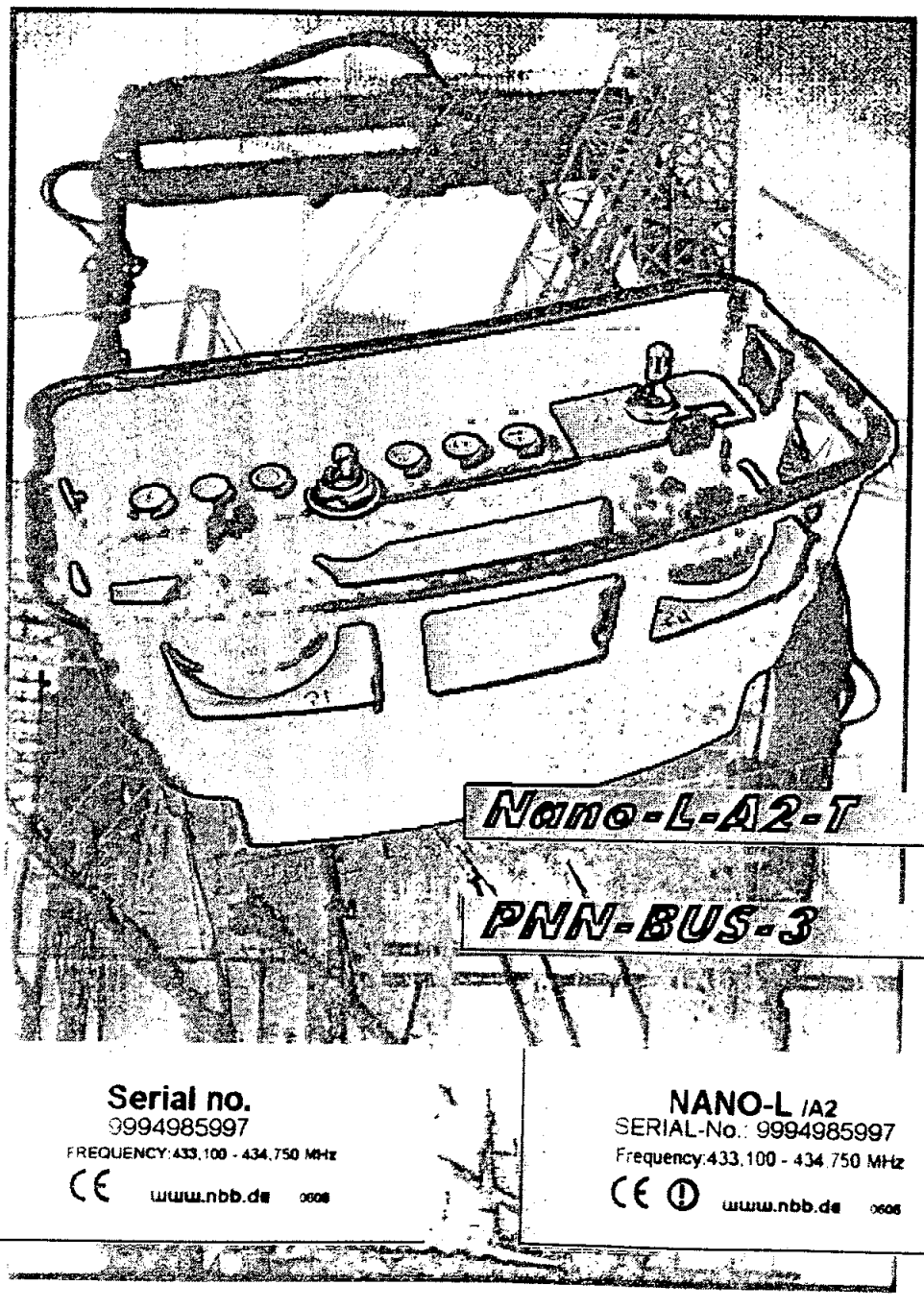
DISEGNO ESEGUITO CON SISTEMA -CAD- NON MODIFICARE A MANO



NI RIDUTTORI are certified.
be certified because
d by users.
of issue.
sciata da BREVINI RIDUTTORI S.p.a.
dischetto non puo' essere certificato
difiche o errori da parte dell'utente
l momento della loro emissione.

12.2 Radio remote control art.no. 13973

OPERATING INSTRUCTIONS



1. STANDARD SPECIFICATION

- Portable transmitter with two replaceable 7,2 volt NiCd batteries, neck and waist straps.
- Receiver with NBB adapter plate for fastening purposes (PNN-BUS-3), receiver with 4 fixing angles (PNN-BUS-5) or with integrated mounting holes (R-16, R-CAN, Compact-M and Compact-V).
- Multi-pin connecting cable for the receiver according to your specifications.
- Automatic battery charger with charging adapter (rapid charging in three hours).

The actual delivery specification is as detailed on the confirmation of order or the delivery note accompanying the goods!

2. SAFETY PRECAUTIONS

Even if you are accustomed to working with radio control systems, read these operating instructions carefully before using this equipment. Only this document contains the latest information relating to your NBB radio control system.

For explanatory notes on obtaining an operating permit please refer to registration documents enclosed in the appendix of this operating instruction. Observe all applicable work-safety and accident prevention regulations carefully. Only fully trained, authorized personnel may use the NBB radio control equipment. Components, etc. built into the NBB equipment for safety purposes must be regularly inspected.

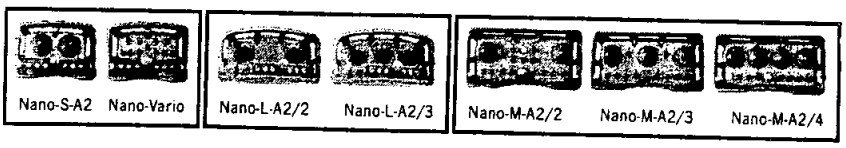
If the NBB radio control unit develops a fault, it must be shut down immediately. The transmitter should be switched off with the EMERGENCY STOP switch. The connecting cable must be disconnected at the receiver from the connecting socket (terminal) of the unit to be controlled . The repair of the equipment must not be carried out other than by NBB or an NBB authorized technician.

Failure to observe these recommendations will put both you yourself and others at risk. Under these circumstances, NBB rescinds the guarantee and any other form of liability. This radio control unit is designed exclusively for the control of construction machines and industrial plants. Only under these conditions are the safety systems (EMERGENCY STOP, zero setting) fully effective. No other form of use is permitted.

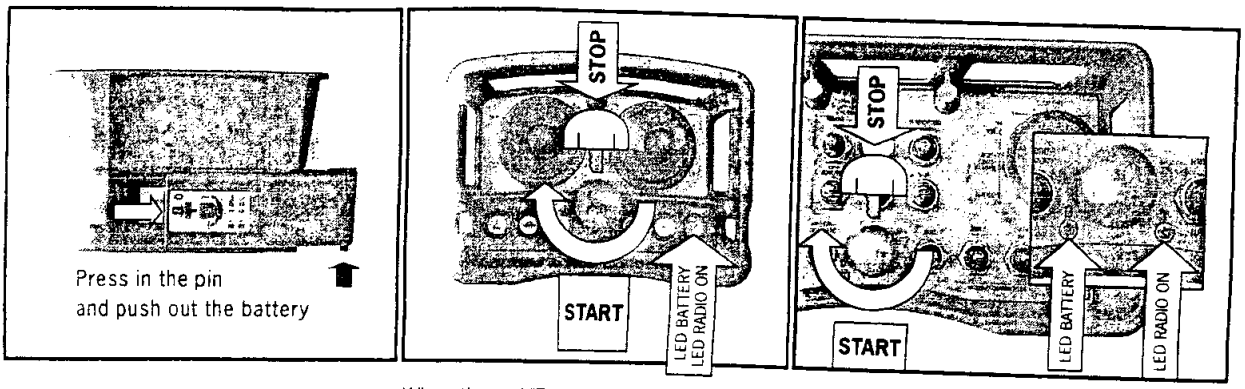
Any non-observance of this condition will relieve NBB of all liability.

3. TRANSMITTER

Nano, Nano-L, Nano-M



To make the unit ready for use, insert the battery into the battery compartment. To remove the battery, press in the pin and push out the battery. The power supply to the transmitter is activated with the EMERGENCY STOP switch. (When pressed, the EMERGENCY STOP switch can also be secured by removing the key cap). The green LED on the transmitter control panel must flash regularly. Commands can now be put in by means of the controls. The operating period with a charged battery is approximately 8 hours with the transmitter in continuous use.

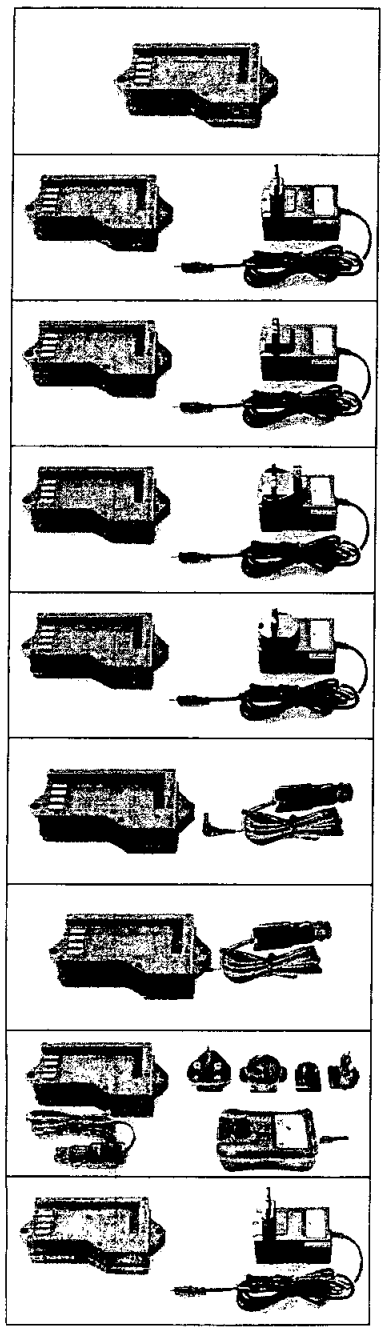


When the red "Battery" indicator lamp lights up, the battery is nearly empty. The transmitter can be operated for approximately 15 minutes more in this condition. During this time, bring the unit to be controlled to a safe position and install a new battery. Removal of the battery interrupts the radio link. As a result, the master switch for the unit to be controlled must be switched on again. Charge the discharged battery with the charger supplied.

4. BATTERY CHARGER L-AD72A2

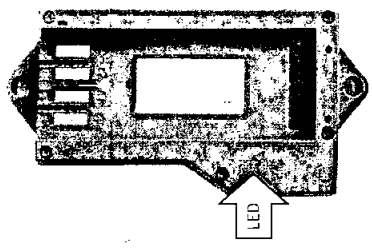
For charging NiCd and NiMH batteries (7,2V).

Optional: Integrated battery charger if DC-supply: In the receivers R-16, R-CAN, Compact-M and Compact-V rapid charging in about 1 hour. In PNN-BUS-3 about 3 hours. Use this battery charger only in closed rooms.



2.250.1449	Universal-charger (without cable), black (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.250.1450	Universal-charger set with 2m cable, black, pluggable with plug Europe and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.251.1450	Universal-charger set with 2m cable, black, pluggable with plug USA/Japan and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.252.1450	Universal-charger set with 2m cable, black, pluggable with plug GB and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.253.1450	Universal-charger set with 2m cable, black, pluggable with plug Australia and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC)
2.250.1451	Universal-charger set with 2m cable, black, pluggable at the charger, with car charger (cigarette lighter), (12V/24V DC)
2.250.1452	Universal-charger set with 2m cable, black, only for car charger (not pluggable at the charger) (12V/24V DC)
2.250.1453	Universal-charger set, black, included: car charger (cigarette lighter), interchangeable ac plugs (GB, Australia, USA/Japan, Europe) and power supply. (AC-DC changer 100/240V AC / 12V DC)
2.250.1455	Universal-charger set EX with 2m cable, black, pluggable with plug Europe and power supply (12V/24V DC, AC-DC changer 100/240V AC / 12V DC) **Only to be used outside the potentially explosive area!**

Operating instructions



Display of the charging process via a DUO-LED:

Green LED - Steady light: STANDBY. The battery charger is ready for use. Place the battery in the charger.

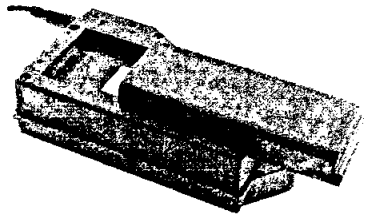
Orange LED - Steady light: CHARGING. The battery will now be charged.

Orange LED - Quickly flashing: The charging process is finished.

Orange LED - Slowly flashing: The battery is totally discharged or the ambient temperature is to low for quick charging. A regeneration respectively a warm-up stage occurs with a reduced charging current until it proceeds to the actual quick charging stage.

No harm will come to the battery if it is left in the charger beyond the required charging time. Use this battery charger only in closed and dry rooms!

Battery



The battery reaches the maximum energy storage capacity only after at least 5 times charging and discharging completely!
Never use an uncharged battery. This will destroy the battery. Discharge the battery completely in the operating unit before charging once more. The charging time depends on the type of battery.
It is normal that the battery warms up during charging or longer use. Charge the battery in an ambient temperature range of 10°C up to 35°C.
To avoid deep discharging the battery should be charged frequently once a month.
No legal liability for follow-up damages.
Deep discharging and extreme temperature damages the battery. Especially heat reduces the efficiency. If the temperature of the battery is too high or too low the charging process will not start to prolong the durability of the battery.
Keep the battery in the charged state in a cool and dry place.

Caution

Only completely discharged batteries should be charged! Therefore please work with your control until the capacity of the battery is totally exhausted.

Safety precautions

Do not open, modify or burn the battery. Do not drop the battery and don't expose it to blows or knocks. Protect the battery against rain, wetness or extreme temperature. Keep the contacts clean and don't get the battery in touch with metal objects (aluminium foil etc.). Do not short-circuit the battery.

A charged battery is a concentrated energy source. Never store a charged battery in a toolbox or similar where it could be short-circuited by metal components (even a key in your trouser pocket can cause a short circuit).

Waste disposal

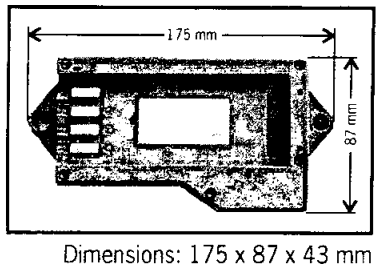
Do not drop used up batteries into the domestic waste. Hand over the batteries to collective point.

Warranty

By damages, defects or premature wear caused by non-observance of the above described operating and safety instructions all warranty claims expire.

Technical data

Power supply via 12V / 24V on board or external power supply.
Range of voltage: 9V - 32VDC (Note: Below 10V the charging process takes longer).
Power supply via hollow plug (Outside diameter = 5,5mm, inside diam. - = 2,1mm)
The parameters of specific accumulators can be adjusted (Delta Peak, dT/dt, charging current, timeout)
AD-changer: 10Bit resolution



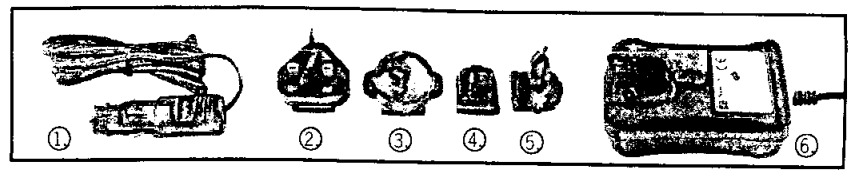
Dimensions: 175 x 87 x 43 mm

Identification of charging stop by:
Delta Peak (minus Delta U to maximum voltage)
dT/dt (Velocity of rise in temperature)
Timeout (shut down of time of charging)

Identification and evaluation of the following starting states:
Undervoltage: Pre-charging with reduced charging current
Untertemperatur: Pre-charging with reduced charging current (warm-up)
Overvoltage: No starting of the charging prosess
Shut down after reaching the maximum of temperatur.
Error memory to collect data of abort of charging.

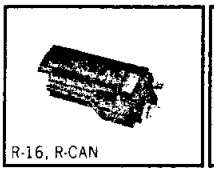
Components:

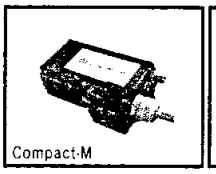
1. Car charger (cigarette lighter), interchangeable ac plugs
(2. GB, 3. Australia, 4. USA/Japan, 5. Europe) and 6. Power pack.

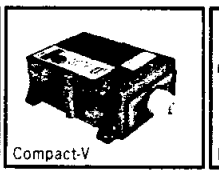


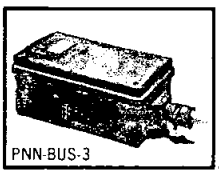
5. RECEIVER

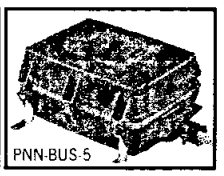
R-16, R-CAN
Compact-M,
Compact-V,
PNN-BUS-3, -5


R-16, R-CAN

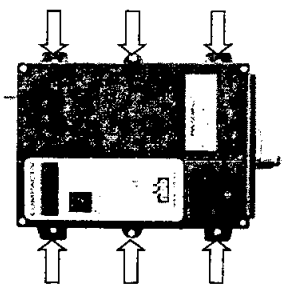

Compact-M


Compact-V

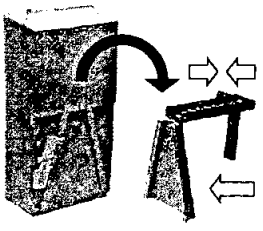

PNN-BUS-3


PNN-BUS-5

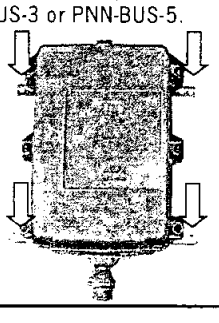
Mounting possibility of the receiver R-16, R-CAN or Compact-M.



Mounting possibility of the receiver Compact-V.



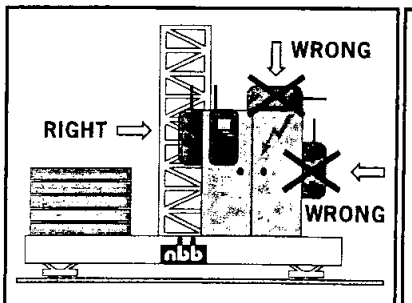
Mounting possibility of the PNN-BUS-3 or PNN-BUS-5.



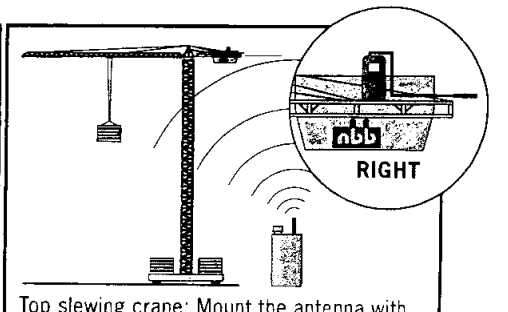
The receiver is connected to the unit to be controlled with the multi-pin connecting cable supplied. Please observe the instructions issued by the manufacturer of the unit to be controlled! **We recommend urgently to realize this connection via a central, well accessible, multi-pin plug connector (for example HTS-plug connector series HE/HB/HN/HA or comparable ones of other manufacturers) to make possible a quick and clear fault diagnosis in the service case and to take off the receiver without an expenditure of assembly.**

The power supply of the receiver is generally effected by the connecting cable.

- **In general, an earth lead is required in case the units to be controlled have not previously been operated by radio control. Failing this, the receiver electronic circuit will not receive any power supply. Ensure that the operating voltage of the receiver complies with the electrical specifications of the unit to be controlled. The applicable operating voltage is specified in the supplement.**
- **Never expose the receiver to a high pressure cleaning jet. This applies to the transmitter also.**
- **The receiver should always be fixed vertically at the outside panel of the switching cabinet. (The antenna should always reach over the top of the panel.)**
- **You have to make sure that the antenna is not shielded by metal parts totally or partly.**
- **Mounting the receiver in a cabine or in a switching cabinet the antenna should be layed with an extension cable to the outside and be attached with the fastening strapping as horizontally as possible with distance to the shielding metal parts.**
- **In general the antenna should always be mounted in such a way so that the antenna is still visible with each change of position of the transmitter.**



Mounting on a tower slewing crane.



Top slewing crane: Mount the antenna with extension cable horizontally.

6. OPERATING THE UNIT

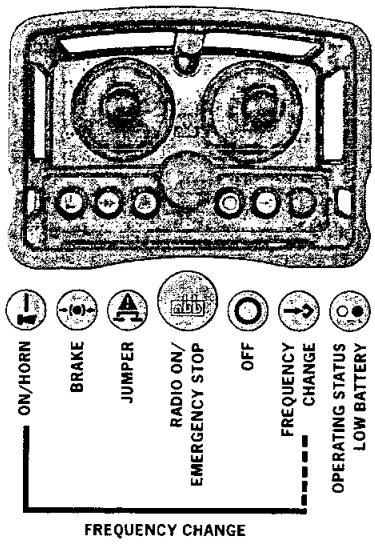
Safety equipment in the NBB-radio remote control:

In the transmitter, this comprises mainly:

- EMERGENCY STOP with automatic disconnection of the power supply.
- Automatic zero positioning.

In the receiver:

- Two diversity units for evaluation of the EMERGENCY STOP signal.
- Automatic zero setting when switching back on after radio interruption.
- Locking of the radio commands at relay level in the event of a defective EMERGENCY STOP circuit.



To ensure fault-free operation, please follow precisely the following rules for operation: The unit to be controlled can only be switched on - it is assumed that the transmitter is ready to operate - when no command unit is actuated. The command necessary to do so is triggered by the key "ON/HORN". This triggers a horn signal in the unit to be controlled. After switch-on of the facility to be controlled, this key is used for repeated emission of the horn signal in accordance with working regulations.

If the NBB radio remote control is not used for a long period, it is urgently recommended that the batteries be charged now and again (about every 4 weeks). This prevents deep discharges of the batteries and prolongs their useful life. If you shut down the NBB radio remote control for a long period, we recommend you take the battery out of the transmitter.

Frequency change:

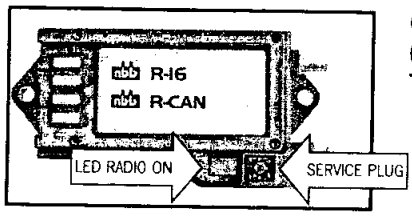
To change the frequency, keep the "ON/HORN" key pressed down. Then operate the "FREQUENCY CHANGE" key. If the receiver locks into the new frequency, a horn signal is given (if present) and the unit to be controlled is ready for operation.

(Please observe the particular postal approval regulations of the concerned country.)

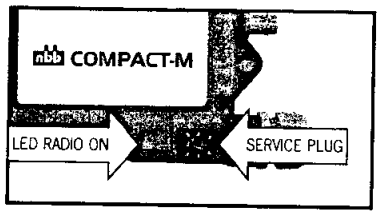
7. FUNCTION CHECK

To maintain operational safety, a regular function check of the NBB radio remote control is necessary. In single-shift day-to-day operation, we recommend performing this check at least once a week. Checking is possible using the display lights provided on the receiver. To do so, the transmitter must be set to the ready-to-operate state.

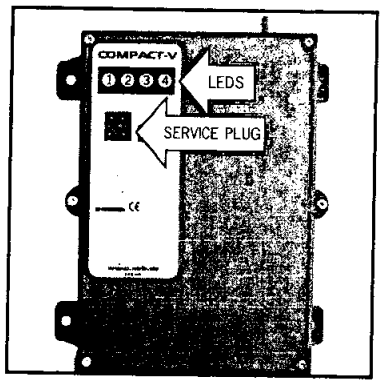
- First connect just the receiver - the transmitter remains switched off.
- Activate the transmitter by unlocking the EMERGENCY STOP switch.
- Now check the commands (always start with the lowest stage) and check for correct reaction of the unit to be controlled.
- Ensure in particular that there is nobody in the danger area.
  ACCIDENT RISK!
- **EMERGENCY STOP check**. Press the EMERGENCY STOP switch at the transmitter until the switch engages. Then observe if the unit to be controlled is switched off (time to switch off according to the application).



Checking the LED display at the receiver R-16 and R-CAN:
(Optional with integrated charger)
The green LED flashes: RADIO PRESENT.
If the LED fails to come on:
1. Check that the transmitter is on.
2. Check the power supply of the receiver.
3. (Optional) Irregular flashing of the LED:
Check or change the current radio channel.



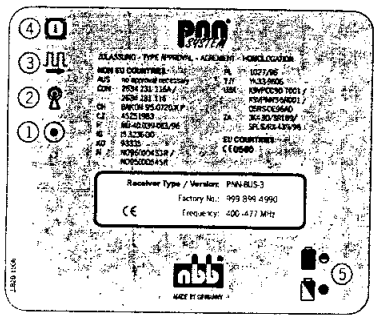
Checking the LED display at the receiver Compact-M:
(Without integrated charger)
The green LED flashes: RADIO PRESENT.
If the LED fails to come on:
1. Check that the transmitter is on.
2. Check the power supply of the receiver.
3. (Optional) Irregular flashing of the LED:
Check or change the current radio channel.



Checking the LED's at the receiver Compact-V:

- **LED 1 green:** POWER ON. If LED fails to come on, check the power supply. If the power lead is OK, call in the after-sales service.
- **LED 2 yellow:** HF PRESENT. Steady light when transmitter is switched on (insignificant for scanner operation).
- **LED 3 green:** Flashes evenly during fault-free operation. Irregular flashing means that the HF channel is probably at fault - please set another channel.
- **LED 4 red:** If this LED flashes, the HF channel is at fault (not in the scanner operation). Steady light notifies the operator that an output function is critical due to over current.

Service plug: **For NBB service only.**



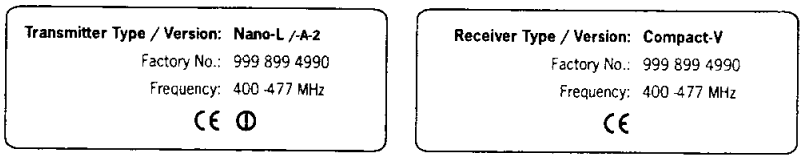
Checking the LED's at the receiver PNN-BUS-3:

- **LED1:** POWER ON. If LED fails to come on, check the power supply. If the power lead is OK, call in the after-sales service.
- **LED2:** HF PRESENT. Steady light when transmitter is switched on (insignificant for scanner operation).
- **LED3:** Flashes evenly during fault-free operation. Irregular flashing means that the HF channel is probably at fault - please set another channel.
- **LED4:** If this LED comes on, the HF channel is at fault.
- **LED5:** Charge condition display of battery (only present when charger is integrated). Steady light when charging a battery. LED flashes: The battery is charged, the charging process is finished.

8. RATING PLATES

The rating plates state the type of transmitter or receiver, the factory number, the frequency range and the approval number for non EU countries.
Always state the factory number in all your queries.

Example:



9. MAINTENANCE

Your NBB radio remote control is largely maintenance-free. Nevertheless, please bear in mind the following points:

- EMERGENCY STOP switch must be easy to move.
- Remove any leftover building materials!
- During electro-welding work on the unit to be controlled, disconnect the receiver from the current supply! Otherwise there is a risk of damage to the receiver's electronic system!
- Check wear and tear parts like dust shield tops regular!

10. WARRANTY

We grant a function warranty for 12 months after the sale date for all NBB radio remote controls (transmitter, receiver, charger). The warranty covers working time and material used. Shipping costs shall be charged to the customer. The warranty shall not cover: wear and tear parts, relays and batteries. The function warranty shall be invalidated in the case of damage, accident damage, negligence, incorrect use, non-compliance with operating conditions, non-compliance with operating, testing and maintenance instructions, and repairs or unit modifications not authorised by NBB. NBB shall not be liable for indirect damage and reserves the right to decide on repair or replacement.

11. IN CASE OF DEFECTS

Do not attempt to continue working with a defective NBB radio remote control. Even initially minor defects might be the start of a more extensive defect.
Do not try to repair the NBB radio remote control yourself. If there is any fault please contact your dealer or our company.

TEACH-IN: Individual Setting of Analog Channels (Basic Setting) at Nano Transmitter*.
The output signals of the analog channels can be individually programmed by the transmitter.

Activate programming mode

Select analog function

Save "contact point"

Save maximum speed

Program opposite direction ?

No / Yes

Programming of next function ?

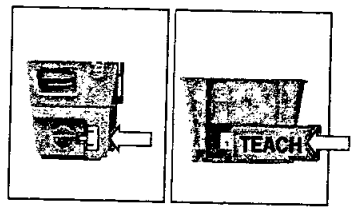
No / Yes

Check the programmed values

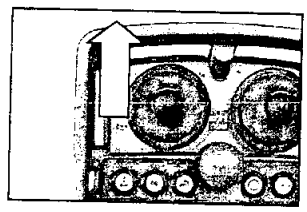
Shut down the programming mode

The control is ready to operate.

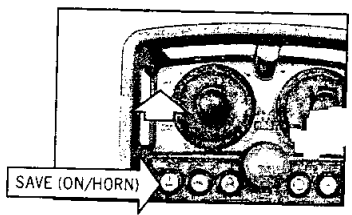
1 Set all analog channels to zero position. (potentiometer without automatic release). Insert the TEACH-battery into the battery compartment or turn on the programming switch*, release the EMERGENCY-OFF switch and press the "ON/HORN" key.
Now the programming mode is activated.



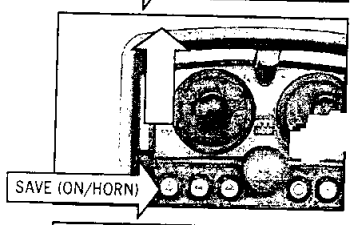
2 To determine which analog function is to be programmed, it is sufficient to turn briefly the appropriate master switch fully in the direction of this function.



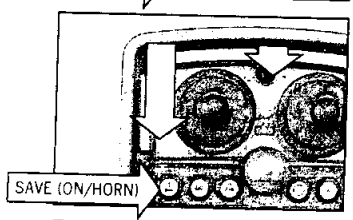
3 Now the "50%/100%" switch has to be turned into the "50%" position.
The master switch is now turned until the required "contact point" is reached.
To save this value, the "SAVE" ("ON/HORN") key must be pressed at this position.



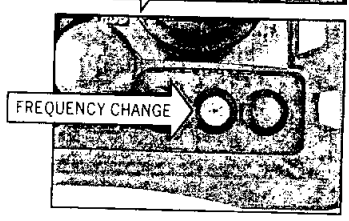
4 The "50%/100%" switch has to be turned into the "100%" position.
The upper initial value is saved by turning the master switch until the maximum speed of the function is reached then pressing again the "SAVE" ("ON/ HORN") key.



5 The opposite direction of this function can then be programmed the same way immediately afterwards.
See point **3** and **4** .



6 When programming several analog channels consecutively, the "FREQUENCY CHANGE" key must be pressed once after saving a function.
Continue point **2** .



7 By pressing and holding the "FREQUENCY CHANGE" key it is possible to change to the working mode to check the programmed values.
As soon as the key is released, the programming mode can be commenced, as described above. (Point **2** to **5** .)

8 Press the EMERGENCY STOP switch, turn off the programming switch* and pull out the key (to avoid unintentional programming),
or change the TEACH battery with the normal working battery, release the EMERGENCY STOP switch again and prepare the control to operate by pressing the "ON/HORN" key.

Please note:
In the programming mode all functions are locked, except "ON/HORN" and each selected function.

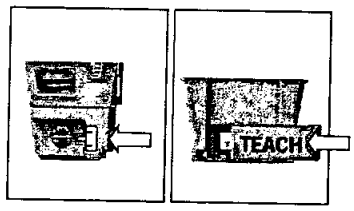
* Please refer to the scope of supply of your radio remote control.

TEACH-IN: Individual Setting of Analog Channels (Basic Setting) at Nano Transmitter with Potentiometer Control. (Optional, only proportional units*)

The output signals of the analog channels can be individually programmed by the transmitter.

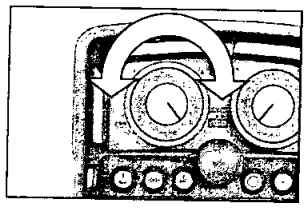
Activate programming mode

1 Set all analog channels to zero position. (potentiometer without automatic release). Insert the TEACH-battery into the battery compartment or turn on the programming switch*, release the EMERGENCY-OFF switch and press the "ON/HORN" key. Now the programming mode is activated.



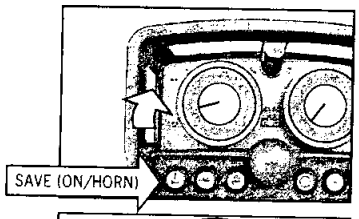
Select analog function

2 To determine which analog function is to be programmed, it is sufficient to turn briefly the appropriate potentiometer fully in the direction of this function.



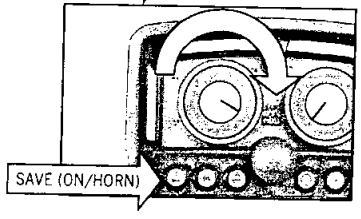
Save "contact point"

3 Now the "50%/100%" switch has to be turned into the "50%" position. The potentiometer is now turned until the required "contact point" is reached. To save this value, the "SAVE" ("ON/HORN") key must be pressed at this position.



Save maximum speed

4 The "50%/100%" switch has to be turned into the "100%" position. The upper initial value is saved by turning the potentiometer until the maximum speed of the function is reached then pressing again the "SAVE" ("ON/ HORN") key.



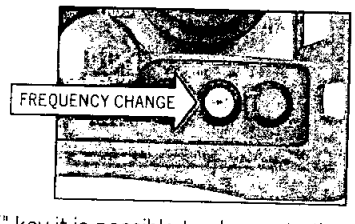
5 No opposite direction.

Programming of next function ?

No

Yes

6 When programming several analog channels consecutively, the "FREQUENCY CHANGE" key must be pressed once after saving a function. Continue point **2** .



Check the programmed values

7 By pressing and holding the "FREQUENCY CHANGE" key it is possible to change to the working mode to check the programmed values. As soon as the key is released, the programming mode can be commenced, as described above. (Point **2** to **5** .)

Shut down the programming mode

The control is ready to operate.

8 Press the EMERGENCY STOP switch, turn off the programming switch* and pull out the key (to avoid unintentional programming), or change the TEACH battery with the normal working battery, release the EMERGENCY STOP switch again and prepare the control to operate by pressing the "ON/HORN" key.

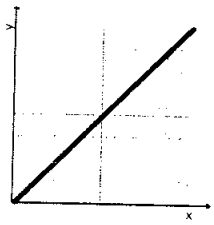
Please note:
In the programming mode all functions are locked, except "ON/HORN" and each selected function.

* Please refer to the scope of supply of your radio remote control.

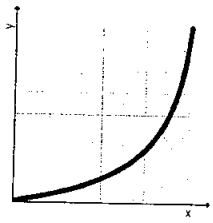
TECHNICAL SUPPLEMENT

NANO: Board E-AN04A2V1/1 TEACH-IN
(Optional, only proportional units*)

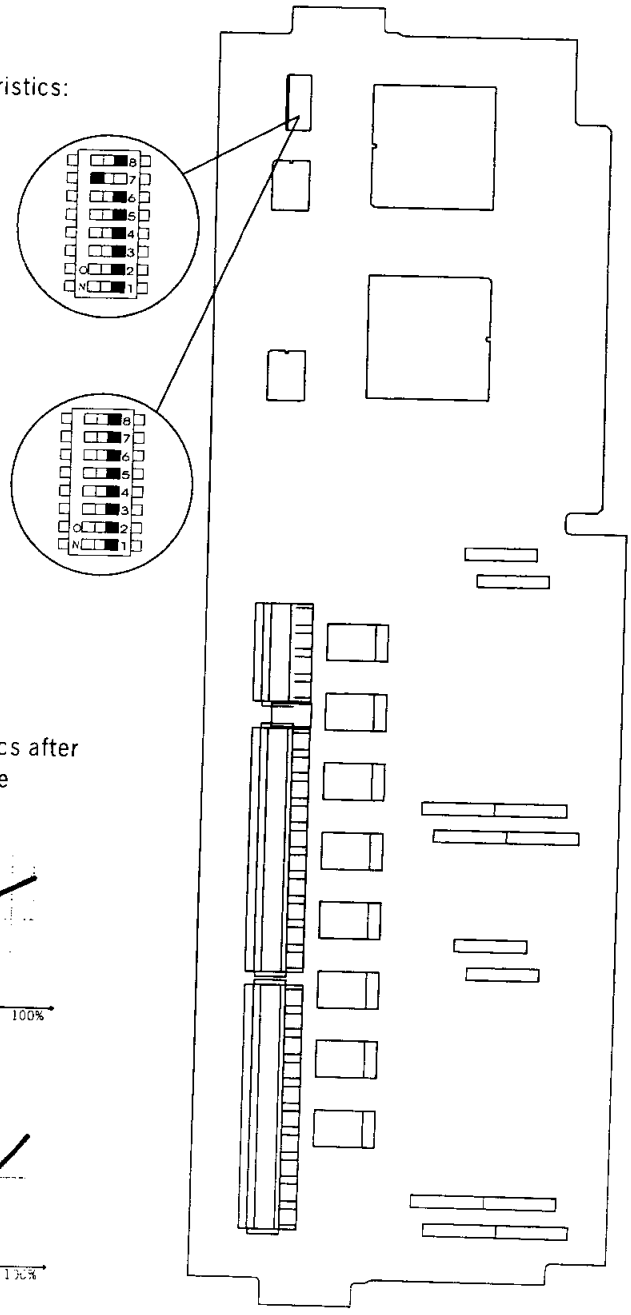
DIL switch (SW2) for setting various transmission characteristics:



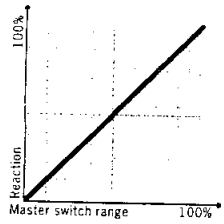
Setting for linear characteristic

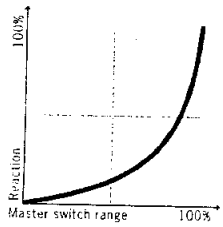


Setting for non-linear characteristic

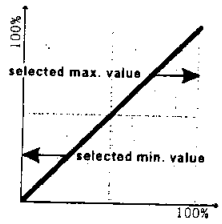


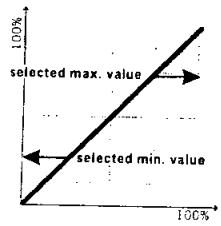
Characteristics linear or non-linear



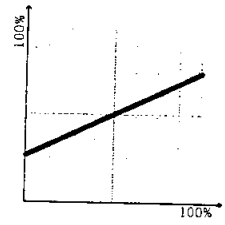


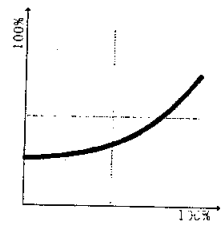
Characteristics in Teach-In mode





Characteristics after Teach-In mode





DIL switch no. 8 : OFF: 50% switching variable
ON : 50% switching fixed

* Please refer to the scope of supply of your radio remote control.

TECHNICAL DATA

Operating ambient temperature	-20 to +65 °C
Insulation class - Protection	IP 65

TRANSMITTER

Pocket, Nano, Nano-L, Nano-M

Transmission frequency range	400 - 477 MHz, 25 mW FM

The use of synthesizer technology permits frequencies to be selected in accordance with the appropriate waveband for the country of use.

Low frequency modulation	FSK signal to CCITT V.23
Data repetition rate	about 60 ms
Baud rate	1200 baud (bits per sec.)
Range	300 up to 1000 m
Power input	60 - 100 mA
RF ouput	≤ 10 mW

	Weight (without battery)	Size (L x W x H)
Pocket-A	0,2 kg	14 x 8,7 x 3,5 cm
Pocket-B	0,2 kg	17 x 8,7 x 3,5 cm
Pocket-D/-F/-S/-V	0,2 kg	18 x 8,7 x 3,5 cm
Pocket-V-3/-9	0,4 kg	18 x 8,7 x 6,2 cm
Nano	0,7 kg	17,5 x 12,6 x 12,2 cm
Nano-L	1,0 kg	24,7 x 13,9 x 11,7 cm
Nano-M	1,5 kg	28,3 x 14,4 x 14,5 cm

RECEIVER

R-16, R-CAN, Compact-M, Compact-V, PNN-BUS-3, PNN-BUS-5

Reception frequency range	400 - 477 MHz

Data security:
Generates a CRC code with a Hamming distance = 4. Generates a neutral position.
Addressing of each transmitter with its own, unique combination (max. 2^{16} possible combinations).

Data reception security: Diversitary evaluators, CRC, EMERGENCY STOP and neutral position bits.

Restart inhibitor if EMERGENCY STOP relay defective. (PNN-BUS-3, PNN-BUS-5)

Contact loading for EMERGENCY STOP and commands. (PNN-BUS-3, PNN-BUS-5)

max. switching voltage	250V AC (12V / 24V DC - R-16, R-CAN, Compact-M, Compact-V)
max. switching current	4A AC (3A DC at 12V / 24V - R-16, R-CAN, Compact-M, Compact-V)
max. switching power	1000 VA

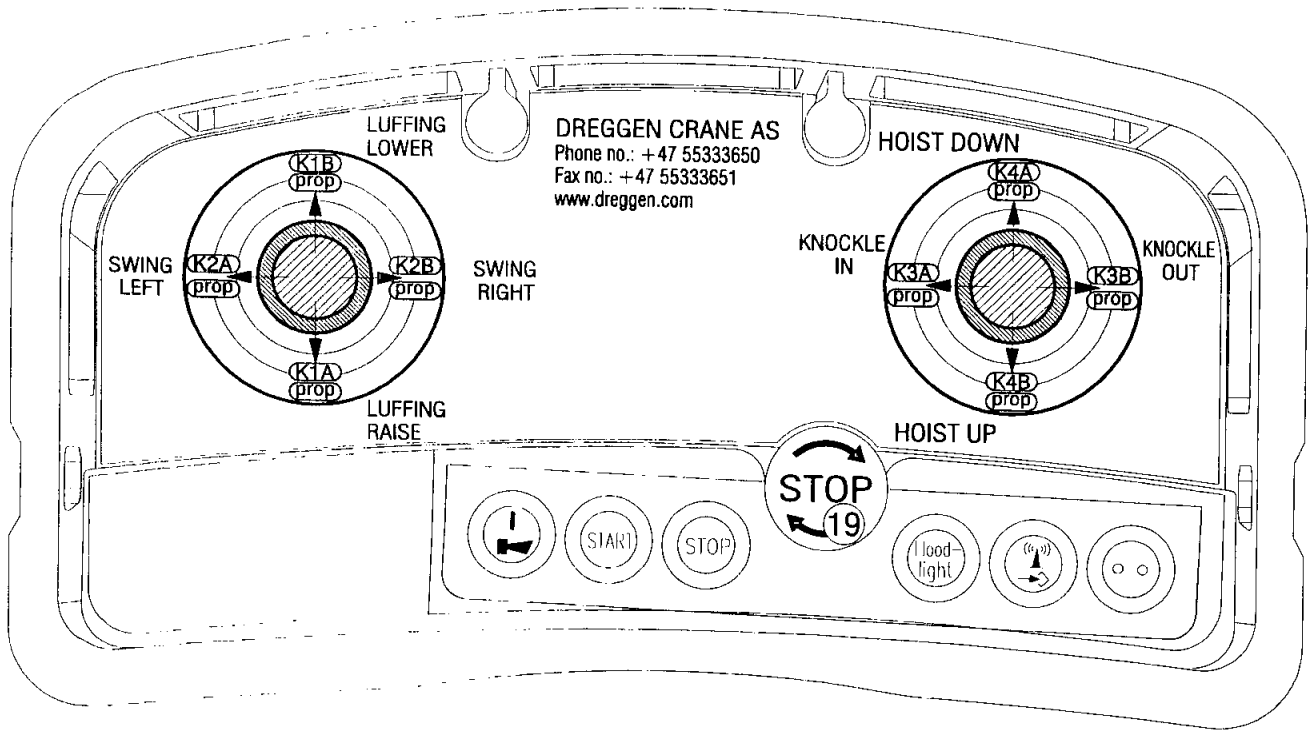
	Weight	Size (L x W x H)
R-16, R-CAN (potted)	640 g 800 g	18 x 9,7 x 4,4 cm
Compact-M (potted)	640 g 800 g	18 x 9 x 7 cm
Compact-V (potted)	1,5 kg	21,5 x 16 x 6,5 cm
PNN-BUS-3	3,0 kg	30,6 x 18,1 x 13 cm
PNN-BUS-5	4,7 kg	36,4 x 28,3 x 15,2 cm

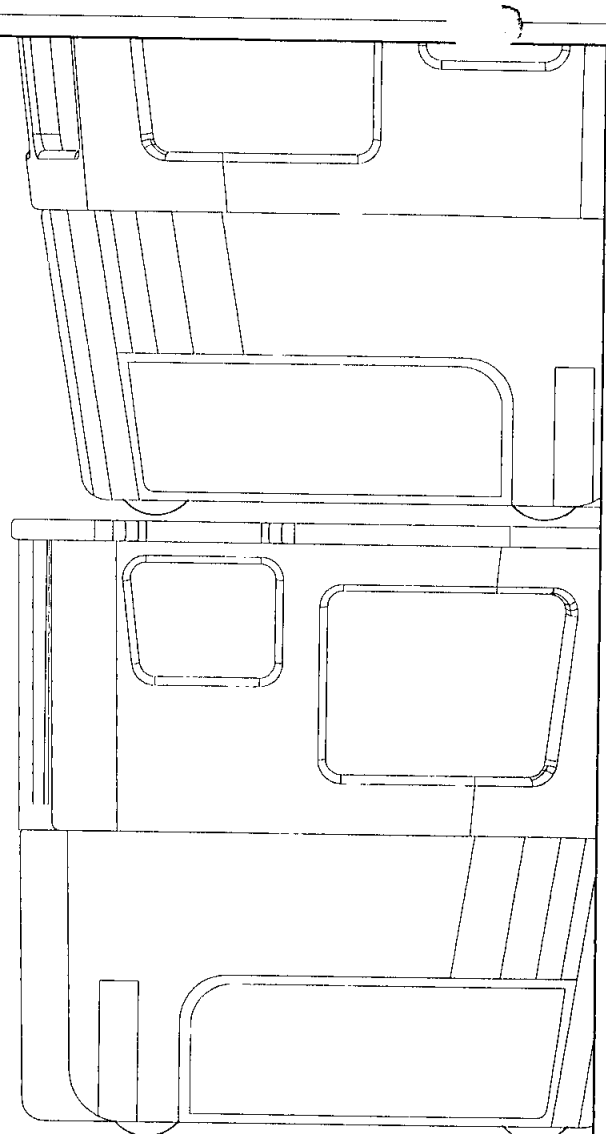
BATTERY

7,2V / 1000mAh

CHARGING UNIT

Operating voltage / external charging unit	12V/24V DC, AC-DC changer 100/240V AC / 12V DC
Operating voltage / PNN-BUS-3 / PNN-BUS-5	40V-230V AC, 8V-32V DC, 12V / 24V DC
Operating voltage / R-16, R-CAN / Compact	12V / 24V DC





No.:	Description:	Order-No.:	No.:	Description:	Order-No.:
1	Key switch 0-ON	3.740.1001	10	Rotary switch Gray-Code 3 steps	3.740.1041
2	Key switch 0-MOM	3.740.1011	11	Rotary switch BCD-Code 10 steps	3.740.1026
3	Toggle switch 0-ON	3.740.1016	12	Rotary switch BCD-Code 12 steps	3.740.1027
4	Toggle switch MOM-0-MOM	3.740.1017	13	Rotary switch Gray-Code 12 steps	3.740.1029
5	Toggle switch ON-0-ON	3.740.1018	14	Rotary switch BCD-Code 16 steps	3.740.1025
6	Toggle switch ON-0-MOM	3.740.1019	15	Potentiometer 5k + Contr.knob Φ16	3.980.1156
7	Toggle switch lever lock. ON-0-ON	3.740.1028	16	Control knob Φ17mm	3.930.1002
8	Pushbutton switch APR 0-MOM	3.740.1020	17	Control knob Φ20mm	3.930.1003
9	Rotary switch ON-0-ON	3.740.1022	18	Control knob Φ24mm	3.930.1004
22	Toggle switch 0-MOM	3.740.1043	19	Emergency Stop Switch with Key 0-On reed	3.740.1000
23	Miniature pushbutton switch 0-MOM	3.740.1030	20	Emergency Stop Switch 0-On reed	3.740.1014
24	Toggle switch lever lock. ON-0	3.740.1045	21	Emergency Stop Switch 0-On black	3.740.1004

nbb

Serial no.:	Ref.: 999 498 5997
Model:	
Customer:	Dreggen Crane AS
Date:	2005.09.14
Name:	K. Hanig
Modification:	
Actel:	SNL48786/FM

TRANSMITTER
NANO-L

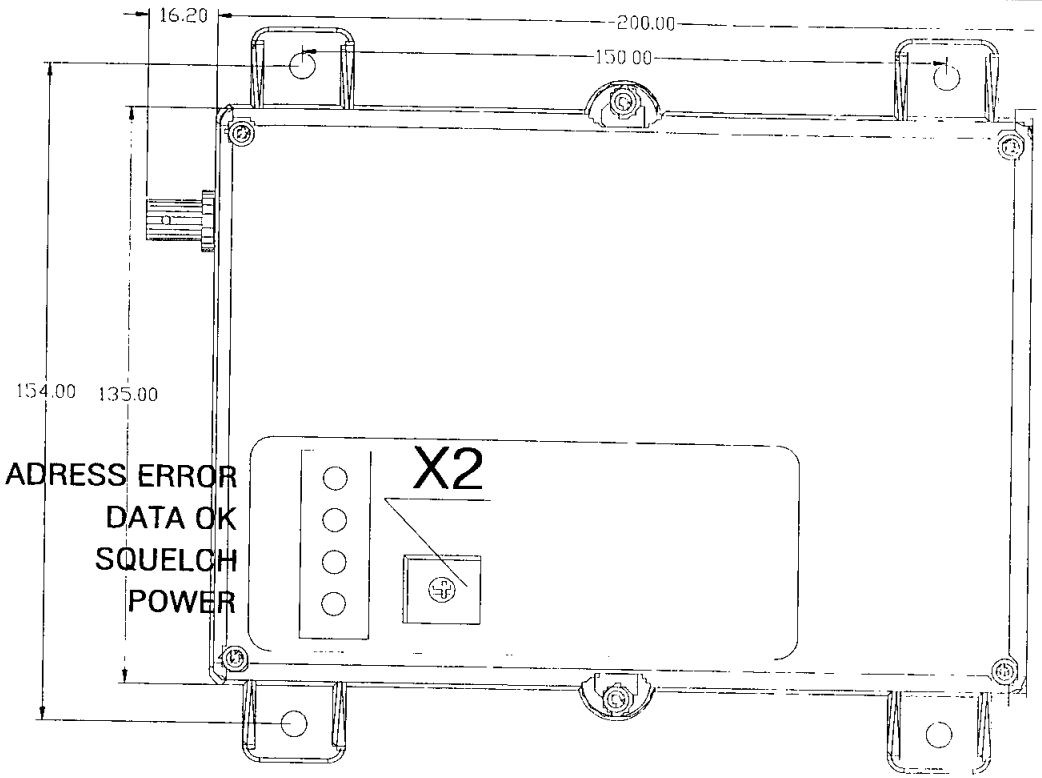
Colour:			
	Face Blade:	silver	3.720.1036
	Upper part:	black	3.300.1057
	Lower part:	black	2.250.1055

ON 1 2 3 4 5 6 7 8
TRANSMITTER-CODE

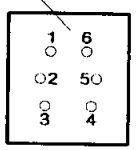
Approbation:

Date:

Signature stamp:



X2



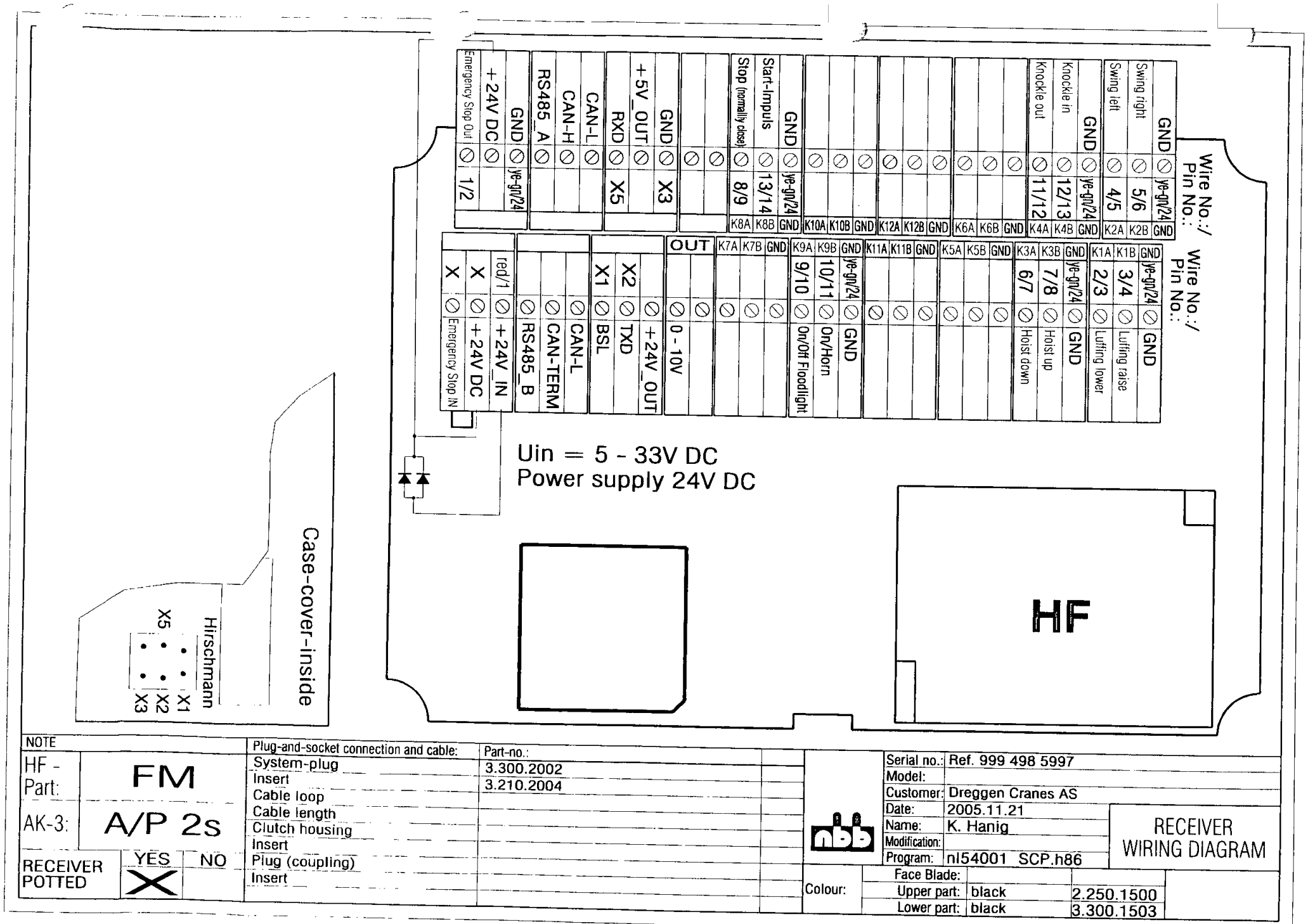
PROG.-CONNECTION

NOTE			Plug-and-socket connection and cable:	Part-no.:
HF - Part:	FM		System-plug	3.300.2002
			Insert	3.210.2004
			Cable loop	
AK-3:	A/P 2s		Cable length	
			Clutch housing	
			Insert	
RECEIVER POTTED	YES: X	NO	Plug (coupling)	
			Insert	

Serial no.:	Ref. 999 498 5997	
Model:		
Customer:	Dreggen Crane AS	
Date:	2006.01.18	
Name:	K. Hanig	
Modification:		
Program:	nl54001 SCP.h86/FM	

RECEIVER WIRING DIAGRAM

Colour:		
Face Blade:		
Upper part:	black	2.250.1500
Lower part:	black	3.300.1503



NOTE			Plug-and-socket connection and cable:	Part-no.:
HF - Part:	FM		System-plug	3.300.2002
AK-3:	A/P 2s		Insert	3.210.2004
			Cable loop	
			Cable length	
			Clutch housing	
			Insert	
RECEIVER POTTED	YES: X	NO	Plug (coupling)	
			Insert	

Serial no.:	Ref. 999 498 5997	
Model:		
Customer:	Dreggen Cranes AS	
Date:	2005.11.21	
Name:	K. Hanig	
Modification:		
Program:	nl54001_SCP.h86	

RECEIVER WIRING DIAGRAM

Colour:			
	Face Blade:		
	Upper part:	black	2.250.1500
	Lower part:	black	3.300.1503

CONNECTING PLAN

Serial no.:	**Ref.: 999 498 5997**	Cable length.:	
Model:		Cable loop-no.:	
Wiring diagram no.:	---	System-plug-no.:	**Internal Conection**
Producer:	**Dreggen Crane AS**	Insert-no.:	**3.300.2002**
Date:	**2005.09.14**	Clutch housing-no.:	
Name:	**K. Hanig**	Insert-no.:	
Relay board code:		Plug-no.:	
Program-Code:	**NL54001.H86/FM**	Insert-no.:	

RECEIVER			CONTROL CABLE		SYSTEM
Terminal strip no .:			Function:	Wire-No.:/Pin-No.:	Terminal strip: / or plug socket:
5-33VDC / 8V DC		red	**Power Supply 24V DC**	**red / 1**	
		ye/gn	**Power Supply 0V DC**	**ye /gn / 24**	
			Common	**--- / ---**	---
Emergency stop		1	**Emergency Stop** (set /reset)	**1 / 2**	2
			Common	/	---
Out 1A	**K1B**	2	**Luffing Lower (PWM)**	**2 / 3**	
Out 1B	**K1A**	3	**Luffing Raise (PWM)**	**3 / 4**	
Out 2A	**K2A**	4	**Swing Left (PWM)**	**4 / 5**	
Out 2B	**K2B**	5	**Swing Right (PWM)**	**5 / 6**	
Out 3A	**K4A**	6	**Hoist Down (PWM)**	**6 / 7**	
Out 3B	**K4B**	7	**Hoist Up (PWM)**	**7 / 8**	
Out 4A	**K3B**	11	**Knockle Out (PWM)**	**11 / 12**	
Out 4B	**K3A**	12	**Knockle In (PWM)**	**12 / 13**	
Out 5A				/	
Out 5B				/	
Out 6A				/	
Out 6B				/	
Out 7A				/	
Out 7B				/	
Out 8A		8	**Stop (normally close/open when Stop is activated)**	**8 / 9**	
Out 8B		13	**Start-Impuls**	**13 / 14**	
Out 9A		9	**On/Off Floodlight (set/reset)**	**9 / 10**	
Out 9B		10	**On/Horn**	**10 / 11**	
Out 10A				/	
Out 10B				/	
Out 11A				/	
Out 11B				/	
Out 12A				/	
Out 12B				/	
Out AN0				/	
Out SW1				/	

APPROVALS AND CERTIFICATES

Approvals EU countries: CE

Enclosure:

EC Declaration of Conformity

Obtainable at demand:

M-Zert mbH
Certificate DIN EN ISO 9001:2000-12 No. 03022
NBB Controls & Components AG 15.07.2003

© NBB Controls & Components AG
Otto-Hahn-Straße 1-3
D-75248 Ölbronn-Dürrn
Tel.: 0 72 37 / 9 99 - 0
Fax: 0 72 37 / 9 99 - 1 99
eMail: sales@nbb.de
http://www.nbb.de

Bedienungsanleitung Nano-S, -V, -L, -M, R-16, R-CAN, Compact-M, -V, PNN-BUS-3, -5,
Englisch, Teile-Nr. 3.150.1051, Stand 01.06

12.3 Winch gear art.no. 21307

Prodotto tipo / Product type:

7 13 C 3 B 34 A0 81 S6 5WHU U26

Comp./Sign.: ***Cignani***
Sostituisce il/Replacing:
Sostituito dal/Replaced by:

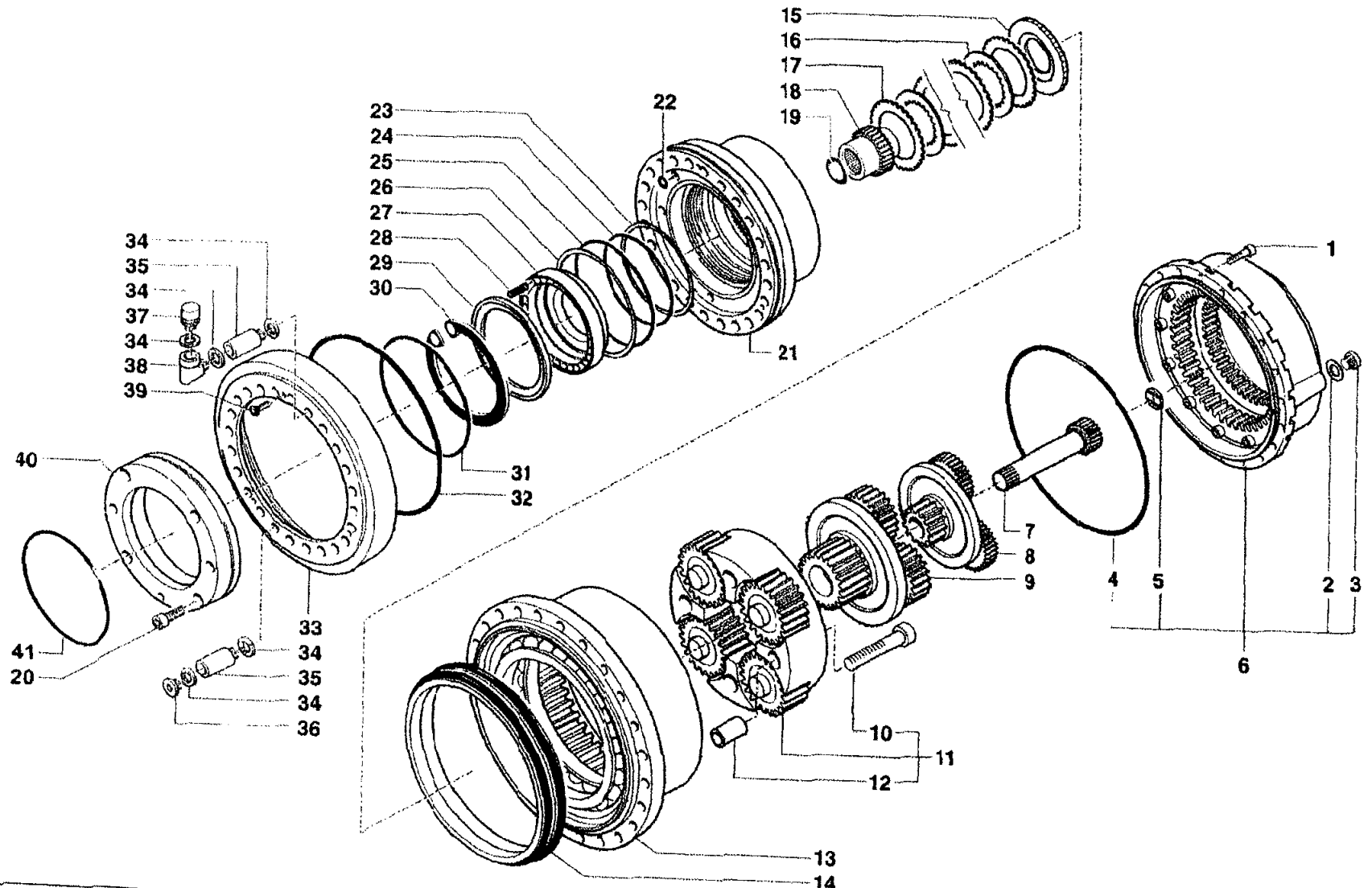
Data/Date: ***13/09/2005***
Da matr./From serial nbr:
A matricola/To serial nbr:

Lista ricambi n°:
Spare part list No.:
1.63900843
(7 13 C 3 B 34 A0 81 S6 5WHU U26)

Rev: 0

RAPPORTO TOTALE / TOTAL RATIO: **1:81**
COPPIA FRENANTE / BRAKING TORQUE: **615 Nm**
PRED.MCTORE / MOTOR ADAPTOR: **SAE D (SAE 8/16 z13)**

CODICE DI ORDINAZIONE PRODOTTO/PRODUCT ORDERING CODE: **2T263900353**



Prodotto tipo / Product type:

7 13 C 3 B 34 A0 81 S6 5WHU U26

Comp./Sign.: *Cignani* Data/Date: *13/09/2005*

Sostituisce il/Replacing: Da matr./From serial nbr:

Sostituito dal/Replaced by: A matricola/To serial nbr:

Lista ricambi n°: Spare part list No.:

1.63900843

(7 13 C 3 B 34 A0 81 S6 5WHU U26)

Rev: 0

Ref	Codice/Code	Qt.	Denominazione	Denomination	Denomination	Beschreibung	Note	
1	720965005	20	VITE	SCREW	VIS	SCHRAUBE	UNI 5931 M12x35-12.9	
2	718006008	2	RONDELLA	WASHER	RONDELLE	SCHEIBE	UNI 9001 22x28x1,5	
3	6682500640	2	TAPPO SFIATO	OIL BREATHER PLUG	RENIFLARD	ENTLUEFTUNGSTOPFEN	M22x1,5 DIN 908	
4	715303261	1	O-RING	O-RING	O-RING	O-RING	3,53x329,79	#
5	6663350310	1	PASTIGLIA	PAD	DISQUE DE FRICT.	ANLAUFSCHEIBE		
6	2T237178010	1	ASSIEME COPERCHIO	COVER ASSEMBLY	ENSEMBLE COUVERCLE	DECKEL MIT ZUBEHOR		
7	6643010681	1	SOLARE	SUN GEAR	ENGREN CENTRAL	SONNENRAD	z24 1:4,25 m3,00	
8	2T235378190	1	ASSIEME 1° RIDUZIONE	1st RED. ASSEMBLY	ENSEMBLE 1° REDUCT.	KOMPL.MONT.1°STUFE	1:4,25	
9	2T235378110	1	ASSIEME 2° RIDUZIONE	2nd RED. ASSEMBLY	ENSEMBLE 2° REDUCT.	KOMPL.MONT. 2°STUFE	1:4,40	
10	720965715	4	VITE	SCREW	VIS	SCHRAUBE	UNI 5931 M24x140-10.9	11*
11	2T235378100	1	ASSIEME 3° RIDUZIONE	3rd. RED. ASSEMBLY.	ENSEMBLE 3° REDUCT.	KOMPL.MONT.3°STUFE	1:4,40	
12	3661000400	4	BOCCOLA	BUSH	DOUILLE	BUCHSE		11*
13	2T237470711	1	CORPO+CUSCINETTO	HOUSING+BEARING	CARTER+ROULEMENT	GEHAEUSE+LAGER		
14	710317009	1	TENUTA FRONTALE	LIFETIME SEAL	JOINT LIFETIME	LIFETIME-DICHTUNG	Øi 366,5	#
15	3660300471	1	SPINGIMOLLA	SPRING RETAINER PLATI	POUSSE-RESSORT	FEDERDRUCKSCH		
16	3680700040	5	DISCO ACCIAIO	STEEL DISC	DISQUE ACIER	STAHLSCHEIBE	z28	#
17	3680900200	6	DISCO SINTERIZZATO	SINTERED DISC	DISQUE FRITTE	SINTERSCHEIBE	z4	#
18	6633031670	1	ALBERO FRENO	BRAKE SHAFT	ARBRE FREIN	BREMSEWELLE		
19	718299032	1	ANELLO ELASTICO	CIRCLIP	ANNEAU ELASTIQUE	SICHERUNGSRING	UNI 7437-37	
20	720956005A	4	VITE	SCREW	VIS	SCHRAUBE	UNI 5931 M16x50-8.8	
21	3632592650	1	MOZZO FLANGIATO	HUB	MOYEU	NABE		
22	715303026	1	O-RING	O-RING	O-RING	O-RING	2,62x12,37	#
23	722369038	1	AN. ANTIESTRUSIONE	BACKUP RING	ANN. SPIRAL	SPIRALRING	W 4,65x172,16 PK	#
24	715307364	1	O-RING	O-RING	O-RING	O-RING	5,33x170,82 PK 2-364	#
25	715307368	1	O-RING	O-RING	O-RING	O-RING	5,33x196,22 PK 2-368	#
26	722369039	1	AN. ANTIESTRUSIONE	BACKUP RING	ANN. SPIRAL	SPIRALRING	W 4,65x197,56 PK	#
27	6635060093	1	PISTONE FRENO	BRAKE PISTON	PISTON FREIN	KOLBEN		
28	3680000100	18	MOLLA	SPRING	RESSORT	FEDER		
29	6660300291	1	SPINGIMOLLA	SPRING RETAINER PLATI	POUSSE-RESSORT	FEDERDRUCKSCH		
30	718299134	1	ANELLO ELASTICO	CIRCLIP	ANNEAU ELASTIQUE	SICHERUNGSRING	UNI 7437-200	
31	715303345A	1	O-RING	O-RING	O-RING	O-RING	3,53x228,19	#
32	715303261	1	O-RING	O-RING	O-RING	O-RING	3,53x329,79	#
33	6660800350	1	ANELLO RITEGNO	COVER	COUVERCLE	DECKEL		
34	718006008	7	RONDELLA	WASHER	RONDELLE	SCHEIBE	UNI 9001 22x28x1,5	
35	6668200170	3	PROLUNGA	EXTENSION	RALLONGE	VERLAENGERUNG	M22x1,5	
36	722366103	3	TAPPO CHIUSO	PLUG	BOUCHON	STOPFEN	M22x1,5 DIN 908	

*Componenti inclusi nell'assieme indicato
*Components included in the indicated assembly
*Composants inclus dans le sous ensemble
*In der Baugruppe enthaltene Teile

Ricambi consigliati da tenere a magazzino
Recommended for stock
Pièces à stocker
Wir empfehlen diese Teile zu bevorraten

Ref. / Item	Sostituisce / Replaces	Data / Date

Prodotto tipo / Product type:

7 13 C 3 B 34 A0 81 S6 5WHU U26

Comp./Sign.: ***Cignani*** Data/Date: ***13/09/2005***

Sostituisce il/Replacing: Da matr./From serial nbr:

Sostituito dal/Replaced by: A matricola/To serial nbr:

Lista ricambi n°:
Spare part list No.:

1.63900843

(7 13 C 3 B 34 A0 81 S6 5WHU U26)

Rev: 0

Ref	Codice/Code	Qt.	Denominazione	Denomination	Denomination	Beschreibung	Note
37	718401048	1	TAPPO SFIATO	BREATHER PLUG	RENIFLARD	ENTLUEFTUNGSTOPFEN	M22x1,5
38	6668200121	1	GOMITO	ELBOW	EQUERRE	STUECK	M22x1,5
39	720886004A	3	VITE	SCREW	VIS	SCHRAUBE	UNI 5933 M10x25-10.9
40	6654507440	1	FLANGIA MOTORE	MOTOR ADAPTOR	BRIDE	MOTOR FLANSCH	

*Componenti inclusi nell'assieme indicato
*Components included in the indicated assembly
*Composants inclus dans le sous ensemble
*In der Baugruppe enthaltene Teile

Ricambi consigliati da tenere a magazzino
Recommended for stock
Pièces à stocker
Wir empfehlen diese Teile zu bevorraten

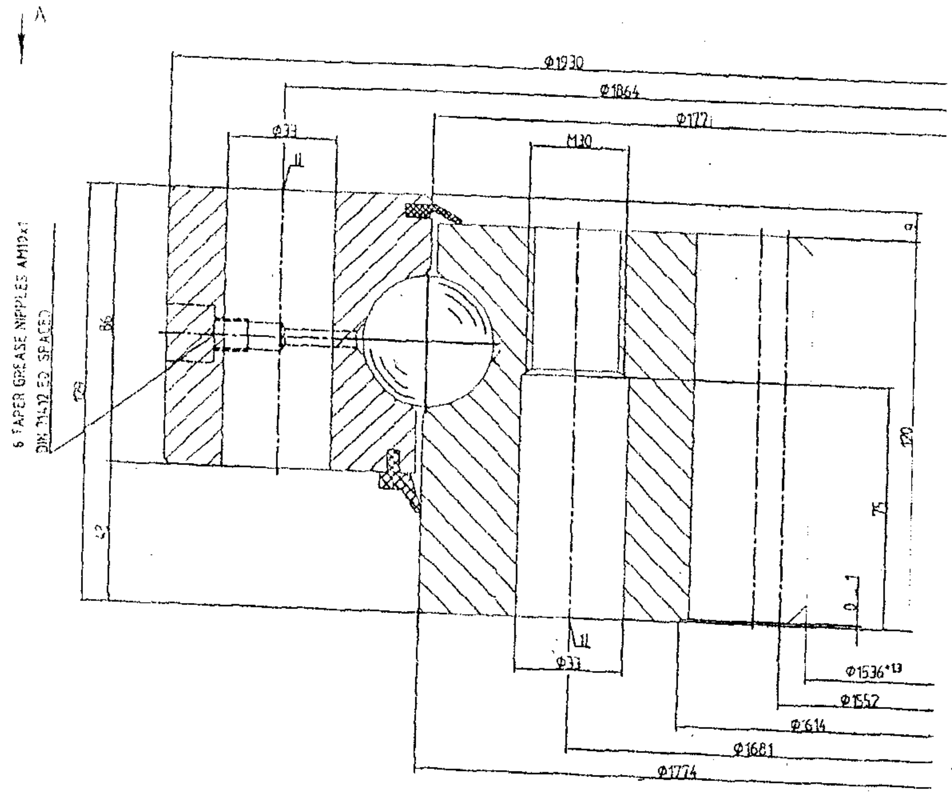
Ref. / Item	Sostituisce / Replaces	Data / Date

12.4 Winch motor art.no. 14222

12.5 Hydraulic cylinder art. no. 10915

12.6 Slewing ring art.no. 21560

DK 220



Art. no : 21560

1) – [⌖|Ø0.64] MOUNTING SURFACE SIDE 3 AND TRANSPORTING HOLES M16-30 DEEP

OUTERRING 50 HOLES, EQUALLY SPACED FOR BOLTS M30
BORING PLAN: 062 40.1773.000-103

INNERRING 60 HOLES, EQUALLY SPACED FOR BOLTS M30
CHORD 6.000° = 81.0
CHORD 60.000° = 840.5

Verzahnungsdaten/Gear data		
Modul / Module	m	16.0
Zähnezahl / No. of teeth	z2	-97.0
Profilverschiebung / Addendum modification	xm2	-8.000
Kopfkürzung / Addendum reduction	km2	0
Teilkreis / Pitch circle diameter	d2	1552
Qualität DIN 3961, Toleranzfeld / Quality DIN 3967, tolerance block		12de
Eingriffswinkel / Pressure angle	alpha	20°
Bezugsprofil / Basic rack profile		DIN 867

Untolerierte Durchmesser-Maße (spanend bearbeitet)
Dia. dim. without tolerance (machined)

≤315	≤1000	≤2000	≤4001	≤6300	≤10000
±1.6	±2.5	±3.5	±5.0	±7.0	±10.0

Schutzvermerk ISO 16016 beachten
Copyright reserved

	Datum/Date	Name
Bearb./Drawn	08.05.2003	Schmidt
Gepr./Checked	09.05.2003	Stroph

Werkstoff/Material: Ringe/Rings 42CrMo4V

Maßstab / Scale: 1:1
Gewicht / Weight: 617.0 kg/kgs
Ident-Nr. / Ident-No.: 36334300
Benennung / Title: BALL BEARING SLEWING RING
Zeichnungs-Nr. / Drawing No: 062 40.1773.001 49.1522
062.40.1773.000.19.1522

Mounting- and maintenance instructions

Preface:

The following instruction offers you all information you need, to mount- and maintenance a IMO slewing ring correctly.
In case of special slewing rings (for instance thin walled slewing rings, wire race slewing rings or other types that only support a decreased stability because of constructive features) there could be deviations from these instructions in case of both mounting and maintenance.
If such cases are in effect and you haven't received any special instructions please contact our staff to receive the relevant information.
Please also observe any supplement sheets, that may change- or substitute for procedures included in this instruction.
We oblige you and your customers to follow these instructions, if there are obscure points, please contact us immediately.

We are not liable in case of :

1. incorrect mounting
2. improper maintenance or
3. omitting of passing on of this instructions to your customers and / or to a third party that needs this instructions to built in, or maintenance our slewing rings correctly, or in case of falsification of the text of this instruction.

All relevant information concerning mounting and maintenance are included in this instructions, this instruction and possible supplement sheets are always authoritative in their newest number of revision.
Our staff would naturally like to answer you any questions you may have about mounting and maintenance.
Every instruction issued by our firm about mounting and maintenance lose its validity, from now on the number of revision, included at the end of this instructions, decides about the validity of the instruction.
This instruction is meant to be given to your customer, please also refer to it in possible existing machinery instructions, but give this instructions in any case with any machine to your customer and / or maintenance contractors, subcontractors or resembling.
All working steps described in this instruction have to be performed by qualified staff, also consider the quality of the supporting surfaces the slewing ring is fixed on to (as described below), this can affect function and durability of the slewing ring substantially.

Symbols in this instruction :

= Information relevant for safety
Information's marked by this sign have to be followed exactly.
If this instructions are not followed exactly, this might lead to endangering of :
- staff
- the slewing ring
- the machinery or parts of the equipment.

= Working proceedings are marked by this symbol. They have to be considered as a whole.
All working steps have to be performed, all information's have to be put into consideration.

= Working steps are marked by a number in a circle.
This working steps have to be performed in the order indicated.

= Mounting- and shaping proceedings are marked by this symbol.

= Measurement proceedings are marked by this symbol.

= Calculation proceedings are marked by this symbol.

Contents :

0. Transport- handling- and storage instructions

0.1 Transport- and handling instructions

Transports of slewing rings have to be performed in a horizontal position.
Pay attention to the fact, that a slewing ring may not be exposed to hard impacts during handling procedures.
Handling procedures have to be performed with working gloves, to avoid injuries. If the slewing ring is supplied with tapping holes eye screws can be screwed in, this enables secure handling on a hitch.

- The slewing ring has to be suspended at least at 3, better on 4 points, a spreading angle of the ropes suspended on the eye screws of more than 120° is not permissible.

- Make sure, the eye screws are screwed in on their full lengths and that the ropes and the eye screws are in faultless condition and are proved for the designated loads.

- Make also sure, that the tapping holes are in faultless, not corroded condition.

0.2 Storage instructions

Slewing rings have to be stored horizontally, if they are piled up, with a layer of wooden planks between each slewing ring.
The corrosion protection, applied by our firm will last for 1 week.
If you want to store the slewing ring for a longer time, a long term corrosion protection has to be applied.

- Uncovered storage places are not suitable for slewing rings

1. Fitting

1.1 Preparation for fitting

1.1.1 Cleaning of the fixing surface of the slewing ring and of the supporting structure

The fixing surfaces have to be absolutely clean. Also remove any corrosion protection.

- By no means cleaning agents may enter the raceway system of the slewing ring.

- Observe any important instructions concerning the cleaning agents (for instance manufacturer specifications, health and security instructions, environmental protection instructions)

- Do not use any aggressive cleaning agents or solvents, that could harm the rubber of the seals.

Common detergents : cold detergents (for instance washing gas, diesel, Katryl KEV etc.)

Cleaning procedure of the fixing surfaces of the slewing ring and of the supporting structure

1. *Remove alien material from the connection surfaces (including dry paint and welding beads)*
2. Remove corrosion protection from the slewing ring utilizing a fuzz free cloth, dry the connecting surfaces of the slewing ring and the supporting structure.

1.1.2 Determination of the permissible plane deviation δ_P, angular deviation δ_W and the permissible deformation of the fixing surface of the supporting structure δ_v

Chart 1 : permissible plane- including angular deviation for slewing rings of standard design

Diameter of the raceway (mm)		250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
Plane- including angular deviation for each fixing surface (mm)	ball bearing	0,08	0,10	0,13	0,15	0,18	0,20	0,23	0,25	0,28	0,30	0,33	0,35
	roller bearing	0,06	0,08	0,09	0,10	0,11	0,13	0,14	0,15	0,16	0,17	0,18	0,20

Chart 2 : permissible deformation of the supporting structure for slewing rings of standard design

Diameter of the raceway (mm)		250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
Deformation of the supporting structure for each fixing surface (mm)	ball bearing	0,21	0,27	0,35	0,40	0,48	0,5	0,61	0,67	0,75	0,80	0,88	0,93
	roller bearing	0,16	0,21	0,24	0,27	0,29	0,35	0,37	0,40	0,43	0,45	0,48	0,53

For slewing rings with decreased play, preloaded slewing rings as well as precision slewing rings and slewing rings with rotation resistance demands the chart values have to be reduced according to the fields of employment

The diameter of the raceway (D_L) can be taken from our identity no.

XX -XX XXXX / X - XXXXX

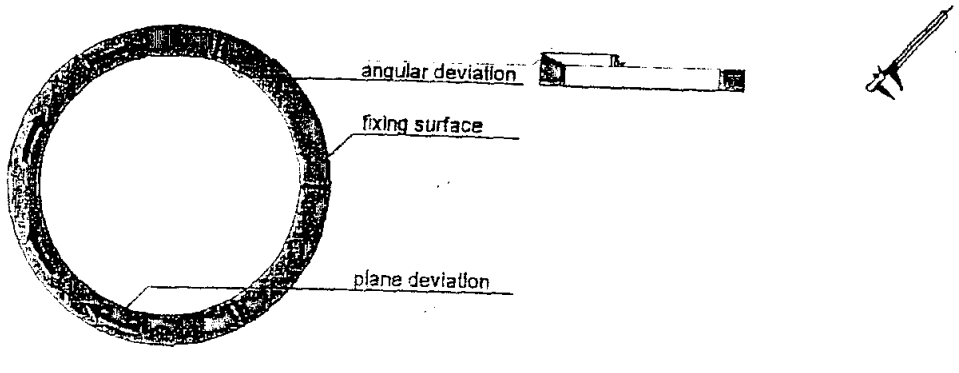
diameter of the raceway

If the actual diameter of the raceway is between 2 charted values, take the smaller value.
In case of slewing rings above 3000 mm diameter of the raceway, take the value listed at 3000 mm.
The maximum permissible angular deviation δ_W is calculated for a flange 100 mm broad and may not exceed half the value listed in chart.
If the breadth of the fixing surface deviates from 100 mm, the actual maximum permissible value has to be calculated according to the following formula :

$$\delta_{W\,MAX\,perm.} = \frac{\text{maximum permissible deviation according to chart 1}}{200} \times \text{breadth of flange in mm}$$

The maximum remaining value for plane deviation δ_P in the circumference direction may only be reached once at half of the circumference of the slewing ring.
The curve of the plane deviation has to look similar to a sinus curve, increasing and decreasing slowly.

Sketch 1: plane- and angular deviation at the supporting structure



1.1.3 Greasing of the slewing ring

Slewing rings are delivered completely greased, but raceway and gears have to be regreased before the first operation.
Utilize, for ordinary designs, water-repellent lithiumsoapgrease according to DIN 51 825 TI of NLGI-class 2 DIN 51 818 for the raceway.
Utilize in special cases grease harmless for foods, grease decreasing the rotary resistance or grease, suitable for higher temperatures.
The utilized grease for relubrication has to be conform to the grease, used for the initial lubrication in our factory. If a special grease has been used for initial lubrication, it is also noted on our drawing.
Utilize oils B according to DIN 51 513 for the lubrication of the gears.

1.1.2 Determination of the permissible plane deviation δ_p, angular deviation δ_w and the permissible deformation of the fixing surface of the supporting structure δ_v

Chart 1 : permissible plane- including angular deviation for slewing rings of standard design

Diameter of the raceway (mm)		250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
Plane- including angular deviation for each fixing surface (mm)	ball bearing	0,08	0,10	0,13	0,15	0,18	0,20	0,23	0,25	0,28	0,30	0,33	0,35
	roller bearing	0,06	0,08	0,09	0,10	0,11	0,13	0,14	0,15	0,16	0,17	0,18	0,20

Chart 2 : permissible deformation of the supporting structure for slewing rings of standard design

Diameter of the raceway (mm)		250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
Deformation of the supporting structure for each fixing surface (mm)	ball bearing	0,21	0,27	0,35	0,40	0,48	0,5	0,61	0,67	0,75	0,80	0,88	0,93
	roller bearing	0,16	0,21	0,24	0,27	0,29	0,35	0,37	0,40	0,43	0,45	0,48	0,53

For slewing rings with decreased play, preloaded slewing rings as well as precision slewing rings and slewing rings with rotation resistance demands the chart values have to be reduced according to the fields of employment

The diameter of the raceway (D_L) can be taken from our identity no.

XX -XX XXXX / X - XXXXX

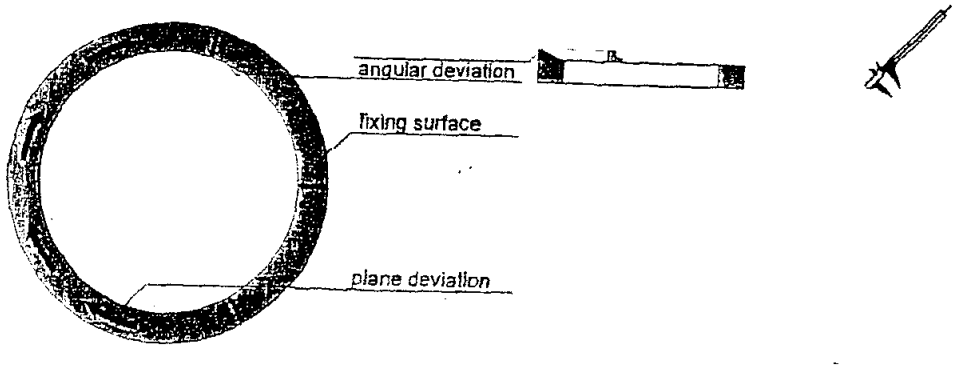
diameter of the raceway

If the actual diameter of the raceway is between 2 charted values, take the smaller value.
In case of slewing rings above 3000 mm diameter of the raceway, take the value listed at 3000 mm.
The maximum permissible angular deviation δ_w is calculated for a flange 100 mm broad and may not exceed half the value listed in chart.
If the breadth of the fixing surface deviates from 100 mm, the actual maximum permissible value has to be calculated according to the following formula :

$$\delta_{W\,MAX\,perm.} = \frac{\text{maximum permissible deviation according to chart 1}}{200} \times \text{breadth of flange in mm}$$

The maximum remaining value for plane deviation δ_p in the circumference direction may only be reached once at half of the circumference of the slewing ring.
The curve of the plane deviation has to look similar to a sinus curve, increasing and decreasing slowly.

Sketch 1: plane- and angular deviation at the supporting structure



1.1.3 Greasing of the slewing ring

Slewing rings are delivered completely greased, but raceway and gears have to be regreased before the first operation.
Utilize, for ordinary designs, water-repellent lithiumsoapgrease according to DIN 51 825 TI of NLGI-class 2 DIN 51 818 for the raceway.
Utilize in special cases grease harmless for foods, grease decreasing the rotary resistance or grease, suitable for higher temperatures.
The utilized grease for relubrication has to be conform to the grease, used for the initial lubrication in our factory. If a special grease has been used for initial lubrication, it is also noted on our drawing.
Utilize oils B according to DIN 51 513 for the lubrication of the gears.

The tightening of screws > M30 has to be performed using a hydraulic clamping device.

If the aggravating factors named above (shock loads or vibrations) are in effect screw retention has to be utilized.

Utilization of screw retention, for example Loctite-0586 Type AVX :

- The surface roughness of the surfaces to be connected shall not exceed R_z 65.
- The enclosed instructions of the manufacturer have to be observed carefully.
- Additional information concerning screw retention can be taken from DIN 25 201 or DIN 25 203, especially Information concerning the anchoring utilization of screw retention.

For special information known manufacturers of screw retention (for instance Loctite) have to be contacted.

1.2 Installation of the slewing ring

1.2.1 Positioning of the slewing ring

❶ The slewing ring has to be placed on the supporting surface.

❷ Determine the point of maximum load.

❸ For bearing rings with static load, place the hardness gap shifted 90° degrees to the maximum load area.
The hardness gap is marked by the filling plug or by an IMO punch.

❹ Test if the slewing ring is supported by the supporting surface on the whole circumference and width by utilizing feeler gauges.

1.2.2 Fixing of the slewing ring

- Slewing rings may only be fixed to a surface utilizing the designated screw holes. It is, in no way, permissible to weld them to the supporting structure, or to perform welding procedures in the surrounding of the supporting structure, because this may lead to an irreparable distortion in the raceway and because of that to an early breakdown.

When mounting a ring to the supporting structure, one ring after the other has to be screwed to the supporting structure (order see below), the rings have to be free of external loads.
In all connections parallel screw axes against each other in not loaded condition and parallel screw axes to the separation gaps standards are assumed.
Further the fixing holes of the rings of the bearing and the supporting structure have to resemble each other exactly, in any other case the slewing ring will be preloaded.

- To avoid intolerable deviations between torque moments of the screws stick to the following procedure.

Screwing

❶ Apply a small amount of oil to the screws to ensure a constant friction coefficient (not if screw retention is utilized).

❷ If screw retention is used, stick to the instruction of these products.

❸ Tighten the screws, possibly with washers, loose.

4. Revolve the unfixed ring a few times, to test the ease of the running characteristics.

5. Tighten the screws at the loose screwed ring in an "over cross pattern" and revolve the loose ring a few screw partitions meanwhile.

6. Preload the screws step by step up to the stipulated value.

7. Now fix the loose ring of the slewing ring by repeating the procedure above.

- If a hydraulical tightening device is used the preload may not exceed 90 % of the elastically values.

The tighten torque moment (according to chart 4) is determined by many factors, especially by the friction value of the thread and can vary heavily in practice.

.2.3 Calculation, testing and adjustment of the backlash of teeth

While adjusting the pinion to a geared slewing ring, the backlash of teeth have to be tested and at the point with the maximum runout of the gearing, marked by paint on the slewing ring, a sufficient teeth backlash has to be adjusted.
Calculation of the nominal value of the teeth backlash according to following formula :

Nominal value of the teeth backlash = (0,03 to 0,04 x Modul)

1.2.4 Determination of the actual tilting clearance

The tilting clearance increases when the slewing ring is built-in.
To determine the increase of the tilting clearance, the tilting clearance has to be measured at the built-in, not yet operated slewing ring.

- Mark the measurement point (for instance with a taped x) in the main load direction at both bearing rings, to have a fixed measurement point for later checks.

- Note and archive all measured values.

Checking of tilting clearance

1. Mark the measurement point possibly in the main load direction on the inner and outer ring of the slewing ring.

2. Prepare the slewing ring as shown in sketch 2 with dial gauge and measurement arm.

3. Create a tilting moment into the "A" direction by an external force.

4. Nill the dial gauge.

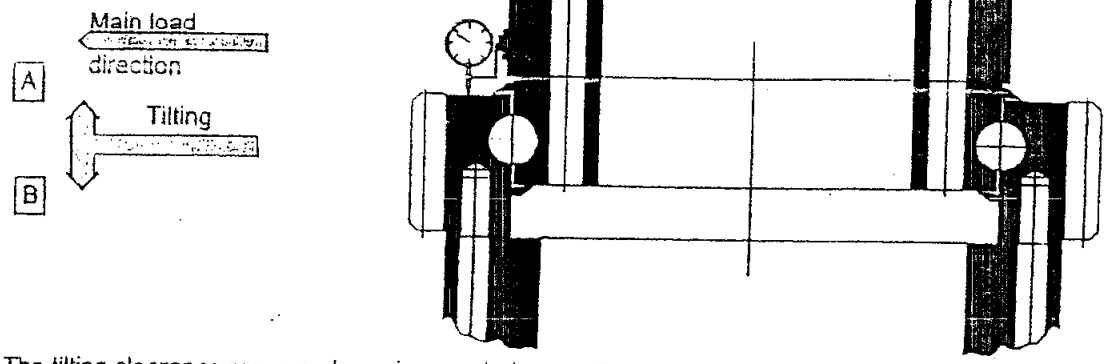
5. Create a tilting moment into the "B" direction by an external force.

6. The value now shown on the dial gauge is equal to the tilting clearance.

- All further checking procedures have to be performed at the same measurement point with the same loads , with the same position of the bearing rings against each other, by utilizing the measurement method indicated.

- Note and archive the measured values for further checks as reference values.

Sketch 2 measurement of tilting clearance



The tilting clearance measured now is regarded as a reference value for subsequent checks
In case of subsequent checks follow the procedure above.

1.2.5 Functional testing

It has to be secured, that the slewing ring is able to rotate smooth with correctly adjusted teeth backlash.
The influence of loads and irregularities at the upper and lower supporting surfaces may increase the frictional resistance.

If a frictional resistance is measured, higher than the specifications, remove the slewing ring from the supporting structure, and measure the frictional resistance again in a dismounted condition.

Functional testing

1. Rotate the mounted slewing ring a few times.
2. Check whether the slewing ring rotates constant and smooth.
3. Perform further tests under full load.

- Perform another test after the test run. If it is necessary retighten the screws to the stipulated values and adjust the teeth backlash.

1.2.6 Permissible circumference speed

- In case of slewing rings the maximum permissible circumference speed is equal to 2 m/sec.
If a slewing ring operates with a higher circumference speed, please contact our staff.
In this case extraordinary measures have to be taken.

1.2.7 Varnishing of the slewing ring and the surrounding structure

- *Fixing surfaces and centering may not be varnished.*

- No paint may be spilled on the seal, respectively on the connecting surface of the seal, because this may decompose the seal or may glue the seal to the connecting surface. Adhesive tape has to be used to protect this sensitive areas before painting.

1.2.8 Permissible temperature of the slewing ring

- The temperature measurable on bearings in normal design may not fall short of -20° C and may not exceed + 70° C.
If the actual temperatures fall short of, or if they exceed this values, or if the temperature on the inner- and outer ring is not equivalent, please contact our staff.
In this cases special measures have to be taken.

2. Maintenance / safety checks and lubrication

2.1 Check of the fixing screws

The fixing screws have to be checked every 700 hours of service or at least every 6 months. This time schedule has to be adjusted if special conditions apply.

- Check the tightening torque's of the screws after the first 100 hours of service, but at least after 4 weeks to equalize possible setting effects, and retighten the screws to the values listed in chart 4.

- After this check, the tightening screws have to be checked every 700 hours or the adjusted time scale, but at least every 6 months.
If this is not observed, personal and installations can be endangered.

Checking on loosening and replacement of the screws

1. Relieve the screws of external loads.
2. Check the tightening torque with a torque wrench and adjust it to the values according to chart 4.
3. Replace loose screws.

- Only new screws, nuts and washers may be used to replace loosened screws or nuts respectively when replacing a slewing ring.

2.2 Checking of the tilting clearance

Wear in the raceway system leads to an increased tilting clearance.
The tilting clearance has to be checked in regular intervals.

- The tilting clearance has to be checked after 2000 operating hours, or at least every 12 months. If this is not observed, personal and installations can be endangered.

Checking of the increase of the tilting clearance δ_k ,if the tilting clearance can be measured directly at the slewing ring.

For the procedure of checking the tilting clearance check page 8, sketch 2
The tilting clearance measured initially (m_1) serves as a reference value for further checking measurements (m_x). The value of the initial measurement is subtracted from all subsequent measurements. The calculated value may not exceed the value of the removal clearance.

$= m_x - m_1$

Chart 5 : removal clearances D_W = ball- respectively roller diameter

D_W	12	14	16	19	20	22	23	25	32	50	60
removal clearances δ_K (mm) ball bearing (removal clearance decreases by 1/3 for all slewing rings with two raceways)	1,02	1,09	1,16	1,27	1,30	1,37	1,41	1,48	1,72	2,35	2,70
removal clearances δ_K (mm) roller bearing	0,18	0,21	0,25	0,30	0,31	0,35	0,37	0,40	0,52	0,82	0,99

Checking of the increase of the tilting clearance δ_K ,if the tilting clearance can not be measured directly at the slewing ring.

Calculate the increase of the tilting clearance δ_K after every measurement (after the initial measurement) according to the following formula.

$$\delta_{ir} = m_x - m_i$$

$$\delta_K = \delta_m \times \frac{D_L}{D_L + 2a}$$

D_L = Diameter of raceway, a = Distance of the measurement point from the raceway diameter of the slewing ring. For the maximum permissible increase of the tilting clearance (removal clearance) see chart 5.

- If the increase of the tilting clearance is equal to 75 % of the value of the maximum permissible increase the inspection interval has to be lowered to 200 operating hours.

- After an increase above 75% of the maximum permissible increase the inspection interval has to be lowered further (to 50 - 100 operating hours).

- If the removal clearance is exceeded, close the unit down and replace the slewing ring.

2.3 Checking of the seal

If a seal fails because of wear, mechanical respectively chemical influence, replace it.
Check the seal, at least, every time you check the fixing screws.
The seal with glue and installation instruction can be received by our company.

2.4 Relubrication of the raceway and the gear

If possible always use the same product for lubrication of the raceway system and the gears.

Utilize, for ordinary designs, water-repellent lithiumsoapgrease according to DIN 51 825 Tl of NLGI-class 2 DIN 51 818 for the raceway.
Utilize in special cases grease harmless for foods, grease decreasing the rotary resistance or grease, suitable for higher temperatures.
The utilized grease for relubrication has to be conform to the grease, used for the initial lubrication in our factory. If a special grease has been used for initial lubrication, it is also noted on our drawing.
Utilize oils B according to DIN 51 513 for the lubrication of the gears.
Also specified in chart 7.

- All relevant legal- and manufacturer specifications for the usage of lubricants have to be taken into consideration.

Raceway system

❶ Clean all grease nipples.

❷ Press grease into every grease nipple until a grease collar consistent of fresh grease forms beyond the seals, or until fresh greases leaks out of the slewing ring gap.
Revolve the slewing ring in the mean time.

❸ Ensure, that the old grease can flow out without problems.

Gear

❶ Clean all teeth especially at their basis.

❷ Spray lubricating oil on the gears, respectively apply it using a brush.

2.5 Relubrication intervals

Relubrication interval are especially dependent on the working conditions, the environmental conditions the design of the slewing ring and the operating hours.
Exact relubrication intervals can only be determined by tests under working conditions.
If there are no test results available the following chart can be used for reference values.

Chart 6 : Relubrication intervals

Working conditions:	Relubrication intervals:
dry and clean factory (turntable / robots et cetera)	approx. every 300 hours of operation, but at the latest each 6 months (whatever occurs earlier)
complicated conditions in open areas (cranes / excavators et cetera)	every 100 to 200 hours of operation but at the latest each 4 months (whatever occurs earlier)
• aggressive climate conditions sea- / desert- / arctic-climate. • very polluted environment • more than 70 hours of operation per week.	50 hours of operation but at the latest each 2 months (whatever occurs earlier)
extreme conditions (drilling machines / steel works / wind energy plants)	continuos lubrication via central lubrication devices or grease cartridges

The values in chart 6 are only valid if the following conditions apply:

- working temperature at the slewing ring < 70° C
- maximum circumference speed < 0.5 m/s
- low to medium loading
- This chart may never substitute for trial values / the most common case for a break down of a slewing ring is insufficient lubrication.

Slewing rings have to be relubricated after the following instances :

- after every cleaning, for instance spraying on water / steam et cetera

before and after longer shut down periods (i. e. in case of cranes and building machinery through the inactive winter months)

3. Removal of a worn out slewing ring

When removing a worn out slewing ring observe the handling instructions (point 0.1) strictly.

- As soon as you perform a dismounting procedure on your own responsibility (removal of the slewing ring from the supporting structure, as well as dismounting of the slewing ring itself), our guarantee becomes obsolete.

The slewing ring can not be handed as a whole to the dispose, seal and distance pieces respectively the cage have to be removed and have to be put into the not recyclable waste.
Rings and balls respectively rollers can be given to the steel waste for recycling.

4. Appendix

4.1 List of grease and lubricants

Chart 7

	Greasing of the raceway			Greasing of the gears		
Supplier	Name of the product	Temperature of utilization range in °C		Name of the product	Temperature of utilization range in °C	
Bechem	RHUS LT 2 EP	- 20	+ 120			
Aral	Aralub HLP 2	- 25	+ 130	Sinit FZ 12	- 25	+ 120
				Aralub FZ 1		
BP	Energreasel LS 2	- 25	+ 130	Energol WRL	+ 0	+ 80
Castrol	Speerol EPL 2	- 20	+ 120	Grippa 33S	- 20	+ 80
DEA	Glissando FT 2	- 30	+ 120	Crater 2X Fluid	- 20	+ 120
Elf	Elf EP 2	- 25	+ 130	Elfnera 490+ fluid	- 20	+ 120
Esso	Beacon 2	- 25	+ 130	Surett Fluid	- 20	+ 100
Fina	Marson EPL 2	- 25	+ 130			
Klüber	Centroplex 2	- 35	+ 130	Grafloscon CA 901	- 20	+ 150
Manke Worringer				Voler Compound 2000E	- 30	+ 70
Mobil	Mobilux 2	- 35	+ 130	Mobiltac 81	- 20	+ 120
				Mobil Dorcia 30		
Reiner	Stabyl LEP 2	- 20	+ 120	Ceplattyn KG 10	- 30	+ 250
Shell	Alvania Fett R2	- 30	+ 130	Cardium Compound C / Fluid C	- 30	+ 70

12.7 Main valve art.no. 21366

2. Type coding, overview

Main valve item 3C

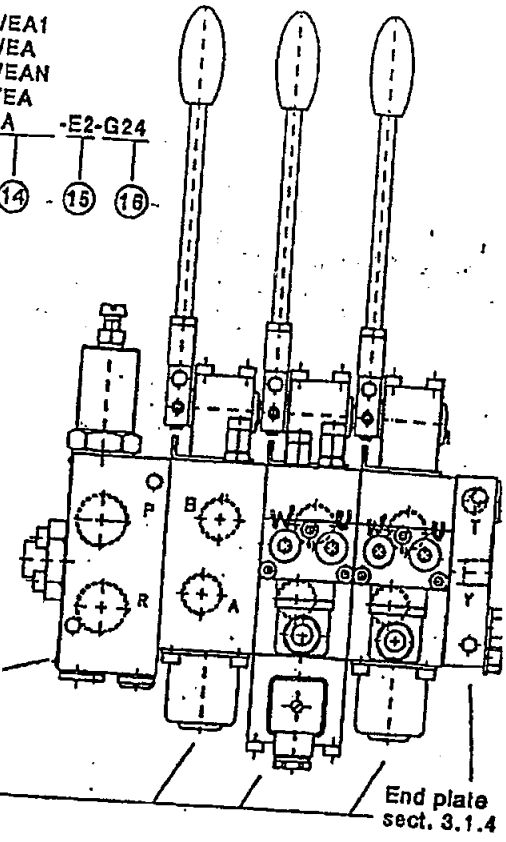
Order coding example: (for circuit diagramm examples in sect. 6)

PSL 4 Z1 F80/400 - 3 -32 -42 -34 -22 -31 J O N H L 25/16 80/63 63/63 3/10 40/25 A300 C250 F3 S /EA1 /EA /EAN /EA /A -E2-G24

① ② ④ ⑤ ⑥ ⑦ ⑧ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮ ⑯ ③ ⑨

A total of max. 12 spool valves, in one or more valve bank(s), may be connected in series via the internal LS-duct. If more are requested an external piping is necessary (see note at sect. 7.1.g).

Drawing for circuit diagramm acc. to sect. 6 example 1



Connection block sect. 3.1

Spool valves sect. 3.2

End plate sect. 3.1.4

① Basic type code for connection block (for detailed information, see chapt 3.1.1 and 3.1.2)
- PSL Pressurized oil supply by constant delivery pump (open center)
- PSV Pressurized oil supply by variable displacement pump with delivery flow metering valve (closed ce as second separate unit and also in combination with a constant pressure system

② Tapped ports acc. to DIN ISO 228/1 at the connection block for P and R
- 3 G 1/2
- 4 G 3/4
- 5 G 1
- 6 G 1 1/4 (PSV only)

③ Damping devices
- (without coding) Basic type
- Optional types:
- S Additional damping device at LS-duct (only with PSV, with PSL standard)
- B Orifice in LS-duct (PSV only)
- G Throttle check valve only (type PSL)
- Z One-way orifice plus pressure relief valve (type PSL)
- H Raised circulation pressure of the 3-way flow metering valve (approx. 14 bar at type PSL

④
- 1 With integrated pressure control valve for the supply of internal control oil
- (without coding) Without pressure control valve in case of an external control oil supply (min. 20 bar up to max. 40 bar)

⑤ Optional 2/2-way solenoid valve for arbitrary idle pump circulation (see table 7, sect. 3.1.3.)
- (without coding) Without directional valve, but flange-on option exists
- F De-energized open = idle pump circulation when valve is de-energized
- D De-energized closed = idle pump circulation when valve is energized
- F... or D... If pressure is specified, with pressure relief valve which can be hooked up for se pressure stage (e.g. F50)

⑥ Pressure relief valve (main pressure limitation) in the connection block (only fixed setting, see table 8 sect. 3
- /... Pressure relief valve set to ... bar
- (without coding) Without pressure relief valve (only PSV)

⑦ Size (acc. to hole-pattern for mounting area of the spool valves to be added)
- 3 Size 3 (for size 5, see D 7700-5)

• ZPL3 S/H1 Intermediate plate shut-off valve hydraulically actuated (see sect. 3.2.2). No. 8 to 14 are omi

⑧ Tapped ports DIN ISO 228/1 at the spool valve for A and B
- 2 G 3/8
- 3 G 1/2
- 4 G 3/4