USER'S MANUAL

PS30

Power Slip System

ORIGINAL INSTRUCTION

REFERENCE PS21	REFERENCE DESCRIPTION Power slips
	VarcoBJ BV Nijverheidsweg 45 4879 AP Etten-Leur P.O. Box 17 4870 AA Etten-Leur The Netherlands Tel + 31-76-5083000 Fax + 31-76-5046000 www.nov.com
DOCUMENT NUMBER **201547-20-MAN-001**	REV **L** July 2011

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NATIONAL OILWELL VARCO

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Revision History

Rev	Date	Reason for issue
L	06.16.2011	Update
K	02.29.2008	Reprint + update
J	12.17.2006	Reprint + update

This document is PDM-Link controlled

Change Description

Revision	Change Description
L	Numerous changes throughout manual
K	Chapter Drawings: Changed CA-drawings
K	Chapter Operations: Updated size components list
K	Chapter Specifications: Updated image
K	Chapter Installation and commissioning: Insert contact height improvements.
J	Chapter Drawings: Drawings updated
J	Chapter Installation and commissioning: Size component data improved
J	Chapter Maintenance: Description paper test procedure improved
J	Chapter Operations: Remark added: The required lift tool for #1 hand slip bowl has PN 50004550-21. The hand slip bowl #2 and #3 to be lifted with pogo stick PN50004600-1
I	Not issued
H	Chapter Operation: Umbilical procedures added
H	Chapter Maintenance: Hydraulic hinge pin wear data added

Table of Contents

General information . . . 9
Instructions . . . 9
How to use this manual . . . 11
Special information . . . 11
Illustrations . . . 11
Intended Audience . . . 11
Conventions . . . 12
Notes, Cautions, and Warnings . . . 12
Safety Requirements . . . 12
Personnel Training . . . 12
Recommended Tools . . . 12
General System Safety Practices . . . 13
Replacing Components . . . 13
Routine Maintenance . . . 13
Proper Use of Equipment . . . 13
Identification numbers . . . 13
Lifting points . . . 14
PS30 restrictions . . . 14
Applicable patent number . . . 14
Warning plates . . . 14
CE marking . . . 15
General specifications . . . 17
Specifications and requirements . . . 17
General description . . . 18
Centering device . . . 19
Back up torque . . . 20
Minimum string weight . . . 21
Design Safety Factor . . . 21
Major components centering device . . . 21
Hydraulic manifold blocks (RST-configuration) . . . 22
Hydraulic manifold block (typical) . . . 22
Hydraulic Hook Up Kit . . . 23
Slip set indicator valves . . . 23
Anti cocking devices . . . 24
Anti cocking shaft center slip . . . 24
Lubrication and maintenance . . . 25
General safety notes . . . 25
Recommended specifications of hydraulic fluid . . . 25
Recommended grease . . . 26
Daily maintenance . . . 26
Inspection . . . 26
Functional checks . . . 27
Lubrication . . . 27
Daily lubrication procedure . . . 27

Table of Contents

Lubrication of the PS slips and bowl in RST configuration . . . 27
Lubrication Top Cover . . . 28
Lubrication slips . . . 29
Lubrication Insert carrier . . . 30
Weekly lubrication procedure . . . 31
Automated greasing system . . . 32
Six monthly maintenance . . . 32
In case of old system with SV1 and SV2 valves (see drawing 202970-1) . . . 32
In case of any other system (see drawing 50004446) . . . 33
Annual Maintenance . . . 34
2 Year maintenance . . . 35
5 Year maintenance . . . 35
Slip test procedure . . . 35
Procedure paper test (for information only) . . . 36
Automated flushing procedures . . . 36
Hydraulic filter maintenance procedure . . . 37
Wear data criteria . . . 37
Wear data bore of bowl . . . 38
Wear data hydraulic hinge pin . . . 38
Acceptance criteria for rig floor equipment components . . . 38
Discontinuities . . . 39
Installation and commissioning . . . 41
Installation of the Hook Up Kit (HUK) . . . 41
Functions as per hydraulic schematic . . . 41
General function . . . 41
Connections . . . 42
Hook Up Kit (HUK) . . . 42
Flushing / filtrating system . . . 42
Manifold PS-HUK connection . . . 43
Connecting the hydraulic manifold block (RST configuration) . . . 43
Software . . . 43
Settings . . . 43
LOGO PLC . . . 44
Copying data from the card to the LOGO . . . 44
Configuring the parameters . . . 46
Lifting procedure . . . 49
Weights . . . 49
Lifting the PS by the hoist swivel rings . . . 50
Opening/closing the top covers . . . 50
Installation of the PS in the Rotary Support Table. . . . 51
Handling the top covers. . . . 52
Installing the slip assembly in the PS . . . 53
Installation of the insert carriers . . . 54
Dressing the insert carrier . . . 55

Table of Contents

Load rings . . . 55
Basic insert . . . 55
Dressing kits . . . 55
Rating . . . 55
PS30 Size components data (see tables) . . . 56
Dressing the slips/insert carriers with inserts . . . 57
Determining pipe crushing loads . . . 58
Reference table for inserts in slip body 10 ¾” . . . 58
Reference table for inserts in slip body 16” . . . 60
Hand slip bowl / stainless steel ram insert / load rings . . . 60
Pipe wiper . . . 60
Stainless steel ram insert . . . 61
System Requirements check . . . 61
Safety . . . 61
Commissioning . . . 62
Operations . . . 63
Operational safety . . . 63
Disconnecting hoses . . . 63
Operation . . . 63
Procedure operation while drilling/tripping pipe . . . 64
Running (Spiral) Grooved Drill Collars . . . 64
For Plain Drill Collars . . . 64
Removal of PS when pipe is in the hole . . . 64
Exceptions . . . 64
Removing the PS from drill pipe while in rotary . . . 65
Connecting and disconnecting of the hydraulic hoses . . . 65
Dis-connection hoses in slips up position . . . 65
Override button . . . 66
Using handslips . . . 66
Running umbilical lines . . . 68
Setting up the PS for running . . . 68
Assembly and dis-assembly . . . 71
Safety . . . 71
Before (dis)assembly of the PS make sure . . . 71
Torques . . . 71
Required tools . . . 71
Special tools . . . 71
Assembly of the PS . . . 72
Procedure changing the ram guides . . . 72
Procedure (dis)-connection of the hydraulic hoses. . . . 72
Hydraulic actuators . . . 73
Cylinder part numbers . . . 73
Disassembly of cylinder . . . 73
Replacing of the RH actuator seals . . . 74

Table of Contents

Assembly of the barrel 74
Replacing of the LH actuator seals 74
Assembly of the levers 75
Assembly of the hydraulic cylinders into the PS 75
Assembly of the Hoisting Swivel Ring 76
Assembly of the manifold block 76
Assembly cover plate hinge pin assembly 77
Assembly centering device cylinder 78
Assembly of the PS 78
Trouble shooting 79
Prior to trouble shooting a problematic PS 79
Trouble shooting Flowcharts 80
1. Slipping pipe 80
2. The PS functions incorrectly. 81
3. Slips don't work properly 81
4. The slips do not raise 82
5. The slips don't move up or down 82
6. Sagging slips 82
7. Faulty signal 83
8. The slips are travelling too slow 84
9. Problems with rams 84
10. Problems with insert carriers 85
11. Problems with the insert carriers 85
12. Problems with slips 85
13. Problems with the inserts 86
14. The lifting eyes on the body bail 86
15. Problems with tubing 86
Appendixes 87
Risk assessment acc. to EN14121-1 87
Conclusion Risk Assessment 87
Applicable standards: 87
Storage, transport, preservation & scrapping. 87
Storage 87
Transport 87
Preservation 88
Scrapping 88
Torque values (US) 89
Torque values (metric) 90
Spare parts 91
General HUK 91
50004442 Ass'y HUK manifold 91
50004511-1 Grease manifold ass'y 91
Control valves 91
Control box 91

Table of Contents

Spare parts Operational pn 202400-12 92
Drawings + Test procedures 95
Test procedures 95
Dimensional drawings 95
Assembly drawings 95
Critical area drawings 96

Table of Contents

General information

Instructions

Original Instructions are published in English; in the event the end-user may wish to obtain a translation of these in the official language of the country in which the machinery is to be used please contact your local NOV representative. Please note that this service may not be free of charge. Original Instruction can be downloaded from www.NOV.com/drilling

Оригиналните инструкции са публикувани на английски език; в случай, че крайният потребител желае да получи превод на тези инструкции на официалния език на държавата, в която се използва оборудването, моля, свържете се с вашия местен представител на NOV. Моля, имайте предвид, че тази услуга може да не е безплатна. Оригиналните инструкции могат да бъдат изтеглени от: www.NOV.com/drilling

Původní návod je zveřejněn v angličtině; pokud si koncový uživatel přeje získat překlad návodu v úředním jazyce země, ve které se zařízení bude používat, může se obrátit na místního zástupce společnosti NOV. Upozorňujeme, že tato služba nemusí být zdarma. Původní návod je k dispozici ke stažení na adrese www.NOV.com/drilling

Juhendi originaal on avaldatud inglise keeles. Kui lõppkasutaja soovib tõlget selle riigi ametlikus keeles, kus seadmeid kasutatakse, palume pöörduda NOV-i kohaliku esindaja poole. Palume silmas pidada, et see teenus ei pruugi olla tasuta. Juhendi originaali saab alla laadida veebisaidilt www.NOV.com/drilling.

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Foilsítear Treoracha bunúsacha sa Bhéarla; i gcás ar mian leis an úsáideoir aistriúchán a fháil i dteanga oifigiúil na tíre ina bhfuil an t-innealra le húsáid déan teagmháil le d'ionadaí áitiúil NOV le do thoil. Bíodh a fhios agat gur féidir nach bhfuil an tseirbhís sin saor in aisce. Is féidir Treoir Bhunúsach a íoslódáil ag www.NOV.com/drilling

How to use this manual

This manual is divided into 9 sections.

When applicable, each section includes:

1. A table of contents, or an illustrated view index showing:
   - Major assemblies, system or operations
   - Page references to descriptions in text
2. Disassembly / assembly information and tools
3. Inspection information
4. Testing / trouble shooting information
5. Repair information
6. Adjustment information
7. Torque values

Special information

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual may contain warnings about procedures which could damage equipment, make it unsafe, or cause PERSONAL INJURY. Please understand that these warnings cannot cover all conceivable ways in which service (whether or not recommended by NOV) might be done, or the possible hazardous consequences of each conceivable ways. Anyone using service procedures or tools, whether or not recommended by NOV, must be thoroughly satisfied that neither personal safety nor equipment safety will be jeopardized.

All information contained in this manual is based upon the latest product information available at any time of printing. We reserve the right to make changes at any time without notice.

Illustrations

Illustrations (figures) represent a graphical representation of equipment components for use in identifying parts or establishing nomenclature. These figures may or may not be drawn to scale.

For more specific component information pertinent to your rig configuration, see the technical drawings that accompany your NOV documentation.

Intended Audience

This manual is intended for use by field engineering, installation, operation, and repair personnel. Every effort has been made to ensure the accuracy of the information contained herein. NOV, Varco ® 2011, Varco LP, will not be held liable for errors in this material, or for consequences arising from misuse of this material.

Conventions

Notes, Cautions, and Warnings

Notes, cautions, and warnings are used throughout this manual to provide readers with additional information, and to advise the reader to take specific action to protect personnel from potential injury or lethal conditions. They may also inform the reader of actions necessary to prevent equipment damage. Please pay close attention to these advisories.

NOTE: The note symbol indicates that additional information is provided about the current topics.

CAUTION: *The caution symbol indicates that potential damage to equipment or injury to personnel exists. Follow instructions explicitly. Extreme care should be taken when performing operations or procedures preceded by this caution symbol.*

WARNING: **The warning symbol indicates a definite risk of equipment damage or danger to personnel. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel, significant property loss, or significant equipment damage.**

Safety Requirements

NOV equipment is installed and operated in a controlled drilling rig environment involving hazardous operations and situations. Proper service and repair is important for safe and reliable operation. Operation and service procedures provided by NOV manuals are the recommended methods of performing those operations.

CAUTION: To avoid injury to personnel or equipment damage, carefully observe the following safety requirements.

Personnel Training

All personnel performing installation, operations, repair, or maintenance procedures on the equipment, or those in the vicinity of the equipment, should be trained on rig safety, tool operation, and maintenance to ensure their safety.

CAUTION: During installation, maintenance, or repair of equipment, personnel should wear protective gear. Protective gear must be worn during certain operation.

Contact the NOV training department for more information about equipment operation and maintenance training.

Recommended Tools

Service operations may require the use of tools designed specifically for the purpose being described. NOV recommends that only those tools specified be used when stated. Ensure that personnel and equipment safety are not jeopardized when using service procedures or tools not specifically recommended by NOV.

General System Safety Practices

The equipment discussed in this manual may require or contain one or more utilities, such as electrical, hydraulic, pneumatic, or cooling water.

CAUTION: Before installing or performing maintenance or repairs on equipment, read the following instructions to avoid endangering exposed persons or damaging equipment.

- Isolate all energy sources before beginning work.
- Avoid performing maintenance or repairs while the equipment is in operation.
- Wear proper protective equipment during equipment installation, maintenance, or repair.

Replacing Components

- Verify that all components (such as cables, hoses, etc.) are tagged and labelled during disassembly and reassembly of equipment to ensure correct installation.
- Replace failed or damaged components with NOV certified parts. Failure to do so could result in equipment damage, or personal injury.

Routine Maintenance

Equipment must be maintained on a regular and routine basis. See this manual for maintenance recommendations.

CAUTION: Failure to conduct routine maintenance could result in equipment damage or injury to personnel.

Proper Use of Equipment

NOV equipment is designed for specific functions and applications, and should be used only for their intended purpose.

Identification numbers

You will find the identification of the PS stamped into the body near the top cover lock.

You will find the identification of the slip stamped into the top of slip.

You will find the identification of the insert carrier stamped into the top of the insert carrier.

The serial number is preceded by NL.....

Lifting points

The lifting procedures should carefully be observed and carried out according to the manual.

PS30 restrictions

- Static loads must not exceed 750 short tons (680 metric tons)
- Back up torque applied on the locks must not exceed 120,000 ft/lbs (163,000 Nm)
- Static load applied on the closed cover must not exceed (on one point) 20,000 lbs (9,000Kg)
- Static load applied on the Bit-breaker-plate must not exceed 50.000 lbs (22,500Kg)
- Torque on/of the cover/bit breaker must not exceed 100.000 ft-lbs (135,000Nm)
- Depending on the weight of the string, the back up torque can not exceed 55,000ft-lbs (74,500Nm)

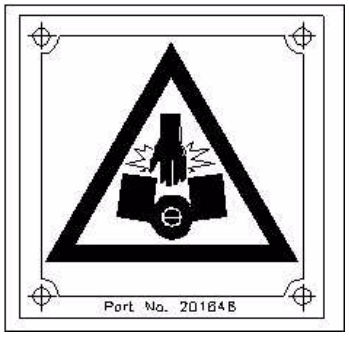
Applicable patent number

"Patents Pending U.S. & Worldwide"

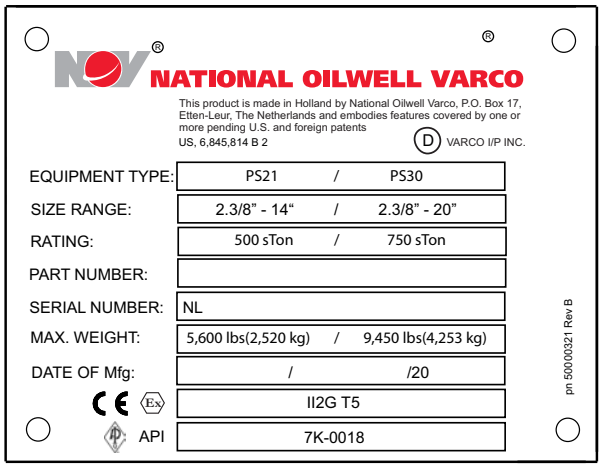
“(D) Varco I/P, Inc., US6,845,814 B2”

Warning plates

WARNING: The warning plates and labels must be present on the PS. Do not remove them.



Warning plate p/n # 201646: Be careful. Keep hand out of moving parts.



Type plate p/n 50000321

CE marking

The PS complies to the Machinery Directive 2006/42/EC and the Directive 94/9/EC "Equipment and protective systems in potentially explosive atmospheres"

The marking is as follows:

CE Ex II 2G c T5

WARNING: Care should be taken to avoid creating possible ignition sources, like sparks, due to improper use of the tool in combination with other equipment.

General specifications

Specifications and requirements

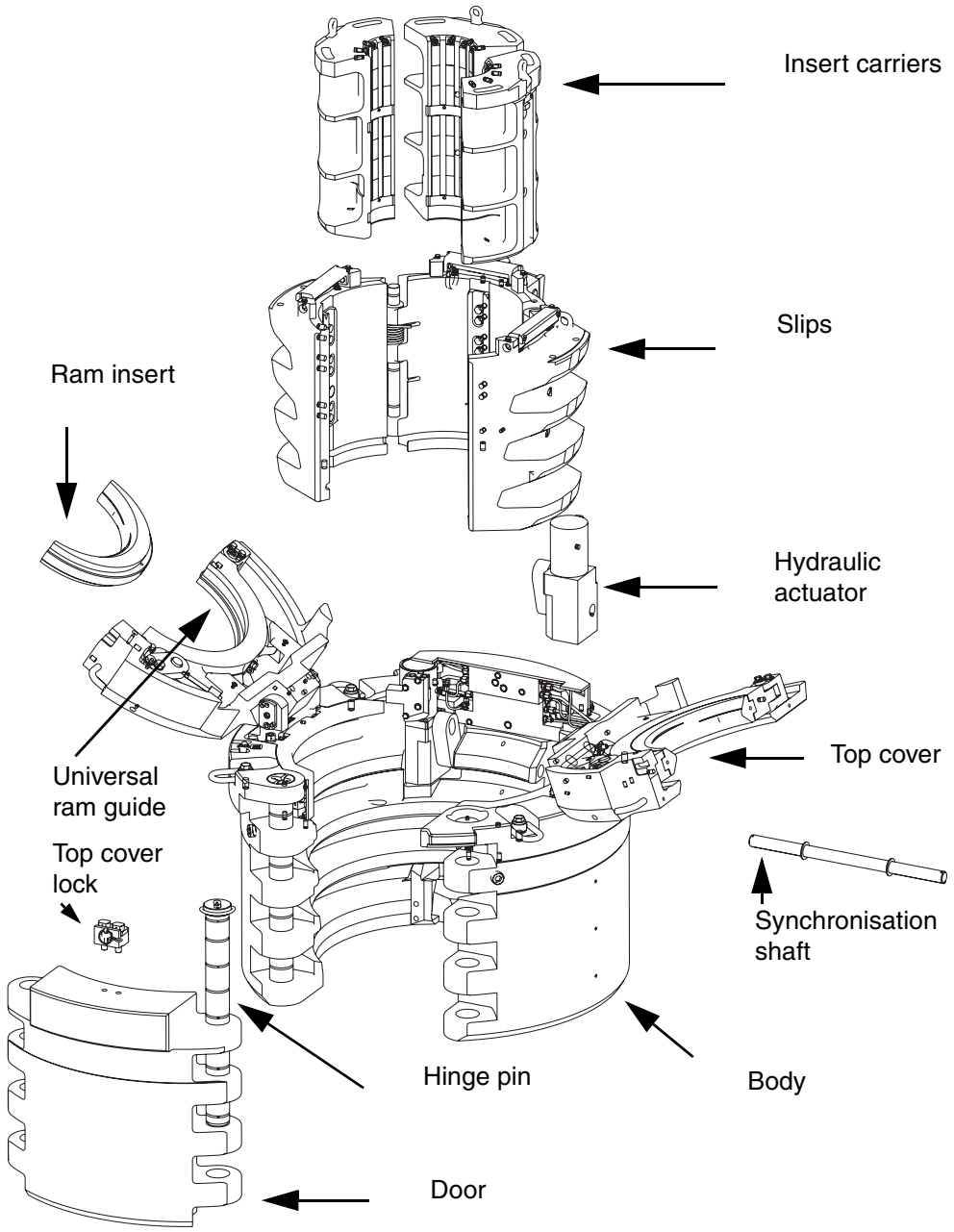
Subject		Description
Weight & Dimensions	Weight PS without slip assembly	7,800 lbs / 3,510 kg
	Weight PS slip assembly	1,650 lbs / 743 kg
	Dimensions	Depending on configuration, see Dimensional Drawings
Rating PS	Pipe size	2 3/8” up to 20”
	Pipe weight	Max. 750 Short tons (680 Metric tons)
	Rotary size	Rotary size 49,5”
	Static vertical load bearing capacity on top cover (on one point)	10 Short tons / 9 Metric tons
	Maximum static load on bit braker plate	50,000 lbs / 22,500 kg
	Maximum back-up torque on locks	120,000 ft lbs / 163,200 Nm
	Maximum torque on bit braker plate	100,000 ft lbs / 135,000 Nm
	Max. back up torque (depending on string weight)	55,000 ft/lbs max / 74,500 Nm max
Style and sizes of tubular	Universal slip with insert carriers	Pipe up to 16”
	Universal ram with ram inserts to center pipe	Pipe up to 16”
	Size specific slips depending on dressing	Pipe 18” - 20”
	Size specific rams	Pipe 18” - 20”
Hydraulic system	Tubing and hoses	All tubing and hoses connecting the PS with the HPU must have a min. diameter of 1/2”
	Tank line	The tank line must be connected directly into tank, to prevent back pressure
	Minimum working pressure	2,300 psi (15,857 KPa)
	Maximum inlet pressure	3,000 psi (20,680 KPa) reduced to 2,500 psi (17,236 KPa) within manifold
	Maximum oil temperature	140 ° F (60 ° C)
	Power unit	A closed center hydraulic power unit or closed center ring line with 2,500 psi (17,336 KPa) working pressure and 5 Gpm (19 l/min.) minimal flow is needed. A minimum flow of 10 GPM (38 l/min.) is recommended
	Maximum allowable back (tank) pressure	200 psi (1,378 KPa)
	Hydraulic oil used shall be according the following specification:	SAE AS 4059 class 9 ISO 4406: 1999 Class 19/17/14 NAS 1638 class 8
	Filter to be applied before HUK	@50 µm
Temperature	Minimum allowed ambient temperature	-4°F (-20°C)
	Maximum allowed ambient temperature	104°F (+40°C)
	In case the ambient temperature is outside this range, please contact NOV for guidance	

NOTE: Optimum pressure is 2,500 psi (17,236 KPa). The pressure must not be lower than 2,300 psi (15,857 KPa) for the PS.

NOTE: A pressure of min. 2,300 psi (15,857 KPa) and a back (tank) pressure of maximum 200 psi (1,378 KPa) is required. The sequence operation of the ram-guide cylinders and the slip cylinders is automatically controlled by the manifold inside the PS. The sequence valve is activated by a pressure difference between the slip up hose and the slip set hose. The PS will function best when the pressure in the activated hose is 2,500psi (17,236 KPa) and the pressure in the other hose is as low as possible. With these pressure settings, a centering force of 10 short tons (9 metric tons) is generated by the ram guides.

General description

- The PS is a hydraulic operated power slip which is equipped with replaceable slips and insert carriers to handle various styles and sizes of tubular.
- The PS can handle casing, drill pipe and drill collars and tubing.
- The PS can be used in combination with the Rotary Support Table.
- When using a Varco RST Rotary Support Table it's not needed to disconnect the hoses, as arrangements are made in the RST to operate the PS (slips up, slips set and signal) by means of a hydraulic slip ring.
- The PS slips will set or raise when a command is given by the driller. Setting and raising slips of the PS is remote controlled. By detecting the signal-line pressure from the PS it is determined that the PS slips are set.



Centering device

The centering device centers the pipe prior to setting the slips, when the pipe is hard to one side due to rig movements (floaters) or heavy directional drilling.

In the centering device, a ram guide in each top cover half pushes the pipe to the center. This happens before the slip cylinders are actuated. These centering ram guides operate in an automatic sequence with the slips.

Back up torque

The PS30 can generate a back up torque up to 55,000 ft/lbs (74,570Nm).

The 55,000 ft.lbs (74,570Nm) limit is related to the center slip torque plates together with the friction on the slip cones due to the power down force of the hydraulic actuators (22,200 lbs). This way the slip set can hold / back-up a 55,000 ft.lbs (74,570Nm) if one could get it transferred from pipe to slips without additional pipe weight.This will not happen because the pipe will slip through the inserts first and get damaged.

If there is enough nett. weight hanging from the PS30 it will be possible to back up more torque, and does not hurt the PS30.

The graphs were made by actual testing pipe and start with zero load hanging off (only using the power down of the tool) and than in steps “hang off” load was added. The limiting factor for back up torque was the slippage of the tubular in the inserts. It was found that for backing up 70,000 ft.lbs (94907Nm) torque on a 5-1/2” grade 135 drill pipe we needed a minimum of 75 short tons of load hanging off in the PS 30. To determine the possible back up torque than it is important to know what the minimum nett. weight is that hangs off from the PS 30.

In this case a low friction between slips and bowl is favorable because the more penetration you get.

Because the back torque is depending on the amount of insert penetration, it is clear that the condition of the insert teeth and the actual hardness of the pipe have an influence on the back up torque capacity.

Figure 2.1: Maximum torque PS30 = 55,000 Ft. Lbs (74,570 Nm)

Minimum string weight

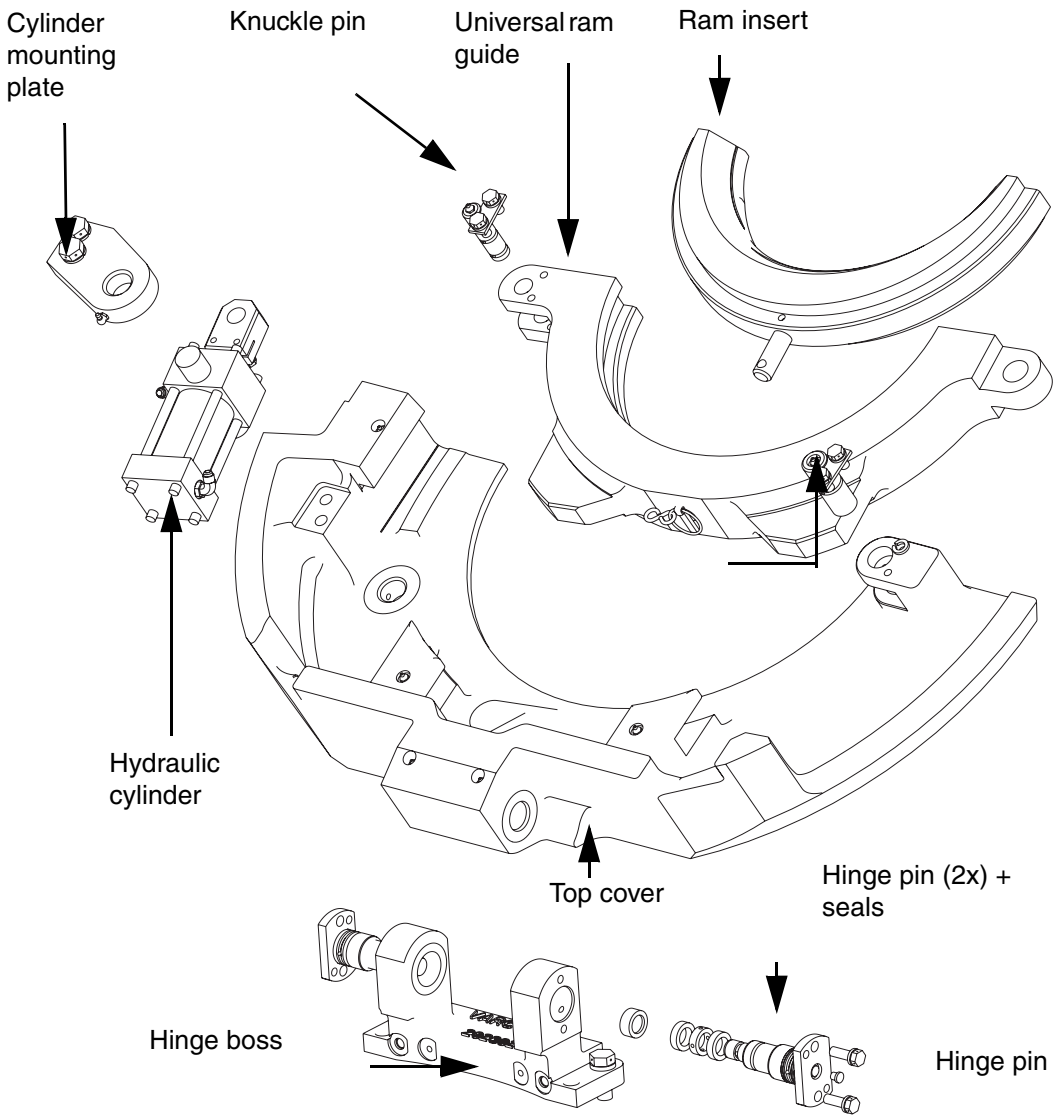
WARNING: Although the theoretical power up force of the actuators is 9,400 Lbs (4,263 Kg), in some conditions (like heave and horizontal drilling), combined with a string weight BELOW 22,200 Lbs (10,000 Kg) the PS may open the slips in case the command <slips open> is given.

WARNING: The power down force generated by the hydraulic actuators is maximum 22,200 Lbs (10,000 Kg). In case of a hydraulic power failure, NO power down force is available at all.

Design Safety Factor

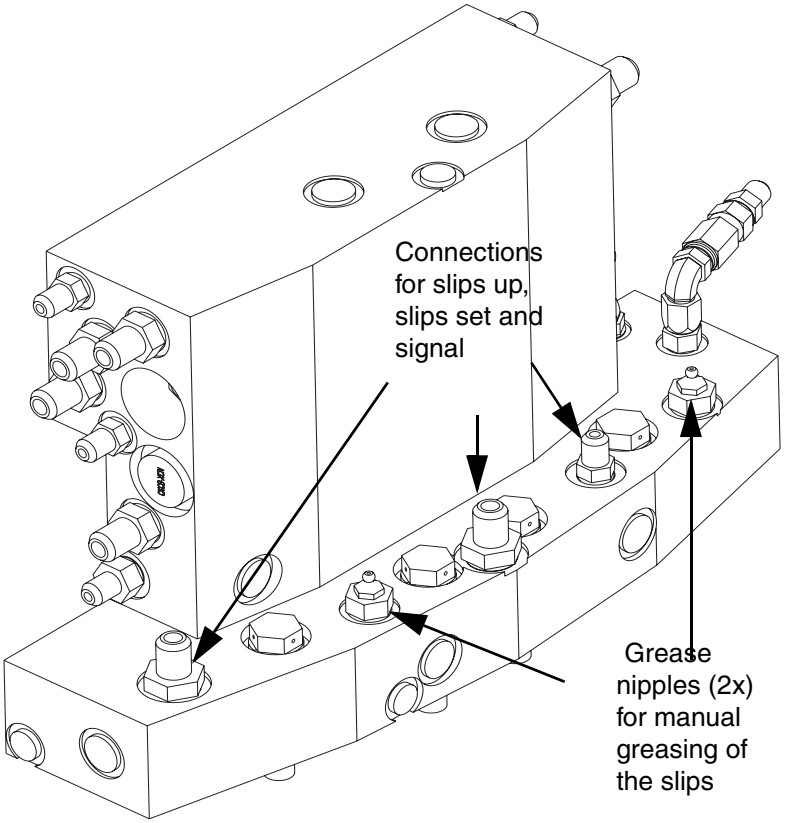
The design-safety factor and the design verification of the PS is in accordance with requirements of API specification 7K.

Major components centering device



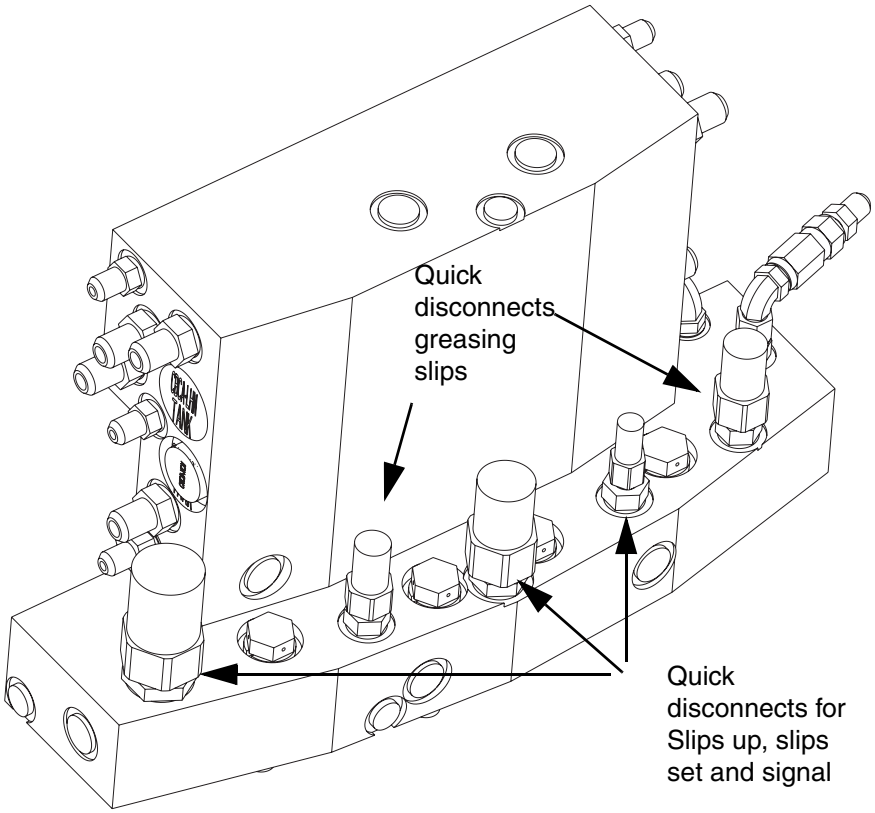
The ram inserts are pipe size specific and should be changed with every slip/insert carrier change.

Hydraulic manifold blocks (RST-configuration)

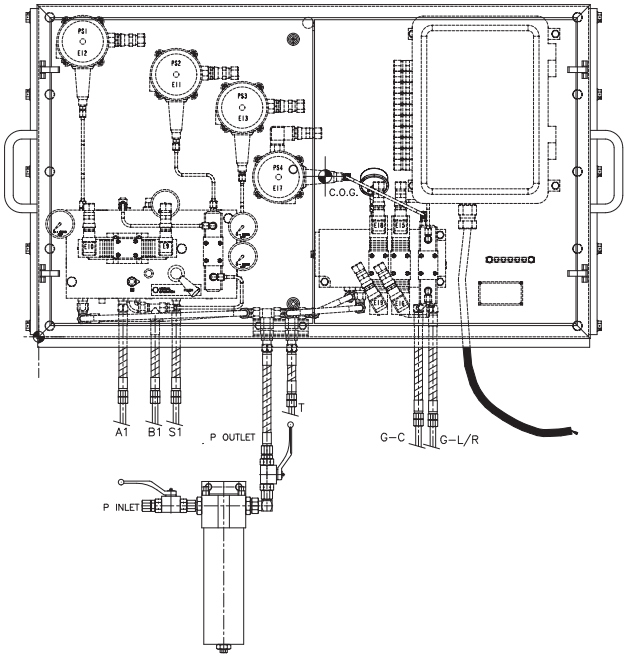


The symbols “Signal”, “Slips up” and “Slips set” are stamped into the manifold block and indicate the proper connection. The hydraulic connections are made by Quick Disconnects (QD)

Hydraulic manifold block (typical)

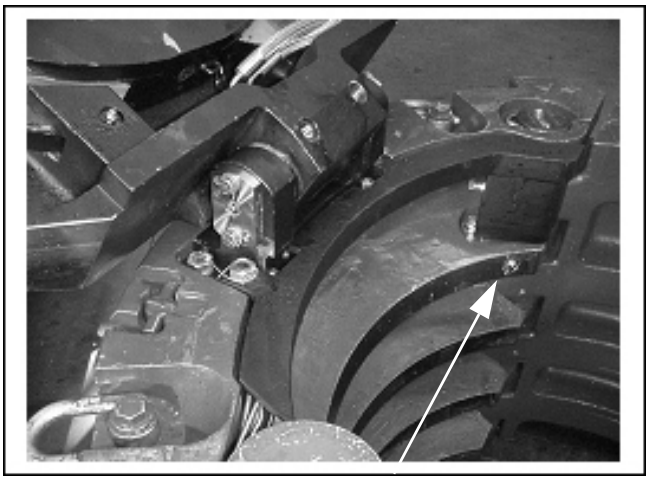


Hydraulic Hook Up Kit



Slip set indicator valves

In order to secure a reliable “slip-set” signal, the PS is provided with two “slip set indicator valves”. The valves allow the signal “slips set” to pass to the drillers cabin when both the side slips are set properly.

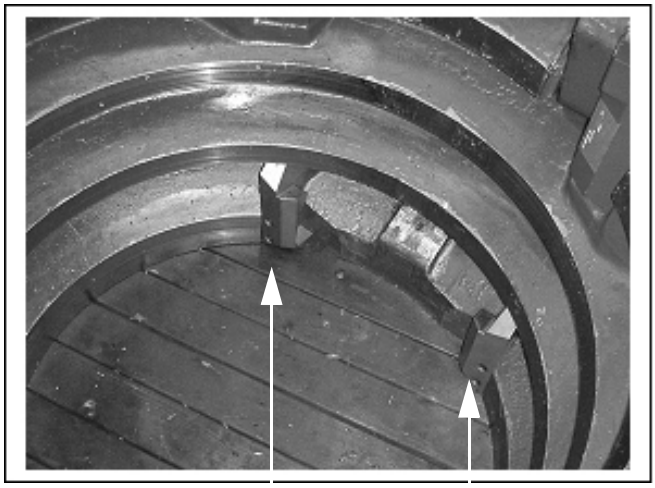


Valves

(2 places)

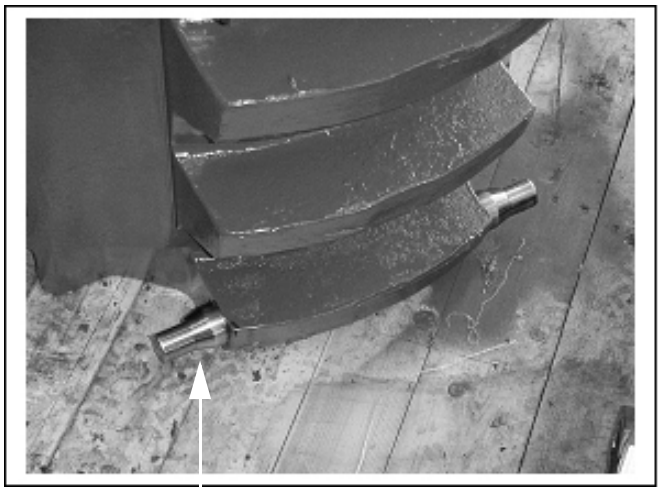
Anti cocking devices

To prevent cocking slips, a cam block is provided.



Cam blocks (2 places)

Anti cocking shaft center slip



Anti cocking shaft

Lubrication and maintenance

General safety notes

WARNING: Do not weld on PS's parts or body.

WARNING: Make sure that all hydraulic lines are isolated before ANY work is carried out on the PS. Shut off the Power Unit / Close the valves.

WARNING: Carry out maintenance according to the manual.

Recommended specifications of hydraulic fluid

The requirements for the hydraulic oil are based upon the best performance of the cylinders at specific temperatures / viscosity.

Recommended oil type	Mineral oil type HLP (DIN 51524) or equivalent
Surrounding temperature range	-4° F up to 122° F (-20° C up to 50° C)
Oil operational temperature range	104° F up to 122° F (40° C up to 50 °C)
Minimum viscosity	13cSt
Maximum oil temperature	140° F (60° C) measured in the tank line
Viscosity at working temperature	20 cSt up to 43 cSt
Optimum working viscosity	35 cSt

Determination of the required viscosity class regarding the working temperature

Viscosity class	**Working temperature (acc. ISO 3448)** ° C
32	86° F up to 122° F (30 up to 50 ° C)
46	104° F up to 140° F (40 up to 60 ° C)
68	122° F up to 158° F (50 up to 70 ° C)
100	140° F up to 176° F (60 up to 80 ° C)

Recommended hydraulic fluid

	Above -20° C	**Below -20° C**
BP	Bartran HV 46	Bartran HV 32
Castrol	Hyspin AWS-46	Hyspin AWS-32
Chevron	AW Hyd oil 46	AW Hyd oil 32
Exxon	Nuto H 46	Nuto H 32
Gulf	Harmony 46AW	Harmony 32AW
Mobil	DTE 25	DTE 24
Shell	Tellus 46	Tellus 32
Texaco	Rando oil HD 46	Rando oil HD 32
Union	Unax AW 46	Unax AW 32

Recommended grease

Application	Temperature range	Brand	Type	Part Number	Remarks
Back of slips / bowl	Colder area's like North Sea Minimum temperature -15°C Maximum temperature + 100°C	Tribol	MOLUB ALLOY 968 SF Heavy	59000045	
Back of slips / bowl	Warmer area's, like Gulf of Mexico Minimum temperature +10°C Maximum temperature + 100°C	Tribol	MOLUB ALLOY 936 SF Heavy	59000046	
Back of slips / bowl	**For warmer and colder area's Minimum temperature -30°C Maximum temperature + 110°C**	**Autol**	**TOP 2000**	**59000194**	**This type is conform Norwegian Environmental OLF Standard**
Hydraulic actuator housing	For warmer and colder area's	Tribol	MOLUB ALLOY 968 SF Heavy	59000045	
Actuator roller bearing	For warmer and colder area's	Castrol	AP2	na	

Expected usage of grease when using an automated greasing system: Every grease cycle will apply about 350 Cubic Centimeter (21 Cubic Inches) to the slips/bowl. Theoretically one can run the PS for 50 hours continuously (20 up/down cycles) before renewing the bucket.

NOTE: To reduce the chance of inserts seizing in the insert slots, NOV recommends to remove inserts after each job, coat the insert slot with light machine oil or EP-2 grease or any other fluid that does not affect the friction coefficient with string weight compared to a none coated insert slot.

Daily maintenance

Inspection

Check for worn and damaged parts

- Check for worn and damaged parts.
- Check for loose and missing parts.
- Check correct sizes of slips, insert carrier and top guide/ram.
- Check correct installation of these parts.
- Check hoses for signs cracks, wear or abrasion.
- Inspect hoist swivel ring parts
  a. corrosion
  b. wear
  c. damage
  d. if bail is bent or elongated
- Check and clean rotary table.
- Check locking of:
  a. bolts and nuts
  b. safety wire
  c. slotted nuts & cotter pins
  d. bend lock taps safety latch pins & lock bars
  e. roll and dowel pins
  f. snap ring cotter pins

Functional checks

Check for the proper function of the PS

- Connect PS30 to control manifold and check:
  a. when slips up: slips raise then centering rams go out.
  b. when slips set: centering rams go in first then slips set.
  c. for any hydraulic leakage.
  d. hydraulic pressure.
  e. slips down signal is on when slips are set.
  f. slips down signal is off when slips are up.
  g. slips up signal is on when slips are up.
  h. slips up signal is off when slips are down.
  i. the anti-sagging slips system when the pressure is off.
- In case the PS door was open
  a. Check that the removable hinge pin has been reinstalled properly.
- Check the correct engagement of the slip and insert carrier quick release mechanism.
- Check the correct installation and locking of the centering rams and ram inserts.
- Check proper engagement of the top cover lock.
- Flush the system.

Lubrication

Lubricate the PS according to the lubrication procedure

- After every run of 50 stands of pipe.
- Prior to cementing.
- When loads will be hanging for more than 1 hour.
- Prior to storage.

Daily lubrication procedure

WARNING: Do not apply grease to the back side of insert carriers (except for the dove tail slot) at the inner bore of the slips and to the dove tail slots retaining the inserts and back side of the inserts

CAUTION: Do not use pipe dope (anti seize compound) for lubricating the PS.

CAUTION: Failing to comply to the lubrication instructions can lead to sticking slips.

NOTE: NOV strongly recommends applying grease at the beginning and finish of every trip with the PS

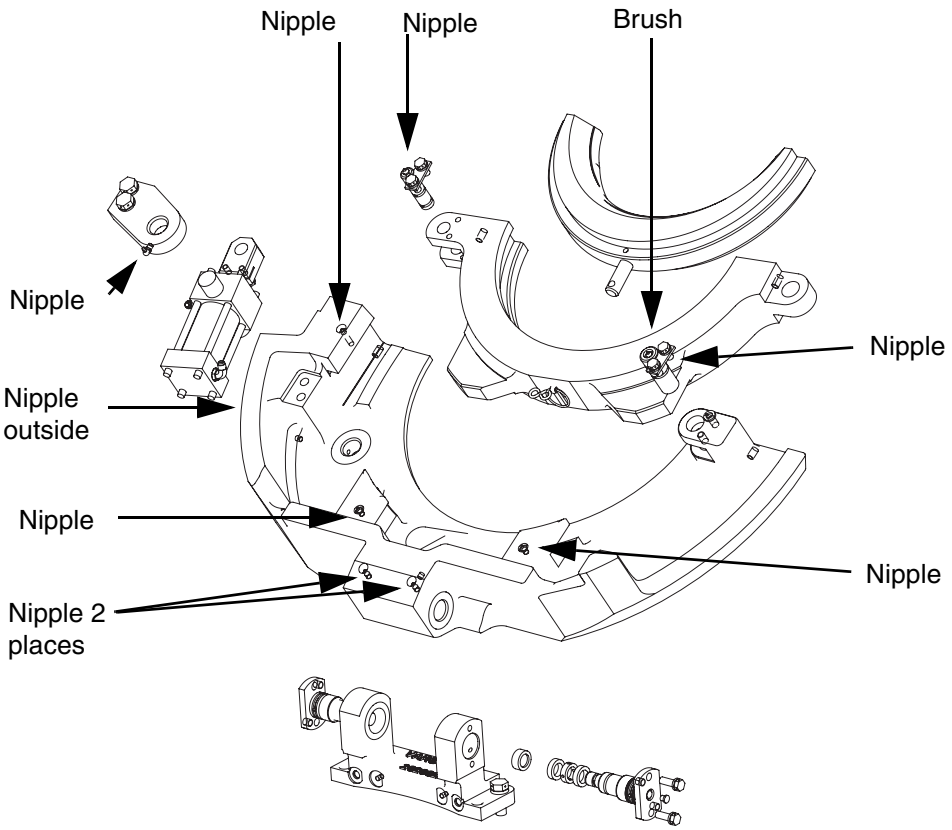
Lubrication of the PS slips and bowl in RST configuration

For lubricating the PS, separate grease lines MUST be connected according to above schedule in order to lubricate the bowl and slips.

NOTE: The RST does NOT lubricate the PS.

Lubrication Top Cover

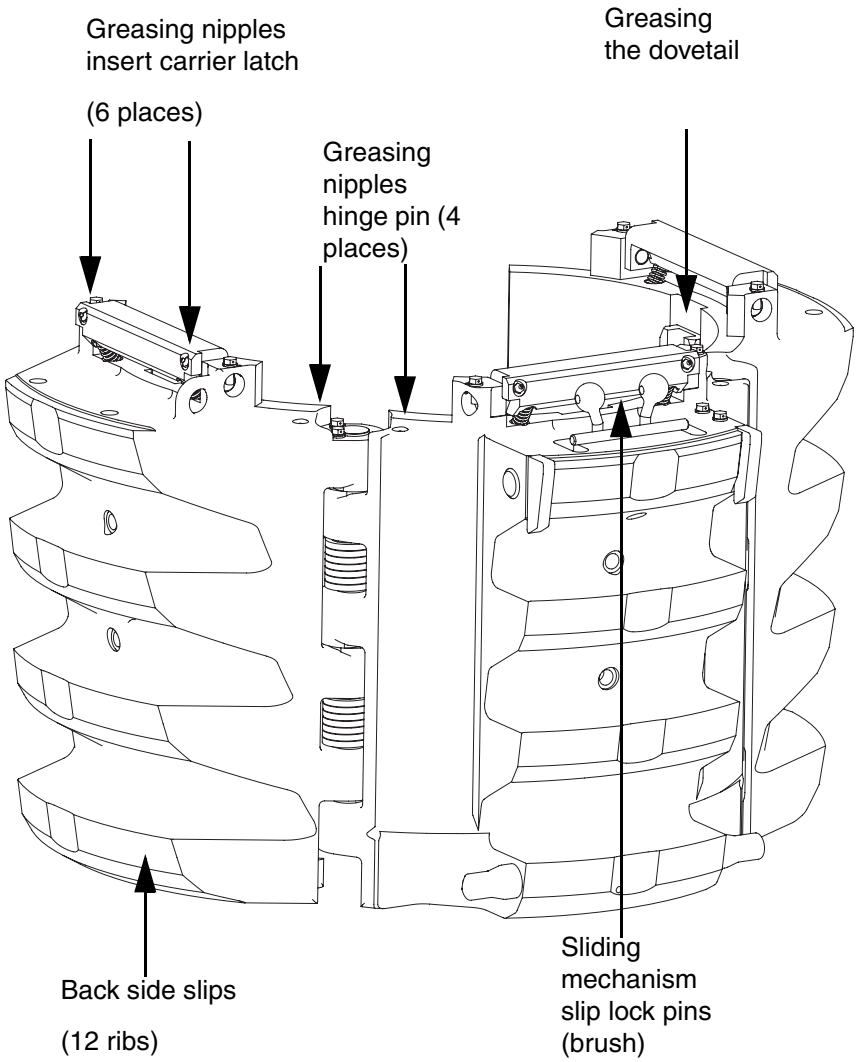
Job
Flush and filter the system
Grease the nipples on the outside of the top cover 2 plc
Grease the nipples on the inside of the top cover for the ram guides
Grease the nipples on the knuckle pins
Grease the hinge pins



9 Grease nipples and lubrication points each top covers half.

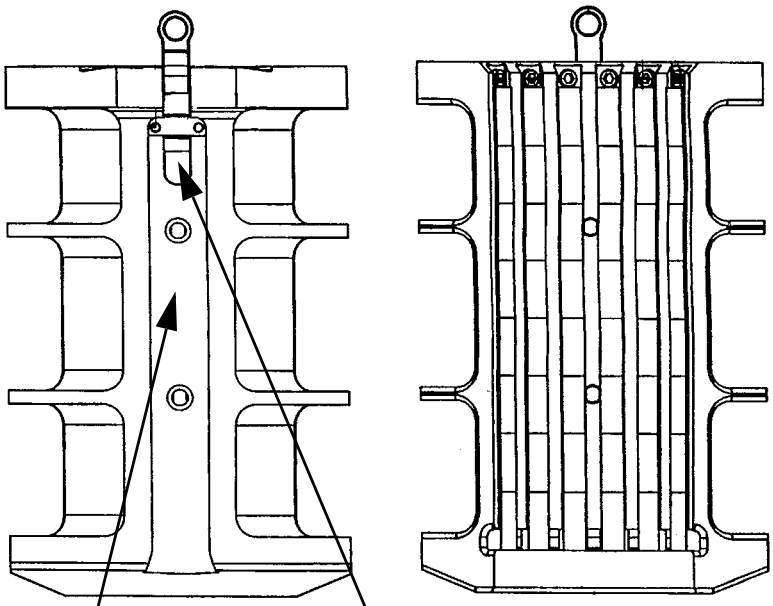
Lubrication slips

Job
Grease the back of the slips
Grease the insert carrier latch
Grease the hinge pins
Grease the sliding mechanism slip lock pin
Grease the dovetail



Lubrication Insert carrier

Job
Grease the dovetail slot
Grease the lock trigger

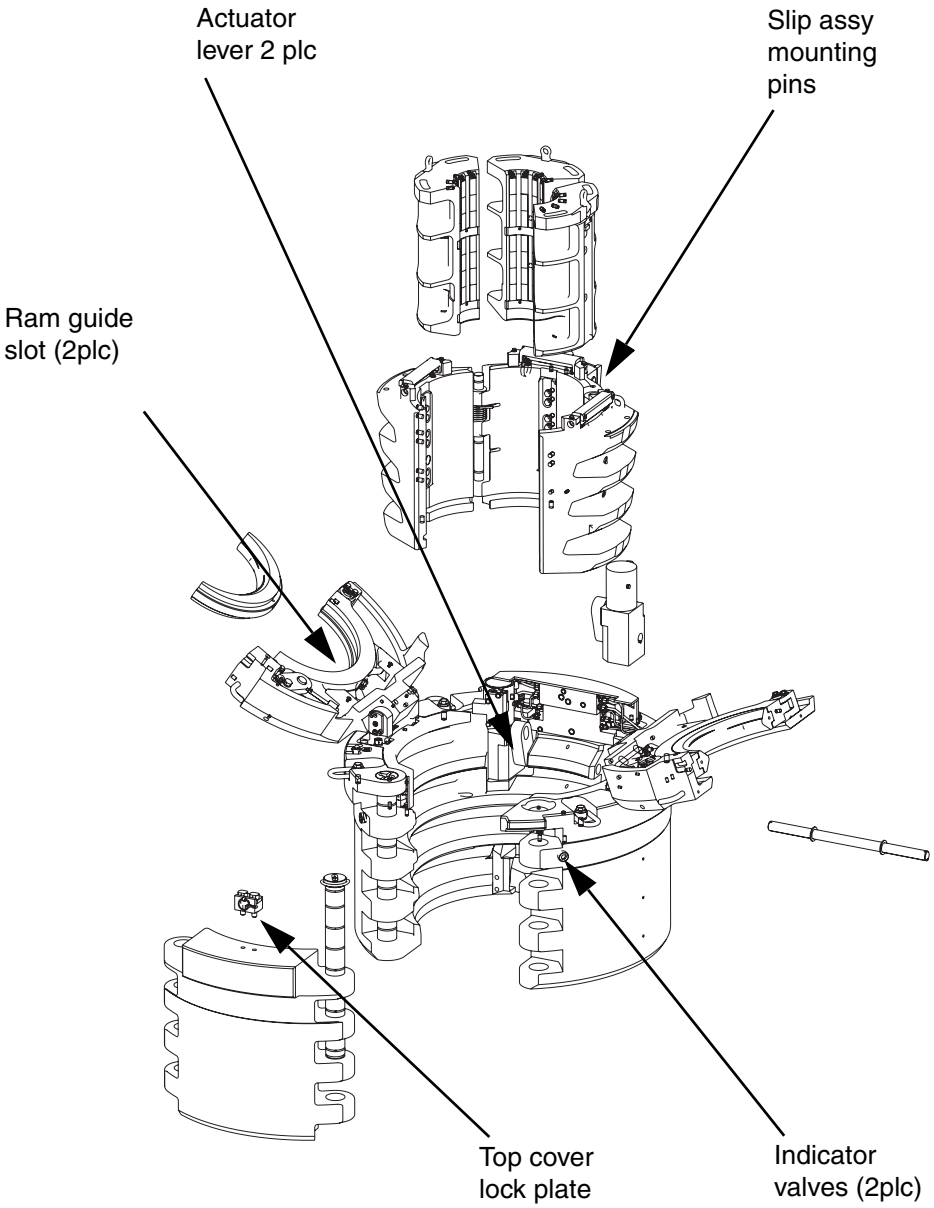


Lubricate the dove tail slot and the lock trigger

WARNING: Do not apply grease to the back side of the insert carriers (except for the dovetail slot), to the inner bore of the slips, to the dovetail tail slots retaining the inserts and the back side of the inserts.

Weekly lubrication procedure

Part	Method
Grease the two indicator valves	Grease nipple
Grease the slot in the ram guides	Apply with brush
Grease the top cover lock plate	
Grease the slip assy mounting pins	
Grease the door hinge pins body 4x	Grease nipple
Grease the cylinder levers 2 plc	Grease nipple



Automated greasing system

CAUTION: The automatic greasing system will NOT supply grease to the bowl and slip in the RST configuration

The performance of the PS power slip is directly related to the greasing of the backside of the slips. This is carried out by applying grease to the grease nipples on the manifold block 2 plc.

Grease will automatically come out the bores as follows:

- First to the center slip “port A” and then to the left - and right - hand slips “port B+C”.
- The restrictors in the body take care about equal distribution

Six monthly maintenance

Procedure

1. Clean tool thoroughly
2. Check all grease restrictors are open
3. Check whether all grease nipples are present and functioning
4. Check condition of inline filters in hook-up manifold
5. Check the condition of the main hydraulic filter according to the procedure
6. Grease tool according to daily + weekly greasing procedure
7. Check PS body & slip assembly by paper test according to TSEL-0054
8. Carry out a hydraulic function test as follows:

In case of old system with SV1 and SV2 valves (see drawing 202970-1)

Procedure

1. Check gauge (PG1) if rig pressure is at least 2,000 psi (13,789 KPa)
2. Command slips set
3. Check SV1 gauge (PG2) reads 1,800 Psi (12,410 KPa) (Hook Up Kit panel)
4. Check signal “slips set” ONLY is showing in drillers cabin
5. Command “slips up”
6. Check SV2 gauge (PG3) reads 1,500 Psi (10,340 KPa) (Hook Up Kit panel)
7. Check signal “slips up” ONLY is showing in drillers cabin
8. Check gauge (PG1) reads <1,500 Psi (10,340 KPa) if low pressure alarm is triggered when rig pressure is below 1,800 Psi (12,410 KPa)
9. Check if required the pressure switch settings as follows

CAUTION: The pressure switches are shop-set. Do not adjust any of the setting unless a faulty pressure switch is swapped out. Even then extreme caution must be taken preventing wrong adjustment, leading to a faulty signals. When in doubt; contact Varco BJ for guidance.

Pressure setting PRV1 (slips up)

10. The Pressure Reducing Valve (PRV1) is standard adjusted at **1600 Psi (11,031 KPa)**. This is the pressure you need when the HUK is used in combination with a PS21.
11. When the HUK is hooked up to a PS30 then you must adjust the Pressure Reducing Valve (PRV1) at **2000 Psi (13,789 KPa)**. (Connect a Pressure Gauge at Port B1 on Manifold 202981.)

Pressure setting of low alarm pressure switch PS1

12. Start with a low pressure on the Power unit and raise the pressure slowly up to **2000 Psi (13,789 KPa).** Than adjust the pressure switch PS1. The pressure switch PS1 has to give a signal when the System Pressure is below **2000 Psi (13,789 KPa).**
13. Pressure Switch PS1 is normally closed.

Pressure setting of slips set pressure switch PS2

14. Verify 1800 psi (12,410 KPa) pressure setting of pressure switch PS2. Slips have to be set.
15. Pressure Switch PS2 is normally open.
16. If you don't have a signal check first that you have a signal on the S1 port of the PS30 manifold. If yes than check the setting of cartridge SV1 in manifold 202981

Pressure setting of slips up pressure switch PS3

17. Verify 1500 psi (10,342 KPa) pressure setting of pressure switch PS3. Slips have to be command to UP and pressure has to be provided to port S1.
18. Pressure Switch PS3 is normally open.
19. If you don't have a signal check first that you have a signal on the S1 port of the PS30 manifold. If yes than check the setting of cartridge SV2 in manifold 202981.

In case of any other system (see drawing 50004446)

Procedure

1. Check gauge (PG1) if rig pressure is at least 2,000 psi (13,789 KPa)
2. Command slips set
3. Check gauge (PG3) reads 1,800 Psi (12,410 KPa) (Hook Up Kit panel)
4. Check signal "slips set" ONLY is showing in drillers cabin
5. Command "slips up"
6. Check gauge (PG2) reads 1,600 Psi (10,340 KPa) (Hook Up Kit panel)
7. Check signal "slips up" ONLY is showing in drillers cabin
8. Check gauge (PG1) reads <2,000 Psi (13,789 KPa) if low pressure alarm is triggered when rig pressure is below 2,000 Psi (13,789 KPa)
9. Check if required the pressure switch settings as follows

CAUTION: The pressure switches are shop-set. Do not adjust any of the setting unless a faulty pressure switch is swapped out. Even then extreme caution must be taken preventing wrong adjustment, leading to a faulty signals. When in doubt; contact Varco BJ for guidance.

Pressure setting of low pressure alarm switch

10. Pressure Switch PS1 (E12) is normally closed and set at **2000 Psi**.
11. Start with a low pressure on the Power unit and raise the pressure slowly up to 2000 Psi (13,789 KPa), than adjust the Pressure Switch PS1. The Pressure Switch PS1 has to give a signal when the System Pressure is below 2000 Psi (13,789 KPa).

Pressure setting of slips up pressure switch

12. Pressure Switch PS2 (E13) is normally open and set at **1600 PSI**.
13. Verify 1600 PSI pressure setting of pressure switch PS2. Slips have to be command to UP and pressure has to be provided to port S1.
14. If you don't have a signal check first that you have a signal on the S1 port of the PS21/30 manifold. If yes than check the pressure off B1 (slips UP). Still no signal check valve DV3 works properly.

Pressure setting of slips set pressure switch

15. Pressure Switch PS3 (E11) is normally open and set at **1800 PSI**.
16. Verify 1800 PSI pressure setting of pressure switch PS3. Slips have to be command to SET and pressure has to be provided to port S1.
17. If you don't have a signal check first that you have a signal on the S1 port of the PS21/30 manifold. If yes than check the pressure off A1 (slips SET).Still no signal check valve DV3 works properly.

Pressure setting of grease empty indication

18. Pressure Switch PS4 (E17) grease empty indication is normally open and set to accommodate grease empty indication: 1000-1200 PSI.

Annual Maintenance

Procedure

If in any doubt, contact an authorized NOV repair facility.

1. Clean the PS thoroughly
2. Check all bolts and nuts for the proper make up torque and lock wire
3. Check the PS visually for extreme wear, abnormalities.
4. Lubricate the PS according to procedure
5. Carry out a paper test according to the TSEL-0054.
6. Carry out functional testing according TSEL-0035.
7. Check hydraulic setting of the HUK according to TSEL-0050

2 Year maintenance

Procedure

1. Clean the PS thoroughly
2. Check the PS visually for extreme wear, abnormalities.
3. Lubricate the PS according to procedure
4. Carry out a paper test according to the TSEL-0054.
5. Remove hydraulic actuators from the body. Check cylinders for:
   - Rust
   - Denting
   - Cracks
   - Damage
6. Dis-assemble the hydraulic actuators, top cover hinge pins and top cover cylinders according to Chapter “ASSEMBLY”.
   - Replace the actuator seals (seal kits available)
   - Lubricate the actuators according to the drawings
   - Replace the seals of the top cover hinge pins
   - Replace the seals of the top cover cylinders
7. Test the actuators according to TSEL-0127
8. Carry out functional testing according TSEL-0035
9. Check hydraulic setting of the HUK according to TSEL-0050

5 Year maintenance

Procedure

1. The PS must be checked completely. It is advised to have this carried out in a NOV authorized repair shop. Please contact NOV for guidance.

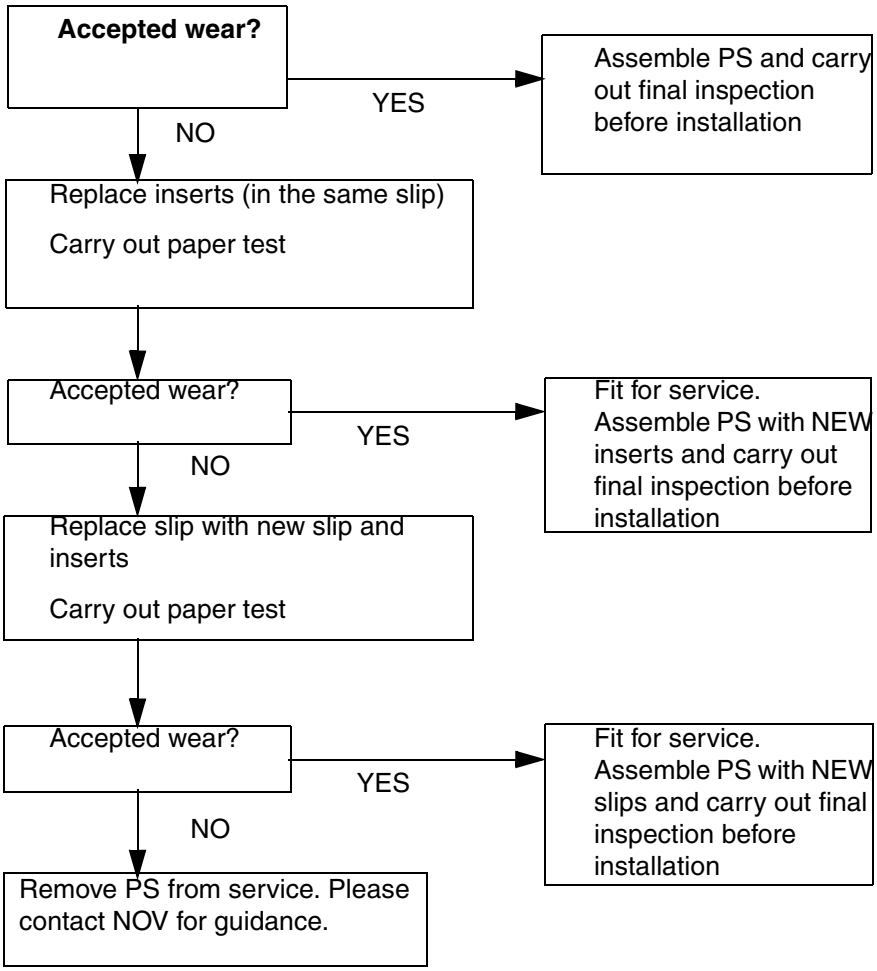
Slip test procedure

Procedure

A slip test is the best way to determine the degree of rotary equipment wear. For accurate results, use a hook load as advised in TSEL-0054.

- Clean an area of pipe where there are no insert marks
- Clean the slip inserts with a wire brush.
- Wrap a layer of test paper around the cleaned section of pipe, use friction tape to hold the paper to the pipe.
- Carefully set the slips, guide the pipe as smooth as possible during movement of the slip.
- Carefully raise the slips, ensuring the paper doesn’t get damaged due to the moving slips.
- Evaluate the second layer of paper. If full insert contact is indicated, no further analyses is necessarily as wear, if at all, is accepted.

Procedure paper test (for information only)



Automated flushing procedures

NOTE: Carry out a flushing cycle after reconnecting the hoses.

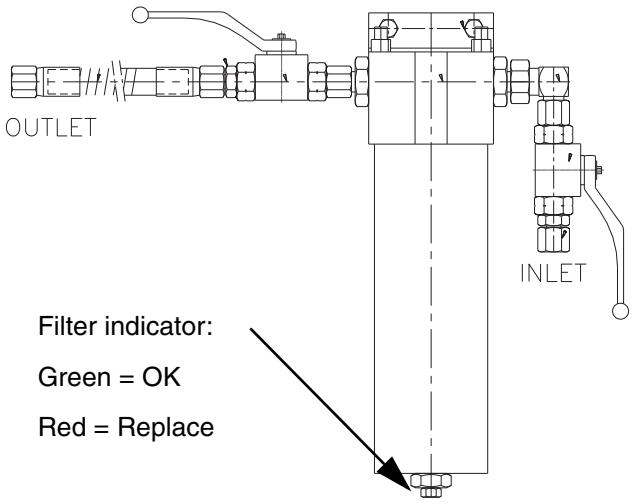
Clean hydraulic fluid is essential for optimal performance of the PS. A flushing system allows the PS unit to be flushed with oil before start up, especially after reconnecting the hoses. Flushing is carried out by reversing the flow in the signal line for slips up / slips set, and therefore the ports in the slip ring and the PS manifold. Flushing must be carried out for a period of 30 seconds.

Procedure

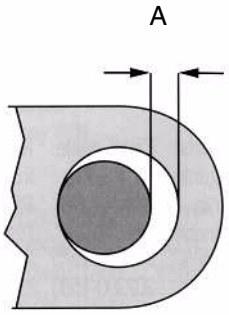
1. Set the slips
2. Switch PS into neutral position (PS to tank)
3. Put the flush valve handle into Flush-mode for appr. 30 seconds
4. Switch the valve back
5. Operate the slips up
6. Put the valve handle into Flush-mode for appr. 30 seconds
7. Put the flush handle back into “Normal-opration-mode”

Hydraulic filter maintenance procedure

NOTE: Depending on the quality of the hydraulic fluids, it is important to check the condition of the filters in the hook-up-kit and the inline filter with regular intervals. The filters are designed to stand for at least one year in conditions as required in this manual. However, rig conditions may differ from these required conditions, or change by contamination, incidents, repairs etc. Depending on the rig conditions it is advised to carry out a filter check after ONE months of service, after SIX months and after ONE YEAR of service. Depending on the results of the checks the intervals between checks can be increased or decreased.



Wear data criteria



Hinge pin wear data	PS30
Stationary hinge pin	202406-1
Removable hinge pin	202405-1
Total clearance "A"	0.050” (1.27 mm)
Hinge pin min. dia new	2.99” (75.946 mm)
Max. bore dia new	3.005” (76.327 mm)
Max. bore diameter worn	max 3.030” (76.962 mm)

Wear data bore of bowl

Carry out the bore wear test according to the TSEL-0054 (Papertest)

Wear data hydraulic hinge pin

Description	Diameter (inch)
New centering cylinder hinge hole	1.375 +0.000/+0.010
Max. worn centering cylinder hinge hole:	1.400
New centering ram hinge hole	1.375 - 1.380
Max. worn centering ram hinge hole:	1.400
New top cover hinge hole	1.500 -0.000/+0.005
Max. worn top cover hinge hole:	1.520
New top cover hinge pin	1.497 - 1.494
Max. worn top cover hinge pin:	1.484

Acceptance criteria for rig floor equipment components

References

- ASTM E 709; Standard practice for magnetic particle examination
- ASTM A 275; Standard test method for magnetic particle examination of steel forging
- ASTM E 125; Reference photographs for magnetic particle indications on ferrous castings
- MSS SP-55; Quality Standard for Steel Castings Visual Method
- Varco BJ critical area drawings
- API Specification 7K and Varco BJ standards
- Of above references the latest editions shall apply.

Qualifications

- All personnel performing and interpreting examinations using this work instruction shall be qualified in accordance with the guidelines of ASNT-TC-1A (latest edition).

Method

- The magnetic particle examination method consists of magnetising the area to be inspected and then applying wet magnetic particles to the surface of the test area.

Surface Condition

- Surface to be inspected shall be cleaned and free from oil, grease, sand and loose rust or scale, which may interfere with satisfactory inspection.

Equipment List (example)

1. - Tiede Universal SW 170- Magnaflux CRV 20
2. - Tiede Yoke or equivalent

Examination

- In case of critical hoisting equipment or manual tong components examination before load test may be limited to the machined surfaces of the components. Examination after load test shall be 100% of all assessable surfaces.

- Unless otherwise specified, magnetic particle examination shall be carried out by the continuous method. Examinations shall be carried out with sufficient overlap to assure 100% coverage of the area or part under inspection.
- The temperature of the wet particle suspension and/or the surface of the part inspected shall not exceed 60° C.

Evaluation of Indications; relevant indications

- Only those indications with major dimensions greater than 1/16 inch (1,6 mm) and associated with a surface rupture shall be considered relevant.
- Relevant indications are indications that result from discontinuities within the test part. Non relevant indications are indications that result from excessive magnetizing current, structural design or permeability variances within the test parts.
- Any indication believed to be non-relevant shall be regarded as relevant and shall be re-examined to determine whether an actual defect exists.
- Linear indications shall be considered as those having a length of more than three times the width. Rounded indications shall be considered as those having a length less than three times the width.
- A lined indication shall be considered as a group of three or more indications which touch an imaginary straight line connecting any two of the group.

Reporting

- When no indications outside the acceptance criteria have been detected, stamp the shop order with the magnetic particle examination stamp and add the required information.
- When indications outside the acceptance criteria have been detected, stamp the shop order with the same stamp. In addition an Inspection Report must be completed
- ASTM E 125 and, where applicable, Varco critical area drawings shall be used as a reference standard for the evaluation of magnetic particle indications.

When no critical area drawings are available all areas shall be considered non-critical.

Discontinuities

		Maximum permitted degree	
Type	**Discontinuity description**	**Critical area**	**Non Critical area**
I	Hot tears and cracks	1/4” (6.25mm)	Degree III
II	Shrinkage	Degree II	Degree III
III	Inclusions	Degree II	Degree IV
IV	Chills and unfused chaplets	Degree I	Degree II
V	Porosity1/24”	Degree II	Degree II

Installation and commissioning

WARNING: The control panel may differ from rig to rig, but the PS MUST be processed through a PLC or another control unit to prevent undesired simultaneous commands from e.g. BX-elevator and PS.

Installation of the Hook Up Kit (HUK)

Please refer to the general arrangement drawings and the hydraulic and electric schematics for additional information.

Functions as per hydraulic schematic

PS 1 Pressure switch low pressure alarm

PS 2 Pressure switch for signal slip up

PS 3 Pressure switch for signal slip set

PS 4 Pressure switch grease bucket empty

DV 1: Directional control valve, operating the slips

DV 2: Directional control valve, operating the flushing system.

DV 3: Directional control valve, controlling the signal pressure

DV 4: Directional control valve, operating the grease pump

DV 5: Directional control valve, operating the control valve DV6.

DV 6: Directional control valve, distributing grease to the center or LH/RH slips

PC 1 - 2 Pilot operated pressure reducing valve

PR 1 Pilot operated pressure relieve valve

CV 1 -2 Check valves

F1 - 2 Filter

PG 1 Pressure gauge to check system pressure

PG 2 Pressure gauge to check slips up signal

PG 3 Pressure gauge to check slips set signal

PG 4 Pressure gauge to check flushing pressure

PG 5 Presssure gauge to check pressure setting for grease pump

General function

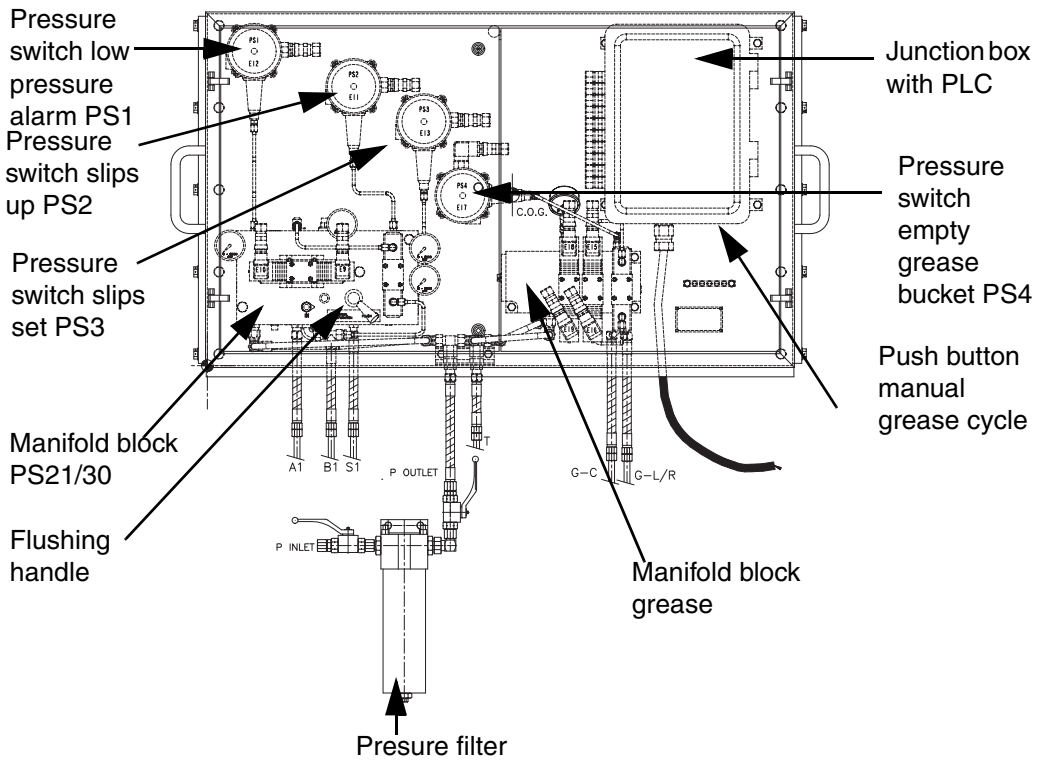
PC 1 and PC 2: The control manifold can be connected to a closed center power supply with working pressure between 2500 - 3000 psi (17,236 - 20,684 KPa). PC 1 is set at 2,500 psi (17,236 Kpa) to protect the PS21/30 against overloading. PC2 reduces the pressure to 1,500 psi (10,342 KPa) for reducing the flushing and greasing pressure.

PS 2 and PS 3: When the slips are up or set, the PS gives a hydraulic signal back to the control manifold.

Connections

NOTE: The valves are pre-set and ONLY to be adjusted by VARCO personnel.

Hook Up Kit (HUK)



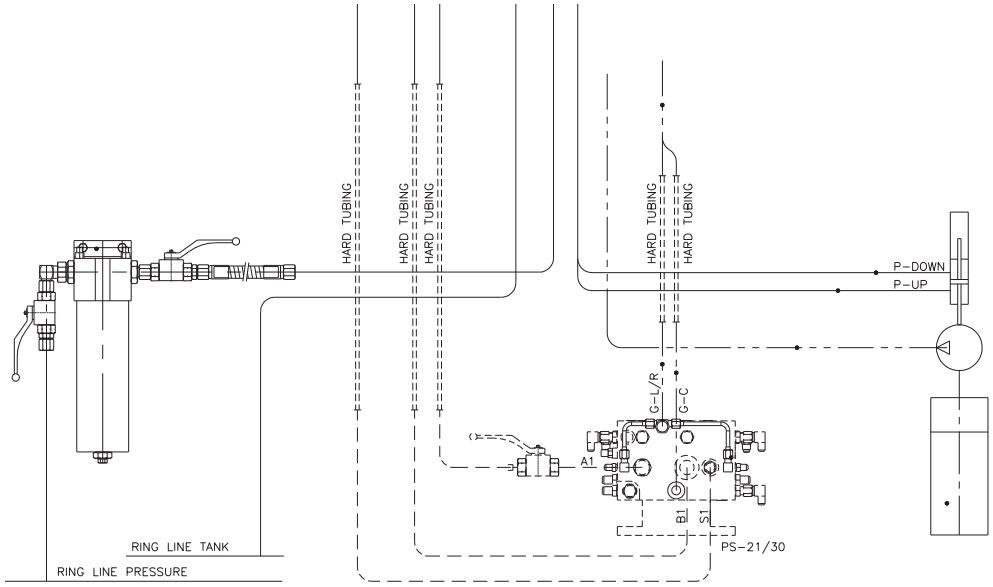
Flushing / filtrating system

An inline filter is placed between the rig pressure ring line and the pressure line going into the PS hook up system.

In addition a flushing manifold directs return oil from the PS flow into the return ring line of the rig and does not enter the hook up kit manifold again.

In combination with a RST with slip ring remove the inline check valve in slips signal line prior to flushing.

Manifold PS-HUK connection



Above illustration shows PS21 manifold block

Connecting the hydraulic manifold block (RST configuration)

NOTE: Clean the hydraulic couplings thoroughly prior to connecting

Software

With the Siemens LOGO Programmable Logic Controller (PLC), the greasing frequency and quantity can be adjusted as follows to meet job specific requirements

Settings

Use the buttons on the front side of the SIEMENS LOGO to change the parameters for the timer.

Two settings are important;

1. The time the solenoid is operated to accomplish a full pump stroke (B20 and B22). The higher the viscosity the longer it takes to make a full pump stroke. A is the center slip. B and C are the left hand and right hand slips.
2. The time a greasing sequence is taking (B08 and B09). The type of grease and the viscosity determines these parameters.

B06 is the number slips set after which a grease cycle starts. This depends on the grease properties and field conditions.

LOGO PLC

The following pages are a quick reference for the copying of data and the configuration of the parameters. Pls. refer to the Siemens LOGO-manual for all user's information.

Copying data from the card to the LOGO

You have a program module (card) that contains your circuit program. There are two ways to copy it to LOGO!:

- Automatically during the startup of LOGO! (POWER ON) or
- by means of the "Card" menu of LOGO!.

Note

If the program on the module/card is protected with the password X, the copied program in the LOGO! is also protected with the same password.

Automatic copying during the startup of LOGO!

Proceed as follows:

1. Switch off the power supply to the LOGO! (POWER OFF)
2. Remove the slot cover.
3. Insert the program module/card into the relevant slot.
4. Switch on the power supply to the LOGO!

LOGO! copies the program from the program module/card to LOGO!. When LOGO! has finished copying, it opens the main menu:

```
>Program..
 Card..
 Clock..
 Start
```

Note

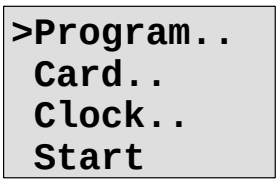
Before you switch the LOGO! to RUN, you must ensure that the system you are controlling with LOGO! does not represent a source of hazard.

1. Move the '>' cursor to '**Start**': Press ▲ or ▼
2. Press **OK**.

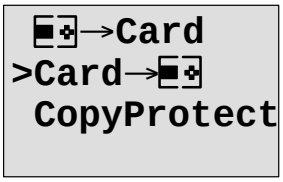
Copying by means of the "Card"menu

To copy a program from the program module (card) to LOGO!:

1. Insert the program module (card)
2. Switch the LOGO! to programming mode (ESC / >Stop).



3. Move the '>' cursor to '**Card**': Press ▲ or ▼
4. Press **OK**. The transfer menu opens.
5. Move the '>' cursor to '**Card** → **LOGO**': Press ▲ or ▼



= LOGO!

6. Press **OK**.

LOGO! copies the circuit program from the program module (card) to LOGO!. When LOGO! has finished copying, it automatically returns to the main menu.

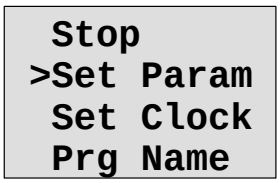
CAUTION: Do not select LOGO to CARD, when LOGO shown "NO PROGRAM". This will erase the memory of the program module (Card)

Configuring the parameters

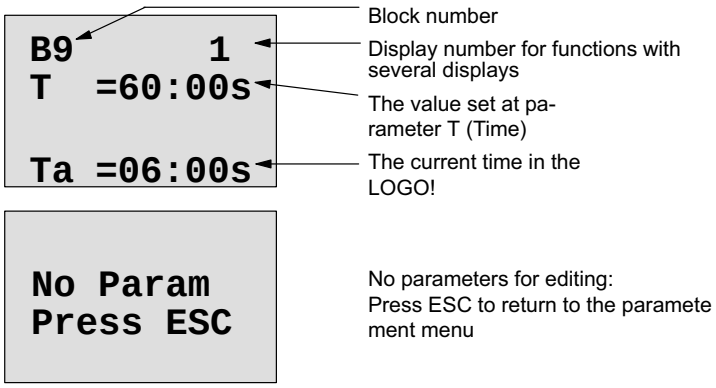
Selecting the parameters

To select a parameter:

1. On the parameter assignment menu, select '**Set Param**': Press ▼ or ▲



2. Confirm with **OK**.
   LOGO! shows the first parameter. If no parameter can be set, you can press ESC to return to the parameter assignment menu.



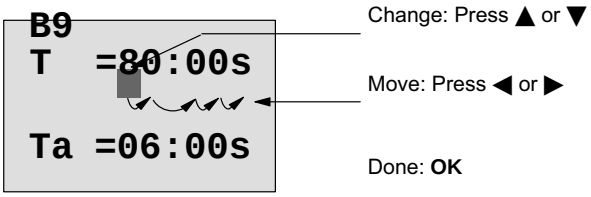
3. Now, select the desired parameter:
   Press ▲ or ▼.
4. Select the parameter you want to edit, and press **OK**.

Modifying parameters

You first select the parameter you want to edit.

You change the value of the parameter in the same way as you did in programming mode:

1. Move the cursor to the point at which you want to make the change: Press ◀ or ▶
2. To change this value: Press ▲ or ▼
3. To apply the value: **OK**

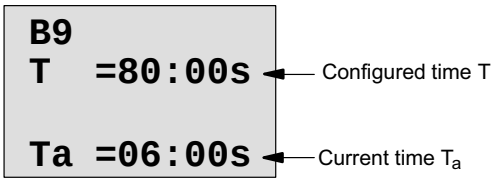


Note

Alongside with a change of the time parameters when the system is in RUN, you can also change the timebase (s = seconds, m = minutes, h = hours). This does not apply if the time parameter represents the result of another function. In this case you
can neither change the value nor the timebase.
The current time is reset to zero when you change the timebase.

Current value of a time T

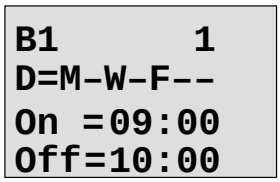
View of a time T in parameter assignment mode:



You can change the configured time T.

Current timer value

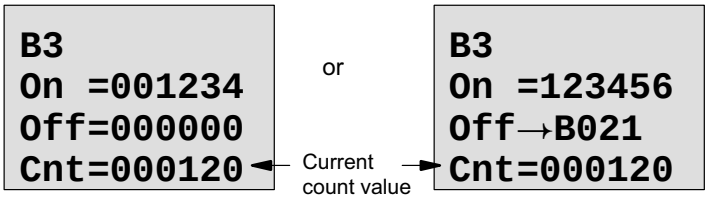
View of a timer cam in parameter assignment mode:



You can change the on/off times and the day.

Current value of a counter

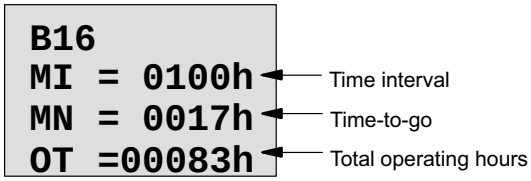
View of a counter parameter in parameter assignment mode:



You can change the on/off threshold. This does not apply if the on or off threshold represents the result of another function.

Current value of an hour counter

View of an hour counter parameter in parameter assignment mode:



You can edit the configured time interval MI.

E.g. B03 represents the function block you can see in the table below. T for the set value and Ta for the actual value..

Function	Description	Org. Set
B03	Indicating light "low grease pressure"	00.40
B06	PS cycle counter	25
B08	Grease cycle time on outlet port A	15
B09	Grease cycle time on outlet port "B+C"	25
B17	PS cycle counter	n/a
B20	Time grease cylinder down	00.40
B22	Time grease cylinder up	00.40
B27	PS cycle counter	n/a

Lifting procedure

Weights

Weight & Dimensions	Description
Weight PS without slip assembly incl. top covers	7,800 lbs 3,510 Kg
Weight PS slip assembly	1,650 lbs 743 Kg
Hinge pin	33 lbs 15 Kg
Top Cover (single half)	510 lbs 230 Kg
Insert carrier	165 - 330 lbs 75 - 150 Kg
Manifold block PS	22 lbs 10 Kg
Bit braker plate	250 lbs 112.5 Kg
4-way lifting sling pn 200982-1	200 lbs 90 Kg
2-way lifting sling pn 50004551	44 lbs 20 Kg
Special slip handling tool for slip handle pn 50004552	33 lbs 15 kg
Lifting hook for lifting insert carriers pn 50004600-1 (pogo stick)	16 lbs 7 Kg

Lifting the PS by the hoist swivel rings

The hoisting swivel rings on the body must be used to lift the PS.

Hoisting swivel rings + 4-way lifting sling p/n 200982-1

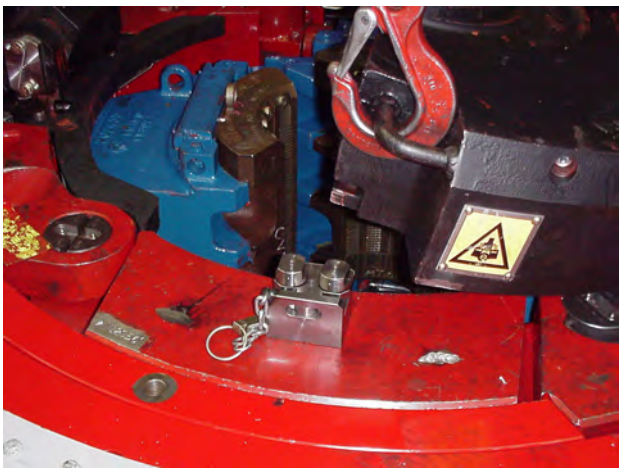
NOTE: In order to pull the PS sideways by means of a tugger line, the tugger line can be fitted to the additional shackle on the outside of the spreader bar of the 4-way lifting sling. This to prevent the bails of the hoist swivel rings from bending open.

CAUTION: When lifting the PS with CLOSED top covers , ensure the centering rams are in CLOSED position.

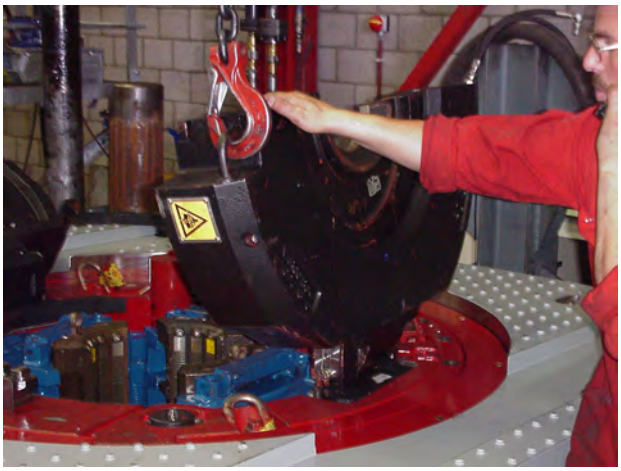
Opening/closing the top covers

Procedure

1. Use the L-bars on the top cover to close and open the top-cover.



2. Lifting L-bar on top-cover.



3. Lift the top cover until it is almost vertical. Than push it until it flips through its center of gravity. Do not lift too far as the PS or top cover may get damaged.

NOTE: For removing the top covers from the body, additional lifting eyes (2x) must be used.

Installation of the PS in the Rotary Support Table.

WARNING: Lift the PS by the four lifting eyes only and never by other parts ! Use the four way lifting sling p/n 200982-1

Procedure

1. Lift the PS with the lifting sling (picture: closed top covers).
2. Make sure that the lock pins are in retracted position.
3. Lower the PS in the drill floor or rotary support table.
4. Locks in locking position.
5. Turn locks (2) into locked position.(picture: PS outside rotary support table).

NOTE: Make sure the manifold block of the PS is on the side where the connections in the rotary support table are

6. Lock disengaged.

Handling the top covers.

NOTE: Use the pogo-stick on a tugger line to open and close the top covers.

The top cover lock

Procedure

1. Disengage the cover lock.
2. Connect the pogo stick to the lifting bracket.
3. Push the top cover till it flips through it's center of gravity.
4. Lower the cover.

Installing the slip assembly in the PS

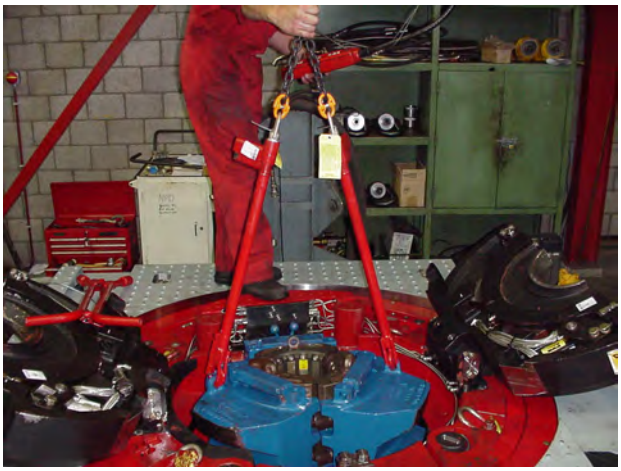
WARNING:Make sure that all hydraulic lines are isolated or that the ball-valve is closed before any work is carried out in the PS

45 degree angle

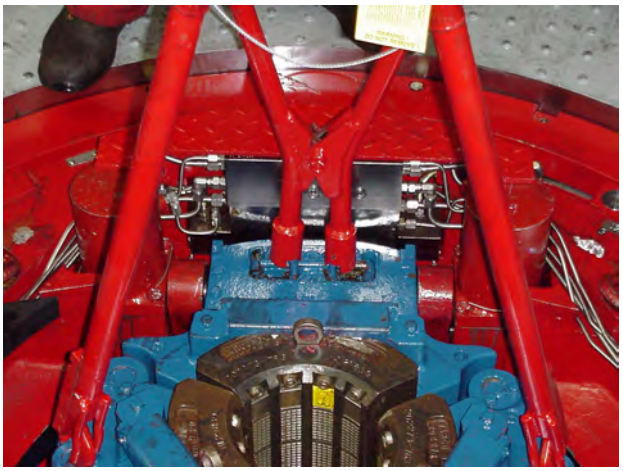
Procedure

NOTE: The lifting hook (pogo stick) has a Safe Work Load of 1,000 lbs.

1. Open the top covers using the revised lifting hook (pogo stick) p/n 50004600-1 with a tugger line.
2. Grease the ribs on the inner bore of the PS.
3. Grease the ribs of the slip assembly.
4. Place the lifting arms 1/3 down, 45°. This position allows easy engagement of the slip pin. Give the command <slips down> and stop the movement of the arms with the ball valve.



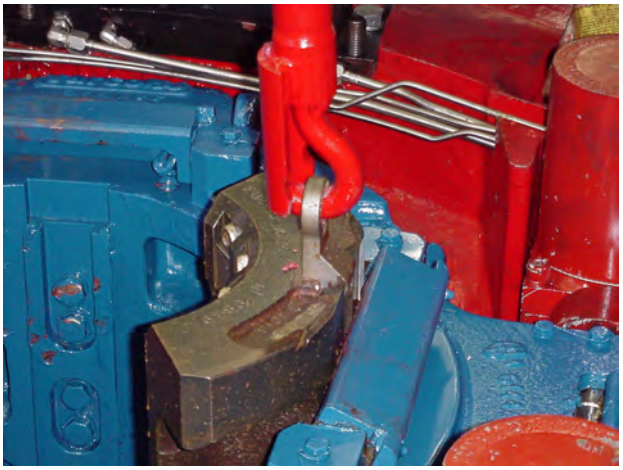
5. Lift the Slip in the PS by using the lifting tool for PS-slip assembly pn 50004551
6. Line up the slip mounting pins.



7. Spread the slip handles by using the special slip handle operating tool pn 50004552.
8. Make sure the slip handles are in the **lock** position.
9. Disengage the slip assembly lifting tool.

Installation of the insert carriers

(while in the Rotary Support Table)

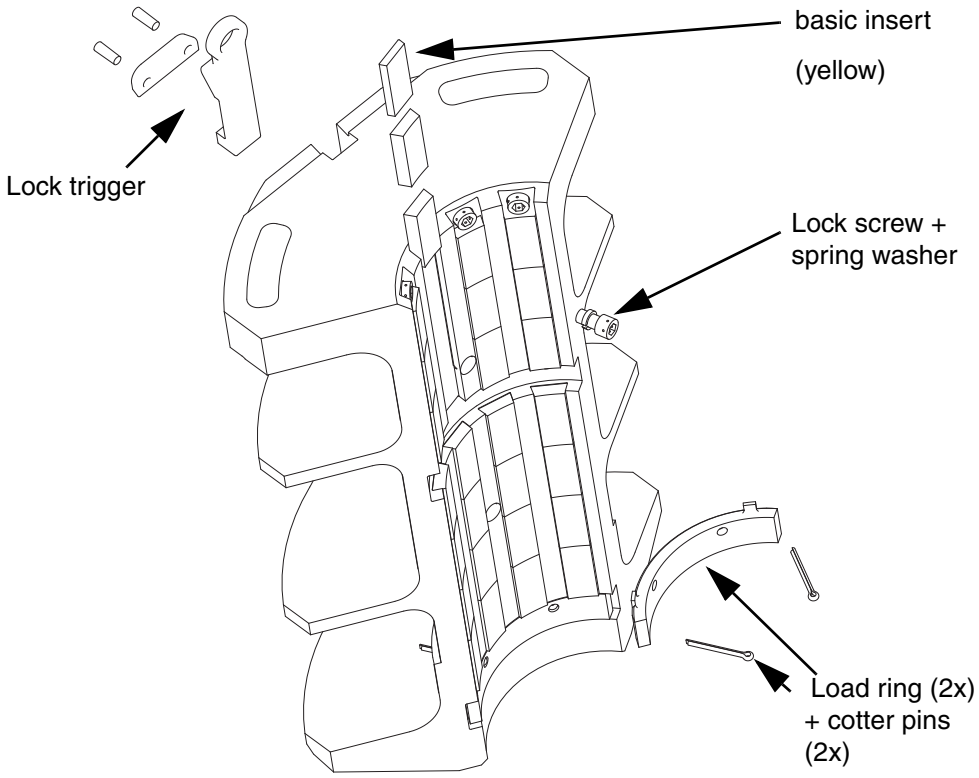


Procedure

By using the revised lifting hook (pogo stick) pn 50004600-1

1. Lean the insert carrier forward, lower it and engage. Pull the insert carrier backwards and lower it till the latch locks it.
2. Lower the insert carrier.
3. Make sure the insert carrier is locked by the latch.

Dressing the insert carrier



Load rings

Depending on the size of the insert carrier, one or two “load rings” have been added. The following insert carriers have this modification.

Don’t forget

- to place the cotter pins (2x per load ring).
- to place the basic insert.
- to place the lock screws and spring washers.

Basic insert

The insert carriers have to be dressed with one plastic basic insert with the size printed in it.

Dressing kits

For replacement of the inserts, a dressing kit is available, containing inserts, loadring(s), size inserts, lock screws, spring washers and cotter pins.

Rating

Due to the fact that the strength of smaller size pipes do not permit high hook loads, a downrating is applicable according to the tables.

PS30 Size components data (see tables)

Slip p/n	Clamping diameter [inches]	Pipe type	Zip DC [inches]	Plain DC [inches]	Rating [Tons]	Slip assy / Insert Carrier p/n	Insert contact height [inches]	Dressing Kit p/n	Insert p/n	Load ring p/n	Ram / Ram- inserts p/n	Throat opening (slips up) [inches]
Inserts directly in slip	20	Csg	--	--	250	202430-2000	21	51202430-2000	2635	--	202381-2000	24
	18-3/4	Csg	--	--	250	202430-1875	21	51202430-1875	2657	--	202381-1875	22-3/4
	18-5/8	Csg	--	--	250	202430-1863	21	51202430-1863	17080	--	202381-1863	22-3/4
	18	Csg	--	--	250	202430-1800	21	51202430-1800	2635	--	202381-1800	22
	17-7/8	Csg	--	--	250	202430-1788	21	51202430-1788	V-2669	--	202381-1788	21-1/2
202430-5	16	Csg	--	--	750	202440-1600	21	51202440-1600	2635	--	202386-1600	20
	14	Csg	--	--	750	202441-1400	21	51202441-1400	2635	--	202386-1400	18
	13-5/8	Csg	--	--	750	202441-1363	21	51202441-1363	2653	--	202386-1363	17-5/8
	13-3/8	Csg	--	--	750	202441-1338	21	51202441-1338	2636	--	202386-1338	17-3/8
	12-3/4	Csg	--	--	750	202441-1275	21	51202441-1275	2657	--	202386-1275	17-1/4
	11-7/8	Csg	--	--	750	202442-1188	21	51202442-1188	2651	--	202386-1188	16-7/16
	11-3/4	Csg	--	--	750	202442-1175	21	51202442-1175	2637	--	202386-1175	16-5/16
	10-3/4	Csg	--	--	750	202443-1075	21	51202443-1075	2637	--	202386-1075	15-3/8
	9-7/8	Csg	--	--	750	202443-988	21	51202443-988	2650	--	202386-988	14-7/16
	9-5/8	Csg	--	--	750	202443-963	21	51202443-963	2656	--	202386-963	14-5/16
	7-5/8	Csg	--	--	750	202445-763	20.65	51202445-763	2633	50004573-1	202386-763	14-1/2
	7	Csg	--	--	750	202445-700	20.65	51202445-700	2623	50004573-1	202386-700	13-7/8
	6-7/8	Csg/DP	--	--	750	202445-688	20.65	51202445-688	2638	50004573-1	202386-688	13-1/2
	6-5/8	Csg/DP	--	--	750	202445-663	20.65	51202445-663	2632	50004573-1	202386-663	13-1/2
	6-1/2	Csg/DP	--	--	750	50004569-650	20.65	51004569-650	2173	50004573-2	202386-650	13-1/4
	5-7/8	DP	--	--	750	50004569-588	20.65	51004569-588	2623	50004573-2	202386-588	13
	5-1/2	Csg/DP	--	--	750	202446-550	20.65	51202446-550	2170	50004573	202386-550	10-3/4
	5	Csg/DP	--	--	750	202446-500	20.65	51202446-500	2169	50004573	202386-500	10-1/4
	4-1/2	Tbg/DP	--	--	750	202446-450	20.65	51202446-450	2168	50004573	202386-450	9-3/4
202433-5	**** 11-1/8**	**Csg**	**--**	**--**	**500**	**202270-1113**	**15.5**	**51202270-1113**	**2651**	**--**	**202386-1113**	**15-3/4**
	**** 11**	**Csg**	**--**	**--**	**500**	**202270-1100**	**15.5**	**51202270-1100**	**2637**	**--**	**202386-1100**	**15-1/2**
	10-7/8	Csg	--	--	500	202270-1088	15.5	51202270-1088	2651	--	202386-1088	15-1/2
	10-3/4	Csg	--	--	500	202270-1075	15.5	51202270-1075	2637	--	202386-1075	15-3/8
	10	Csg	--	--	500	202270-1000	15.5	51202270-1000	2638	--	202386-1000	14-3/4
	9-7/8	Csg	--	--	500	202270-988	15.5	51202270-988	2650	--	202386-988	14-9/16
	9-5/8	Csg	--	--	500	202270-963	15.5	51202270-963	2656	--	202386-963	14-5/16
	9-1/2	Csg	--	--	500	202270-950	15.5	51202270-950	2657	--	202386-950	14-1/4
	9-1/8	Csg	--	--	500	202279-913	15.5	51202279-913	2637	--	202386-913	14-1/4
	8-5/8	Csg	--	--	500	202279-863	15.5	51202279-863	2652	--	202386-863	13-1/2
	7-3/4	Csg	--	--	500	202279-775	15.5	51202279-775	17080	--	202386-775	13
	7-5/8	Csg	--	--	500	202273-763	13.75	51202273-763	2633	50004573-3	202386-763	12-1/2
	7	Csg	--	--	500	202273-700	13.75	51202273-700	2623	50004573-3	202386-700	11-7/8
	6-7/8	Csg/DP	--	--	500	202273-688	13.75	51202273-688	2638	50004573-3	202386-688	11-3/4
	6-5/8	Csg/DP	--	--	500	202273-663	13.75	51202273-663	2632	50004573-3	202386-663	11-5/8
	6-1/2	Csg	--	--	500	202369-650	13.75	51202369-650	2173	50004573-2	202386-650	11-1/2
	6-9/64	Csg/DP	--	--	500	202369-614	13.75	51202369-614	2172	50004573-2	202386-614	11-1/8
	6	Csg/DP	--	--	500	202369-600	13.75	51202369-600	2169	50004573-2	202386-600	11
	5-7/8	DP	--	--	500	202369-588	13.75	51202369-588	2623	50004573-2	202386-588	11
	5-11/16	Csg/DP	--	--	500	202369-568	13.75	51202369-568	2650	50004573-2	202386-568	10-7/8
	5-1/2	Csg/DP	--	--	500	202274-550	13.75	51202274-550	2170	50004573-5	202386-550	10-3/4
	5	Csg/DP	--	--	500	202274-500	13.75	51202274-500	2169	50004573-5	202386-500	10-1/4
	4-1/2	Tbg/DP	--	--	500	202274-450	13.75	51202274-450	2168	50004573-5	202386-450	9-3/4
	**** 4**	**Tbg/DP**	**--**	**--**	**500**	**202278-400**	**13.75**	**51202278-400**	**2165**	**50004573-6**	**202386-400**	**9-3/8**

Slip p/n	Clamping diameter [inches]	Pipe type	Zip DC [inches]	Plain DC [inches]	Rating [Tons]	Slip assy / Insert Carrier p/n	Insert contact height [inches]	Dressing Kit p/n	Insert p/n	Load ring p/n	Ram / Ram- inserts p/n	Throat opening (slips up) [inches]
202433-5	**** 9-1/2**	**DC**	**10**	**9-1/2**	**350**	**202271-950**	**10**	**51202271-950**	**2633**	**--**	**--**	**14-3/16**
	**** 9-1/4**	**DC**	**9-3/4**	**9-1/4**	**350**	**202271-925**	**10**	**51202271-925**	**2655**	**--**	**--**	**13-15/16**
	9	DC	9-1/2	9	350	202271-900	10	51202271-900	2633	--	--	13-11/16
	8-3/4	DC	9-1/4	8-3/4	350	202271-875	10	51202271-875	2655	--	--	13-9/16
	8-5/8	DC	9-1/8	8-5/8	350	202271-863	10	51202271-863	2653	--	--	13-1/2
	8-1/2	DC	9	8-1/2	350	202271-850	10	51202271-850	2652	--	--	13-7/16
	8-1/4	DC	8-3/4	8-1/4	350	202271-825	10	51202271-825	2638	--	--	12-7/8
	8-1/8	DC	8-5/8	8-1/8	350	202271-813	10	51202271-813	2650	--	--	12-3/4
	8	DC	8-1/2	8	350	202272-800	10	51202272-800	2633	--	--	13-1/4
	7-3/4	DC	8-1/4	7-3/4	350	202272-775	10	51202272-775	2655	--	--	13
	7-5/8	DC	8-1/8	7-5/8	350	202272-763	10	51202272-763	2172	--	--	12-1/2
	7-1/2	DC	8	7-1/2	350	202272-750	10	51202272-750	2652	--	--	12-3/4
	7-3/8	DC	7-7/8	7 3/8	350	202272-738	10	51202272-738	2636	--	--	12-1/2
	7-1/4	DC	7-3/4	7-1/4	350	202272-725	10	51202272-725	2638	--	--	12-1/2
	**** 6-3/4**	**DC**	**7-1/4**	**6-3/4**	**350**	**202275-675**	**10**	**51202275-675**	**2633**	**--**	**--**	**11-1/4**
	6-1/2	DC	7	6-1/2	350	202275-650	10	51202275-650	2633	--	--	11
	6-1/4	DC	6-3/4	6-1/4	350	202275-625	10	51202275-625	2655	--	--	10-7/8
	6	DC	6-1/2	6	350	202275-600	10	51202275-600	2652	--	--	10-7/8
	5-3/4	DC	6-1/4	5-3/4	350	202275-575	10	51202275-575	2638	--	--	10-5/8
	5-5/8	DC	6-1/8	5-5/8	350	202275-563	10	51202275-563	2650	--	--	10-1/2
	3-1/2	Tbg/DP	--	--	350	202277-350	13.75	51202277-350	2162	50004573-4	202386-350	8-7/8
	3-1/8	Tbg/DP	--	--	350	202277-313	13.75	51202277-313	2172	50004573-4	202386-313	8-7/8
	2-7/8	Tbg/DP	--	--	350	202277-288	13.75	51202277-288	2161	50004573-4	202386-288	8-1/2
	2-3/8	Tbg/DP	--	--	350	202277-238	13.75	51202277-238	2160	50004573-4	202386-238	8-1/8
	4-3/4	DC	5-1/4	4-3/4	225	202276-475	10	51202276-475	2165	--	--	10
	4-5/8	DC	--	4-5/8	225	202276-463	10	51202276-463	2655	--	--	9-7/8
	4-3/8	DC	4-3/4	4-3/8	225	202276-438	10	51202276-438	2172	--	--	9-3/4
	4-1/4	DC	--	4-1/4	225	202276-425	10	51202276-425	2166	--	--	9-5/8
	4	DC	--	4	225	202276-400	10	51202276-400	2638	--	--	9-3/8

*** Dressing kit includes: inserts, size inserts and retainers.**

**** These insert carriers are size specific and CANNOT be redressed to another size**

Dressing the slips/insert carriers with inserts

CAUTION: DO NOT grease the grooves

CAUTION: The bottom inserts must be tapered in case of a groove.

Procedure

NOTE: The basic insert is a plastic insert, marked with the dress size, replaces one of the inserts.

1. Remove the screws and spring washers on top of the insert carrier assembly.
2. Dress the slip assembly and lock it with socket head lock screws and lock washers.
3. The inserts have the part number stamped in the back.

4. Do not forget the size (basic) inserts.
5. Grind and re-mark the size marking when changing the size of the inserts.
6. In the table you will find the dressing kits, consisting out of inserts, cotter pins, bolts and lock washers.

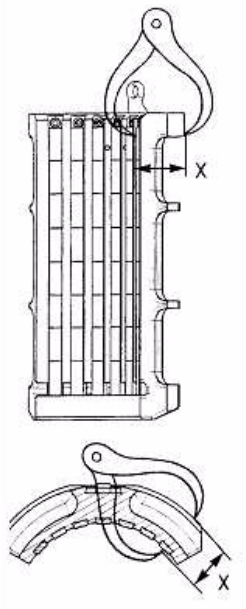
Determining pipe crushing loads

WARNING: Keep in mind that the actual rating is determined by the pipe. Below formula is based on an ideal situation where the pipe is completely circumferential clamped. In reality, especially for big sizes, the slips do not enclose the pipe completely, hence the risk for crushing the pipe is higher.

Applicable for casing with wall thickness t > 0.1 R. Critical hook load of pipe at slip contact.
$F = Qyp * A * \sqrt{\frac{1}{1 + \frac{RK}{L} + \left[\frac{RK}{L}\right]^2}}$ No safety factor to account for dynamic factors is used in this formula
F = Crushing load in lbs.
Qyp = Yield stress of pipe in psi.
A = Sectional area of pipe in inch²
R = Outside radius of pipe in inches.
L = Length of slip contact in inches.
K = Crushing factor (used =) 2.6

Reference table for inserts in slip body 10 ¾”

In order to check whether the applied inserts are correct, check the dimension X according to the table



The correct size insert carrier can be measured with an O.D. calliper using the formula:

X = 7 ½” – (nominal size clamping diameter) / 2

.

Nominal size clamping diameter	Nominal pipe size of Zip DC	Dimension X	
(inches)	(inches)	inches	mm
11 ¾	-	1.625	41.3
11 1/8	-	1.938	49.2
10 ¾	-	2.125	54.0
9 7/8	-	2.563	65.1
9 5/8	-	2.688	68.3
9 1/8	-	2.938	74.6
8 5/8	-	3.188	81.0
7 ¾	-	3.625	92.1
9 ½	-	2.750	69.9
9 ¼	9 ¾	2.875	73.0
9	9 1/2	3.000	76.2
8 3/4	-	3.125	79.4
8 5/8	9 1/8	3.188	81.0
8 1/2	9	3.250	82.6
8 1/4	8 ¾	3.375	85.7
8 1/8	8 5/8	3.438	87.3
8	8 1/2	3.500	88.9
7 3/4	8 1/4	3.625	92.1
7 1/2	8	3.750	95.3
7 1/4	7 3/4	3.875	98.4
7 5/8	-	3.688	93.7
7	-	4.000	101.6
6 1/2	-	4.250	108.0
6 9/64	-	4.430	112.5
6 5/8	-	4.188	106.4
5 1/2	-	4.750	120.7
5	-	5.000	127.0
4 1/2	-	5.250	133.4
6 3/4	-	4.125	104.8
6 1/2	-	4.250	108.0
6 1/4	6 ¾	4.375	111.1
6	6 ½	4.500	114.3
5 3/4	6 1/4	4.625	117.5
5 5/8	6 1/8	4.688	119.1
4 3/4	5 1/4	5.125	130.2
4 5/8	-	5.188	131.8
4 3/8	4 3/4	5.313	134.9
4 1/4	-	5.375	136.5
4	-	5.500	139.7
3 1/2	-	5.750	146.1
2 7/8	-	6.063	154.0
2 3/8	-	6.313	160.3

Reference table for inserts in slip body 16”

The correct size insert carrier can be measured with an O.D. calliper using the formula:

X = 10 ½” – (nominal size clamping diameter) / 2

Nominal size clamping diameter	Nominal pipe size of Zip DC	Dimension X	
(inches)	(inches)	inches	mm
20	-	n/a	n/a
18 5/8	-	n/a	n/a
16	-	n/a	n/a
14	-	3.500	88.9
13 5/8	-	3.688	93.7
13 3/8	-	3.813	96.8
12 3/4	-	4.125	104.8
11 7/8	-	4.563	115.9
11 3/4	-	4.625	117.5
10 3/4	-	5.125	130.2
9 7/8	-	5.563	141.3
9 5/8	-	5.688	144.5
7 5/8	-	6.688	169.9
7	-	7.000	177.8
6 5/8	-	7.188	182.6
5 1/2	-	7.750	196.9
5	-	8.000	203.2
4 1/2	-	8.250	209.6

Hand slip bowl / stainless steel ram insert / load rings

Number	Partnumber	Rating T (metric T)	Size range (inch)	Part number slip	Size slip (inch)
#1	202362	150 (136)	13 3/8 - 11 3/4	202430-1	16
#2	202363	150 (136)	10 3/4 - 9 5/8	202430-1	16
#3	202364	150 (136)	8 5/8 – 2 3/8	202430-1	16

NOTE: For handling the hand slips in the bowls, extended hand slip handles are available: For SD-slips, order 50004604-1. For CMS-slips, order 50004604-2

Pipe wiper

When tripping out drill pipe, Varco BJ recommends a 19" spirol (Helical) wiper to be placed underneath the tool.

This type of wiper can be installed while the tool is in the rotary table. Pull out the insert carriers, then lower the wiper through the slips.

NOTE: Position the wiper UNDERNEATH the tool to keep mud away from the moving parts inside the PS.

Stainless steel ram insert

Stainless steel ram inserts are available for drill pipe size 7 5/8" and smaller. The stainless steel ram insert gives a better anti-spark performance. The stainless steel ram inserts are suitable for the use with plain Drill Collar (DC) and Drill Pipe (DP).

CAUTION: It's always possible sparks are generated by the use of the PS, even while using stainless steel ram inserts.

The new drill pipe guides have a steeper lead-in chamfer on the top and bottom to better guide the tool joint through the top guides (less impact). The contact area between pipe and ram insert is enlarged.

A wear groove is provided for indicating the maximum wear..

NOTE: When the stainless steel ram inserts are worn out, have the inserts repaired by an authorised repair facility rather than welding up in house, as the contour of the insert require special machining facilities.

System Requirements check

Safety

WARNING: Make sure that all hydraulic lines are isolated before any work is carried out on the PS.

NOTE: Fit control manifold close to the hydraulic supply and as near as possible to the PS.

NOTE: Route the hoses on the rig floor to minimise damage caused by cutting and dragging.

NOTE: Before starting operation, remove air from the hydraulic circuit by cycling the slips full up and down for about 10 times. Air in the circuit may lead to improper functioning of the PS, and may lead to dropping of pipe.

CAUTION: NOV strongly recommends to only use one of the NOV's original PS controls to operate the PS. Other controls may damage the hydraulic circuit of the PS

Commissioning

Action	Applicable document
1. Check the system requirements and the pre-installation sheets.	PSEL-0002
2. Check tubing and hoses are minimal 1/2” size.	
3. Check minimum work pressure 2,300 psi (15, 857 KPa) available system pressure.	
4. Check maximum system pressure does not exceed 3,000 psi (20,684 KPa).	
5. Check Power unit: Minimum 5-10 Gpm (19 l/min.-28 l/ min.) at 2,300 – 3,000psi (15, 857-20,684 KPa) available?	
6. Check maximum oil temperature: Oil temperature HPU does not exceed 140ºF (60ºC)?	
7. Application filter. Verify filters fit properly.	
8. Install PS in rig floor.	Installation drawings and procedures in pre-installation sheet PSEL-0002
9. Conduct field commissioning procedure and sign off commissioning sheet.	Field commissioning procedure TSEL-0067
10. Tool ready for operation.	

Operations

WARNING: Be careful when operating the PS while the topcovers are open

WARNING: Do not touch the PS

WARNING: Never raise the slips when the pipe load is still suspended in the slips.

CAUTION: Keep insert carriers together as a set with the same serial number. This to prevent unequal wear.

Operational safety

Procedure

- Make sure that ALL hydraulic lines are isolated before any work is carried out in the PS.
- It is recommended to have the PS operated by the driller.
- For smooth operation, it is recommended to slightly lower the pipe with the elevator while setting the PS slips.
- For smooth operation, it is recommended to slightly raise the pipe with the elevator while releasing the PS slips.
- The rotary locks in the outside of the PS may only be needed on semi submersible rigs or while floating in pipe when there is a chance the PS could come out of the rotary table.

Disconnecting hoses

Procedure

Disconnect the hoses in the following cases:

1. The tool has to be lifted out of the rotary table.
2. The PS and table have to be rotated.
3. Any unwanted slip movements have to be prevented, especially when someone has to work on the PS.

Operation

Procedure

1. Check slips/carriers are set on correct section of the pipe. The PS must be set before releasing the elevator. The PS is properly set when the slips down signal comes on.
2. When the rotary table and the PS have to be rotated, always uncouple the quick disconnects on the PS prior to rotation. Not doing so may cause severe damage to the PS, hydraulic hoses or controls.
3. Place the PS in the rotary table using all 4 lifting eyes and four way lifting sling p/n 200982-1.
4. Connect all hydraulic equipment and check correct functioning of the tool.
5. With the pipe string being held by the PS, make up or break the upper stand or joint, and handle it.

6. Pick up the weight of the pipe string with the elevator, before raising the slips of the PS.
7. Set the slips of the PS and then release the elevator.

Procedure operation while drilling/tripping pipe

Procedure

1. It is allowed to keep the PS in the rotary.
2. Ensure the PS slips are raised.
3. Ensure the correct ram inserts are installed.

Running (Spiral) Grooved Drill Collars

Procedure

1. Keep the top-covers closed.
2. When running the bottom part (BHA) of the drill string, the string doesn't or almost doesn't experience side loads, hence there is no need to use ram inserts to centre the drill string.
3. (Spiral) grooved drill collars wear out the ram-inserts at an increased rate. They also cause trouble because the spiral grooves interfere with the ram-inserts. Therefore using ram-inserts is not recommended.

For Plain Drill Collars

1. Run plain drill collars with ram inserts matching the nominal drill collar.

Removal of PS when pipe is in the hole

WARNING: DO NOT lift the PS on the cover plate L-bars.

WARNING: Lift the PS out of the rotary table ONLY with the 4 way lifting sling with curved spreader beam *(part no. 200982-1),* using ALL 4 hoist swivel rings.

NOTE: Throat opening: The troatopening is the pass through opening if slips are UP and covers are OPEN. The throat opening of the PS30 without slips is 29-1/2" and the door opening is 20-1/2". The top cover opening without ram-inserts is 20" when closed.

CAUTION: Be aware of losing parts while lifting. Prevent this by using the insert carrier lifting look for lifting of insert carriers and opening of the top covers.

Exceptions

1. PS30 dressed for 16":
   - Remove the right and left hand insert carrier enough clearance between the slips to get the pipe through the door.
2. No insert carriers have to be removed to get pipe through door in:
   - PS30: 2-3/8" - 14"

3. Remove the complete slip assembly to get enough clearance to get the pipe through the door.
   - PS30 dressed for 18-5/8" and 20"
4. No slips have to be removed to get pipe through the door in:
   - PS30: 2-3/8" - 16"

Removing the PS from drill pipe while in rotary

Procedure

1. Take the load from the slips.
2. Raise the slips.
3. Depressurize the PS hook up hoses by using the PS neutral button and disconnect the hydraulic hoses from the PS by disconnecting the Q.D's.
4. Unlock the rotary locks.
5. Unlock the top-cover lock.
6. Open the top-covers as described in the manual.
7. Remove the removable hinge pin from the PS door using the insert carrier lifting hook (P.N.50004600-1).
8. Lift the PS from the rotary table by using the four way lifting sling with curved spreader bar (P.N. 200982-1).
9. Open the PS door.
10. Move the PS away from the pipe / well center.

Connecting and disconnecting of the hydraulic hoses

WARNING: Be careful when disconnecting hydraulic hoses. Make sure pressure is of the hoses and the weight of the string cannot generate pressure

Procedure

Once disconnected from the controls, the slips will be hydraulically locked in the last position. Once the hoses are disconnected, the hydraulic oil on either side of the cylinder pistons is trapped in place and therefore the cylinders (slips and/or centering device) are locked in position.

Dis-connection hoses in slips up position

Procedure

1. Set PS in neutral position with the override button
2. Disconnect Quick Disconnects.

Override button

Procedure

On the drillers console, a button is provided releasing all pressure from the system. In case when the slips are up, the anti-sagging seals in the LH-actuator in combination with a counter balance valve inside the manifold block prevents the slips from setting.

Using handslips

Hand slips can be used to prevent the pipe from slipping through the PS, especially when suspending low weights of string, e.g. at the start or finish of a trip. The PS will act as a conventional master bushing with insert bowl when used properly.

WARNING: Using the PS with handslips results in not being able to use the centering device. When running deviated pipe, ensure the handslips are set properly before suspending the load. Take safety precautions.

Procedure

1. Raise the slips.
2. Isolate the PS hydraulically.
3. Open the top covers, remove the ram-inserts.
4. Remove the insert carriers.
5. Install the hand slip bowls.
6. Put pressure back on.
7. Set the slips.
8. Check the slips for proper settings (slips set signal).
9. Check the slips bowls. They have to match each other on contact spots.
10. Close the ball valve in the slips down hose..

CAUTION: If no ball valve is installed, ensure installation will be carried out.

CAUTION:Ensure the PS slips are set before using the PS for running hand slips. The hydraulic power in the PS is required to prevent the PS from opening when using the PS like a masterbushing. However, when opening the PS-slips while using hand slips may cause the PS to open due to the “wedge-action” of the handslips when the PS slip assembly is not properly set.

11. Close the top covers
12. Use hand slips with extensions
13. Start running as usual with a master bushing, bowl and hand slips.

NOTE: Ensure the tooljoint will be sufficiently above the top cover before attempting to place the hand slips in the PS. If the tooljoint is too low, it will be hard if not impossible to place the hand slips.

See chapter “Installation and Commissioning” for the appropriate part numbers for size and rating of hand slip bowls and extension handles

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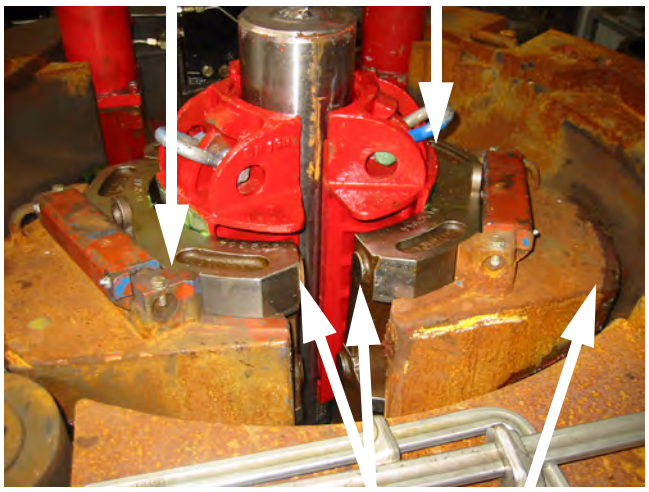
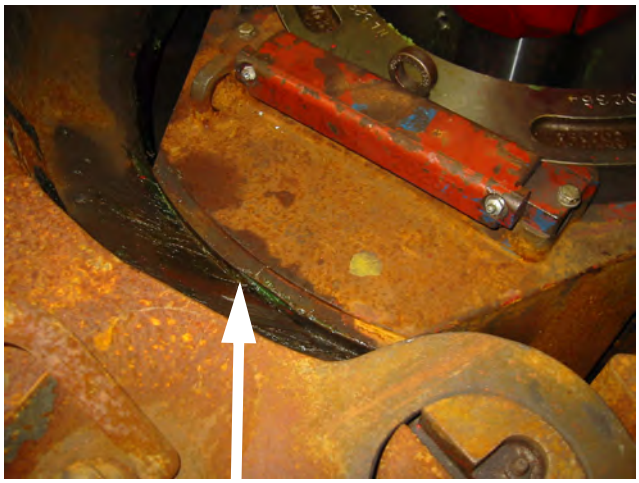
Hand slip bowl (3 plc) Hand slips



Slips not set properly: Opening between hand slip bowls, slips resting on 30° face. No handles showed in image



Slips set properly: Slips in 9° bowl

Running umbilical lines

WARNING: Always keep your hands out of the PS.

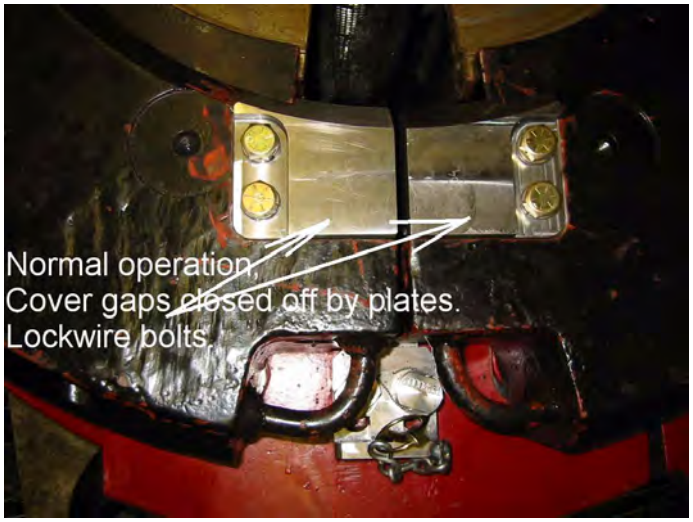
NOTE: The maximum umbilical diameter to pass the guide is 3 inch.

Setting up the PS for running

Procedure

1. Raise the slips of the PS
2. Ensure the rams have fully opened
3. Block the left hand and the right hand rams with the pins

4. Remove the close-off plates



5. Store the close-off plates

6. Open the cover plates.
7. Fit the guide.
8. Dress the PS with slips, insert carriers and ram inserts for the right size..

9. Close the top covers.
10. Lead the umbilical lines through the top cover opening and the guide.
11. Start running the umbilical lines, preferrably from the right or left hand side for optimum guidance..

NOTE: Ensure the umbilical is free from the slips before setting the slips.

12. After umbilical operation, make sure the PS umbilical tools are removed and the ram lock pins installed in unlocked position.
13. Close off the cover gap in reverse order as outlined in points 1 to 5.

NOTE: The process described above can only be done with an upgraded PS. Pls. contact the nearest authorized repair facility for modification of the PS (machining top covers and door). Use kit. pn. 50004736 or new build pn. 202400-%-10

Assembly and dis-assembly

Safety

NOTE: All images in this chapter are for info only. Please use the official drawings for reference.

WARNING: Make sure that all hydraulic lines are isolated before any work is performed on the PS.

Procedure

Prior to working on the PS or any of it's parts:

if the PS is connected to a power unit, bleed the system prior to repair.

To bleed the PS:

1. Shut the valve in the Pressure line.
2. Shut off the power unit.
3. Give command <slips up> and <slips set> a number of times.:

WARNING: When working on the PS, lock and tag the controls in order to prevent unexpected movement of the PS.

WARNING: Do not weld on PS or individual parts

NOTE: Prior to assembly or disassembly, clean the PS thoroughly with a steam-cleaner in order to prevent the parts from getting contaminated with dirt, mud etc.

Before (dis)assembly of the PS make sure

Procedure

1. All tools are at hand.
2. Hoisting equipment is available.
3. Lifting equipment is suitable for handling heavy parts (crane, lifting bands, chains, eyes etc).

Torques

Use the proper torque for assembly parts. Applying too much torque easily could damage cartridges. See the torque lists in this manual.

Required tools

For normal maintenance and repair, standard tools will be sufficient for all work. However, bigger size spanners may be required for hydraulic tubes.

Special tools

The removal of cartridges from the PS manifold block may require an extended socket be modified. If required, the outside diameter of a 7/8"socket should be reduced (turned down) to 29 mm, 1.14".

Assembly of the PS

Procedure

Follow the reverse order for disassembly of the PS:

1. Changing centering device ram inserts.
2. Close ball valve.
3. Disengage the top cover lock and open the top covers.
4. Remove the lynch pin clip that locks the ram insert into the universal ram guide.
5. Replace the ram insert. Two threaded holes (1/2" UNC) for lifting eyes are provided in each ram insert to ease handling.
6. Lock the new ram insert with the lynch pin clip.
7. Close and lock the top covers.
8. Open ball valve.

CAUTION: To prevent damage to the tool during operation, never operate the PS without a ram insert assembled into the universal ram c.q. without a centering ram assembled. EXCEPTION: Drill collars will be run without ram inserts installed in the universal ram.

Procedure changing the ram guides

Procedure

1. Open top covers.
2. Disconnect lynch pin from pin on guide half.
3. Change out ram guide halves.
4. Re-assemble lynch pin.
5. Close and lock top covers.

Procedure (dis)-connection of the hydraulic hoses.

See chapter operations.

Hydraulic actuators

NOTE: Prior to disassembly, clean the PS thoroughly with a steam-cleaner to prevent the disassembled parts from getting contaminated with dirt, mud etc.

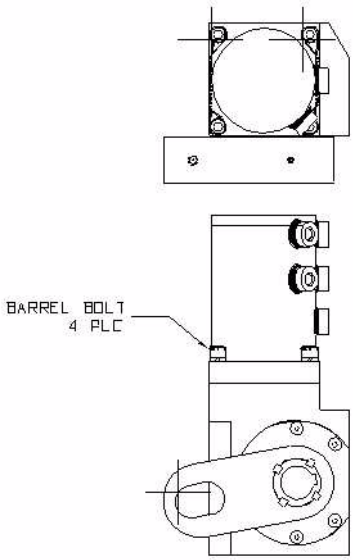
Cylinder part numbers

Part	Part number
Left hand cylinder	202203-55
Right hand cylinder	202204-55

Disassembly of cylinder

Procedure

1. Open up the PS top covers.
2. Ensure the slip lift levers are in halfway raised position.
3. Disconnect all 3 hydraulic tubes from the right hand cylinder.
4. Remove all 4 bolts that connect the cylinder barrel to the cylinder gear box.



5. Gently slide the barrel up until the barrel parts from the piston. No excessive force should be needed to remove the barrel. Making a turning movement with the barrel while sliding up eases the disassembly of the barrel.

Replacing of the RH actuator seals

These instructions lists the step by step procedure to replace the piston seals and/or piston inside the right hand PS cylinder (= the cylinder with the signal port).

Procedure

1. Inspect the seals for any damages and/or scoring.
2. Determine the assembly position of the seals.
3. Warm up the 2 white outer rings of the piston seals in hydraulic oil with a temperature of approx. 65°C (150° F).
4. First assemble the bottom piston seals, before the top seals.

NOTE: Never assemble the top seal first, as the top seal will get damaged during assembly of the bottom seal.

NOTE: In order to allow the bottom seal to be assembled first, the 2 half moon rings (delivered together with replacement seals) have to be assembled in the top seal groove.

5. Fit the bottom.
6. Assemble the o-ring.
7. Assembly of the white outer ring. The warmed-up outer ring needs to be stretched gently BY HAND over the taper on the piston.

NOTE: Never apply brute force while assembling the white outer ring. Sometimes the outer ring needs to be warmed-up again during stretching.

8. When the outer ring is stretched beyond the taper on the piston, gently slide the outer ring downwards until the ring falls into the bottom seal groove. The outer ring will shrink back to its original diameter when cooling down.
9. Remove the 2 half moon rings from the top seal groove and assemble the top seal.

NOTE: Take care the seals are assembled in the correct position. Once assembled the seals cannot be removed again without damage.

Assembly of the barrel

Procedure

1. Slide the barrel over the new piston seals.
2. Turn and slide the barrel to ease the assembly of the piston into the barrel.
3. Secure the barrel to the cylinder gear box using the 4 original bolts. Assemble the bolts with blue Locktite and pre-torque the bolts properly.

Replacing of the LH actuator seals

See drawings.

Assembly of the levers

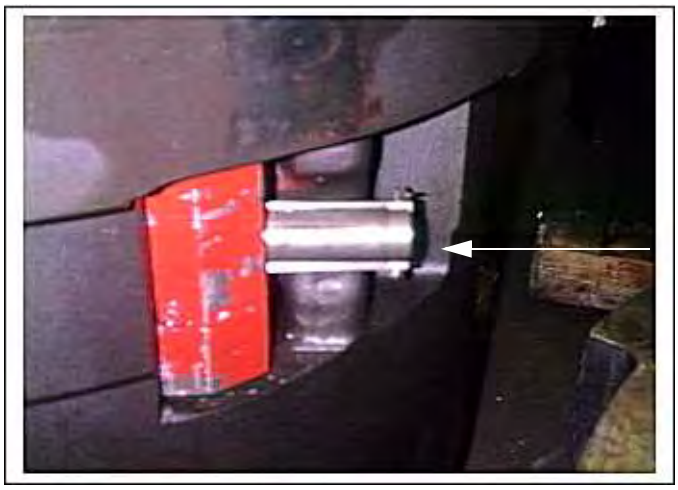
Procedure

1. Make sure the V-mark on the levers is lined up with the V-mark on the spline shaft of the cylinders.

Assembly of the hydraulic cylinders into the PS

Procedure

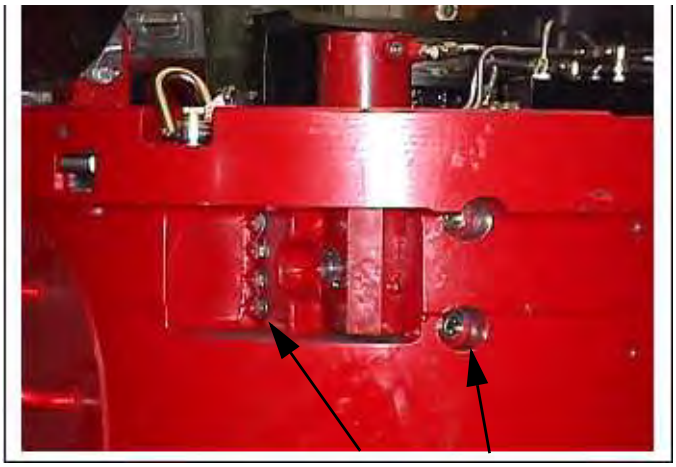
1. Put the hydraulic cylinders into position without tightening the bolts.
2. Insert from one side the synchronization shaft through both cylinders (Do not forget the 2 protection rings). In the new design only one key is present



Synchronisation shaft. New design has 1 key only.

3. Put the cylinders into position and assemble them with 8 bolts and washers on the sides. Do not tight the bolts.
4. Assemble the 4 bolts and washers in the back.
5. Torque to 157 - 173 ft-lbs (213 - 235 Nm) when using anti-seize compound.

NOTE: After all bolts are tightened, try to shift the synchronisation shaft. Use a mallet to slightly tap the shaft in order to check the alignment of the 2 cylinders. The shaft must be tight but not clamped.



Torque the bolts (sides) + (back)

Assembly of the Hoisting Swivel Ring

Procedure

1. Hoist swivel rings pn 980473-2

WARNING: To avoid loads from slipping or falling, always use the proper hoist ring assembly and folow the lifting procedures.

Hoist swivel ring p/n 980473-2

2. Ensure there are no spacers (washers) used between bushing flange and the mounting surface.
3. Verify threads on shank and receiving holes are clean, not damaged, and fit properly.
4. Apply locktite no. 243 to the thread.
5. Installation torque 2500 lbs SWL hoist ring: 28 ft/lbs (37 Nm)
6. Installation torque 5000 lbs SWL hoist ring: 100 ft/lbs (135 Nm)
7. After installation, always ensure free movement of bail. The bail should pivot 180º and swivel 360º.

Assembly of the manifold block

Procedure

1. Put the manifold into position on the PS-body. Tighten the bolts and lock wire.
2. Use 3 O-rings on the bottom side of the block.

Assembly cover plate hinge pin assembly

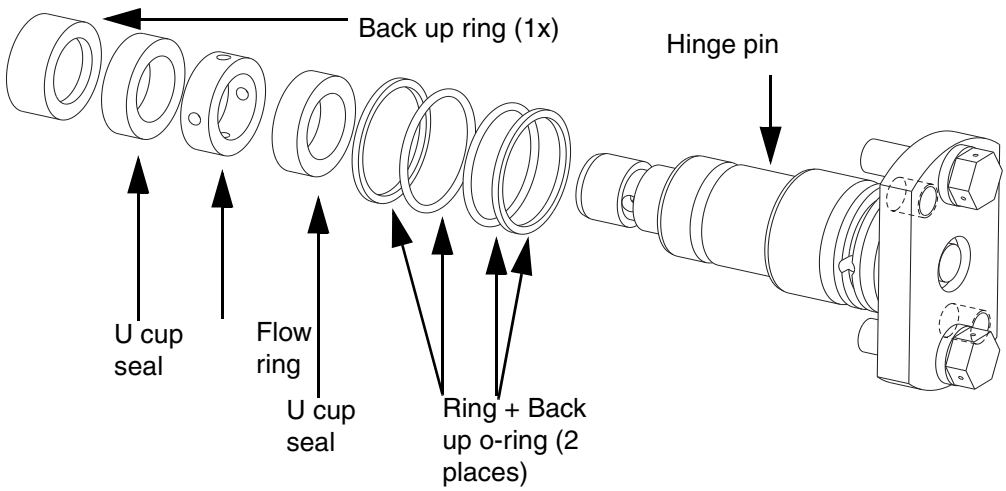
NOTE: The hinge pin must be assembled with great care to ensure functioning properly. Clean pin and hinge boss hole and remove any sharp burrs that might damage the seals during assembly. Clean the seals.

Procedure

1. Apply a coat of hydraulic fluid to all pin surfaces.

NOTE: Take care all seals are mounted in the correct position

2. Assemble O-rings, backup rings, lips seals and spacer rings.
3. Apply a grease coating to all hinge boss holes.
4. Gently assemble the pin with the seals.
5. Gently assemble the hinge pin.



NOTE: Do not forget the spacer ring between the hinge pins.

NOTE: Pull back the pin when resistance during assembly is observed to prevent damage on the seal surfaces.

NOTE: Always change out seals when an hinge pin is removed from the boss when it has been used!

Assembly centering device cylinder

Procedure

The knuckle is correctly mounted onto the cylinder piston rod when there is 0.125" space between the knuckle and the piston rod shoulder.

Assembly of the PS

NOTE: Use the proper torque for assembly parts. Cartridges easily could be damaged by applying too much torque.

Procedure

Assembly is the reverse procedure of disassembly.

1. Lock wire all parts as indicated on the assembly drawings.
2. Check the PS according the Test Procedure.

Trouble shooting

Prior to trouble shooting, carry out the following checks. When problems cannot be solved, please contact an authorized Varco repair facility.

WARNING: Make sure that all hydraulic lines are isolated and the ball valve is closed before any work is carried out on the PS.

NOTE: When a solution is not available in the following flowcharts, please contact an authorised Varco repair facility for further information.

Prior to trouble shooting a problematic PS

NOTE: When problems occur, carry out the following checks according the **PCLEFOL**-rule. Solve discovered problems first, than go to the trouble shooting flow charts.

Symbol	Check
P	Check available **P**ressure to Hook Up Manifold is 2300 psi (15,857 KPa) minimum read out pressure gauge near accumulator.
C	Check that all hoses and quick disconnects are properly **C**onnected and the ball valve is open.
L	Check **L**ubrication status of tool.
E	Check whether **E**lectrical power is available at the control panel.
F	Check if the flush valve handle is in Normal Operation Mode.
O	Check whether **O**il leakage is visible at manifold block, Hook Up Kit, Quick disconnects or hoses.
S	Is **S**ignal slips set/up coming up correctly after setting/raising slips?

Trouble shooting Flowcharts

When no solutions available in the flow-chart, please contact an authorised Varco repair facility for further information.

1. Slipping pipe

The pipe is slipping through the inserts.

Problem	Possible solution
Are teeth on inserts in slip or insert carrier are worn? Status of inserts can be verified by conducting a slip paper test. See instructions on special Varco Slip Test Paper paper 980303, test spec TSEL-0054 and manual.	Replace inserts. See tabels to verify correct insert part number for specific pipe size.
Wrong insert carriers used?	Check and/or change out insert carriers. See tabels to verify correct insert carrier part-number for specific pipe size.
Wrong inserts used in slip or insert carrier?	Check size and/or change out inserts. See tabels to verify correct insert part-number for specific pipe size
Slips not setting correctly in clamping cones inside body?	Lack of grease on back of slips is preventing slips to set correctly. Apply grease frequently as listed in chapter maintenance.
	Built-up of dirt inside a slip cylinder is preventing a full stroke of the cylinder. See instructions in manual to inspect and assemble these cylinders.
Is lack of slips down force preventing insert teeth from gripping the pipe. (Especially applicable when tripping high graded pipe in combination with oil based mud).	Check available pressure to HUK manifold is 2,300 psi (15,857 psi) min. on pressure gauge.
Is the PS (slip and body) modified with anti cocking-device (PS30 only)?	Modify PS.

2. The PS functions incorrectly.

Problem	Possible solution
Wrong insert carriers used?	Check and/or change out insert carriers. See tabels to verify correct insert carrier part-number for specific pipe size.
Wrong inserts used in slip or insert carrier?	Check size and/or change out inserts. See tabels to verify correct insert partnumber for specific pipe size.
Is a strong radial or angular deviation of the pipe towards the door side of the PS preventing the slips from setting correctly?	Rotate PS with center slip towards deviation.
Is pipe not correctly clamped by slips because incorrect sized ram inserts in centering device are used?	Check size and/or change out ram inserts. See tabels to verify correct ram insert partnumber for specific pipe size.
Are slips not setting correctly in clamping cones inside body?	Solutions in logical order: Lack of grease on back of slips. Apply grease frequently as listed in chapter maintenance. Slip hinge pins are not properly greased or have broken/ wrongly assembled torsion springs. Rams closing/slip setting sequence is not functioning properly. Slips set before rams are completely closed. Check minimum pressure differential between slips up and slips down hose of 2,100 psi (14,478 KPa). Dirt inside PS manifold may cause a malfunctioning of the sequence valves. Flush and/or clean PS manifold. Check proper pressure setting of sequence valve inside PS manifold. Valve should be set at 1,900 psi (13,100 KPa). Built-up of dirt inside a slip cylinder is preventing a full stroke of the cylinder. Inspect and assemble these cylinders.

3. Slips don’t work properly

The slips don’t retract / open up completely in raised position.

Problem	Possible solution
Is there a built up of dirt inside the body and/or on top of the ribs on the backside of the slips?	Take slips out of body regularly to clean slips and body.
Do slip hinge pins have too much friction?	Apply grease to hinge pins nipples on slips. Check whether torsion springs on slip hinge pins are broken / worn / have been wrongly assembled with the spring legs outside their retaining holes.
Is the piston inside one of the slip cylinders not fully stroking up?	Built-up of dirt inside a slip cylinder is preventing a full stroke of the cylinder. Inspect and assemble these cylinders. Piston inside one of the cylinders has come loose from the piston rod. Check correct internal assembly of slip cylinders.

4. The slips do not raise

Problem	Possible solution
Is hydraulic pressure high enough to raise slips?	Pressure in slips up hose is min. 2,300 psi (15,857 KPa). Back pressure in power down hose may not exceed 200 psi 1,378 KPa). Check pressure and back pressure in hydraulic lines between Hydraulic Power Supply and HUK manifold. Check in-line filters in PS hydraulic system are not clogged up. Filters in HUK manifold must be cleaned/replaced. Check proper functioning of quick disconnects in hydraulic lines between HUK manifold and PS. Return filter on HPU is clogged up. Replace or clean.
Is there lack of lubrication on clamping cones resulting in too much friction on upward slip movement?	Frequently grease back of slips as outlined in chapter maintenance. Check proper and equal grease distribution over all ribs/ clamping cones inside body. Check condition of grease supply and grease outlets if applicable.
Is directional control valve on HUK manifold malfunctioning?	Check for dirt in hydraulic system that is causing a malfunctioning of the valve. Check for high back pressure in return line to HPU and/or in non-pressurized hose running to PS that may cause a malfunctioning of the valve.

5. The slips don’t move up or down

Problem	Possible solution
Is hydraulic pressure supplied to the PS?	Pressure in slips up hose should be 2300 psi (15,857 KPa). Back pressure in power down hose may not exceed 200 psi (1,378 Kpa) Check hydraulic hoses are connected to PS. Check ball valve in slips down hose is open.

6. Sagging slips

The slips sag when Hook Up manifold is isolated from power supply

Problem	Possible solution
Are Non-Leaking seals in left hand slip cylinder are worn out?	Replace piston seals in left hand cylinder.
Is Anti-sagging Pilot Operated Check valve (POC) in PS manifold malfunctioning?	Dirt inside POC valve is causing leakage over valve. Clean and inspect valve and reinstall. Parts of POC valve are defect. Replace valve.
Tubing connection leaking?	Tighten or replace.
Internal pressure relief valve inside LH actuator leaking or defect	Tighten or replace

7. Faulty signal

Incorrect (double, faulty, absent, continuous etc) slips down / slips up signal is observed while slips are travelling up and down correctly

Problem	Possible solution
Is HUK manifold getting hydraulic signal from PS?	In logical order: Check condition of quick disconnects in signal hose. Check condition of accumulator. Check condition of inline filter in signal hose near HUK manifold. Check whether middle barrel port in right hand slip cylinder is not blocked. Check condition of piston seals in right hand cylinder. Replace seals if required.
Is pressure switch getting signal from HUK manifold?	Built-up of dirt inside HUK manifold may cause a malfunctioning of the signal valves SV1 or SV2. Clean/replace valves if applicable Pressure setting of SV1 or SV2 may be higher than actual system pressure. Valves should be set at 1,500 psi (10,342 KPa). Adjust if applicable (OLD SYSTEM). High back pressure in return line may cause malfunctioning of SV1 or SV2. Check DV3 (NEW SYSTEM).
Are pressure switches on HUK giving correct signal?	Dirt inside pressure switch may cause malfunctioning of switch. Setting of pressure switche(s) may be higher than actual system pressure. Check if pressure switches are correctly wired to control panel.
Is one of the slip set indicator valves malfunctioning	Replace malfunctioning valve.

8. The slips are travelling too slow

The slips are travelling up and/or down too slow. (Set/raise time should not exceed 6 seconds)

Problem	Possible solution
Hydraulic pressure supply to the PS sufficient?	In logical order: Check inline filters in PS hydraulic system are not dirty. Filters in HUK manifold must be cleaned/ replaced. Check condition of accumulator. Sequence valves inside PS are not opening properly. Check minimum pressure differential between slips up and slips down hose of 2,100 psi (14,478 KPa). Dirt inside PS manifold may cause. Malfunctioning of the sequence valves. Flush and/or clean PS manifold. Check proper pressure setting of sequence valve inside PS manifold. Valve should be set at 1,900 psi (13,100 KPa). Check available pressure to HUK manifold is 2,300 psi (15, 857 KPa)min. on pressure gauge near accumulator.
Is the hydraulic flow supply to the PS sufficient?	Check condition of quick disconnects in hoses running to PS. Check ball valve in slips down hose is fully open. Assemble flow meter in pressure line to HUK manifold and check flow is 5 GPM (19 l/min) minimum. A flow of 10 GPM (38 l/min) is recommended.

9. Problems with rams

Rams inside top cover do not open or close properly

Problem	Possible solution
Is the piston inside top cover cylinder fully stroking?	Built-up of dirt inside top cover cylinder may prevent a full stroke of the cylinder.
Is the knuckle on the top cover cylinder rod properly connected?	Check correct assembly of knuckle onto cylinder rod.
Is hydraulic oil leaking from top cover hinges?	Disassemble top cover hinge pins (2 per hinge) one at the time and check condition and replace seals if necessary.

10. Problems with insert carriers

The insert carriers are sliding inside the slips during tripping

Problem	Possible solution
Are the insert carriers properly locked in place by latches positioned on top of slips?	In logical order: Built-up of dirt on stop pads of latches is preventing the latches from falling properly over the insert carriers. Latches engage properly when their top surface it sitting horizontal after engagement. Is the latch spring in place or worn? Built-up of dirt on top of insert carriers is preventing the latches from properly falling over the insert carriers. Lifting hook on insert carriers is not falling down on its seat after assembly of the insert carrier, preventing the latch from falling properly over the insert carrier. Built-up of dirt on top of slip is preventing the insert carrier from sliding down far enough, preventing the latch from falling properly over the insert carrier.

11. Problems with the insert carriers

The insert carriers are hard to assemble into or disassemble from the PS slips

Problem	Possible solution
Is built-up of dirt preventing insert carriers from assembly?	Clean outer contour and retainer slot on insert carrier. Clean inner contour and carrier retainer on slip.
Is retainer slot on insert carrier matching with carrier retainer on slip?	Remove burrs from retainer slot on insert carrier. Check condition of carrier retainer on slip and replace if applicable.
Is the carrier quick release mechanism functioning?	Check latches on top of slip can move freely. Check lifting eye on top of insert carrier can move freely.

12. Problems with slips

The slips are hard to put in or out the PS

Problem	Possible solution
Are the slip mounting pins in center slip stuck?	In logical order: Check sliding hole inside center slip is not clogged up with mud or other debris. Check condition of mud drain hole in bottom of sliding hole. Check pins are properly greased. Check slip mounting pins are not bent. Check if correct slip assembly procedure as listed in manual is followed. The use of the ball valve in the slips down hose during slip changes is essential. Check presence and functionality of ball valve in slips down hose.
Are the handles on the slip mounting pins preventing these pins from fully retraction?	Ball headed grips on slip mounting pin handles must face towards the levers of the slip cylinders.

13. Problems with the inserts

The bottom row of the inserts in the insert carriers are cracking frequently and/or the teeth on the inserts are breaking off frequently

Problem	Possible solution
Are the inserts performing properly?	Check only genuine NOV inserts are used. The use of non-Varco inserts may seriously affect the functionality of the PS.
Check correct sized ram inserts are used.	Check insert carriers are dressed with bevelled inserts in the bottom row at all times. This is also applicable when non-reducing inserts are used.

14. The lifting eyes on the body bail

Problem	Possible solution
Have the lifting eyes been overloaded?	Never lift complete PS with top cover lifting eyes. Always lift PS using all 4 lifting eyes on body simultaneously. Only lift PS using dedicated Varco 4-way lifting sling with curved spreader bar. Replace the broken lifting eyes.
Have the lifting eyes been side loaded?	The lifting eyes on the body (hoist swivel rings) are designed for hoisting only and are not suitable to adopt side loads. Replace lifting eyes.

15. Problems with tubing

The hydraulic tubing inside the PS starts to leak after extended operation

Problem	Possible solution
Is the tubing moving during operation?	Slip cylinders are not properly attached to PS body. Regularly check pre-torque moments of cylinder assembly bolts. PS manifold is not properly attached to PS body. Regularly check condition of manifold assembly bolts. Top cover hinge blocks are not properly attached to PS body. Regularly check condition of hinge block assembly bolts.

Appendixes

Risk assessment acc. to EN14121-1

Conclusion Risk Assessment

In general, crew must:

- Wear personal safety protection like safety glasses, hard hat etc
- Follow instructions as stated in the manual
- Have knowledge of rig procedures
- Must have been instructed for safe use of the PS
- Always use secondary retention as established and implemented by NOV.

Applicable standards:

EN-982: Hydraulic Safety requirements for fluid power systems and their components

EN-1127-1: Explosion prevention and protection

EN-14121-1: Risk assessment

EN-13463-1 & 5: Non electrical equipment for potentially explosive atmospheres

EN-ISO 12100-1 Safety of machinery

ATEX-directive 94/9/EC

Machinery Directive: 2006/42/EC

API ISO 14693:2000 7K

Storage, transport, preservation & scrapping.

The following sections detail proper disassembly of the tool to comply with various environmental requirements.

Storage

When the PS is not being used for a longer period then 3 days the following steps should be carried out:

1. Remove the slip assembly.
2. Clean PS slip assembly.
3. Grease PS and slip assembly as described in checklist lubrication.
4. Place PS in closed position.
5. Grease all blank parts.
6. Use an extreme pressure, multi-purpose, lithium based grease of No. 1 or No. 2 consistency and multi grade motor oil.
7. Grease trigger finger-shaft.
8. Clean and cap hydraulic Quick Disconnect Couplings.

Transport

1. Lift the PS by the lifting eyes only.

2. The best way of transporting the PS is in its original crate. Use oiled paper and seal the box with plastic from leaking when stored outside. Secure the top.

Preservation

For short and long term preservation, see TSEL-0194.

Scrapping

1. The tool contains hydraulic fluids, grease, aluminium, steel, rubbers, plastic and several assembled components from undefined consistency or mixtures. The tool can be contaminated with mud.
2. When the tool is taken out of service it is recommended to disassemble the tool in a place where drainage for waste fluids is possible.

CAUTION: Hydraulic fluids, mud and grease are unsafe when touched by the skin. Always wear gloves and safety goggles when disassembly the tool.

3. Remove all quick-disconnects, hoses, cylinders and manifold block and bleed off hydraulic oil.
4. Clean the tool with a steam cleaner.
5. Remove the doors, latch, trigger valve, levers and remove all bronze wear parts.
6. Carry of to proper place for final storage or destruction.

NOTE: When the tool is taken out of service it is recommended to disassemble the tool in a place where waste fluids can be contained and properly disposed.

Torque values (US)

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
		Grade 8			Grade 8		
Dia.	**Threads per inch**	**Min. Torque (ft lb)**	**Max. Torque (ft lb)**	**Clamp force (lb)**	**Min. Torque (ft lb)**	**Max. Torque (ft lb)**	**Clamp force (lb)**
Coarse Thread Series, UNC							
1/4”	20	11.4	12.6	2860	8.6	9.5	2860
5/16”	18	24	26	3720	17.8	19.7	3720
3/8”	16	43	47	7000	32	35	7000
7/16”	14	67	74	9550	50	55	9550
1/2”	13	105	116	12750	78	87	12750
9/16”	12	143	158	16100	107	118	16100
5/8”	11	209	231	20350	157	173	20350
3/4”	10	361	399	30100	271	299	30100
7/8”	9	570	630	41600	428	473	41600
1”	8	855	945	54500	641	709	54400
1 1/8”	7	1216	1344	68700	912	1008	68700
1 1/4”	7	1729	1911	87200	1297	1433	87200
1 3/8”	6	2261	2499	104000	1696	1874	104000
1 1/2”	6	3002	3318	126500	2252	2489	126500

Tensile strength=150,000 psi. Proof strength=120,000 psi.

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
		Grade 8			Grade 8		
Dia.	**Threads per inch**	**Min. Torque (ft lb)**	**Max. Torque (ft lb)**	**Clamp force (lb)**	**Min. Torque (ft lb)**	**Max. Torque (ft lb)**	**Clamp force (lb)**
Fine Thread Series, UNF							
1/4”	28	13.3189	14.7	3280	10	11	3280
5/16”	24	24	26	5220	17.8	19.7	5220
3/8”	24	48	53	7900	36	39	7900
7/16”	20	76	84	10700	57	63	10700
1/2”	20	114	126	14400	86	95	14400
9/16”	18	162	179	18250	121	134	18250
5/8”	18	228	252	23000	171	189	23000
3/4”	16	399	441	33600	299	331	33600
7/8”	14	627	693	45800	470	520	45800
1”	14	950	1050	59700	713	788	59700
1 1/8”	12	1368	1512	77000	1026	1134	77000
1 1/4”	12	1900	2100	96600	1425	1565	96600
1 3/8”	12	2584	2856	118400	1938	2142	118400
1 1/2”	12	3382	3738	142200	2537	2804	142200

Tensile strength=150,000 psi to 1” dia. Proof strength=120,000 psi.

Torque values (metric)

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
		Grade 8			Grade 8		
Diameter	**Threads per inch**	**Min. Torque (Nm)**	**Max. Torque (Nm)**	**Clamp force (N)**	**Min. Torque (Nm)**	**Max. Torque (Nm)**	**Clamp force (N)**
Coarse Thread Series, UNC							
1/4”	20	15.5	17.14	12870	11.7	12.9	12870
5/16”	18	32.6	35.4	16740	24.2	26.8	16740
3/8”	16	58.5	64	32500	43.5	47.6	31500
7/16”	14	91.1	100.6	42980	68	92.5	42980
1/2”	13	143	158	57380	106	118	57380
9/16”	12	195	215	72450	145.5	160	72450
5/8”	11	284	314	91580	213.5	235	91580
3/4”	10	491	542	135450	368	407	135450
7/8”	9	775	857	187200	582	643	187200
1”	8	1163	1285	245250	872	965	245250
1 1/8”	7	1654	1828	309150	1240	1370	309150
1 1/4”	7	2351	2598	382400	1764	1949	392400
1 3/8”	6	3075	3398	468000	2306	2549	468000
1 1/2”	6	4082	4512	569250	3062	3385	569250

		Bolts Lubricated with Light Machine Oil			Bolts lubricated with Anti-seize compound		
		Grade 8			Grade 8		
Diameter	**Threads per inch**	**Min. Torque (Nm)**	**Max. Torque (Nm)**	**Clamp force (N)**	**Min. Torque (Nm)**	**Max. Torque (Nm)**	**Clamp force (N)**
Fine Thread Series, UNF							
1/4”	28	18.1	20	14760	13.6	15	14760
5/16”	24	32.6	35	23490	24.2	26.8	23490
3/8”	24	65.3	72	35550	49	53	35550
7/16”	20	103	114	48150	77.5	86	48150
1/2”	20	155	171	64800	117	129	64800
9/16”	18	220	239	82130	165	182	82130
5/8”	18	310	343	103500	232	257	103500
3/4”	16	542	600	151200	406	450	151200
7/8”	14	853	943	206100	639	707	206100
1”	14	1292	1428	268650	970	1071	268650
1 1/8”	12	1860	2056	346500	1396	1542	346500
1 1/4”	12	2584	2856	434700	1938	2128	434700
1 3/8”	12	3514	3884	532800	2635	2913	532800
1 1/2”	12	4599	5083	639900	3450	3813	639900

Spare parts

NOTE: Please select below the appropriate valves and parts, depending on the configuration.

General HUK

Part number	Qty	Description
980052-1	1	Replacement filter element 30p-2 media 40-w

50004442 Ass'y HUK manifold

Part number	Qty	Description
93548-1S30N	2	Check valve cartridge, cxcd-xcn
94817-2AN	1	Pressure reducing cartridge, pbfb-lan
980016	1	Back connection pressure gauge:0-3500 psi
59000117-1	1	Flush valve, parker dm103ld cartridge
59000129	1	Hydr. pilot operated 4/2 cetop 03 valve, w/detend

50004511-1 Grease manifold ass'y

Part number	Qty	Description
94520-1cn	1	Cartridge relief valve, RPEC-LCN
94817-1AN	1	Cartridge pressure reducing valve, PBDB-LAN
979801-a6-2	1	Hydr. pilot operated 4/3 cetop 03 valve, w/o detend
203016	1	Pressure switch,eexd

Control valves

Part number	Qty	Description
112554-J2	1	24v/dc, eexd 4/3 valve, atos
112554-J3	1	110-120v/ac, eexd 4/3 valve, atos
112554-J4	1	220-240v/ac, eexd 4/3 valve, atos
979801-A4-3	1	Air pilot operated 4/3 valve, atos

Control box

Part number	Qty	Description
59000219-1	1	Logo! 24rc (ac), 24vdc 8 inputs & 4 outputs
59000220-1	1	Logo! expansion module dm8 12/24r, 24vdc 4 inputs & 4 outputs
59000219-2	1	Logo! 24rc (ac), 115-240vac 8 inputs & 4 outputs
59000220-2	1	Logo! expansion module dm8 12/24r, 115-240vac 4 inputs & 4 outputs
59000221	1	Logo! program module, yellow card

Spare parts Operational pn 202400-12

Part number	Description	Qty
979455-10	Expander 10mm	4
979504-5	Male connector with o-ring	1
51708-24-C	Bolt, shoulder socket head (unc-3a)	2
50004559-13	Tube rams close rh	1
56506-6-4-S	Elb, 90' ext pipe /37'	1
202294-1	Compression spring PS30	2
979504-6	Male connector with o-ring	1
53300-524	Cable tie tyton t120r	4
202289	Handle,center slips	2
50012-16-C8D	Screw, cap-hex hd (unc-2a)	8
979504-12	Male connector with o-ring	1
202226	Cylinder protection ring	2
50012-24-C8D	Screw, cap-hex hd (unc-2a)	2
56519-6-6-S	Elbow, o-ring boss /37'	9
94518-13HN	Sun counter balance valve	1
50004523	Rod end for hinge block PS30	4
50004576	Right-hand cam-block PS30	1
56506-4-4-S	Elb, 90' ext pipe /37'	1
51506-26	Pin, grooved taper	2
50004559-12	Tube rams open rh	1
50004559-1	Tube grease lh slip	2
50004575	Left-hand cam-block PS30	1
202393	Slip spring	4
53202	Fitting,grease,45 deg	4
53203	Fitting,grease,90 deg	2
50004559-11	Tube from indicator valve rh	1
50004559-6	Tube slips down lh	1
59001008-5	Chain, straight link, short,dia 5mm	1
202407	Lock bar for stationary hinge pin	1
50010-10-C8D	Screw, cap-hex hd (unc-2a)	18
56551-02-06-S	Connector,int pipe / o-ring boss	2
979504-3	Male connector with o-ring	1
979962-2538	Hydraulic u-cup seal	8
51302-223	Ring, back up-o ring	8
56529-6-6-S	Connector, o-ring boss /37'	10
56518-6-6-S	Elbow, 90' swivel int 37' /37'	8
50004559-14	Tube slips down rh	1
202263	Knuckle, ps21 centering device	2
202391	Hose assembly for centering device	4
56506-2-4-S	Elb, 90' ext pipe /37'	5
202210	Key for synchronisation shaft	2
56507-2-4-S	T adapter jic male/jic male/nptf	1
50006-12-C8D	Screw, cap-hex hd (unc-2a)	4
56529-4-4-S	Connector, o-ring boss /37'	1
56519-6-4-S	Elbow, o-ring boss /37'	1
979504-8	Male connector with o-ring	1
979942-4-4	Adapter o-ring boss / jic swivel	1
51008-C	Washer, lock-heavy	23

Part number	Description	Qty
51010-C	Washer, lock-heavy	10
979942-4-4	Adapter o-ring boss / jic swivel	1
56529-8-6-S	Connector, o-ring boss /37'	2
50004577	Shaft center-slip PS30	2
50010-8-C8D	Screw, cap-hex hd (unc-2a)	1
50008-6-C8D	Screw, cap-hex hd (unc-2a)	1
56519-4-4-S	Elbow, o-ring boss /37'	1
93547-1B30N	Sun pilot to open check valve	2
56519-4-6-S	Elbow, o-ring boss /37'	1
50910-C	Washer, lock-regular	18
50806-N-C	Washer, flat	4
202372	PS30 slip mounting pin	2
979935-2-4	Elbow 90deg bsp to jic	1
50004559-15	Tube slips up rh	1
50004559-10	Tube to indicator valve rh	1
50004559-9	Tube signal rh actuator	1
50004559-8	Tube grease rh slip	1
50004559-7	Tube slips up lh	1
50004559-5	Tube rams close lh	1
50004559-4	Tube rams open lh	1
56548-4-4-S	Swivel, 45 deg	1
56529-6-4-S	Connector, o-ring boss /37'	1
56526-6-6-S	Tee, 37' /37' /swivel int 37'	2
979504-4	Male connector with o-ring	1
93547-1B30N	Sun pilot to open check valve	2
59000142-1	Inline standard non-return valve	1
50012-72-C8D	Screw, cap-hex hd (unc-2a)	4
202203-41	Seal kit for l.h. actuator	1
50010-24-C8D	Screw, cap-hex hd (unc-2a)	8
979512-10	Plug 7/8"-14 un o-ring socket type	1
979512-2	Plug 9/16-18 sae o-ring socket type	1
979512-1	Plug 3/4"-16 un o-ring socket type	1
980473-2	Hoist swivel ring adb, modified	4
202306	Greasing sticker, warning	2
948051-2	S-hook	3
7887	Lynch pin	3
30107236-1AN	Direct acting sequence valve	1
979485-15	Lock washer s.s. din 432-17a2	4
50006-8-C8D	Screw, cap-hex hd (unc-2a)	6
50006-5-C8D	Screw, cap-hex hd (unc-2a)	2
50006-4-C8D	Screw, cap-hex hd(unc-2a)drilled	4
202290	Ring,centerslips	1
202283	Latch-pin	6
50906-C	Washer, lock-regular	20
50008-12-C8D	Screw, cap-hex hd (unc-2a)	12
202349-25	Grease restrictor 2.5mm	6
202349-15	Grease restrictor 1.5mm	3
50004531	Pin,cover plate lock	2
56526-4-4-S	Tee, 37' /37' /swivel int 37'	1

Part number	Description	Qty
53000-2	Plug,external pipe- countersunk hex	4
50012-18-C8D	Screw, cap-hex hd (unc-2a)	4
979966-1	Relief valve 1/8"-27npt	2
51012-C	Washer, lock-heavy	10
949708-223	O-ring id 1.599/1.619 thck	8
202204-41	Seal kit for rh actuator	1
50008-22-C8D	Screw, cap-hex hd (unc-2a)	4
50010-16-C8D	Screw, cap-hex hd (unc-2a)	4
50004559-3	Tube to lh indicator valve	1
53201	Fitting,grease,straight	20
979512-3	Plug 7/16-20 sae o-ring socket type	2
979532-2-4	Nipple, straight, bsp to jic	1
50008-8-C8D	Screw, cap-hex hd (unc-2a)	8
939352-66	Washer, lock-light series	4
202349-50	Grease restrictor 5mm	3
56557-6-6-S	Elbow, 45' o-ring boss /37'	1
56557-6-6-S	Elbow, 45' o-ring boss /37'	2
979386-5	Compression spring	6
51708-16-C	Bolt, shoulder socket head (unc-3a)	1
56518-4-4-S	Elbow, 90' swivel int 37' /37'	2

Drawings + Test procedures

Test procedures

Drawing number	Name
TSEL 0035	Inspection criteria for PS 21 standard, PS21/PS30 TC+CD
TSEL 0050	Test spec. HUK PS21/30
TSEL 0054	PS 21/30 Slip assembly test

Dimensional drawings

Drawing number	Name
DD-202400-3	PS30 National
DD-202400-5	PS30 Varco
DD-202430-5	Dimensional drawing slip assembly 6 5/8 “ - 16”
DD-202430-2	Dimensional drawing slip assembly 18 5/8” - 20”
DD-202433-5	Dimensional drawing slip assembly 2 3/8” - 10 3/4”

Assembly drawings

Drawing number	Name
202400-3	PS30 National
202400-5	PS30 Varco
202430-5	PS30 slip ass'y 4-$^{1}/_{2}$ - 16 inch
202430-2	PS30 slip ass'y 18-$^{5}/_{8}$ - 20 inch
202433-5	PS30 slip ass'y 2-$^{3}/_{8}$ - 11-$^{1}/_{8}$ inch
202375-1	PS30 Left hand top cover ass'y
202375-2	PS30 Right hand top cover ass'y
202203-55	Actuator LH
202204-55	Actuator RH
50004730	Direct acting relieve valve
50004722	Piston rack assembly L.H.
50004727	Piston rack assembly R.H.
202384-1	RAM cylinder assembly PS30
50004590-2	Manifold PS30 in combination with RST
50004590	Manifold PS30
50004550-30	Lift tool hand-slip bowl #1 PS30
50004551	Lifting tool for PS slip assembly
50004552	Operating tool for PS slip handles
50004600(-)	Lifting-Hook Insert-carriers
200982-1	Four way lifting sling S.W.L 6.0 Ton
202458	Closed hatch plate PS30
202459	Bit breaker plate PS30
50004446	General HUK-drawing
50004725	Hydraulic schematic
50004591-1	Indicator valve RH
50004585-1	Indicator valve LH
50004525	Ram insert wear piece set
202386	Assembly ram insert
202386-775	Assembly ram insert
202271 (-)	DC insert carrier assembly
202369(-)	Insert carrier assembly
202445 (-)	Insert carrier assembly

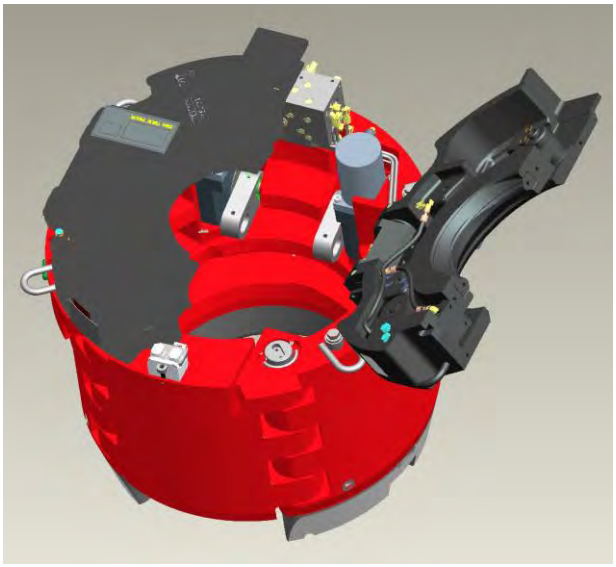
204702 Inline filter

Critical area drawings

Drawing number	Name
CA-257	Critical area's PS30 body
CA-258	Critical area's door PS30
CA-260	Critical area's PS30 cover plate
CA-265	Critical area's PS30 insert carriers
CA-330	Critical area's PS30 center slip
CA-331	Critical area's PS30 side slip

NATIONAL OILWELL VARCO

TEST SPECIFICATION
PS21/30



Configuration *:_____*

Part Description *:_____*

Part Number *:_____*

Serial Number *: NL _____*

Shop Order *:_____*

Final inspection "Operator": *_____Name, _____Signature*

Final inspection "Quality Inspector": *_____Name, _____Signature*

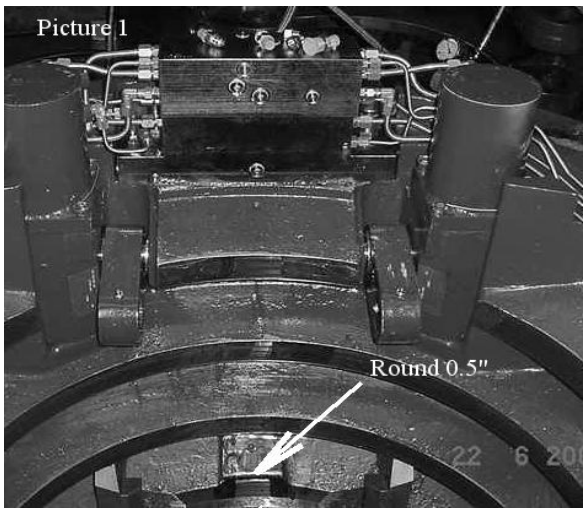
Final inspection "Picker": *_____Name, _____Signature*

ORIGINAL DOCUMENT		LATEST REVISION	
Name:	P.G. Frank	Name	N.Uitdehaag
Date:	4 Februari 1998	Date	7 June 2011
Drawing type:	Word document.	ECN	701969

Varco BJ B.V. Nijverheidsweg 45 4879 AP Etten-Leur The Netherlands Tel: +31-76-5083000 Fax: +31-76-5046000	Revision: **H**	Document No.: **TSEL-0035**	Description: **Inspection criteria for PS21/30**	Sheet: **1 of 9**

1. Assembly

		Initials required; Operator	Quality Inspector
1.1.	***Check marking on presence, legibility and verify with shop order;***		
1.1.1.	***Part number:_____***		
1.1.2.	***Serial number:_____***		
1.1.3.	***Rating:_____***		
1.2.	***Check if the hoist ring receiving holes are clean, not damaged and machined 90º with mating surface.***		
1.3.	***Check that the grease channels are free from burrs, oil etc.***		
1.4.	***Verify if slip sliding path has been rounded R 0.5"±0.1". See picture.***		

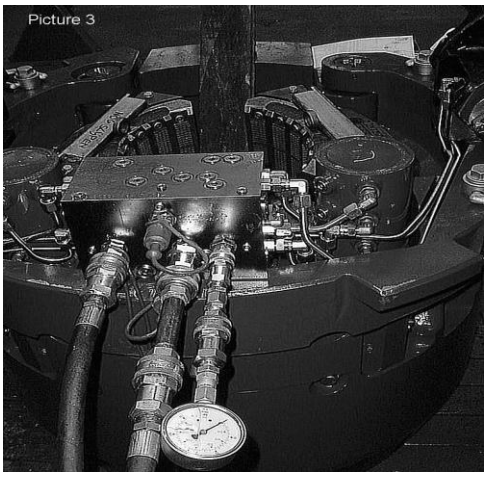


1.5.	***Verify that the correct size grease restrictors are installed accordance drawing.***		
1.6.	***Verify the door can be opened minimum 90° by hand.***		

1.7.	***Verify that removable door hinge pin can be replaced by hand.***		
1.8.	***Verify that the left and right cam blocks are properly installed. (Only PS30)***		
1.9.	***Verify that the actuators are in full contact with the mounting surfaces.***		
1.10.	***Verify that the cylinder protection rings are installed.***		
1.11.	***Verify that the rotary table locks are functioning properly. (Check with top covers assembled on the PS and closed position)***		
1.12.	***Check position of the top covers closed, confirm that it lies flat on the body en it's free from other components.***		
1.13.	***Check if the position of the top covers opened is accordance drawing.***		
1.14.	***Verify that the safety chain is welded on the top cover lock and the lynch pin is attached to it.***		
1.15.	***Verify that all warning, name and information plates have been placed.***		
1.16.	***Verify that the nameplate is correctly marked.***		
1.17.	***Check that all parts are present and assembled in accordance with the drawings.***		
1.18.	***Check whether all bolts are on torque and secured by lock wire, tab washers, loctite or cotter pins in accordance with the drawings.***		

2. Functioning

		Initials required; Operator	Quality Inspector
2.1.	***Check a proper functioning of the top cover lock. (Be aware, door must be lifted)***		
2.2.	***Check that the bit breaker plate is available and lies flat on the top cover.***		
2.3.	***Check the QD sizes on the manifold are accordance drawing and connect the PS on the hydraulic system.***		
2.4.	***Control the actuators of the PS and the cylinders of the top cover several times in and out to remove air out of the system.***		
2.5.	***Install a pressure gauge on the signal port and adjust the pressure to 2500±50 PSI (no slips installed)and command slips up and check for a slips up signal command slips set and there should be no signal. (Slip set indicator valves are not triggered)***		
2.6.	***Install a set of qualified slips and grease the body and slip cones with autol top-2000 grease.***		
2.7.	***Command slips up and check if the slip is free from the actuators.***		
2.8.	***Command slips up and check for a slips up signal***		
2.9.	***Command slips set and check for a slip set signal when the slips are set on pipe and slip set indicator valves are triggered.***		
2.10.	***Command slips set and check for an absence of a slip set signal when the slips are down and tilted, the slip set indicator valves are not triggered. This can be obtained by a wooden beam in between the left and right hand slip. See picture.***		



2.11. ***Install a calibrated pressure gauge on the slips down and slips up hose. Command slips up. Adjust pressure at 1500 PSI and command slips set. Increase pressure and check what pressure the sequence starts (must start at 1900 PSI differential between slips down and slips up hoses , ± 50 PSI)When setting not correct, adjust the sequence valve on the PS manifold block.***

2.11.1. ***List calibration number of gauge:_____***

2.11.2. ***List actual pressure slips down hose:_____PSI***

2.11.3. ***List actual pressure slips up hose :_____PSI***

2.12. ***Check the operating sequence. Adjust the pressure to 2500 PSI at 5 GPM / 20 Litres/min.***

2.12.1. ***Slips set cycle: rams close first, then the slips set. Slips set cycle time:_____secconds (max. 6 sec.)***

2.12.2. ***Slips up cycle: slips rise first, then rams open. Slips up cycle time:_____seconds (max. 6 sec.)***

2.13. ***Make 5 slips set and up cycles and check for a flawless movement of the slips.***

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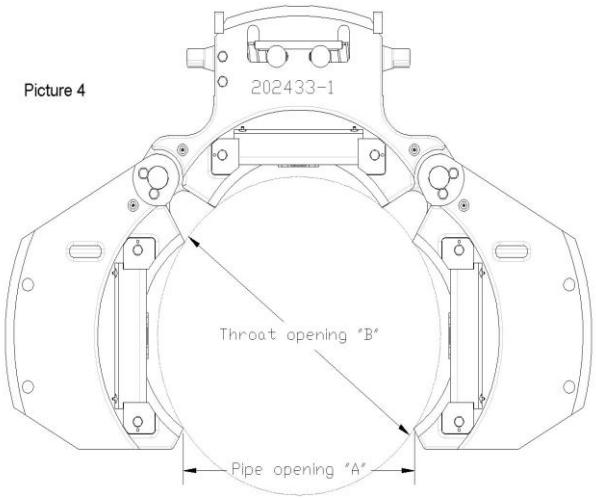
2.14. ***Command slips up and verify that the left hand and the right hand slip can move free and do not interfere with the PS body.***

2.15. ***Command slips up and check pipe/throat opening A and B according table. Note down the measured values and the NL number of the slip. NL_____***

Picture 4



Slip assembly	Pipe opening A minimum	A measured	Throat opening B minimum	B measured
202250-2	14.25”		Ø 17.5”	Ø
202250-5	14.25”		Ø 17.5”	Ø
202253-2	12.75”		Ø 15.5”	Ø
202430-2000	20.25”		Ø 24”	Ø
202430-3	18.38”		Ø 23”	Ø
202430-5	16.50”		Ø 23.5”	Ø
202433-5	13”		Ø 17.5”	Ø

2.16. ***Cycle test: Run the slips through the following load cycles. Hydraulically raise and set the slips between every cycle. Hydraulic power down pressure has to be applied to the actuators at all times during load cycle. The slip and body assembly must pass all cycles without sticking. In case of sticking, remove slips from body, clean body and slip tapers and inspect the body and slip tapers. In case of damaged tapers, buff the tapers, re-grease the tapers and repeat the test until slip and body assembly passes all cycles successfully. If the slip or body assembly fails this test more than 1 time, stop testing and inform engineering.***

Note down mandrill diameter : _____

Cycle nr.	Applied load ShTons/Mton	Load hold time in seconds	Run 1	Run 2
1	275 / 250	30		
2	275 / 250	30		
3	275 / 250	30		
4	275 / 250	30		
5	330 / 300	30		
6	330 / 300	30		
7	330 / 300	30		
8	330 / 300	30		
9	385 / 350	30		
10	385 / 350	30		
11	385 / 350	30		
12	385 / 350	30		
13	385 / 350	30		
14	385 / 350	30		
15	385 / 350	30		

2.17. ***Check if slips stay up for at least 2 hours without hydraulic pressure supply. Raise the slips then disconnect the PS from the pressure supply and connect drain hoses to the slips up and set port. Load up the slips with extra weight.***

2.18. ***Open and close the top covers 5 times while under pressure (2500PSI). No leakage shall occur.***

2.19. ***Pressure proof test at 3100±100PSI. Check whether no leakage occurs when pressurized for 5 minutes minimum.***

2.19.1. ***Slips up at 3100±100PSI. No leakage occurs.***

2.19.2. ***Slips set at 3100±100PSI. No leakage occurs.***

2.20. ***Oil cleanness test. Use the tapped oil for an oil clean test and verify it is as a minimum:***

SAE AS 4059 Class 9
ISO 4406: 1999 Class 19/17/14
NAS 1638 Class 8

2.21. ***Remove the slip out of the PS and clean and inspect the body and slip tapers. In case of damage buff the tapers.***

2.22. ***Apply grease to all grease fittings until clean grease comes out on the appropriate surfaces. (Free from burrs, oil etcetera)***

2.23. ***Prior to paintjob;***

2.23.1. ***Check presence and correctness of API marking.***

2.23.2. ***Clean PS from oil, grease and dirt.***

2.23.3. ***Check if manufacture instructions are attached to the hoist swivel rings.***

2.23.4. ***Complete the traceability information table.***

2.23.5. ***Grease PS body tapers.***

3. REMARKS

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A Varco Company

TEST SPECIFICATION
H.U.K. PS-21/30

Shop Order :_____

Part Number H.U.K. :_____

Part Description :_____

E-Serial Number control plate :_____

Test Technician Name :_____

3rd Party Witness Agency :_____

3rd Party Witness Name :_____

3rd Party Witness Signature :_____

Test Date :_____

Remarks :_____
_____
_____

ID SERIAL CODE	HUK:

	Name:	Date
Prepared	L.Sonneveld	30 june „98
Checked	H. Bakkers	30 june „98
Approved	H. Tiebout	30 june „98

Rev.	ECN	Name	Date	Checked
G	601209	L. Sonneveld	22 aug. 03	R. Mulder
B	546902	L. Sonneveld	01 june „99	H. Bakkers
A	549601	L. Sonneveld	30 june „98	H. Bakkers

Document No.: **TSEL 0050**

Title: **TEST SPEC. H.U.K. PS-21/30**

This specification defines the production testing and inspection of the PS-21/30 H.U.K. The H.U.K. consist of a control plate, pressure filter, hoses and control box for in drillers cabin. Each H.U.K. must be tested in combination with the PS-21/30. Any discrepancy is cause for discontinuing the test until the discrepancy has been eliminated. In the event of a major discrepancy whose repair would affect items previously inspected or tested, the affected items shall also be re-tested or re-inspected after the discrepancy has been eliminated.

1.0 INSTALLATION

Before you hookup the H.U.K. to a PS-21/30 first check to following items.

1) Are the pressure switches, solenoid valve and J-box electrical connected according drawing 50004446. (additional DWG"s 203062, 50004453-4)
2) Are the tubing properly and tight enough connected.
3) Before you put on the Power-unit check if everything is properly connected.
4) Adjust the Pressure on the Power unit at 2500 PSI, and the flow at 10 GPM (40 L/min.)
5) For connecting the "Control Console" see drawing 50004446.
   Before you operate the Solenoid valve be aware that you **ADJUST THE CORRECT VOLTAGE ON THE "CONTROL CONSOLE".**

2.0 PRESSURE SETTING PC1 (SYSTEM PRESSURE)

The Pressure Reducing Valve PC1 (PBFB-LAN) is standard adjusted at **2500 PSI**. Manifold 50004442.
This is MAXIMUM operating system pressure to control PS-21/30.
To adjust set HPU above 2500 PSI.

_____ OK

2.1 PRESSURE SETTING REDUCING VALVE (FLUSHING)

The Pressure Reducing Valve PC2 (PBFB-LAN) is standard adjusted at **1500 PSI**. Manifold 50004442.
This is the pressure during flushing.

_____ OK

2.2 PRESSURE SETTING RELIEF VALVE (GREASE PUMP)

Manifold 50004511-1.
The Pressure Relief Valve PR1 (RPEC-LCN) must be adjusted to approx. **1700 PSI**. This is SAFETY for operating system pressure to control grease pump.
To adjust the PR1, pressure reducing valve PC2 (PBDB-LBN) has to be set at 1700PSI. Turn PR1 fully in, than turn PR1 out, until you hear the oil release to tank.
.

_____ OK

2.3 PRESSURE SETTING REDUCING VALVE (GREASE PUMP)

Manifold 50004511-1.
The Pressure Reducing Valve PC2 (PBDB-LAN) must be adjusted at **1500 PSI**.
This is the MAXIMUM pressure to control the grease pump.

_____ OK

3.0 PRESSURE SETTING OF LOW ALARM PRESSURE SWITCH PS1

Pressure Switch PS1 (E12) is normally closed and set at **2000 PSI**.
Start with a low pressure on the Power unit and raise the pressure slowly up to 2000 PSI, than adjust the Pressure Switch PS1. The Pressure Switch PS1 has to give a signal when the System Pressure is below 2000 PSI.

_____ OK

3.1 PRESSURE SETTING OF SLIPS UP PRESSURE SWITCH PS2

Pressure Switch PS2 (E13) is normally open and set at **1600 PSI**.
Verify 1600 PSI pressure setting of pressure switch PS2. Slips have to be command to UP and pressure has to be provided to port S1.
If you don"t have a signal check first that you have a signal on the S1 port of the PS-21/30 manifold. If yes than check the pressure off B1 (slips UP).
Still no signal check valve DV3 works properly.

_____ OK

3.2 PRESSURE SETTING OF SLIPS SET PRESSURE SWITCH PS3

Pressure Switch PS3 (E11) is normally open and set at **1800 PSI**.
Verify 1800 PSI pressure setting of pressure switch PS3. Slips have to be command to SET and pressure has to be provided to port S1.
If you don"t have a signal check first that you have a signal on the S1 port of the PS-21/30 manifold. If yes than check the pressure off A1 (slips SET).
Still no signal check valve DV3 works properly.

_____ OK

3.3 PRESSURE SETTING OF GREASE EMPTY INDICATION PRESSURE SWITCH PS4

Pressure Switch PS4 (E17) grease empty indication is normally open and set to accommodate grease empty indication: **1000-1200 PSI**.

_____ OK

4.0 FUNCTIONAL TEST

Operate PS for 25 times minimum.
When the Control valve is a Solenoid valve than control the valve by using "control-console".

_____ OK

Verify that pressure gauge PG2 gives a reading only when slips are UP and not when slips are SET.
Pressure read out is the same as system pressure (2500 PSI).

_____OK

Verify that pressure gauge PG3 gives a reading only when slips are SET and not when slips are UP.
Pressure read out is the same as system pressure (2500 PSI).

_____OK

Verify that auto greaser starts pumping after 25 cycles slips up.

15 seconds to center slips _____OK

25 seconds to side (L/R) slips _____OK

Verify operation of manual override to start pump cycle.
Indication light should not flash while pumping.

_____OK

Verify grease empty indication.
Indication light on when pressure in grease lines is to low, depending on pressure switch setting.

_____OK

Verify operation flushing valve.
By reversing the flow to PS, signal and operating lines will be cleaned out.
(NO visual check possible)

_____OK

4.1 CYCLE TIME

The cycle time for Slips up and Slips set should NOT exceed 5 seconds.

Slips Up : __sec. _____OK
Slips Set : __sec. _____OK

5 CONTROL BOX DRILLERS CABIN

IF APPLICABLE: Verify functions and indications on control box.
Operational switches and/or indication lights according applicable DWG"s.

Part number:._____

_____OK

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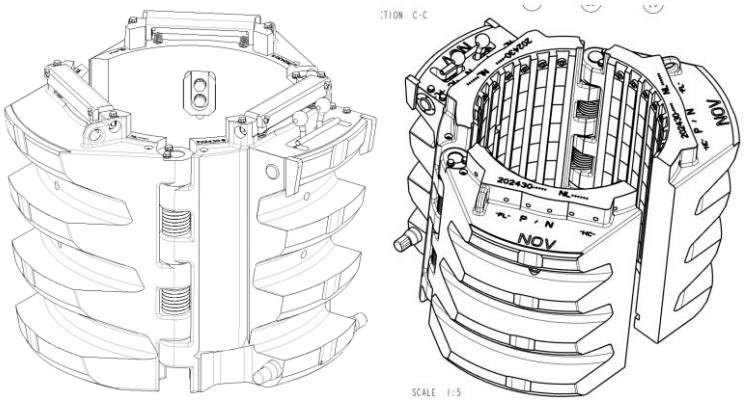
TEST SPECIFICATION
PS-21/PS-30 slip assembly



Configuration

:SLIP ASSEMBLY

: 202250-5:	*11 1/8"- 2 3/8"*	☐	*: 202253-1188: 11 7/8"*	☐
: 202433-5:	*11 1/8"- 2 3/8"*	☐	*: 202253-1175: 11 ¾"*	☐
: 202430-5:	*16"- 4 1/2"*	☐		
: 202250-1400: 14"		☐	*: 202430-2000: 20"*	☐
: 202250-1363: 13 5/8"		☐	*: 202430-1875: 18 3/4"*	☐
: 202250-1350: 13 1/2"		☐	*: 202430-1863: 18 5/8 "*	☐
: 202250-1338: 13 3/8"		☐	*: 202430-1800: 18"*	☐
: 202250-1300: 13"		☐	*: 202430-1788: 17 7/8"*	☐
: 202250-1275: 12 3/4"		☐		

Serial Number *:_NL:_____*

Part Number *:_202_____*

Part Description *:_____*

Shoporder no: *:_____*

Test Date *:_____*

Final inspection "Operator": _____*Name,* _____*Signature*

Final inspection "Quality Inspector": _____*Name,* _____*Signature*

Final inspection "Picker": _____*Name,* _____*Signature*

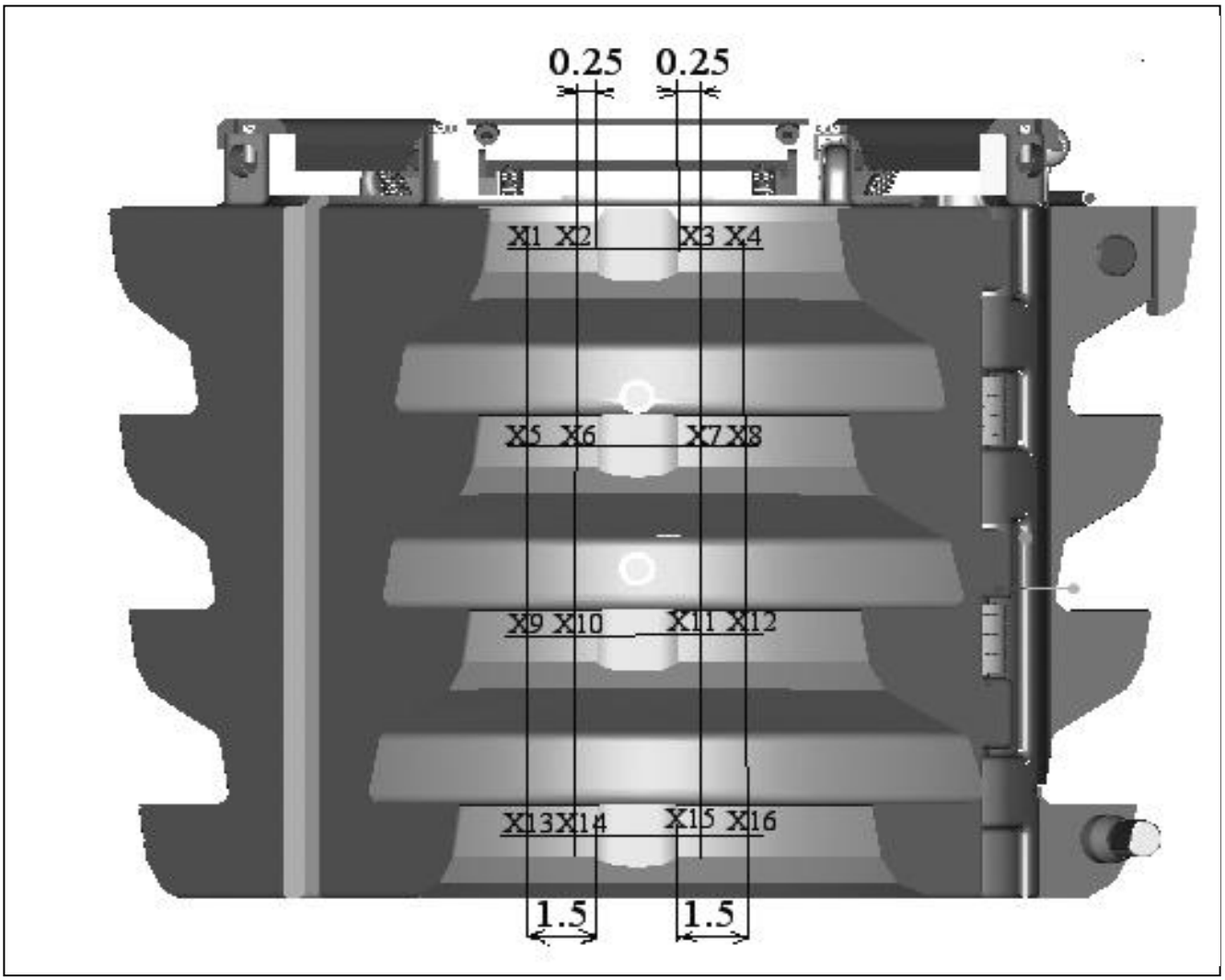
Test Technician (Outside vendor);
Needs to fill out sheets 3 up to and incl. sht.5 and sign off here.
Name, date, and Signature
_____*Name,* _____*Date,* _____*Signature*

1. Contents

1.- Contents
2.- Hardness check
3.- General
4.- Assembly
5.- Lubrication
6.- Functional
7.- Paper test
8.- Final inspection

2. Hardness check (outside vendor).

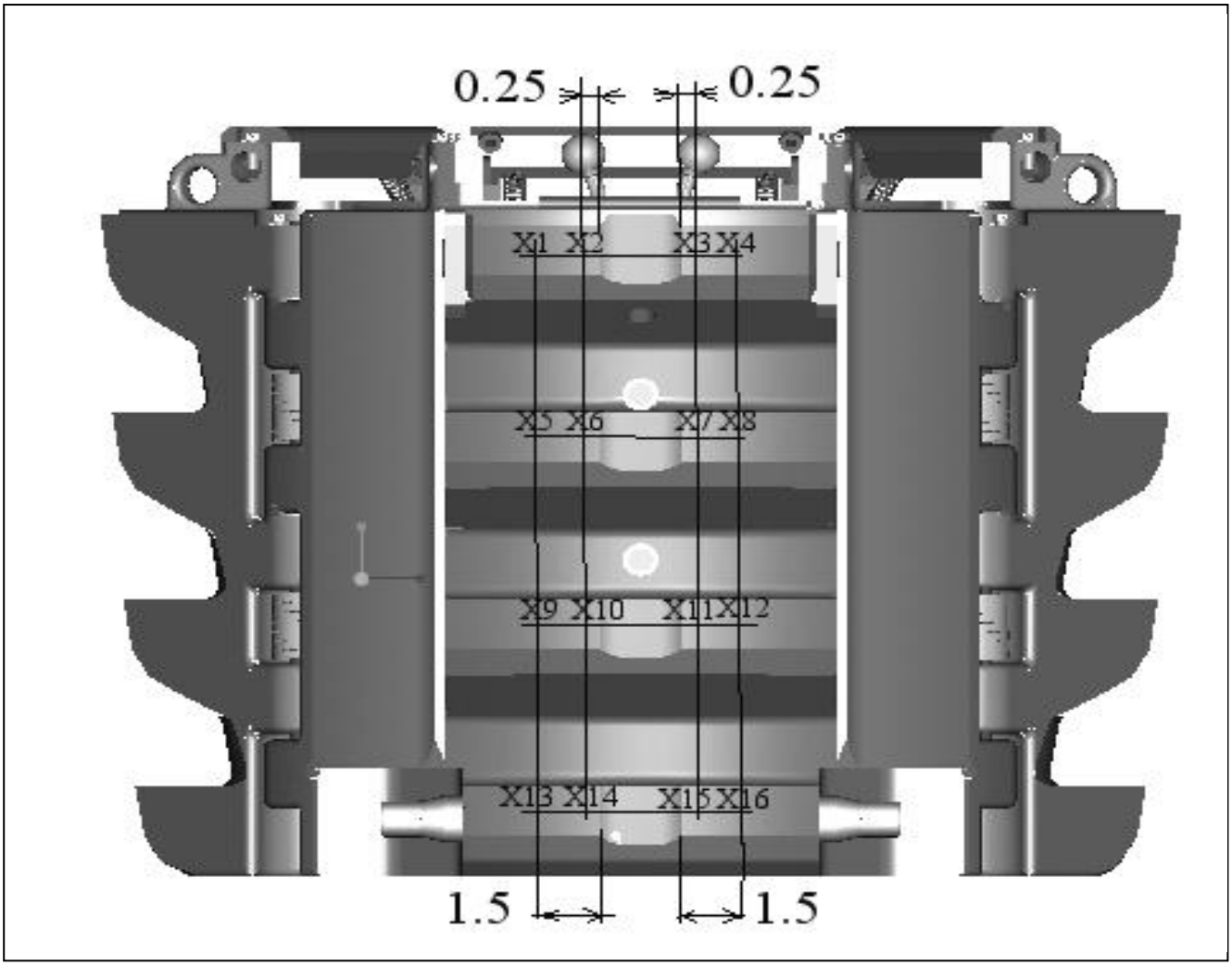
2.1. Left-hand-slip:



X1	*Hrc.*	*X9*	*Hrc.*
X2	*Hrc.*	*X10*	*Hrc.*
X3	*Hrc.*	*X11*	*Hrc.*
X4	*Hrc.*	*X12*	*Hrc.*
X5	*Hrc.*	*X13*	*Hrc.*
X6	*Hrc.*	*X14*	*Hrc.*
X7	*Hrc.*	*X15*	*Hrc.*
X8	*Hrc.*	*X16*	*Hrc.*

Note:
Hardness measure of left-hand-slip:
For PS21 slips (PN;202250% and 202253%) measurement points ;X13,X14,X15,and X16 are not applicable.
Hardness must be from 47 Hrc up to 60 Hrc.

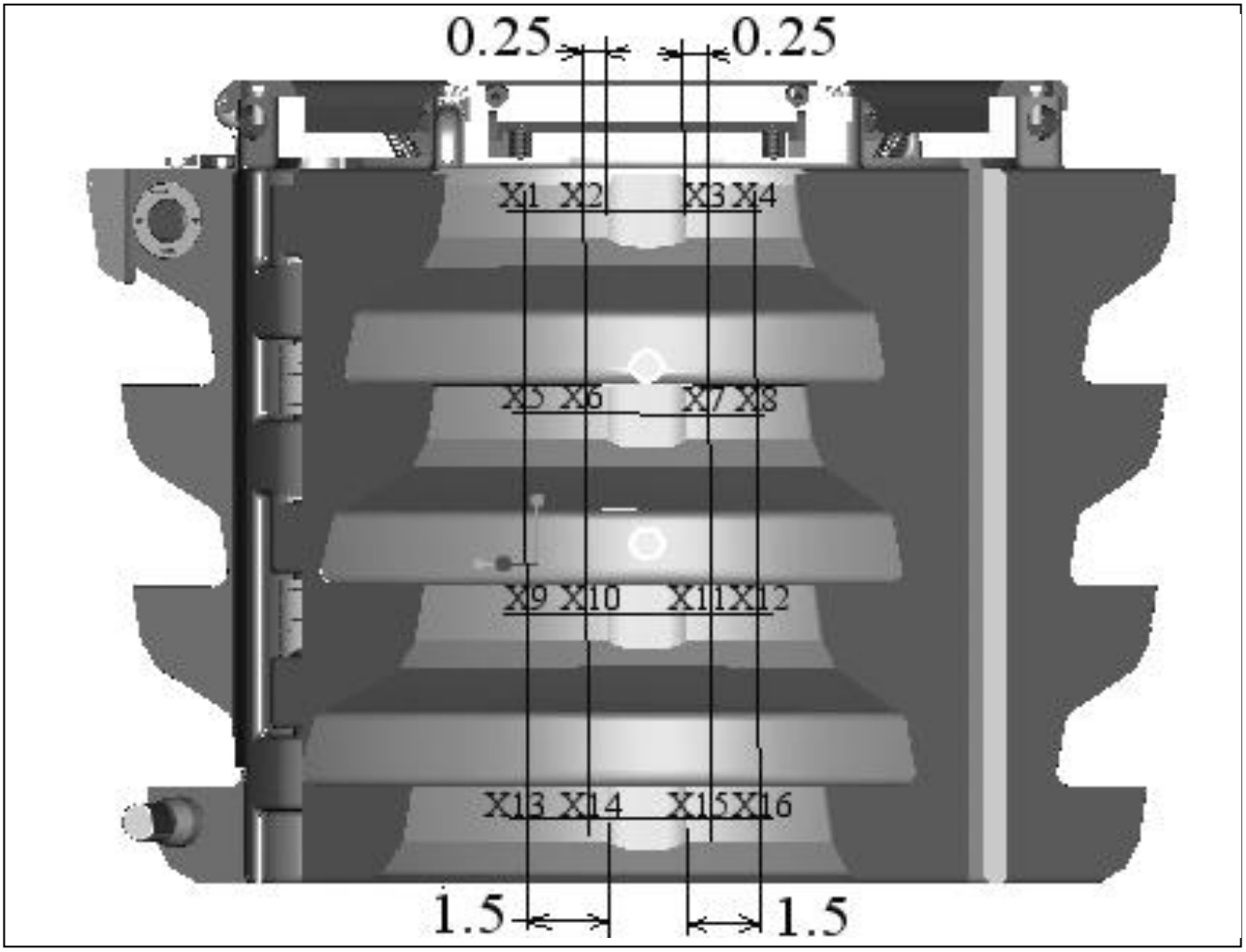
2.2. Center-slip:



X1	*Hrc.*	*X9*	*Hrc.*
X2	*Hrc.*	*X10*	*Hrc.*
X3	*Hrc.*	*X11*	*Hrc.*
X4	*Hrc.*	*X12*	*Hrc.*
X5	*Hrc.*	*X13*	*Hrc.*
X6	*Hrc.*	*X14*	*Hrc.*
X7	*Hrc.*	*X15*	*Hrc.*
X8	*Hrc.*	*X16*	*Hrc.*

Note:
Hardness measure of center-slip:
For PS21 slips (PN;202250% and 202253%) measurement points ;X13,X14,X15,and X16 are not applicable.
Hardness must be from 47 Hrc up to 60 Hrc.

2.3. Right-hand-slip:



X1	*Hrc.*	*X9*	*Hrc.*
X2	*Hrc.*	*X10*	*Hrc.*
X3	*Hrc.*	*X11*	*Hrc.*
X4	*Hrc.*	*X12*	*Hrc.*
X5	*Hrc.*	*X13*	*Hrc.*
X6	*Hrc.*	*X14*	*Hrc.*
X7	*Hrc.*	*X15*	*Hrc.*
X8	*Hrc.*	*X16*	*Hrc.*

Note:
Hardness measure of right-hand-slip:
For PS21 slips (PN;202250% and 202253%) measurement points ;X13,X14,X15,and X16 are not applicable.
Hardness must be from 47 Hrc up to 60 Hrc.

3. GENERAL.

Initials Required
Operator *Quality Inspector*

Check for presence of Part numbers, Heat codes and Serial numbers.

3.1.	*Part number*	*Foundry*	*Heat code*	*Oven charge Number(s)*		
Center slip						
Left hand slip						
Right hand slip						

3.1.1 Check that the assembly has been M.P.I.tested

3.2. Serial-number of slip assembly: NL……..

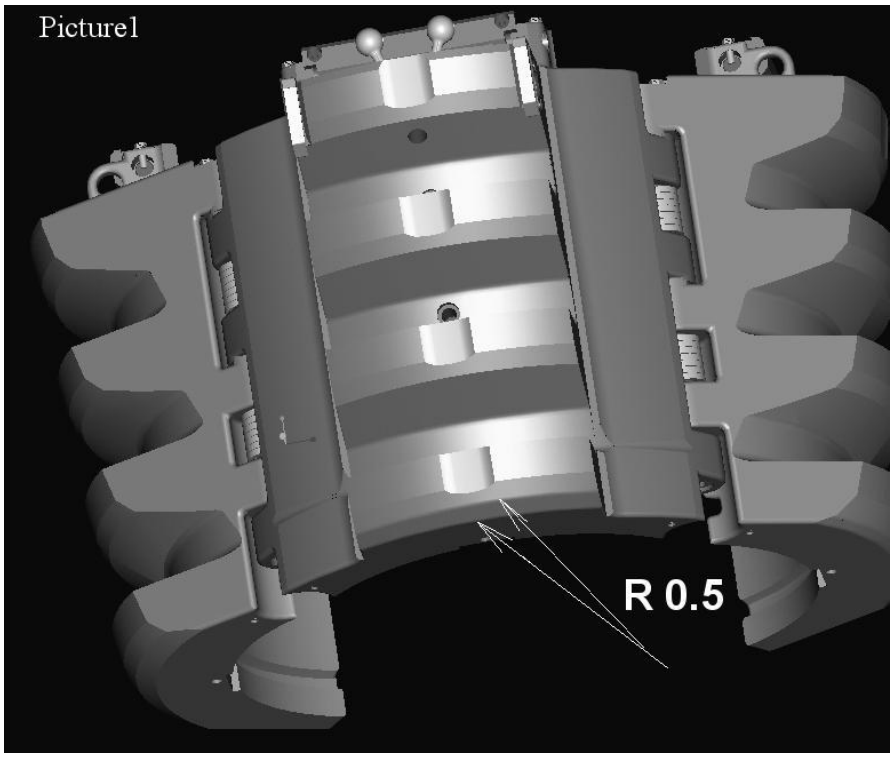
3.3. Part-number of slip assembly: ……..

3.4. Check all sharp corners are properly de-burred.

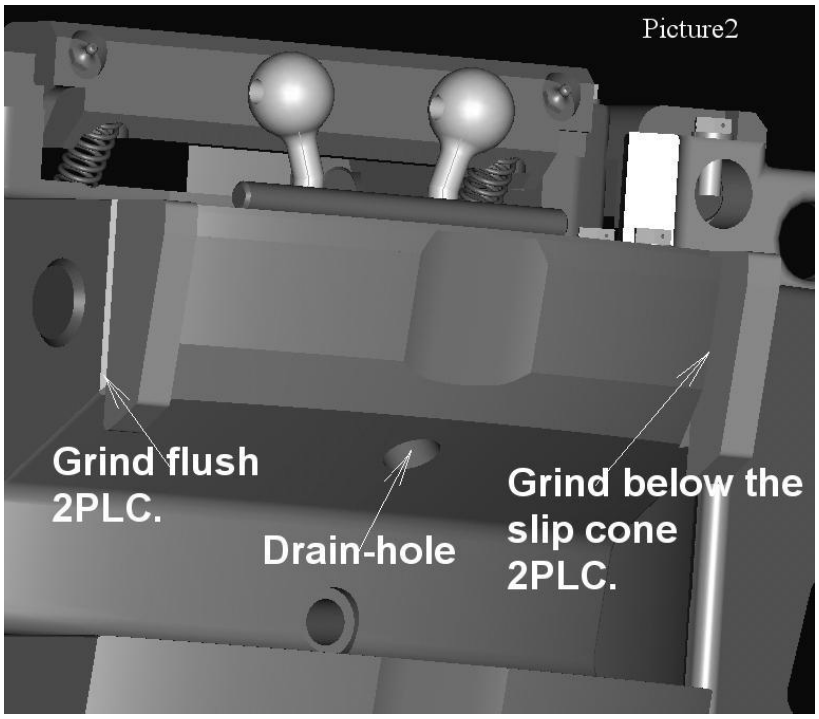
3.5. Check whether the slip-cone surface roughness is correct. No visible horizontal (turning or grinding) grooves may be visible.

3.6. Check whether the center-slip is machined with two rounds at the lowest rib see picture 1.

Picture1



3.7. Check whether the mud drain hole (center-slip) is present and open see picture 2.



3.8. Check proper welding of center-slip torque-plates (sharp grind, removal of all material outside slip-cone contour). Check by using welding caliber, see picture 2. Grind flush or maximum 0.05" below slip cone

Initials Required
Operator/ Quality Inspector

4. ASSEMBLY

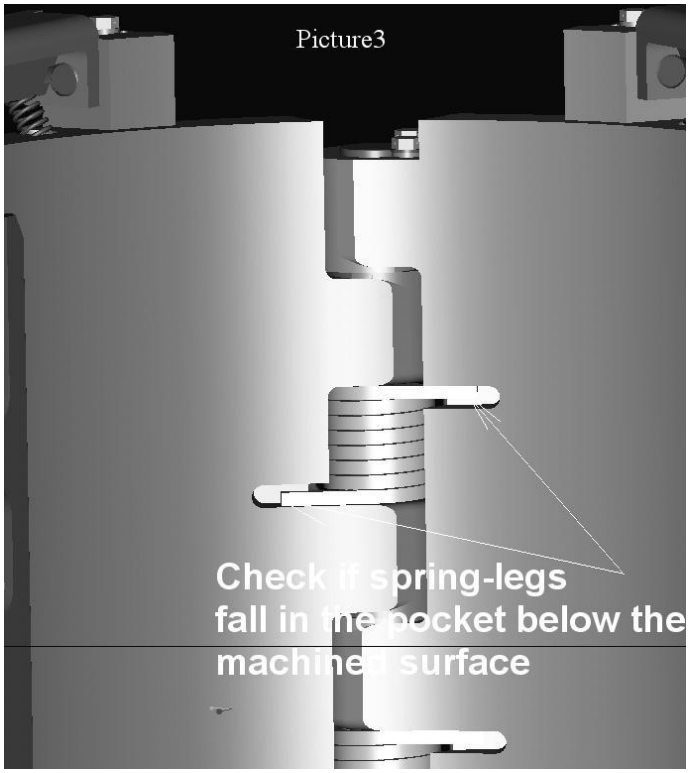
4.1. Check if all parts are assembled in accordance with the drawing ☐

4.2. Check the correct assembly of slip hinge pins (UP/Part-Number visible on top). ☐

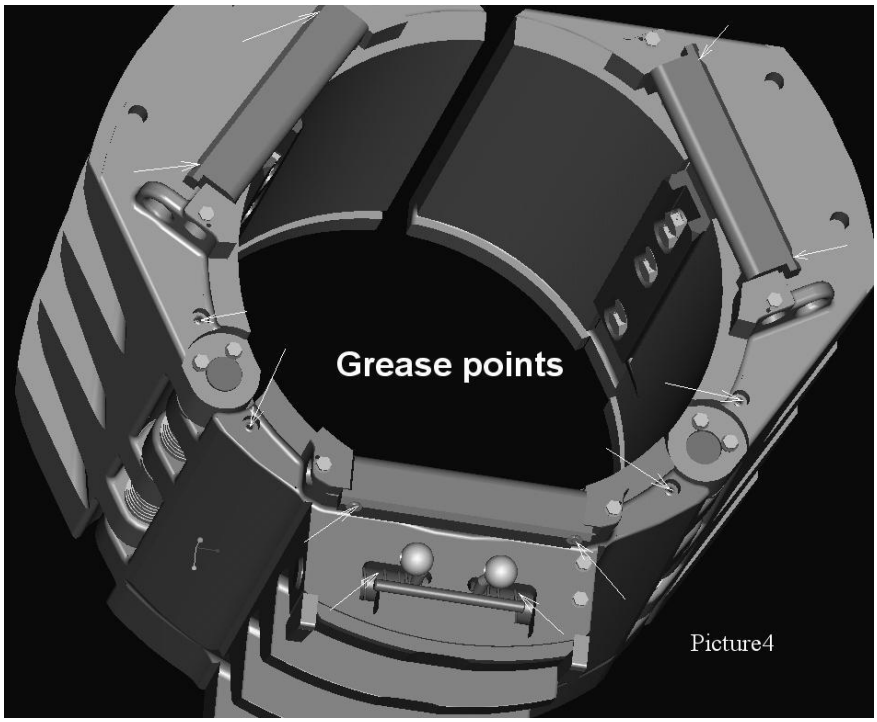
4.3. Check whether all bolts are lock-wired. ☐

4.4.

Check whether the hinge pin spring legs fall back in the pockets below the machined surface see picture 3. When slips are fully closed spring-legs should be supported with a minimum of 0.25” in the pocket. ☐



4.5. Check the presence of all grease fittings, see picture 4.



4.6. Check if all movable Parts / Hinges can move

5. LUBRICATION

Initials Required
Operator/ Quality Inspector

5.1. Check Autol Top-2000 grease being applied to all grease fittings until grease comes out on all appropriate surfaces in equal amounts, see picture 4.

5.2. Check slip-cones and all movable parts/hinges are greased with Autol Top-2000 grease;

- Slip-hinge-pins

-Slip mounting pins

-Latches

6. FUNCTIONAL

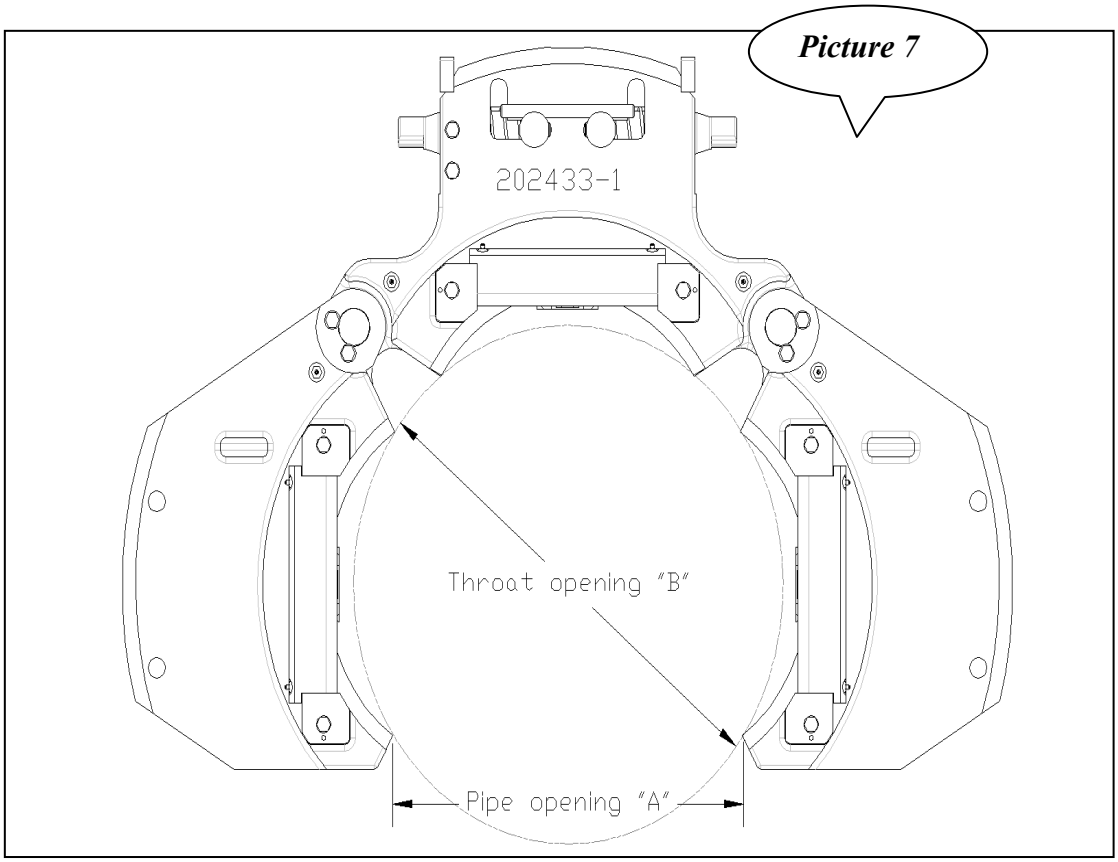
Initials Required
Operator/ Quality Inspector

6.1. Check a proper functioning of the pins that connect the slips to the actuator levers.

6.2. ▌Assemble the slip ass'y into a Qualified PS-21/30 (this is not necessarily the PS21/PS30 which will be shipped together with these slips) and check for a flawless movement of the slips.Check the throat-opening "B" of the slips without insert-carriers (is the biggest circular opening of the slip without insert-carriers or with inserts) and Check the pipe-opening "A" at door-side, of the slips without insert-carriers when the slips are up and pressurized, see picture 7:
The side Slips shall be free to move, in and out against the spring force, and the body ribs shall have contact in-between the Slip ribs.

Slip-assembly:	*Throat-opening. "B" minimum:*	*"B" measured:*	*Pipe-opening "A" minimum:*	*"A" measured:*
202433-5	*Ø17.5 inch*	*Ø*	*13.0 inch*	
202250-5	*Ø17.5 inch*	*Ø*	*13.0 inch*	
202250-1400	*Ø17.5 inch*	*Ø*	*14.25 inch*	
202250-1363	*Ø17.5 inch*	*Ø*	*14.25 inch*	
202250-1350	*Ø17.5 inch*	*Ø*	*14.25 inch*	
202250-1338	*Ø17.0 inch*	*Ø*	*14.25 inch*	
202250-1300	*Ø17.0 inch*	*Ø*	*14.25 inch*	
202250-1275	*Ø16.75 inch*	*Ø*	*14.25 inch*	
202253-1188	*Ø15.25 inch*	*Ø*	*12.25 inch*	
202253-1175	*Ø15.25 inch*	*Ø*	*12.25 inch*	
202430-2000	*Ø24 inch*	*Ø*	*20.25 inch*	
202430-1875	*Ø22.75 inch*	*Ø*	*20.25 inch*	
202430-1863	*Ø22.75 inch*	*Ø*	*20.25 inch*	
202430-1800	*Ø22.0 inch*	*Ø*	*18.38 inch*	
202430-1788	*Ø21.5 inch*	*Ø*	*18.38 inch*	
202430-5	*Ø23.5 inch*	*Ø*	*16.50 inch*	

Picture 7



6.3. Check proper engagement of insert carrier latch:

- No insert carrier fitted: The latch needs to tilt slightly forward (towards center bore).

- With insert carrier fitted: The latch needs to move easily back and forward as well as to slide over the insert carrier to a horizontal position.

6.4. Check the insert carriers can be easily assembled and disassembled using the special insert-carrier lifting-hook (P.N.:50004600-1).

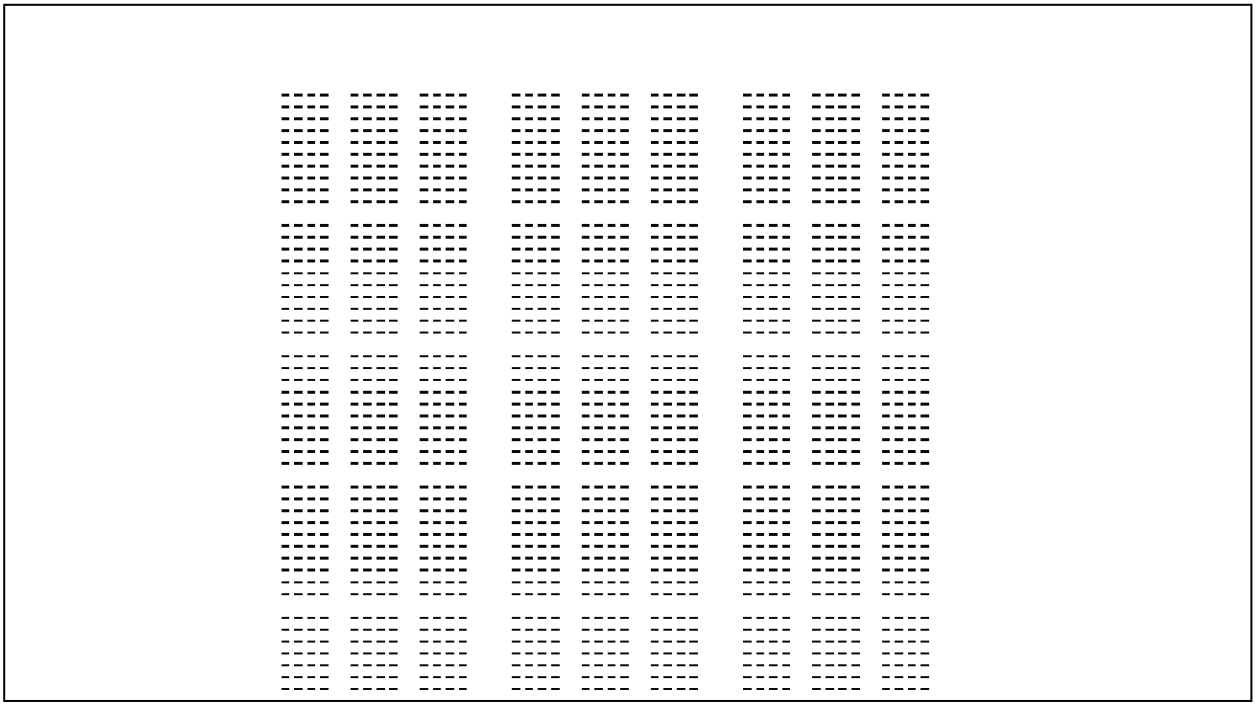
7. The intend of **a paper test** is to find anomalies in the machining, therefor one needs to review the paper prints with this in mind. Combinations of the given examples is also possible and are unacceptable. 95 % contact is required. For example one insert on a certain location could be of minimal height which causes it to give bad paper-print

7.1. ▌Conduct a paper test on a test mandrill / pipe applying 59.5short ton (54 metric ton) vertical load.

7.2. Review results, using below described criteria.

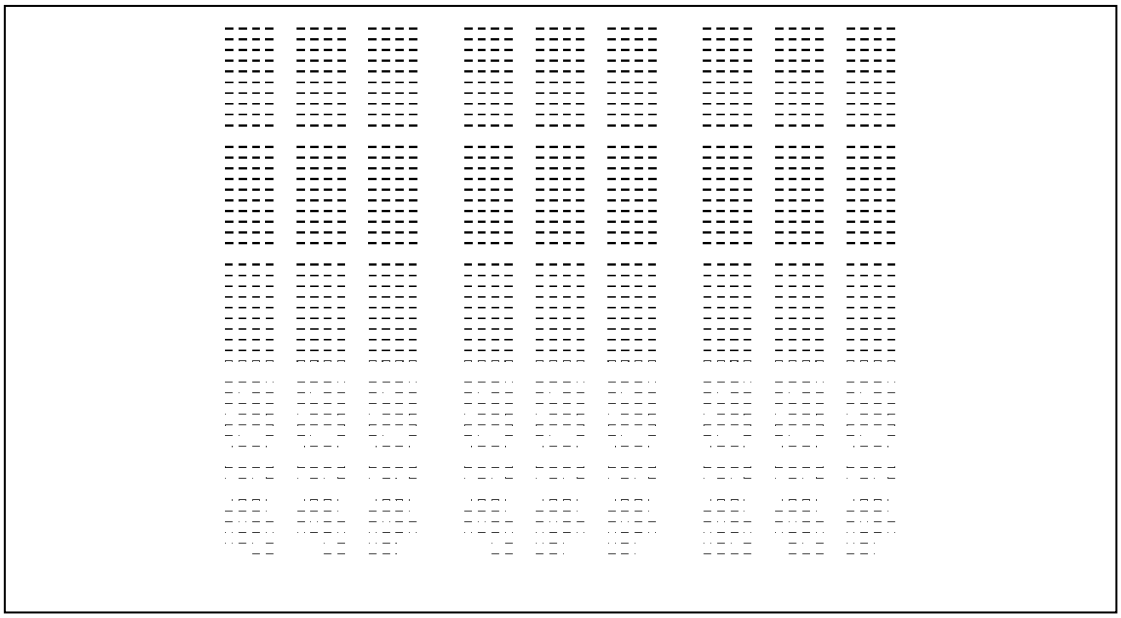
7.3. Paper test acceptance criteria:

L.H.-slip *C.-slip* *R.H.-slip* *Top*



7.4. Detail 1). 100% contact acceptable *Bottom*

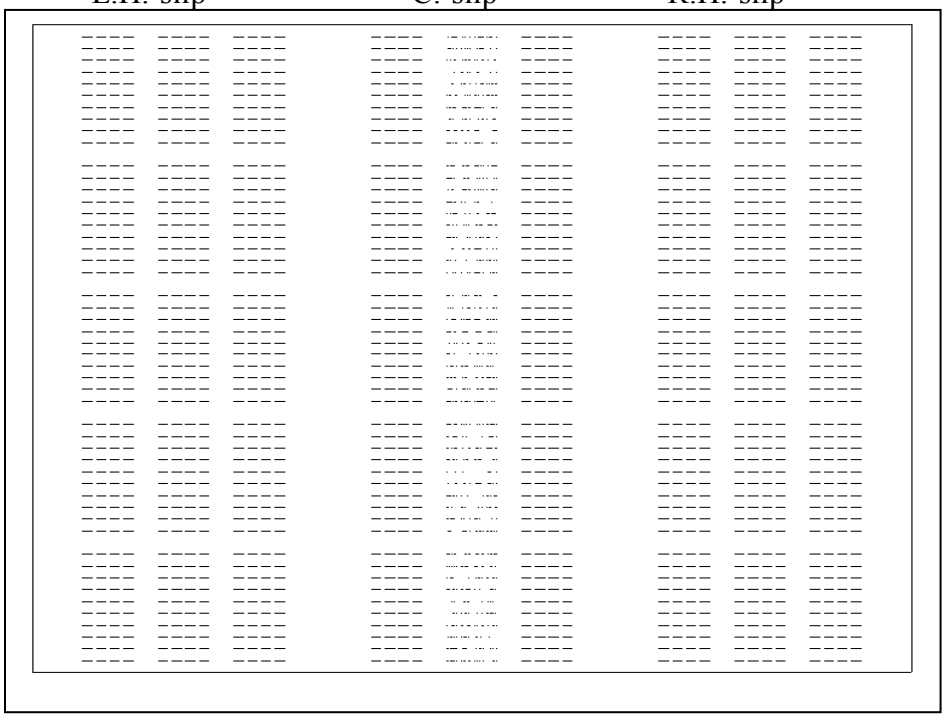
L.H.-slip *C.-slip* *R.H.-slip* *Top*



7.5. Detail 2)Run out of bottom dovetails (all segments) or worn bowl/bushing **Bottom**

Not acceptable (80%< contact< 85%)

L.H.-slip C.-slip R.H.-slip

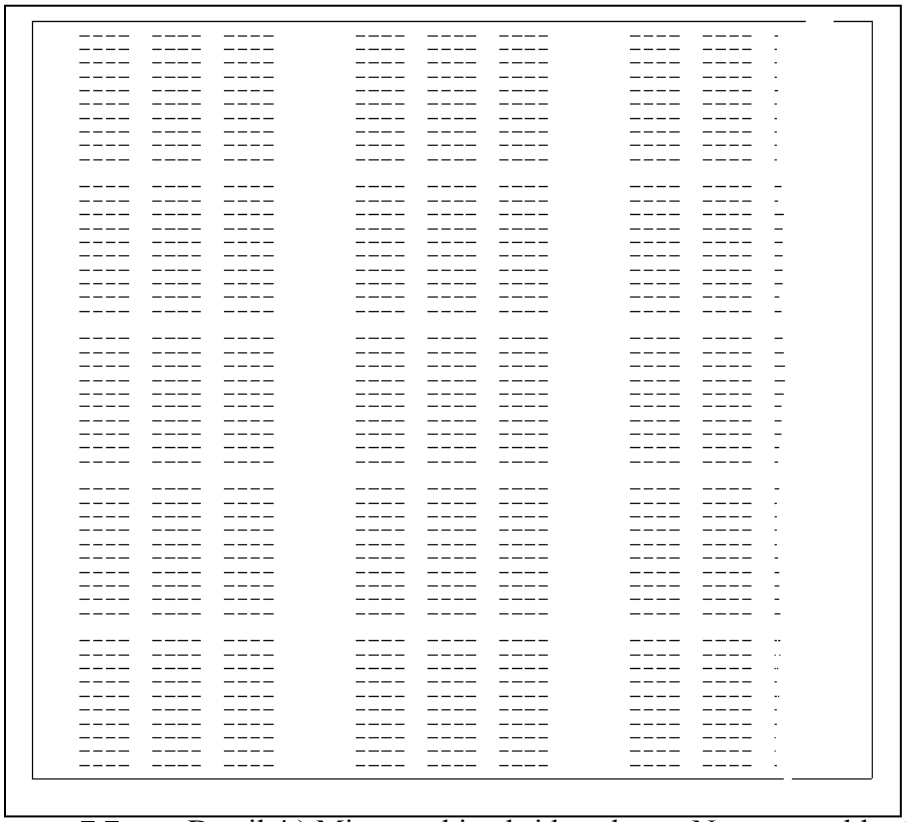


Top

Bottom

7.6. Detail 3.). Miss-machined middle column (too deep). Not acceptable *(≈90% contact)*

L.H.-slip C.-slip R.H.-slip

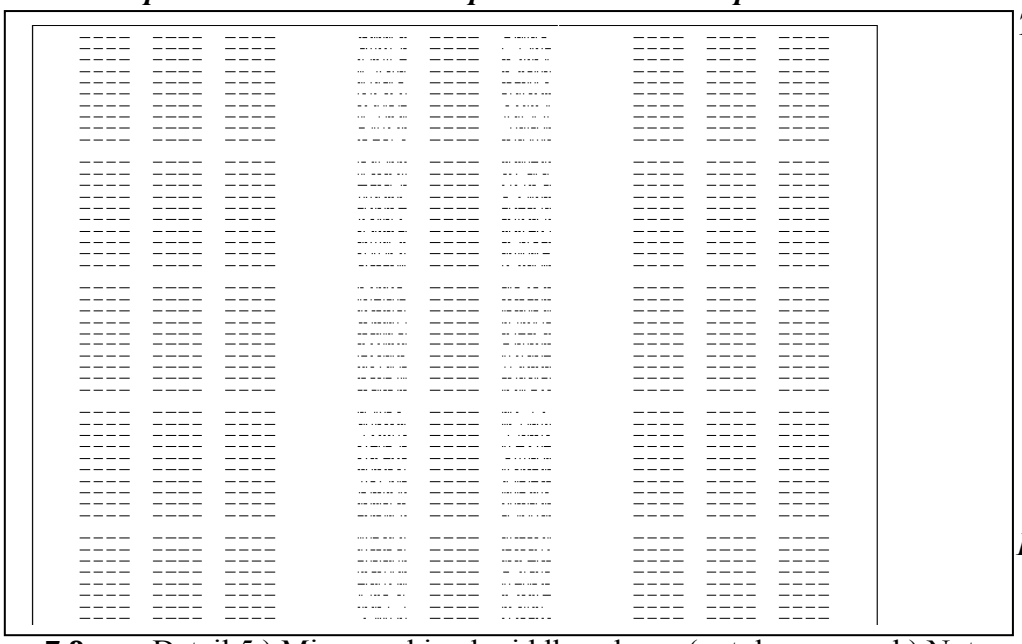


Top

Bottom

7.7. Detail 4.) Miss-machined side column. Not acceptable. (≈90% contact)

L.H.-slip *C.-slip* *R.H.-slip*

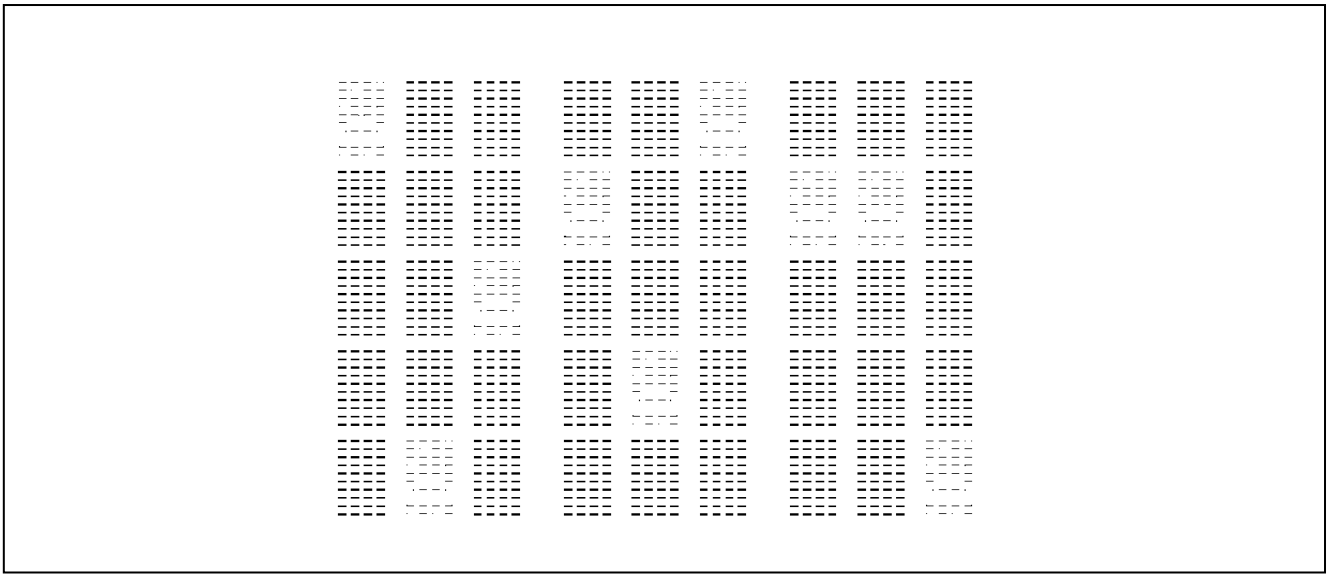


Top

Bottom

7.8. Detail 5.) Miss-machined middle column (not deep enough) Not acceptable *(≈80% contact)*

L.H-slip *C. –slip* *R.H. -slip* *Top*



Bottom

7.9. Detail 6.) About 80% contact most likely due to inserts worn / damaged or not made within the tolerances.

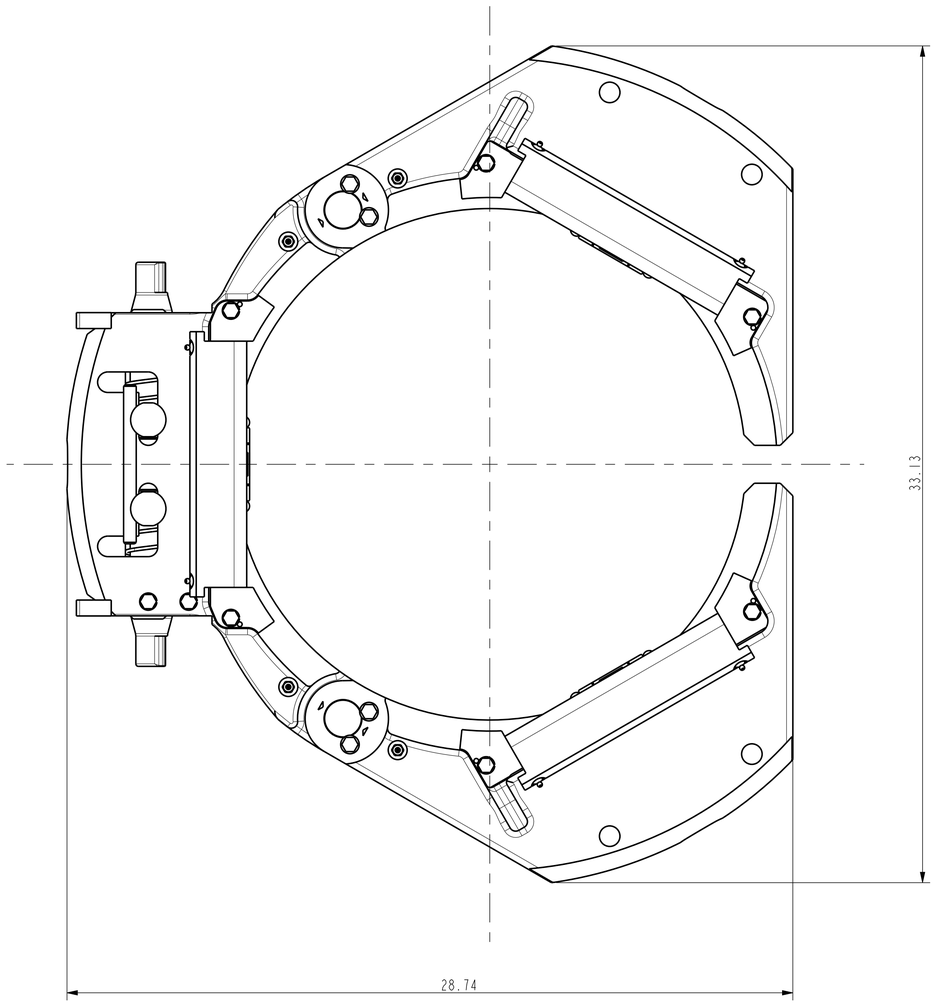
This is Not acceptable

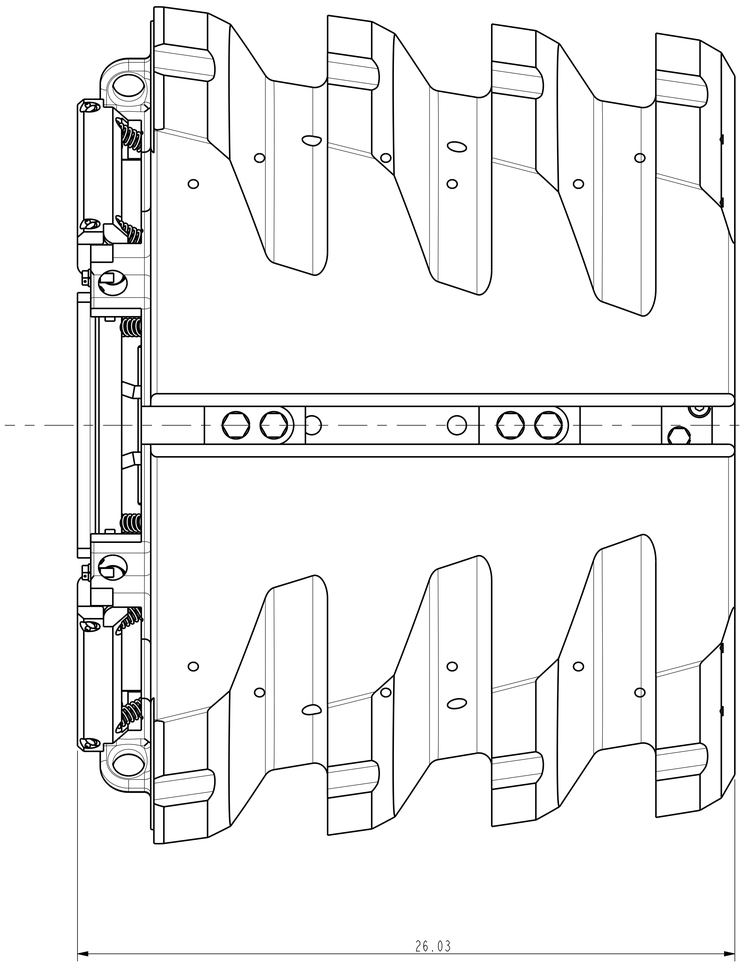
If results are not satisfactory please redo the test with maximum 50 short-tons extra load
Review results, using above described criteria
If still not satisfactory do a blue die test and contact a project engineer.

8. FINAL INSPECTION (after last paintjob)

Initials Required
Picker

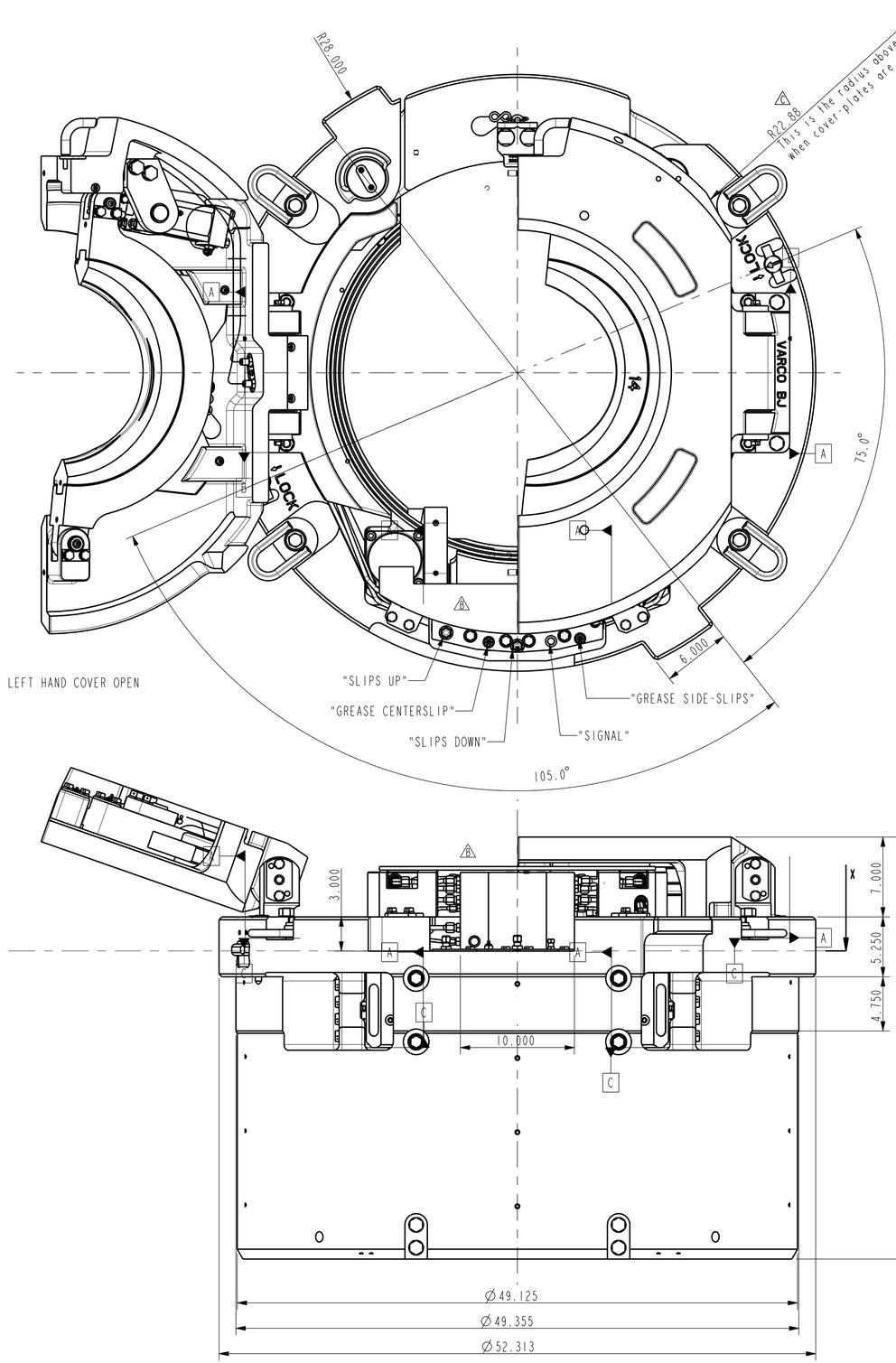
8.1. Check paintjob according ***P-001***

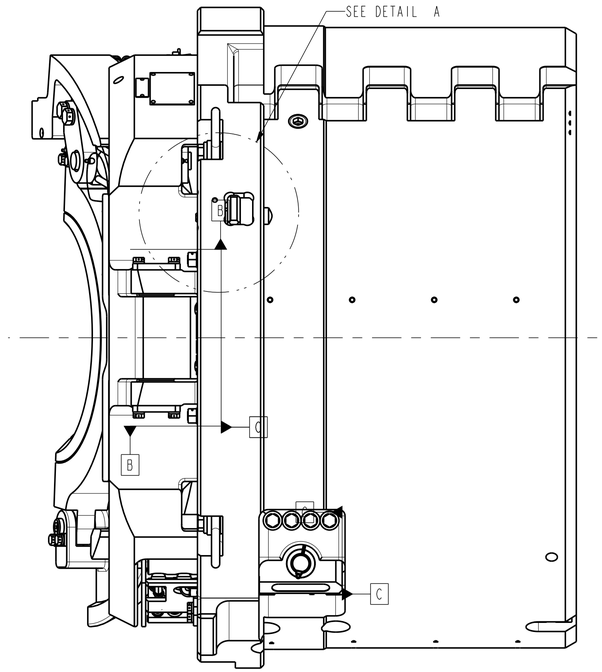


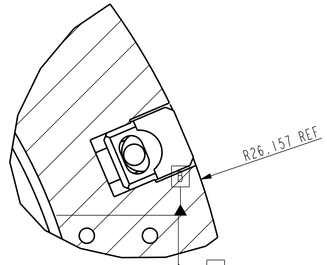


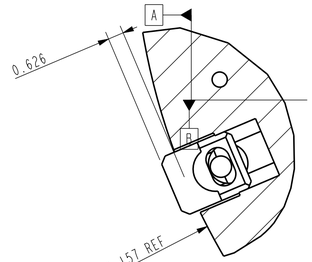
PARTNUMBER	202430-5				UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO	
MATERIAL	- -				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.	-				BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
COLOR	-				MACHINED SURFACES 250 / 1000		
WEIGHT	1760.4 Lbs 798.5 kg				TORCHCUT SURFACES		
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:3	PROJ.
NAME	B.v.d.P.	NAME	B.v.d.P.	REV.			
DATE	20-Apr-04	DATE	20-Apr-04	A	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)	
		E.C.N.	601248				
TITLE	SLIP ASSEMBLY 6-5/8-16				SIZE D	DRAWING NO. DD-202430-5	SHEET 1 OF 1

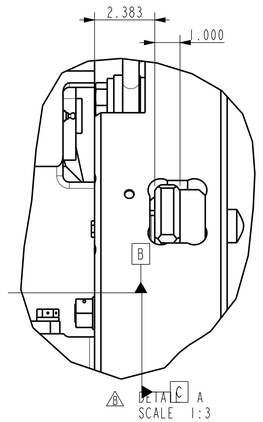
PART NUMBER
DD202400-5











⚠ HOSE SET TO CONNECT INTO:
RST 49-1/2: P.N.: 202399-495
RST 60-1/2: P.N.: 202399-605

⚠ PICTORIAL CHANGES

202400-5	--	--	--
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ™ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± 0 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
APPROVED	H.T.	19-Jun-98
CHECKED	H.v.R.	19-Jun-98
PREPARED	R.S.	25-May-98

PROJ. | MATERIAL | SCALE 1:6 | UNITS INCH (MM) | WEIGHT 9066.783 LBS/ KG

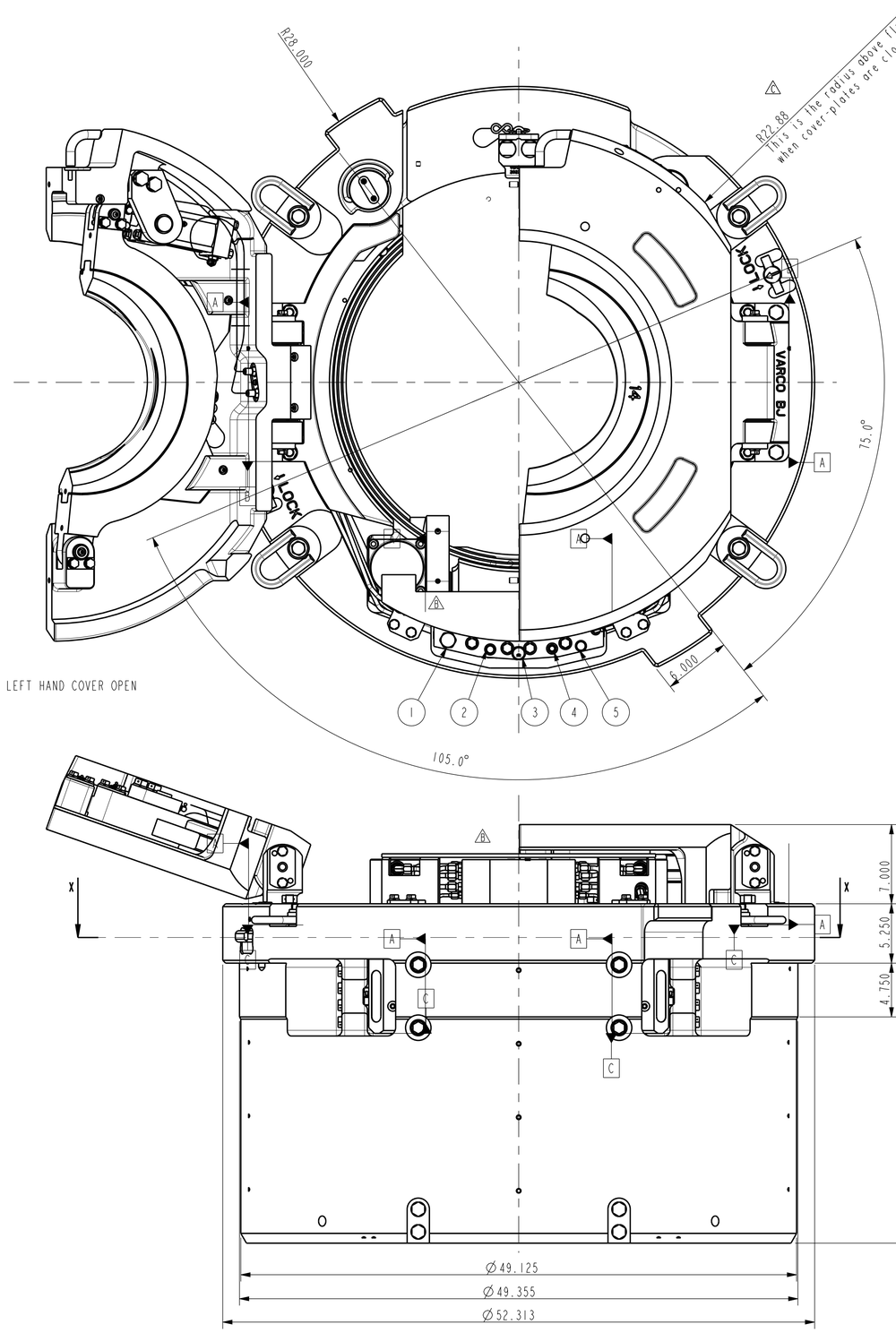
REV.				
K				
J				
I				
H				
G				
F				
E				
D	600331	BV	13JUL01	CDL
C	600293	EF	04-May-01	AK
B	583101	L.S.	10OCT00	CDL
A	528101	R.S.	17-Jun-98	H.v.R.
REV.	E.C.N	NAME	DATE	CHECKED

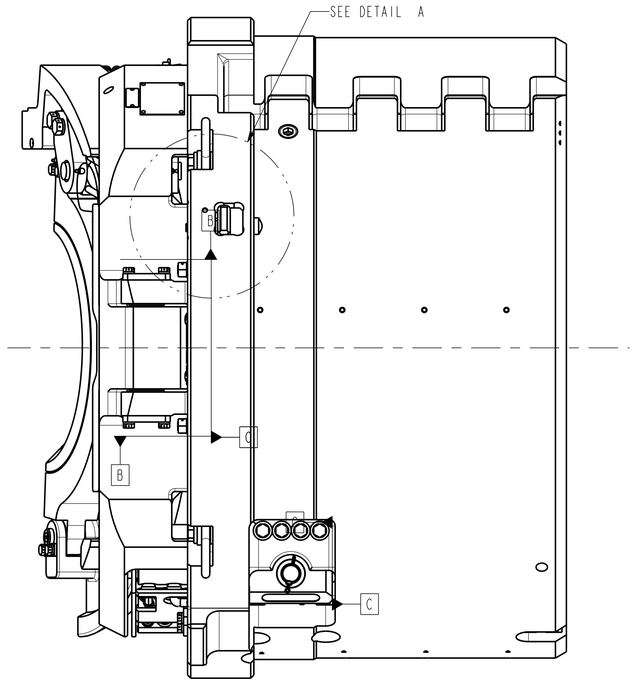
PROJE FILE NO.: DD-202400-5

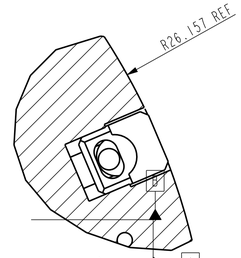
TITLE: DIMENSIONAL DRAWING PS30 VARCO 49.1/2''
SIZE: D
DRAWING NO.: DD202400-5
SHEET 1 OF 1

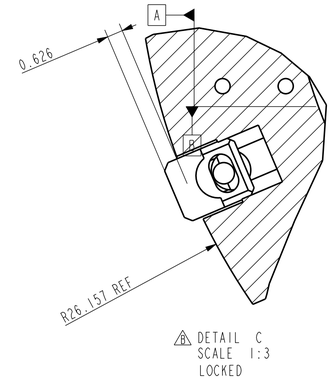
REDRAWN / REPLACED BY:
REPLACES:

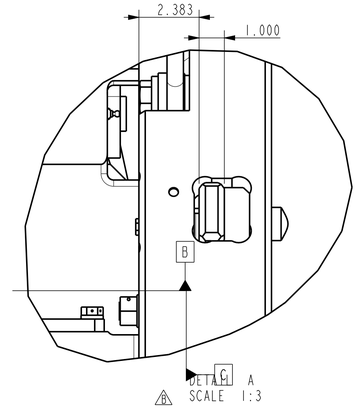
PART NUMBER
DD202400-3











Hydraulic/Grease Quick Disconnects		
1	Slips Up	Male FD45 #12 AEROQUIP
2	Grease Centerslip	Male FD45 #4 AEROQUIP
3	Slips Down	Male FD45 #10 AEROQUIP
4	Signal	Male FD45 #2 AEROQUIP
5	Grease Side-slips	Male FD45 #6 AEROQUIP

PICTORIAL CHANGES

202400-3	--	--	--
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± 1 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE	PROJ.
APPROVED	H.T.	27-May-98	
CHECKED	H.v.R.	27-May-98	SCALE 1:6
PREPARED	R.S.	26-May-98	UNITS INCH (MM)

MATERIAL

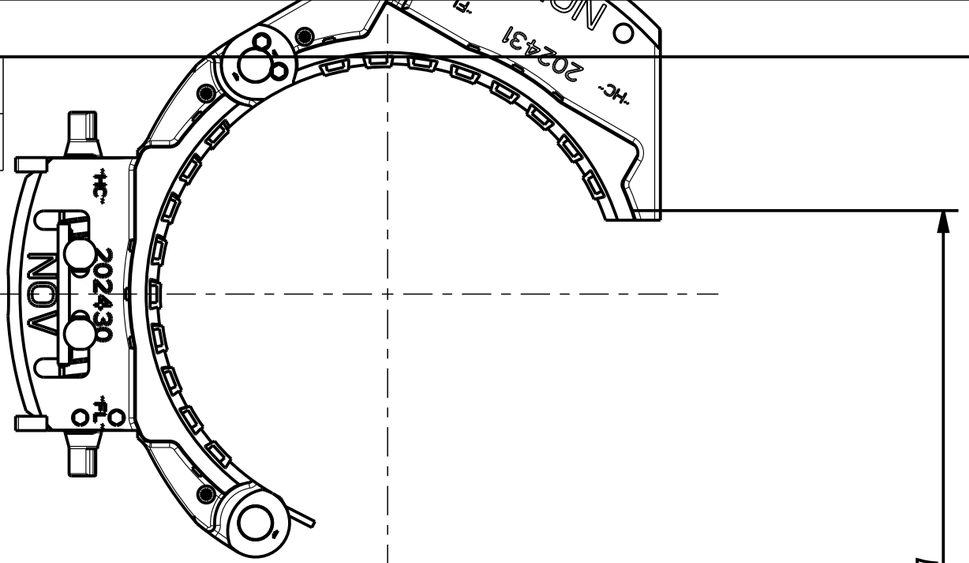
WEIGHT 9883.725 LBS/ KG

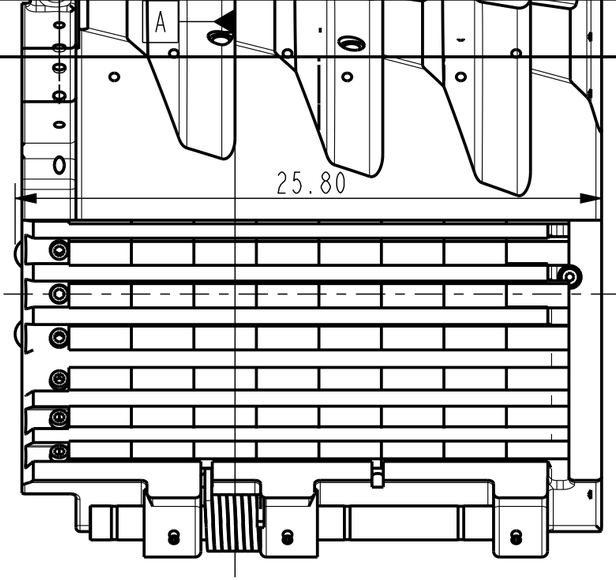
REV.		E.C.N	NAME	DATE	CHECKED
K					
J					
I					
H					
G					
F					
E					
D		600331	BV	13JUL01	CDL
C		600293	EF	04-May-01	AK
B		583101	L.S.	10OCT00	CDL
A		528101	R.S.	26-May-98	H.v.R.

PROVE FILE NO.: DD-202400-3

TITLE: DIMENSIONAL DRAWING PS30 NATIONAL 49.1/2''
SIZE: D
DRAWING NO.: DD202400-3
SHEET 1 OF 1

REDRAWN / REPLACED BY:
REPLACES:





33.07

28.73

PART NUMBER
202430-2

⚠B PICTORIAL CHANGES

202430-2	--	--	--
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ TM
OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE

BREAK SHARP CORNERS .010 ± .005

MACHINED SURFACES 250

	NAME	DATE
APPROVED	H.T.	16-Apr-98
CHECKED	H.v.R.	16-Apr-98
PREPARED	M.KALS	16-Apr-98

PROJ.

SCALE 3:20

UNITS INCH (MM)

MATERIAL

WEIGHT LBS/ KG

REV.		E.C.N	NAME	DATE	CHECKED
K					
J					
I					
H					
G					
F					
E					
D					
C					
B		600331	BV	19JUN01	CDL
A		528101	R.S.	16-Apr-98	H.v.R.

PRO/E FILE NO.: DD-202430-2

TITLE: SLIP ASSEMBLY 18-5/8 - 20

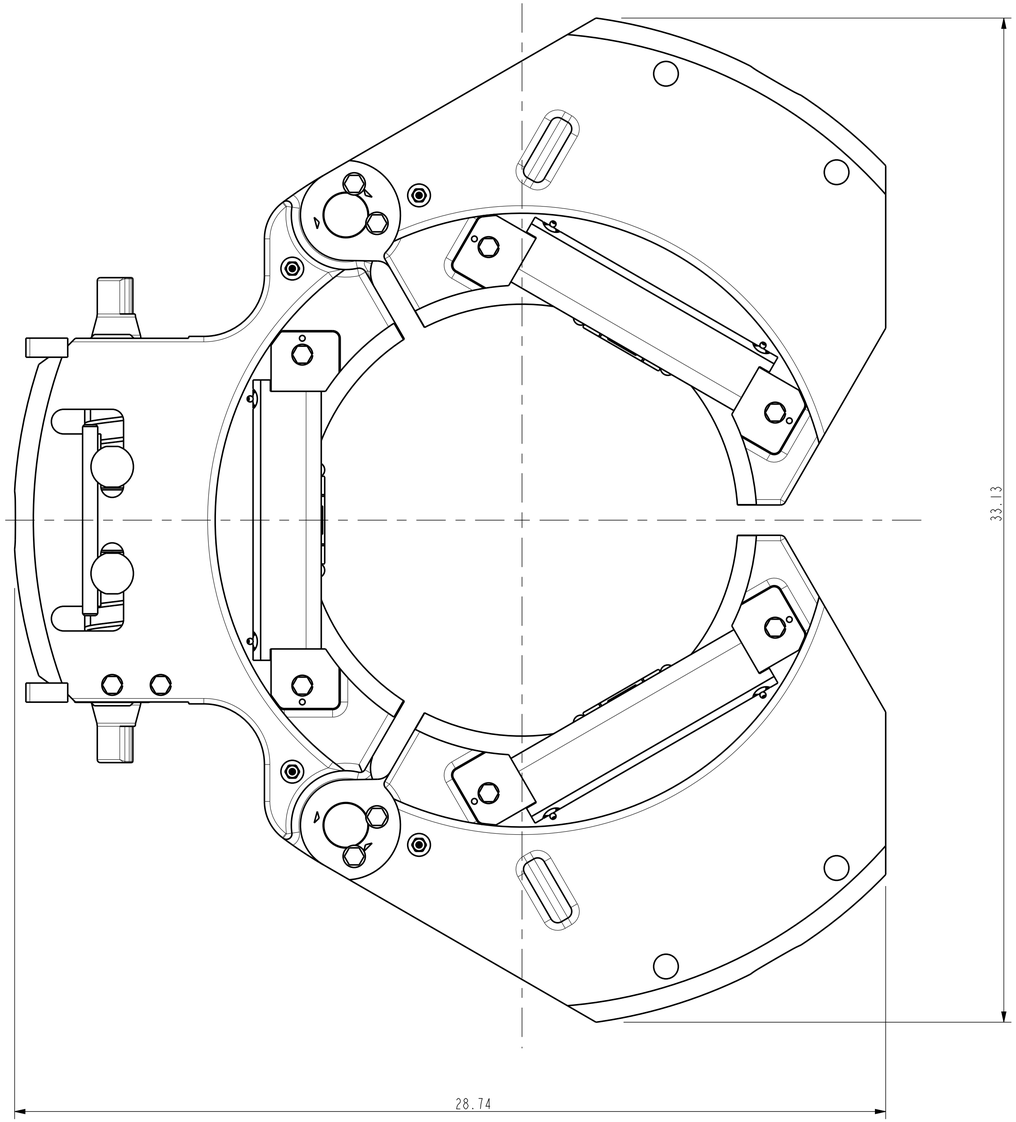
SIZE: B

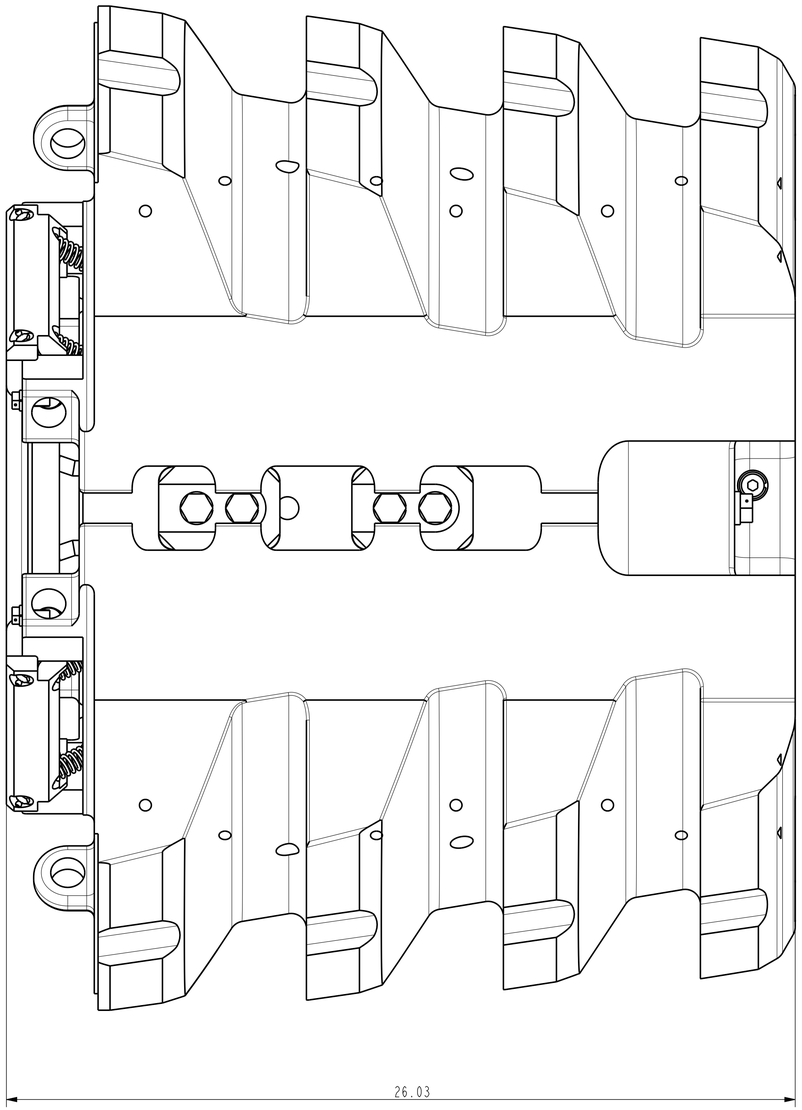
DRAWING NO.: DD-202430-2

SHEET 1 OF 1

REDRAWN / REPLACED BY:

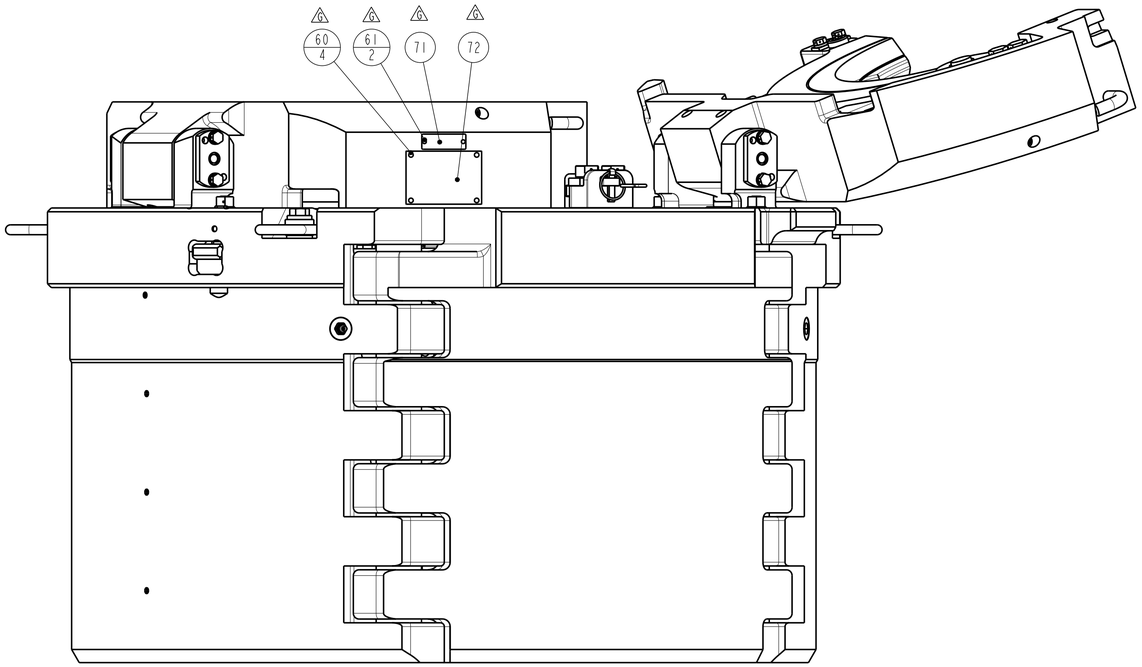
REPLACES:



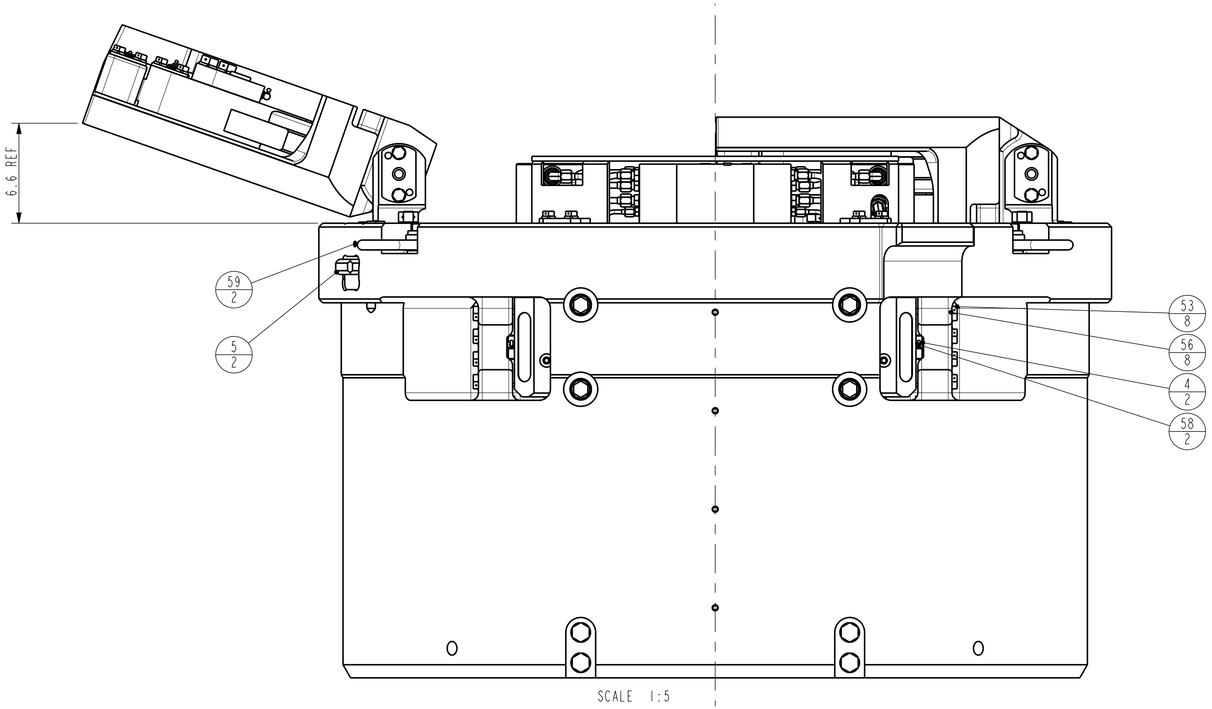


PARTNUMBER	202433-5				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	NATIONAL OILWELL VARCO THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
MATERIAL	- -					
SURF. FINISH / PAINTSPEC.	-					
COLOR	-					
WEIGHT	2008.7 Lbs 911.1 kg					
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 2:5 PROJ.
NAME	B.v.d.P.	NAME	B.v.d.P.	REV.		
DATE	22-Apr-04	DATE	21-Apr-04	A	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
		E.C.N.	601248			
TITLE	SLIP ASSEMBLY 2-3/8--10-3/4			SIZE D	DRAWING NO. DD-202433-5	SHEET 1 OF 1

PART NUMBER
202400-3



6 SCALE 1:5



SCALE 1:5

Apply torque according
to 50005000.xls.
to items 53
After installation of Item 58
bend open cotter-pin legs.

ALL SCREWS NEED TO BE
LOCK WIRED AS SHOWN!!

NOTE:
SEE ALSO SUB-ASSEMBLY DRAWINGS;
202203-55 (ACTUATOR L.H. INT. RELIEF)
202204-55 (ACTUATOR R.H. INT. RELIEF)
202375-1 (L.H. COVER PLATE ASSEMBLY)
202375-2 (R.H. COVER PLATE ASSEMBLY)
50004590 (MANIFOLD ASSEMBLY)
50004585-1 (L.H. INDICATOR VALVE ASSEMBLY)
50004591-1 (R.H. INDICATOR VALVE ASSEMBLY)

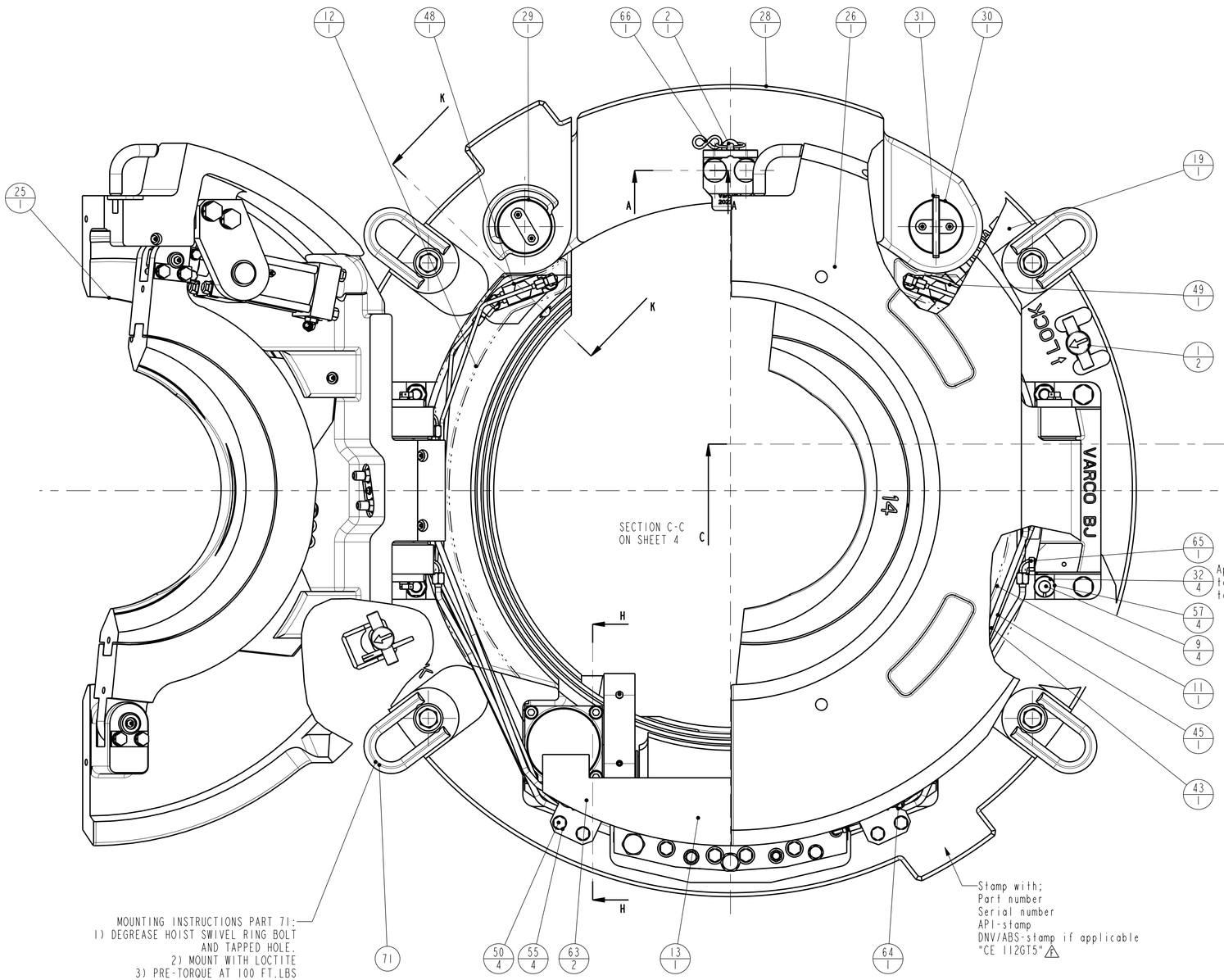
ITEM	QTY	PART NUMBER	SS EQUIVALENT	DESCRIPTION
1	2	1014		EXCENTRIC PIN
2	1	7887		LYNCH PIN
3	2	53204		STRAIGHT GREASE FITTING
4	2	202210		SYNCHRONISATION SHAFT KEY
5	2	202211		LOCK FOR VARCO BJ NATIONAL
6	1	202215		COVER PLATE LOCK
7	2	202226		CYLINDER PROTECTION RING
8	1	202409		SYNCHRONISATION SHAFT
9	4	50004523		ROD END FOR HINGE BLOCK LOCK PS-30
10	2	50004531		PIN for COVER-PLATE LOCK PS21/30
11	1	50004532		TUBING GUARD PS30 RIGHT HAND
12	1	50004533		TUBING GUARD PS30 LEFT HAND
13	1	50004534		TUBING GUARD MANIFOLD PS-30
14	1	50004548		COVER PLATE LOCK RETAINER PS-21/30
15	1	50004575		LEFT CAM BLOCK PS-30
16	1	50004576		RIGHT CAM BLOCK PS-30
17	1	50004590	50004590-1	Manifold Assembly PS-30
18	2	50004747		Slip indicator pin with grease holes
19	2	50004748		Modified Plug external pipe_ countersunk hex
20	1	202203-55		ACTUATOR LH PS INT. REL.
21	1	202204-55		ACTUATOR RH PS INT. REL.
22	3	202349-15		GREASE RESTRICTOR 1.5MM
23	6	202349-25		GREASE RESTRICTOR 2.5MM
24	3	202349-50		GREASE RESTRICTOR 5MM
25	1	202375-1		LEFT-HAND COVER PLATE ASSY
26	1	202375-2		RIGHT-HAND COVER PLATE ASSY
27	1	202401_3M		BODY MACHINING FOR NATIONAL 49-1/2"
28	1	202402-3M		DOOR MACHINING FOR NATIONAL 49-1/2"
29	1	202405-1		REMOVABLE HINGE PIN ASSEMBLY
30	1	202406-1		STATIONARY HINGE PIN ASSEMBLY
31	1	202407_		LOCK BAR FOR STATIONARY HINGE P
32	4	202707-1		3/4-10 UNC NUT WITH LOCKWIRE HOLE
33	1	50004559-1	50004559-1-1	Tube Grease LH slip PS30
34	1	50004559-2	50004559-2-1	Tube From LH IV PS30
35	1	50004559-3	50004559-3-1	Tube To LH IV PS30
36	1	50004559-4	50004559-4-1	Tube Rams open LH PS30
37	1	50004559-5	50004559-5-1	Tube Rams closed LH PS30
38	1	50004559-6	50004559-6-1	Tube Slips down LH PS30
39	1	50004559-7	50004559-7-1	Tube Slips up LH PS30
40	1	50004559-8	50004559-8-1	Tube grease RH slip PS30
41	1	50004559-9	50004559-9-1	Tube Signal RH actuator
42	1	50004559-10	50004559-10-1	Tube To IV RH PS30
43	1	50004559-11	50004559-11-1	Tube From IV RH PS30
44	1	50004559-12	50004559-12-1	Tube Rams open RH PS30
45	1	50004559-13	50004559-13-1	Tube Rams closed RH PS30
46	1	50004559-14	50004559-14-1	Tube Slips down RH PS30
47	1	50004559-15	50004559-15-1	Tube Slips up RH PS30
48	1	50004585-1		indicator valve left
49	1	50004591-1		indicator valve right
50	4	50008-08-C8D		SCREW,CAP-HEX HD (UNC 1/2")
51	4	50008-22-C8D		SCREW,CAP-HEX HD (UNC 1/2")
52	4	50010-16-C8D		SCREW,CAP-HEX HD (UNC 5/8")
53	8	50010-24-C8D		SCREW,CAP-HEX HD (UNC 5/8")
54	4	50012-72-C8D		SCREW,CAP-HEX HD (UNC 3/4")
55	8	51008-C		WASHER, LOCK-STEEL
56	8	51010-C		WASHER, LOCK-STEEL
57	8	51012-C		WASHER, LOCK-STEEL
58	2	51403-20		COTTER PIN 3/16 X 2 1/2
59	2	51506-26		PIN_GROOVED_TAPER-51506-26
60	4	53301-10-6		SCREW, DRIVE 0.179 DIA X 3/8
61	2	53301-6-5		SCREW, DRIVE 0.138 DIA X 5/16
62	2	56506-2-4-S	56506-2-4-C	ELBOW 90 degr EXT.1/8-27NPT TO EXT.7/16-20UNF
63	2	56518-6-6-S	56518-6-6-C	ELBOW 90degr 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
64	1	56519-06-04-S	56519-06-04-C	ELBOW 90 de O_RING EXT.9/16UNF TO 7/16 JIC
65	8	56519-06-06-S	56519-06-06-C	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16 JIC
66	1	948051-2		S-HOOK
67	2	979386-55		COMPRESSION SPRING
68	12	979455-10		EXPANDER
69	4	979485-15		LOCKWASHER S.S. DIN432-
70	4	979771-2225		GLACIER BEARING MB2225DU
71	1	50000125		INFO & READ MANUAL PLATE
72	1	50000321		NAMEPLATE PS21 AND PS30
73	4	980473-2		HOIST SWIVEL RING

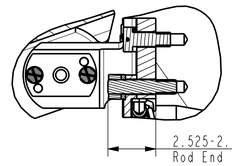
SS EQUIVALENT Applicable to P.N.:202400-3-1

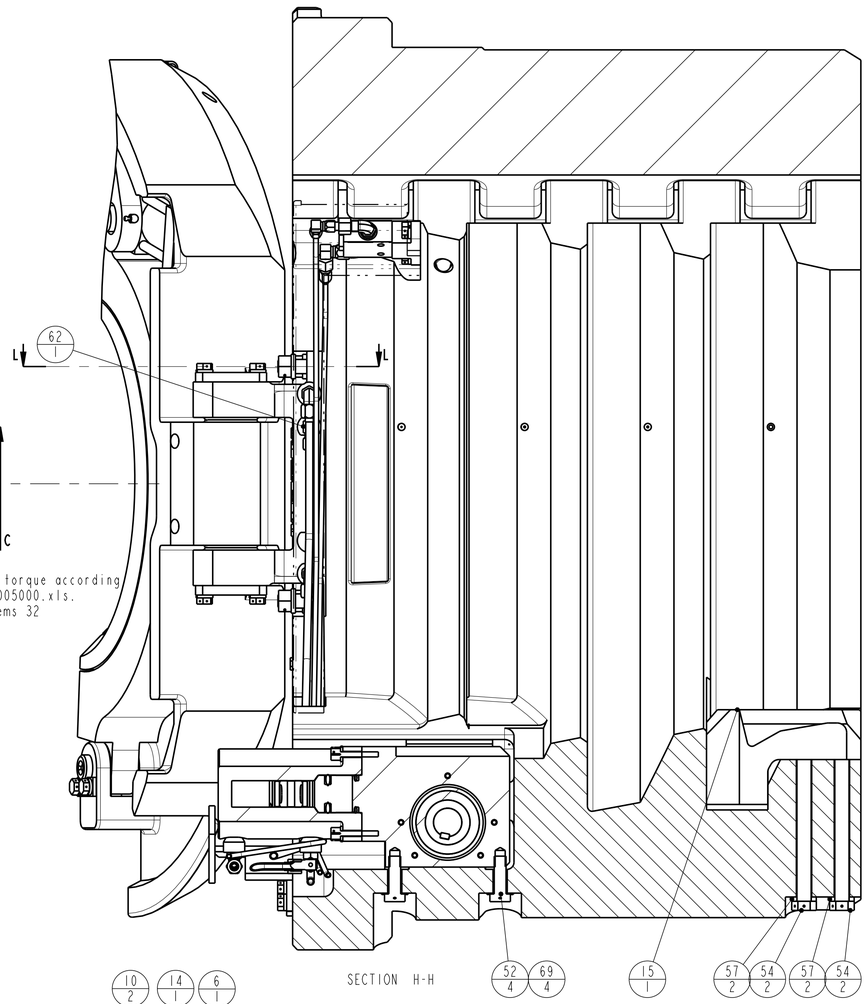
SS EQUIVALENT Applicable to P.N.:202400-3-1

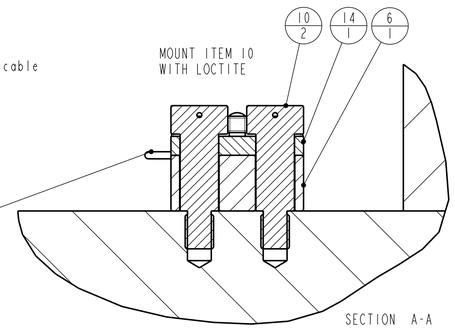
PARTNUMBER	202400-3			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.	P-001				
COLOR	Body; Red, Top-covers; Black				
WEIGHT	9083.725 lbs 3797 kg				
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	R.S.	NAME	CdL	REV.	DO NOT SCALE DOCUMENT
DATE	10-Oct-05	DATE	9-APR-09	G	THIS DOCUMENT IS PDMlink CONTROLLED
		E.C.N.	0701064		
SCALE 1:4				PROJ.	
UNITS INCH (mm)					
TITLE	PS30 FIN. ASSY FOR NATIONAL 49.1/2''	SIZE	D	DRAWING NO.	202400-3
SHEET	1 OF 4				

PART NUMBER
202400-3





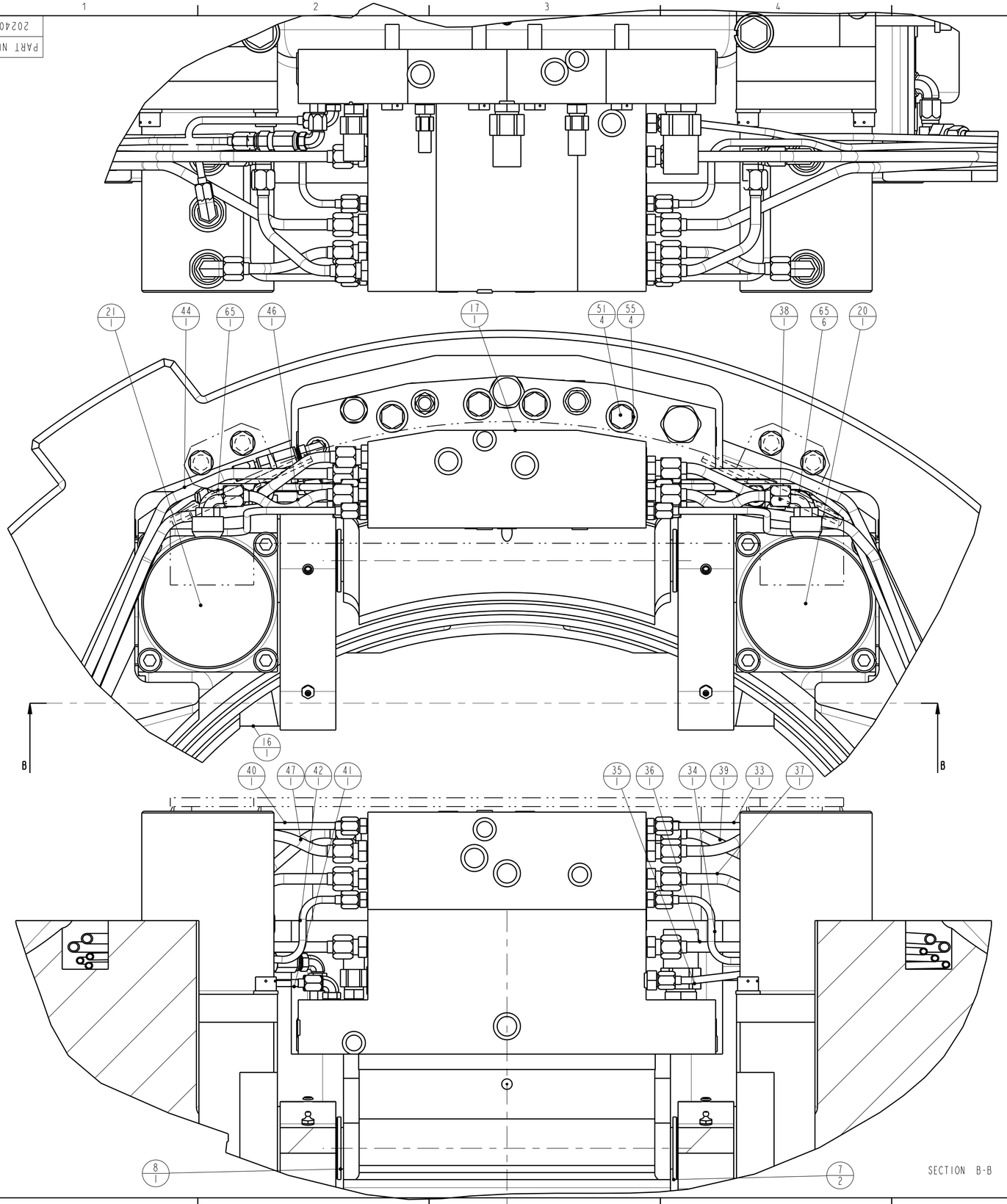




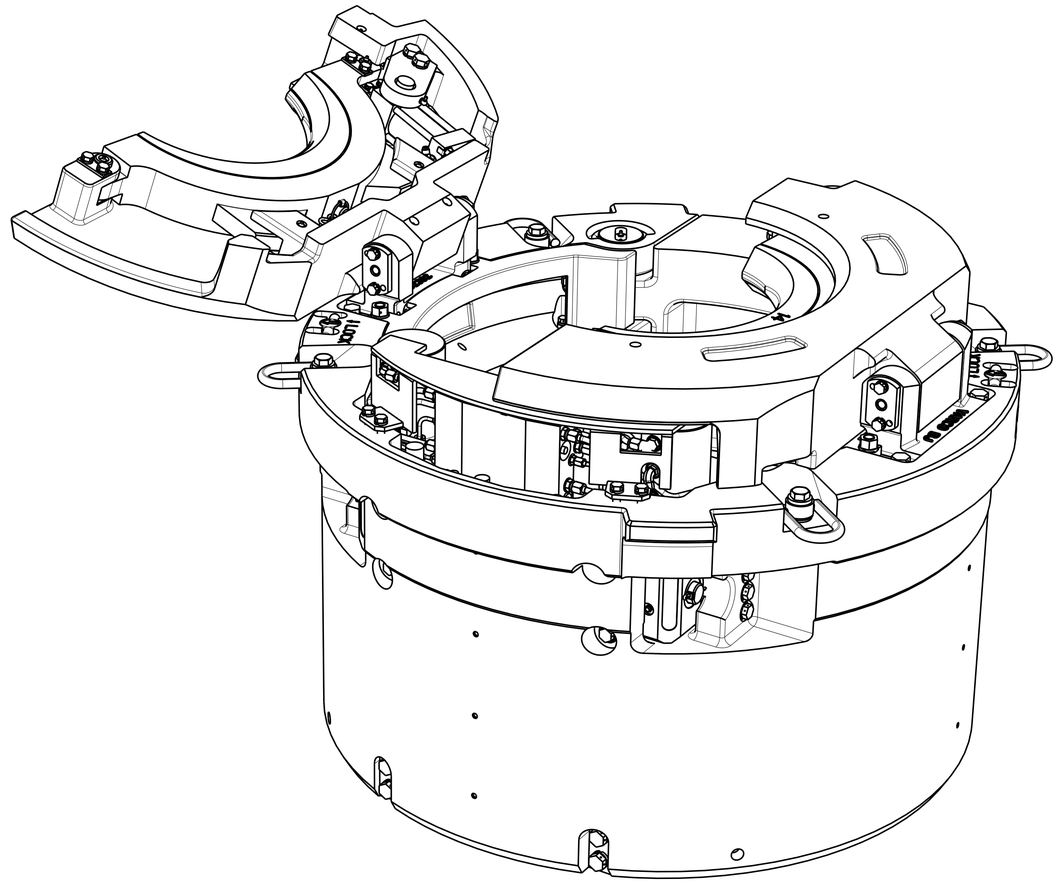
PARTNUMBER	202400-3				UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO
MATERIAL					TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	
SURF. FINISH / PAINTSPEC.					BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
COLOR					MACHINED SURFACES 250	
WEIGHT	Lbs		kg		TORCHCUT SURFACES 1000	
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:4 PROJ.
NAME	R.S.	NAME	CdL	REV.		
DATE	10-Oct-05	DATE	9-APR-09	G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)
		E.C.N.	0701064			

TITLE	SIZE	DRAWING NO.	SHEET
PS30 FIN. ASSY FOR NATIONAL 49.1/2''	D	202400-3	OF 2 4

PART NUMBER
202400-3

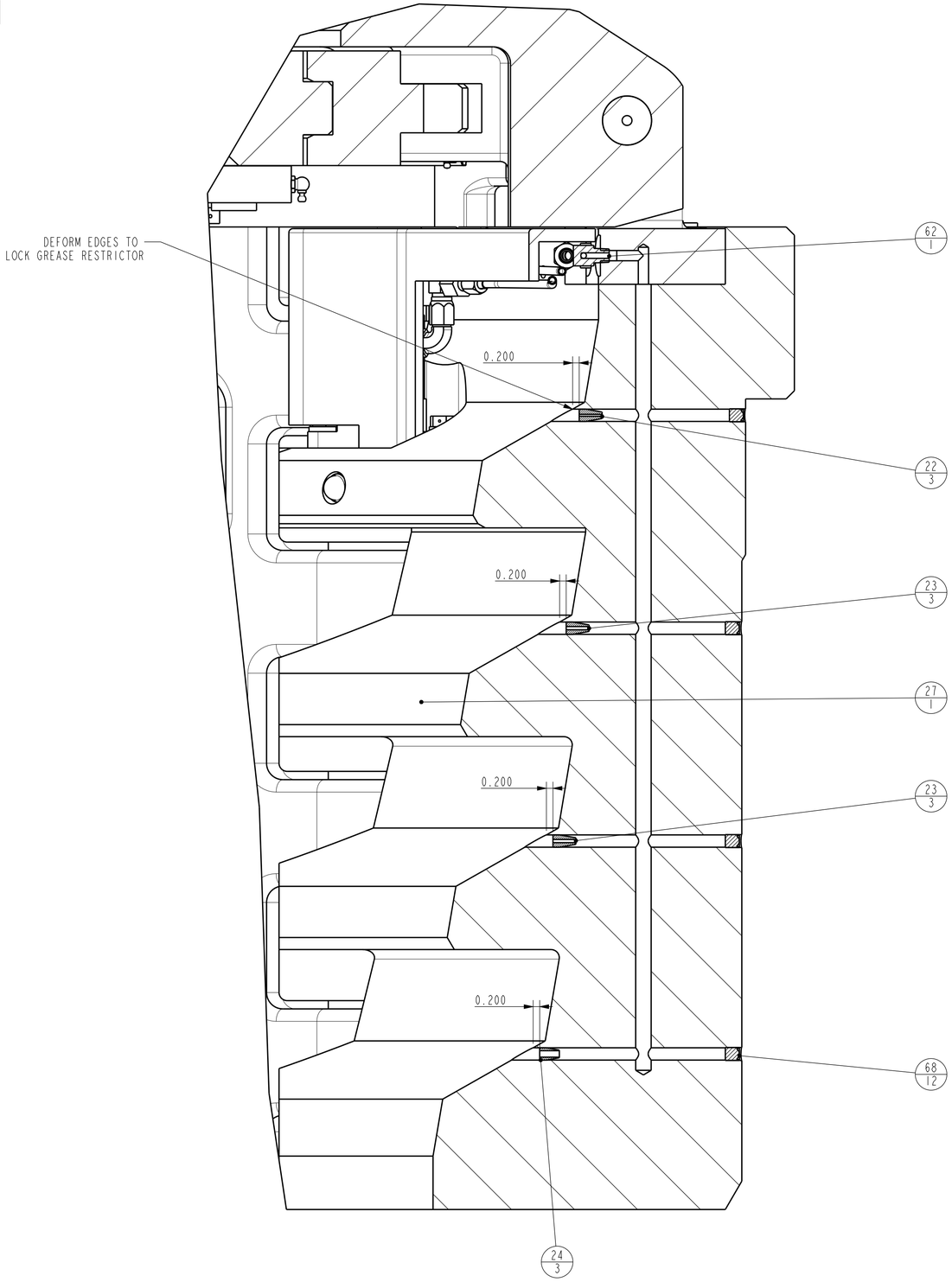


SECTION B-B

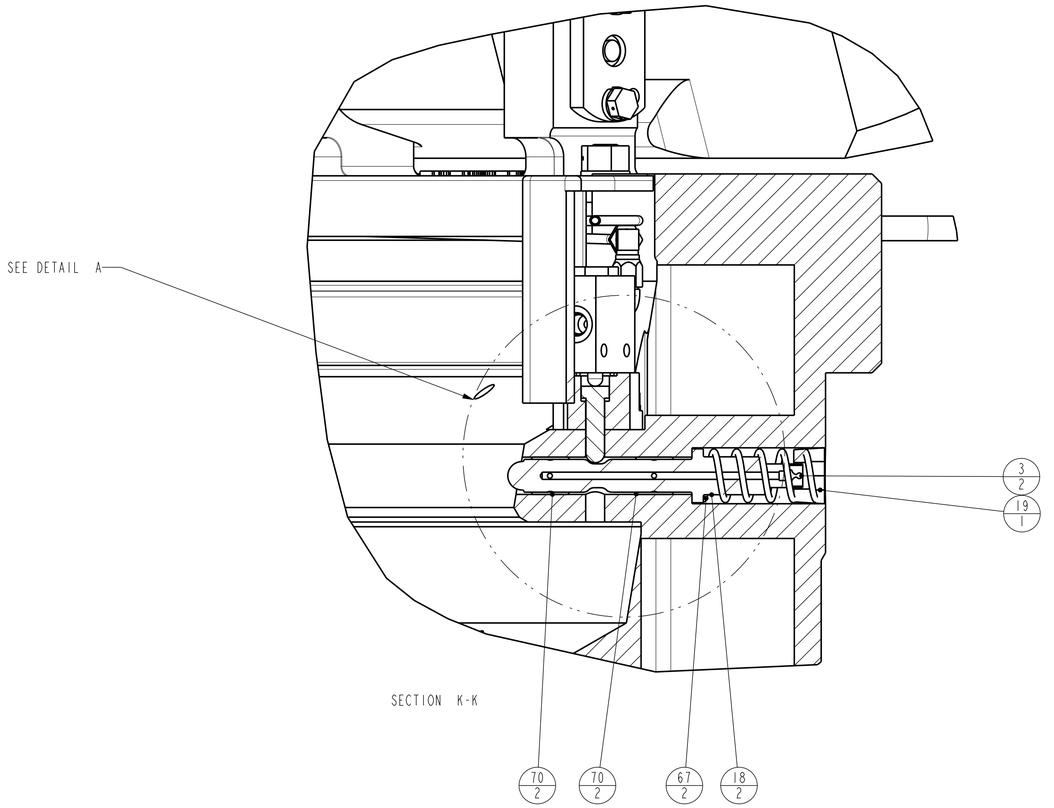


PARTNUMBER	202400-3			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.				BREAK SHARP CORNERS .010 ± .005	
COLOR				MACHINED SURFACES 250 1000	
WEIGHT	Lbs	kg		TORCHCUT SURFACES	
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2 PROJ.
NAME	R.S.	NAME	CdL	REV.	
DATE	10-Oct-05	DATE	9-APR-09	G	THIS DOCUMENT IS PDMlink CONTROLLED
		E.C.N.	0701064		UNITS INCH (mm)
TITLE	PS30 FIN. ASSY FOR NATIONAL 49.1/2''			SIZE D	DRAWING NO. 202400-3 SHEET 3 OF 4

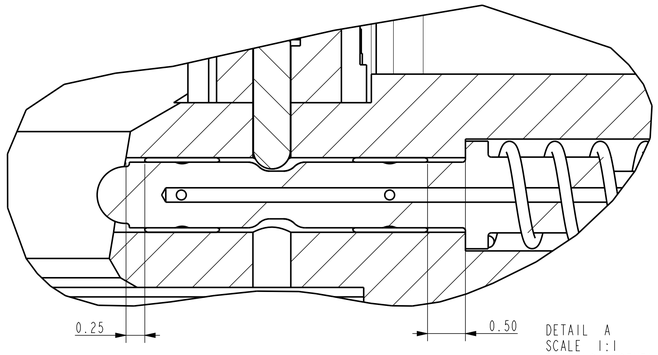
PART NUMBER
202400-3



SECTION C-C

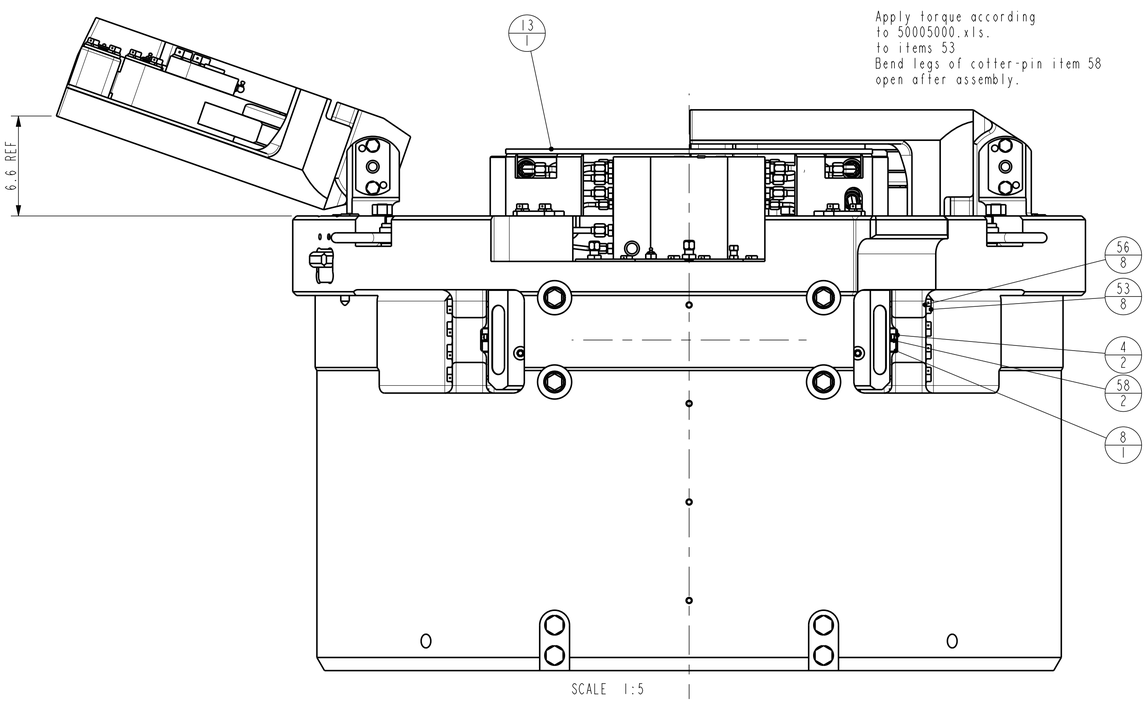


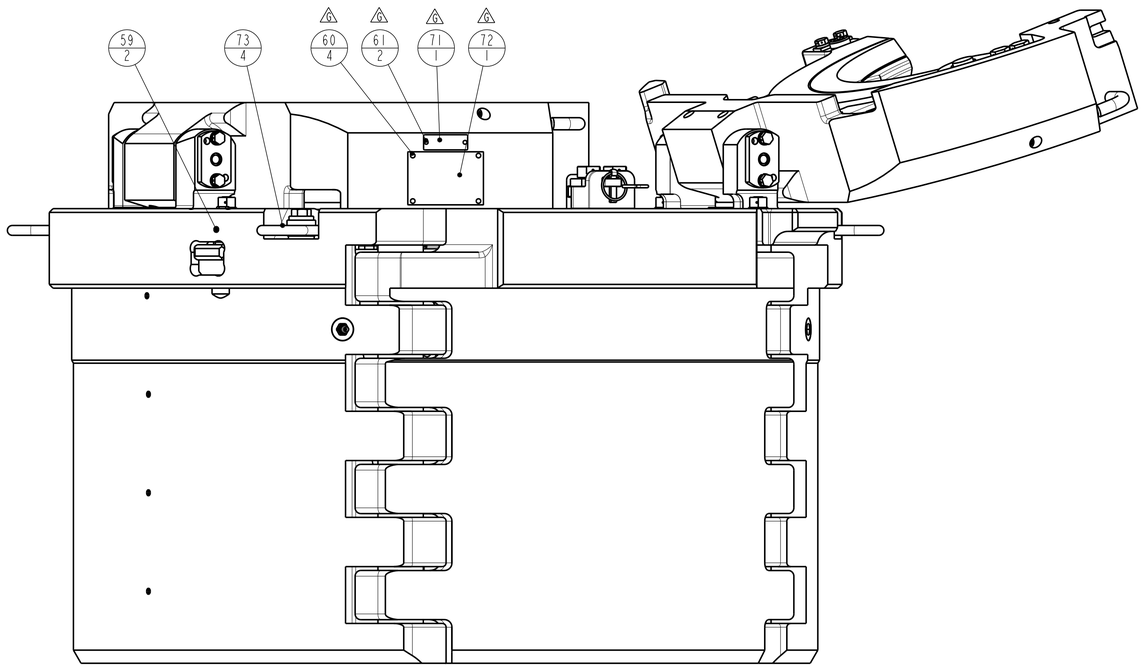
SECTION K-K



DETAIL A
SCALE 1:1
BUSHING ASSEMBLY
DIMENSIONS

PARTNUMBER	202400-3				UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO
MATERIAL					TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	
SURF. FINISH / PAINTSPEC.					BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
COLOR					MACHINED SURFACES 250	
WEIGHT	Lbs kg				TORCHCUT SURFACES 1000	
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:2 PROJ.
NAME	R.S.	NAME	CdL	REV.		
DATE	10-Oct-05	DATE	9-APR-09	G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)
		E.C.N.	0701064			
TITLE: PS30 FIN. ASSY FOR NATIONAL 49.1/2''					SIZE D	DRAWING NO. 202400-3 SHEET 4 OF 4





55	8	51008-C		WASHER, LOCK-STEEL
56	8	51010-C		WASHER, LOCK-STEEL
57	8	51012-C		WASHER, LOCK-STEEL
58	2	51403-20		COTTER PIN 3/16 X 2 1/2
59	2	51506-26		PIN_GROOVED_TAPER-51506-26
60	4	53301-10-6		SCREW, DRIVE 0.179 DIA X 3/8
61	2	53301-6-5		SCREW, DRIVE 0.138 DIA X 5/16
62	3	56506-2-4-S	56506-2-4-C	ELBOW 90 degr EXT.1/8-27NPT TO EXT.7/16-20UNF
63	2	56518-6-6-S	56518-6-6-C	ELBOW 90degr 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
64	1	56519-06-04-S	56519-06-04-C	ELBOW 90 de O_RING EXT.9/16UNF TO 7/16 JIC
65	8	56519-06-06-S	56519-06-06-C	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16 JIC
66	1	948051-2		S-HOOK
67	2	979386-55		COMPRESSION SPRING
68	12	979455-10		EXPANDER
69	4	979485-15		LOCKWASHER S.S. DIN432-
70	4	979771-2225		GLACIER BEARING MB2225DU
71	1	50000125		INFO & READ MANUAL PLATE
72	1	50000321		NAMEPLATE PS21 AND PS30
73	4	980473-2		HOIST SWIVEL RING

ITEM	QTY	PART NUMBER	SS EQUIVALENT	DESCRIPTION
1	2	1014		EXCENTRIC PIN
2	1	7887		LYNCH PIN
3	2	53204		STRAIGHT GREASE FITTING
4	2	202210		SYNCHRONISATION SHAFT KEY
5	2	202211		LOCK FOR VARCO BJ NATIONAL
6	1	202215		COVER PLATE LOCK
7	2	202226		CYLINDER PROTECTION RING
8	1	202409		SYNCHRONISATION SHAFT
9	4	50004523		ROD END FOR HINGE BLOCK LOCK PS-30
10	2	50004531		PIN for COVER-PLATE LOCK PS21/30
11	1	50004532		TUBING GUARD PS30 RIGHT HAND
12	1	50004533		TUBING GUARD PS30 LEFT HAND
13	1	50004534		TUBING GUARD MANIFOLD PS-30
14	1	50004548		COVER PLATE LOCK RETAINER PS-21/30
15	1	50004575		LEFT CAM BLOCK PS-30
16	1	50004576		RIGHT CAM BLOCK PS-30
17	2	50004747		Slip indicator pin with grease holes
18	2	50004748		Modified Plug external pipe_ countersunk hex
19	1	202203-55		ACTUATOR LH PS INT. REL.
20	1	202204-55		ACTUATOR RH PS INT. REL.
21	3	202349-15		GREASE RESTRICTOR 1.5MM
22	6	202349-25		GREASE RESTRICTOR 2.5MM
23	3	202349-50		GREASE RESTRICTOR 5MM
24	1	202375-1		LEFT-HAND COVER PLATE ASSY
25	1	202375-2		RIGHT-HAND COVER PLATE ASSY
26	1	202401_5M		BODY MACHINING FOR VARCO BJ 49-1/2"
27	1	202402-5M		DOOR MACHINING FOR VARCO RST 49-1/2"
28	1	202405-1		REMOVABLE HINGE PIN ASSEMBLY
29	1	202406-1		STATIONARY HINGE PIN ASSEMBLY
30	1	202407_		LOCK BAR FOR STATIONARY HINGE P
31	4	202707-1		3/4-10 UNC NUT WITH LOCKWIRE HOLE
32	1	50004559-1	50004559-1-1	Tube Grease LH slip PS30
33	1	50004559-2	50004559-2-1	Tube From LH IV PS30
34	1	50004559-3	50004559-3-1	Tube To LH IV PS30
35	1	50004559-4	50004559-4-1	Tube Rams open LH PS30
36	1	50004559-5	50004559-5-1	Tube Rams closed LH PS30
37	1	50004559-6	50004559-6-1	Tube Slips down LH PS30
38	1	50004559-7	50004559-7-1	Tube Slips up LH PS30
39	1	50004559-8	50004559-8-1	Tube grease RH slip PS30
40	1	50004559-9	50004559-9-1	Tube Signal RH actuator
41	1	50004559-10	50004559-10-1	Tube To IV RH PS30
42	1	50004559-11	50004559-11-1	Tube From IV RH PS30
43	1	50004559-12	50004559-12-1	Tube Rams open RH PS30
44	1	50004559-13	50004559-13-1	Tube Rams closed RH PS30
45	1	50004559-14	50004559-14-1	Tube Slips down RH PS30
46	1	50004559-15	50004559-15-1	Tube Slips up RH PS30
47	1	50004585-1		indicator valve left
48	1	50004590-2		Manifold Assembly PS-30 RST
49	1	50004591-1		indicator valve right
50	4	50008-08-C8D		SCREW,CAP-HEX HD (UNC 1/2")
51	4	50008-22-C8D		SCREW,CAP-HEX HD (UNC 1/2")
52	4	50010-16-C8D		SCREW,CAP-HEX HD (UNC 5/8")
53	8	50010-24-C8D		SCREW,CAP-HEX HD (UNC 5/8")
54	4	50012-72-C8D		SCREW,CAP-HEX HD (UNC 3/4")

SS EQUIVALENT Applicable to P.N.:202400-5-1

ALL SCREWS NEED TO BE
LOCK WIRED AS SHOWN!!

NOTE:
SEE ALSO SUB-ASSEMBLY DRAWINGS;
202203-55 (ACTUATOR L.H. INT. RELIEF)
202204-55 (ACTUATOR R.H. INT. RELIEF)
202375-1 (L.H. COVER PLATE ASSEMBLY)
202375-2 (R.H. COVER PLATE ASSEMBLY)
50004590-2 (MANIFOLD ASSEMBLY)
50004585-1 (L.H. INDICATOR VALVE ASSEMBLY)
50004591-1 (R.H. INDICATOR VALVE ASSEMBLY)

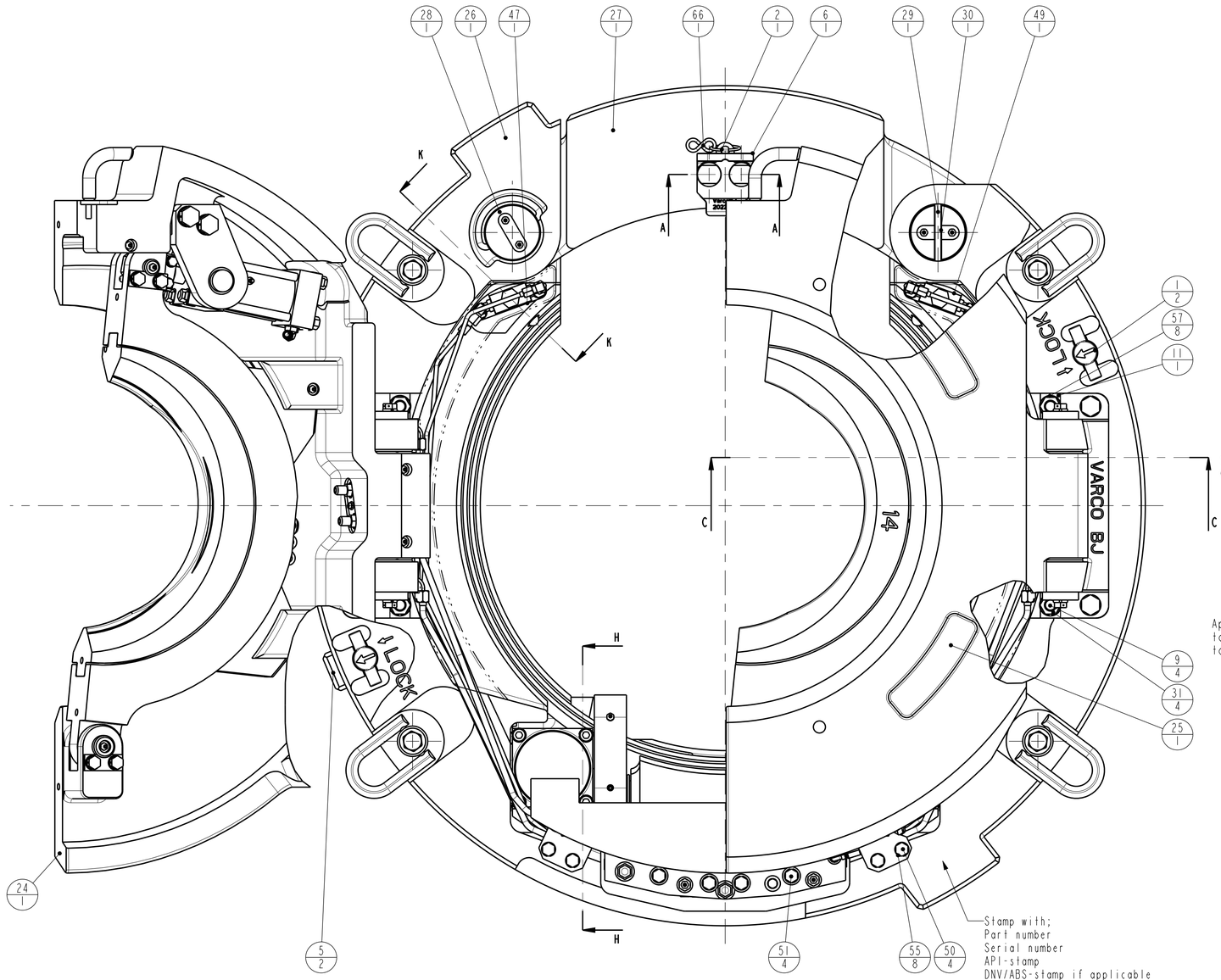
PARTNUMBER	202400-5				
MATERIAL					
SURF. FINISH / PAINTSPEC.	P-001				
COLOR	Body; Red, Top-covers; Black				
WEIGHT	9066.8 Lbs 3790 kg				
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	R.S.	NAME	CdL	REV.	
DATE	09-Apr-09	DATE	10-APR-09	G	
		E.C.N.	0701064		

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250
TORCHCUT SURFACES 1000
ALL WELD SYMBOLS ACC. TO ISO
DO NOT SCALE DOCUMENT
THIS DOCUMENT IS PDMlink CONTROLLED
SCALE 1:4
UNITS INCH (mm)
PROJ.

NOV
NATIONAL OILWELL VARCO

TITLE	PS30 FIN.ASSY FOR VARCO 49.1/2''	SIZE	DRAWING NO.	SHEET
		D	202400-5	1 OF 4

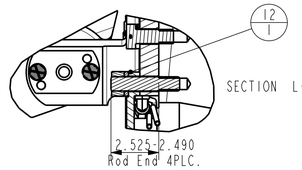
PART NUMBER
202400-5

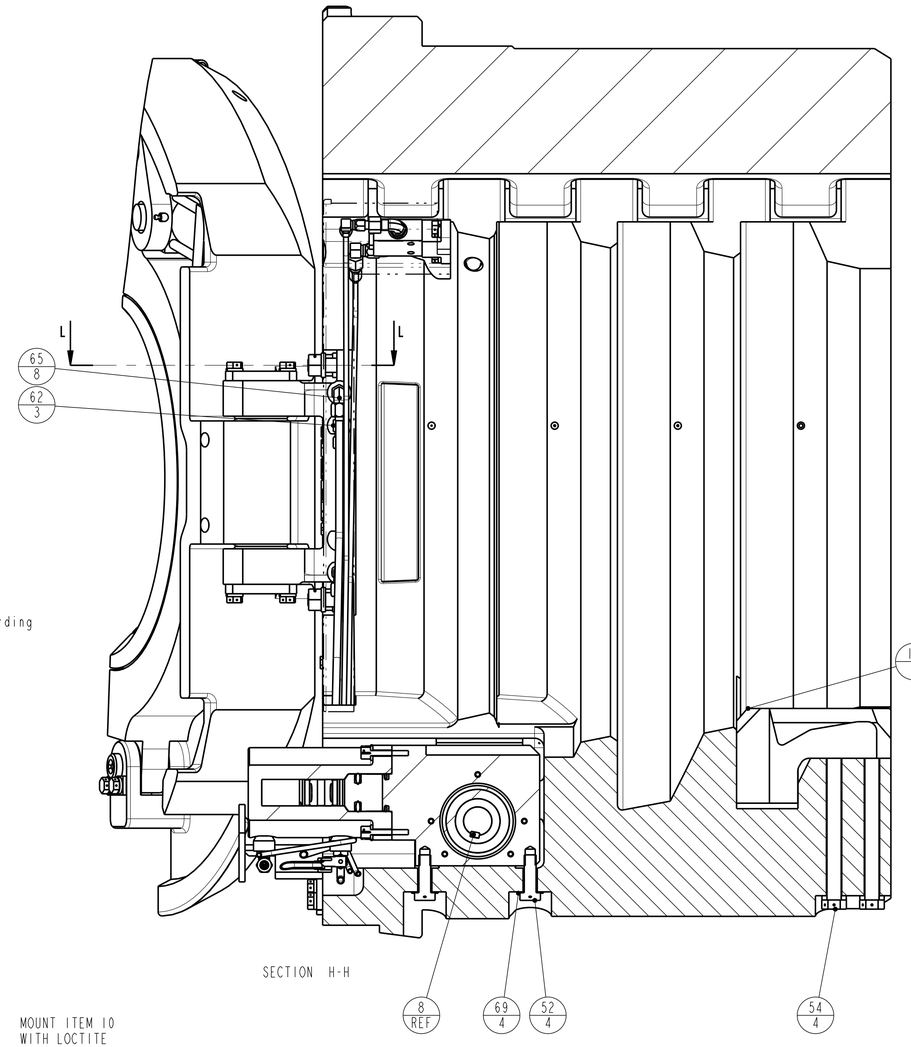


MOUNTING INSTRUCTIONS PART 71:
1) DEGREASE HOIST SWIVEL RING BOLT AND TAPPED HOLE.
2) MOUNT WITH LOCTITE
3) PRE-TORQUE AT 100 FT.LBS

Stamp with;
Part number
Serial number
API-stamp
DNV/ABS-stamp if applicable
"CE 112GT5"⚠

Apply torque according to 50005000.xls. to items 31

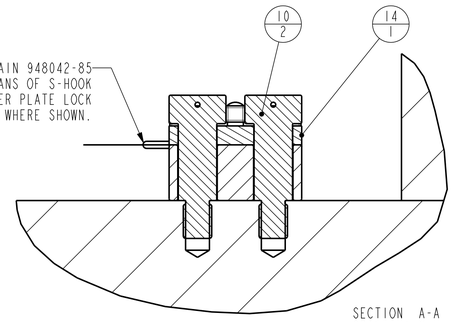




SECTION H-H

Apply torque according to 50005000.xls. to items 52, 54

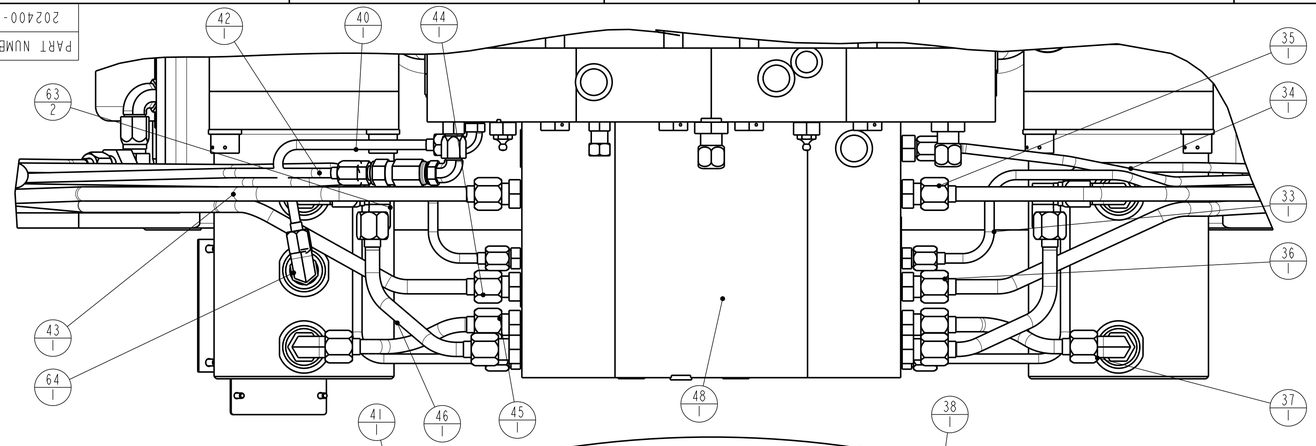
MOUNT ITEM 10 WITH LOCTITE



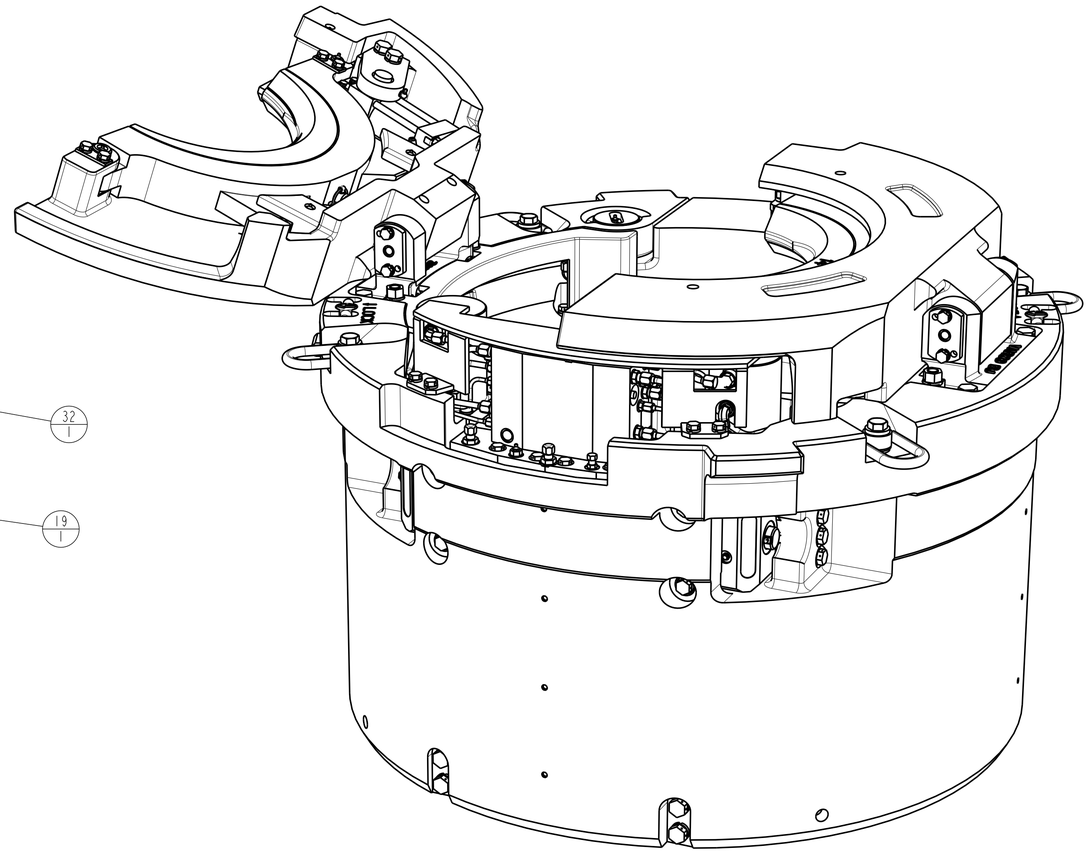
SECTION A-A
SCALE 1:2

PARTNUMBER	202400-5			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.				BREAK SHARP CORNERS .010 ± .005	
COLOR				MACHINED SURFACES 250	
WEIGHT	Lbs	kg		TORCHCUT SURFACES 1000	
ORIGINAL DOCUMENT	LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:4 PROJ.
NAME R.S.	NAME CdL		REV.		
DATE 18-Oct-05	DATE 10-APR-09		G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)
	E.C.N. 0701064				
TITLE PS30 FIN.ASSY FOR VARCO 49.1/2''			SIZE D	DRAWING NO. 202400-5	SHEET 2 OF 4

PART NUMBER
202400-5

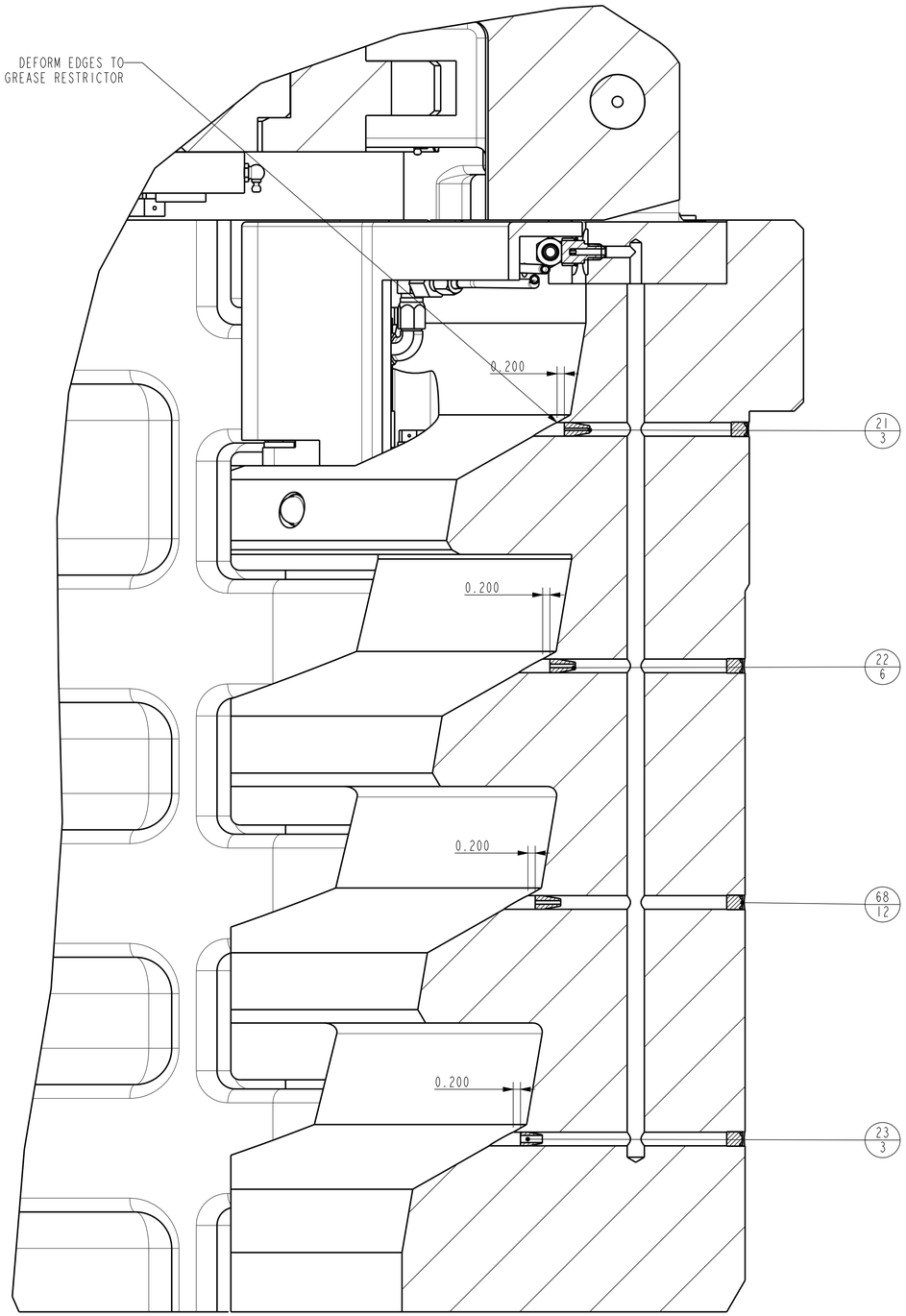


SECTION B-B

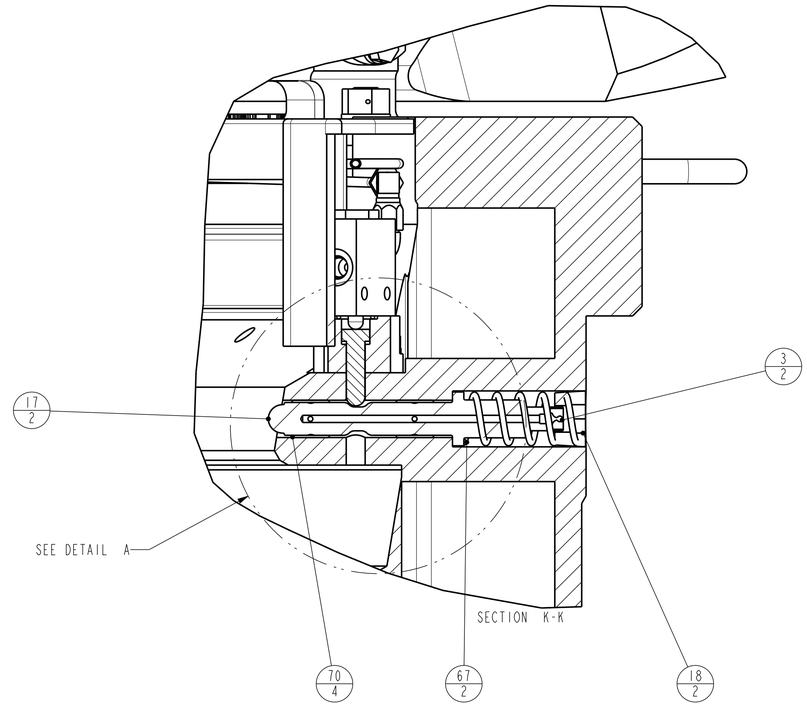


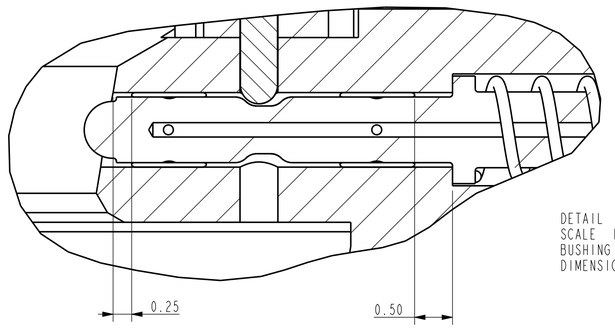
PARTNUMBER	202400-5			UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.				BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
COLOR				MACHINED SURFACES 250		
WEIGHT	Lbs kg			TORCHCUT SURFACES 1000		
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:2	PROJ.
NAME	R.S.	NAME	CdL	REV.			
DATE	18-Oct-05	DATE	10-APR-09	G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)	
		E.C.N.	070164				
TITLE	PS30 FIN.ASSY FOR VARCO 49.1/2''			SIZE D	DRAWING NO. 202400-5		SHEET 3 OF 4

PART NUMBER
202400-5



SECTION C-C



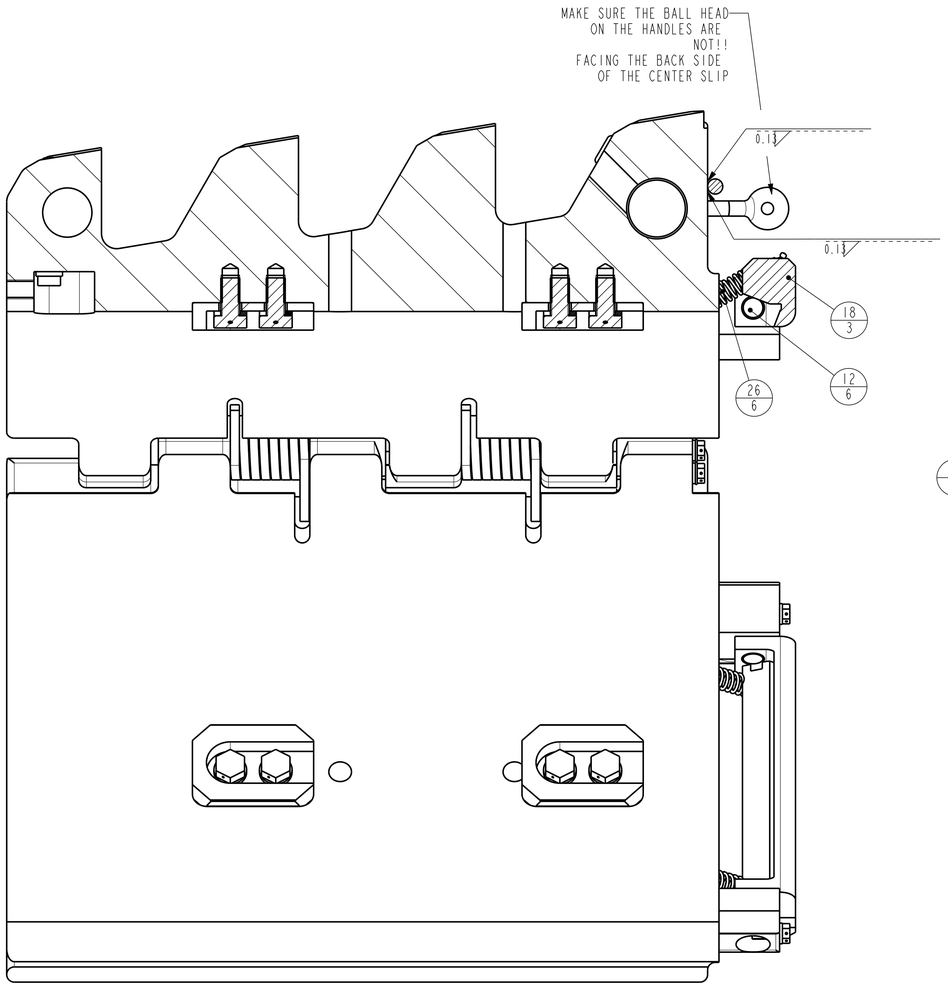


DETAIL A
SCALE 1:1
BUSHING ASSEMBLY
DIMENSIONS

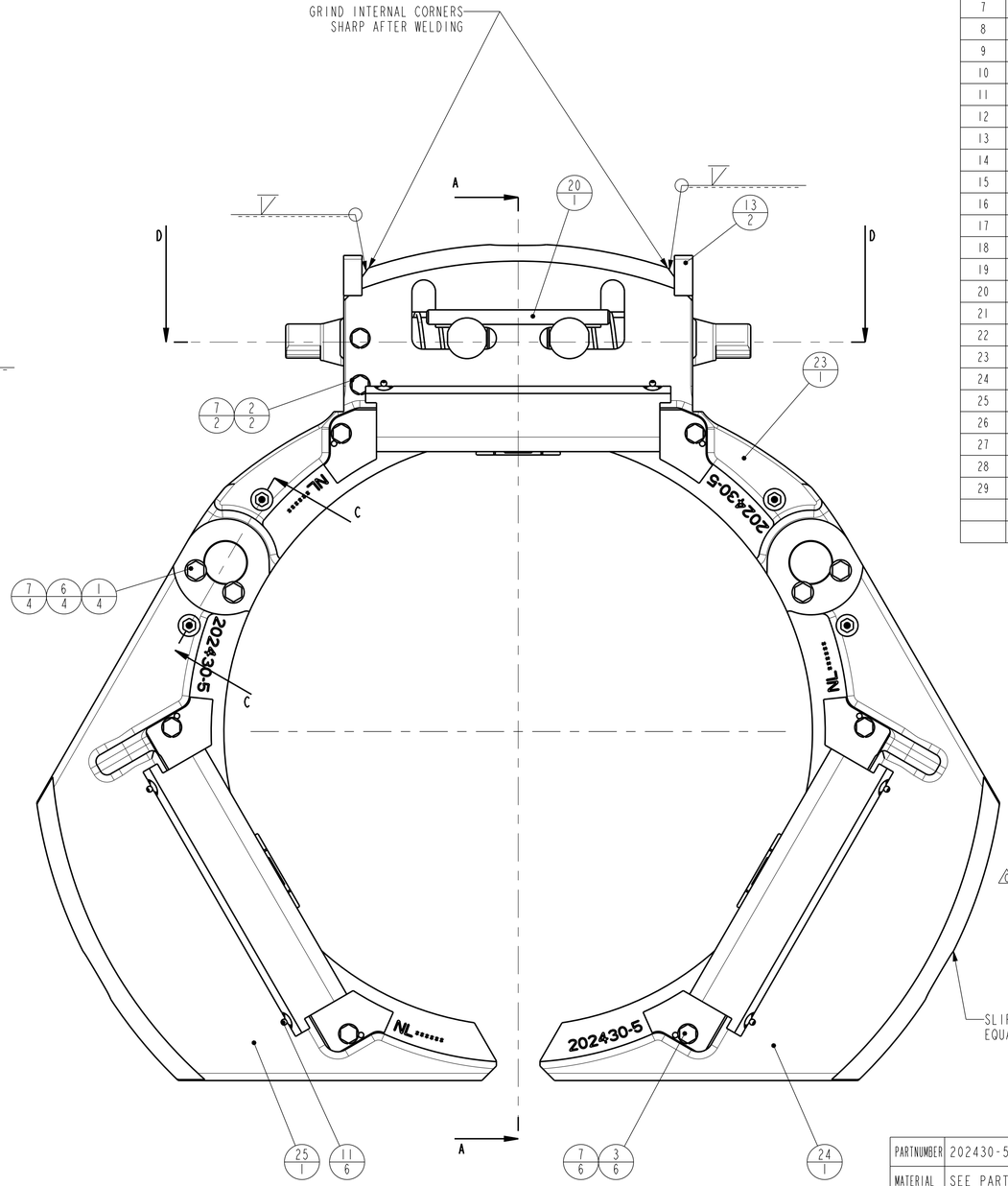
PARTNUMBER	202400-5			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.				BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	
COLOR					
WEIGHT	Lbs kg				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2
NAME	R.S.	NAME	CdL	REV.	
DATE	18-Oct-05	DATE	10-APR-09	G	
		E.C.N.	070164	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)

TITLE	SIZE	DRAWING NO.	SHEET
PS30 FIN.ASSY FOR VARCO 49.1/2''	D	202400-5	4 OF 4

ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	50006-04-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	2	50006-05-C8D	SCREW,CAP-HEX HD (UNC 3/8")
3	6	50006-08-C8D	SCREW,CAP-HEX HD (UNC 3/8")
4	1	50008-06-C8D	SCREW,CAP-HEX HD (UNC 1/2")
5	12	50010-10-C8D	SCREW,CAP-HEX HD (UNC 5/8")
6	4	50806-N-C	WASHER, FLAT
7	12	50906-C	WASHER, LOCK-REGULAR 0.375
8	12	50910-C	WASHER, LOCK-REGULAR 0.625
9	2	51008-C	WASHER, LOCK-STEEL
10	1	51708-24-C	BOLT-SHOULDER SOCKET HEAD (UNC-3A)
11	10	53201	GREASE FITTING, STRAIGHT
12	6	202283	LATCH-PIN
13	2	202287-T	PLATE-CENTERSLIPS
14	2	202289	HANDLE CENTERSLIPS
15	1	202290	RING,CENTERSLIPS
16	2	202294-1	COMPRESSION SPRING
17	2	202370	SLIP HINGE PIN
18	3	202371	LATCH
19	2	202372	SLIP MOUNTING PIN
20	1	202373	BAR CENTER SLIPS
21	2	202374	WELD RING CENTER SLIPS
22	4	202393	SLIP SPRING
23	1	202430-5M	CENTER SLIP, MACHINING 16
24	1	202431-5M	LEFT -HAND SLIP MACHINING 16
25	1	202432-5M	RIGHT-HAND SLIP MACHINING
26	6	979386-5	COMPRESSION SPRING
27	16	979455-10	EXPANDER
28	1	50004577	SHAFT CENTER SLIP PS 30
29	6	50008281	CARRIER RETAINING BLOCK



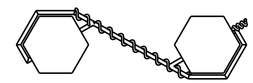
SECTION A-A



NOTES:
⚠ -FIRST SET WITH MATERIAL CMS-05 HAS SERIAL NUMBER;NL0119660
-REVISION C; REMOVED SHEET3, CHANGED MATERIAL
REMOVED CASTED TOE GROOVES
-CHECK FOR PART- AND SERIAL NUMBER
IN ALL SLIPS.

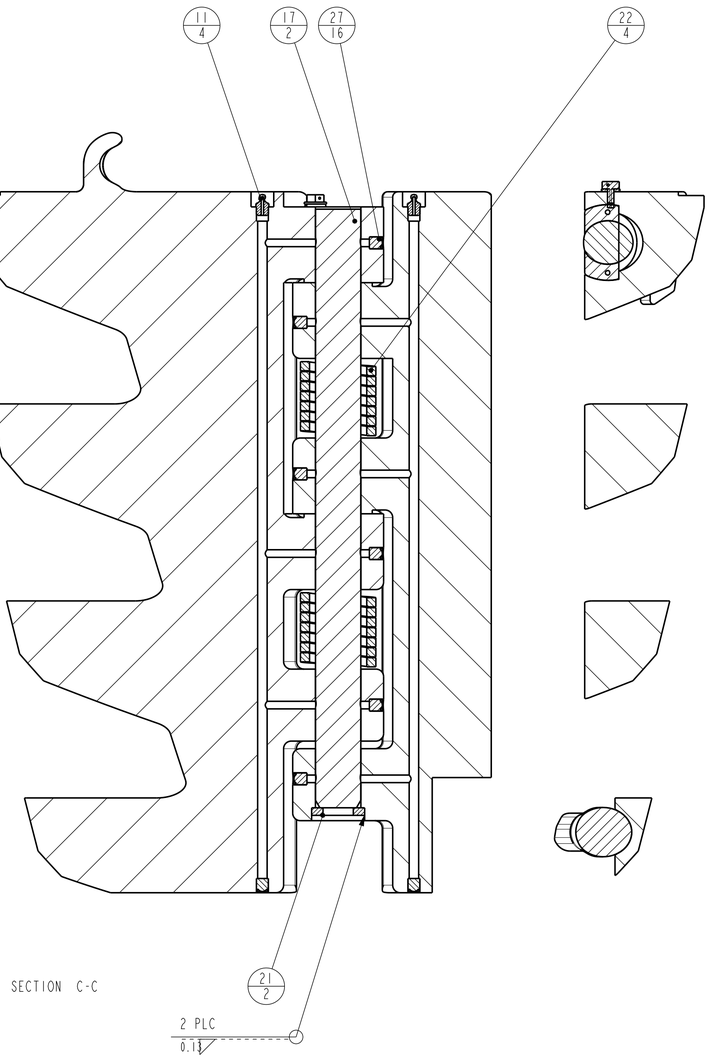
ALL SCREWS NEED TO BE LOCK WIRED AS SHOWN!

SLIP GROOVES WIDTH EQUAL FOR ALL SLIPS

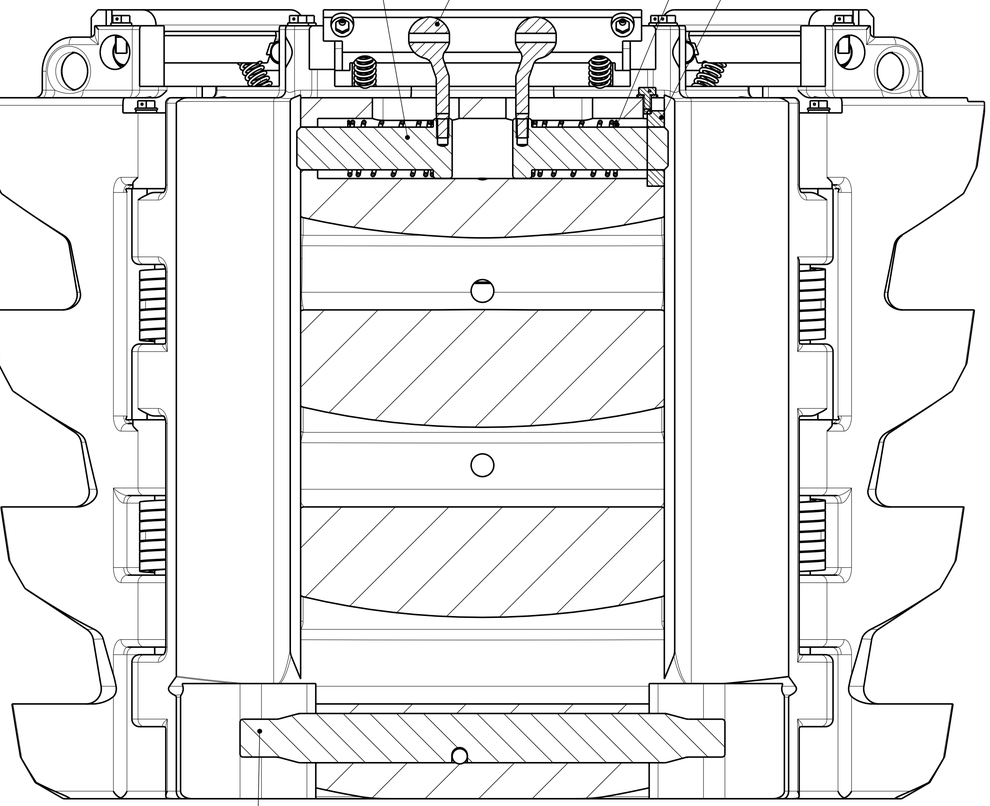


SCALE 2:1

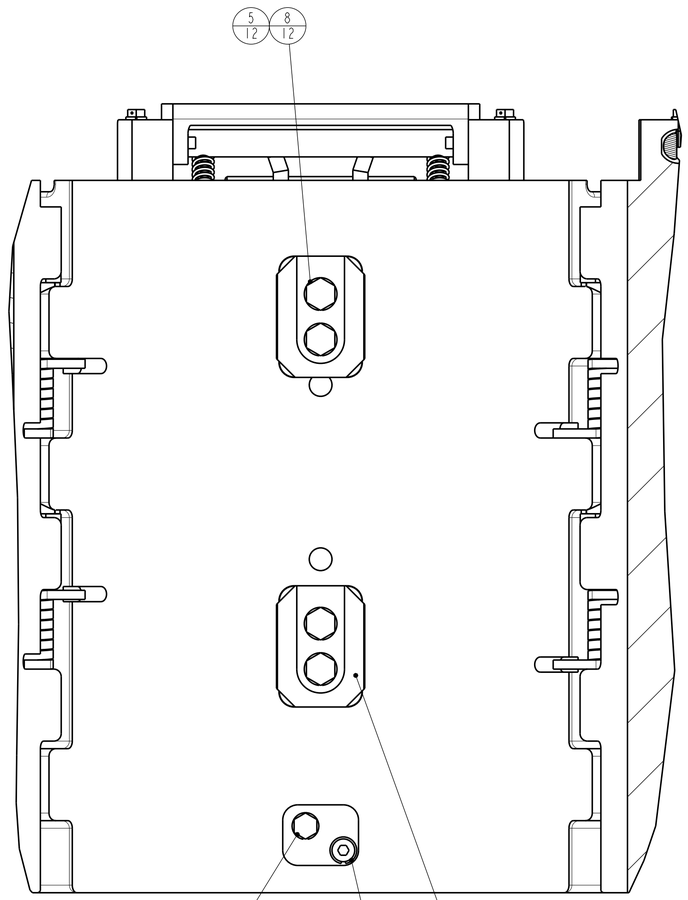
PARTNUMBER	202430-5				UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO	
MATERIAL	SEE PARTS LIST				TOLERANCES (PER ANSI Y 14.5). 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
SURF. FINISH / PAINTSPEC.	-				BREAK SHARP CORNERS .010 ± .005		
COLOR	-				MACHINED SURFACES 250 / 1000		
WEIGHT	1763 Lbs 800 kg				TORCHCUT SURFACES		
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 2:5	PROJ.
NAME	B.v.d.P.	NAME	CdL	REV.	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)	
DATE	20-Apr-04	DATE	19-JAN-11	C			
		E.C.N.	0701273				
TITLE	SLIP ASSEMBLY 6-5/8-16				SIZE D	DRAWING NO. 202430-5	SHEET 1 OF 2



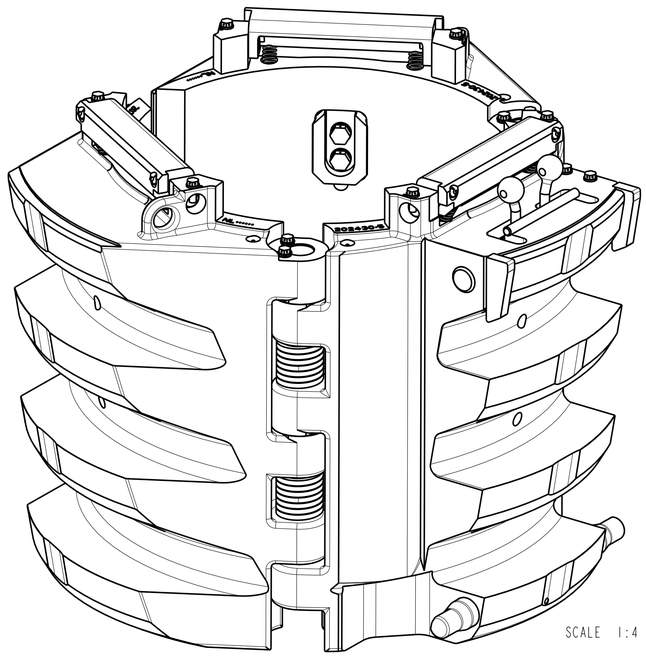
SECTION C-C



SECTION D-D



SECTION B-B

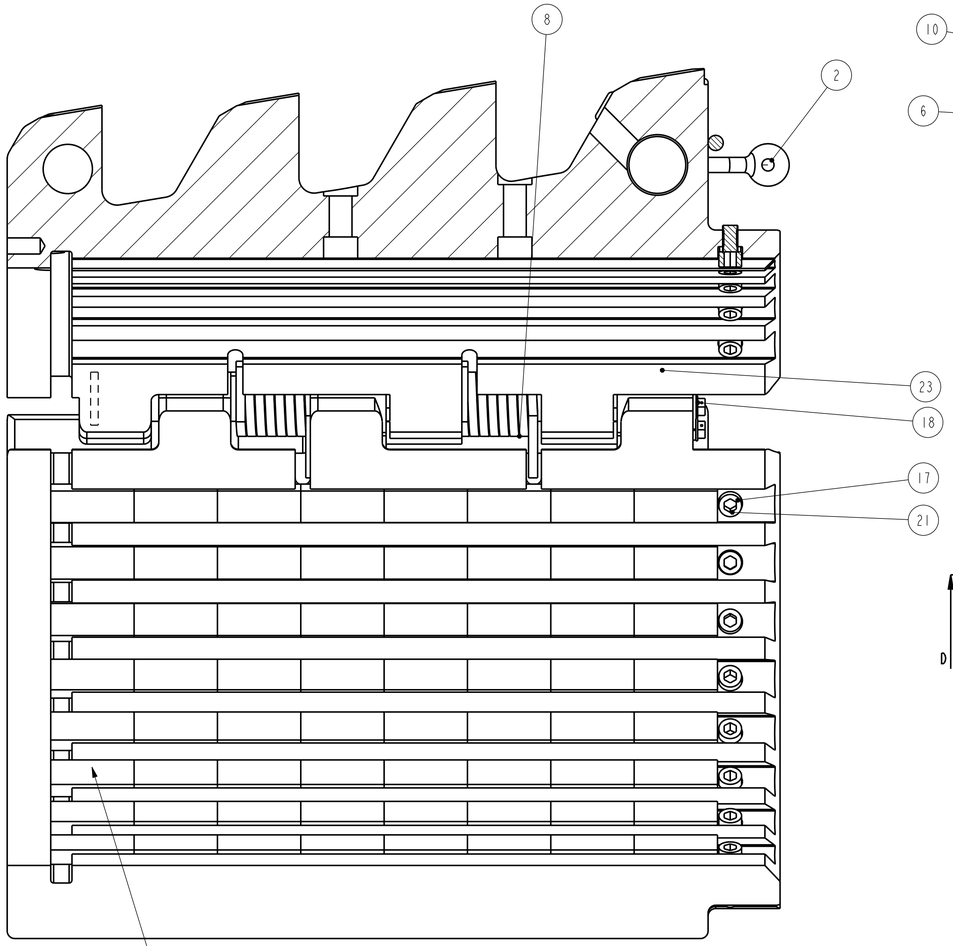


SCALE 1:4

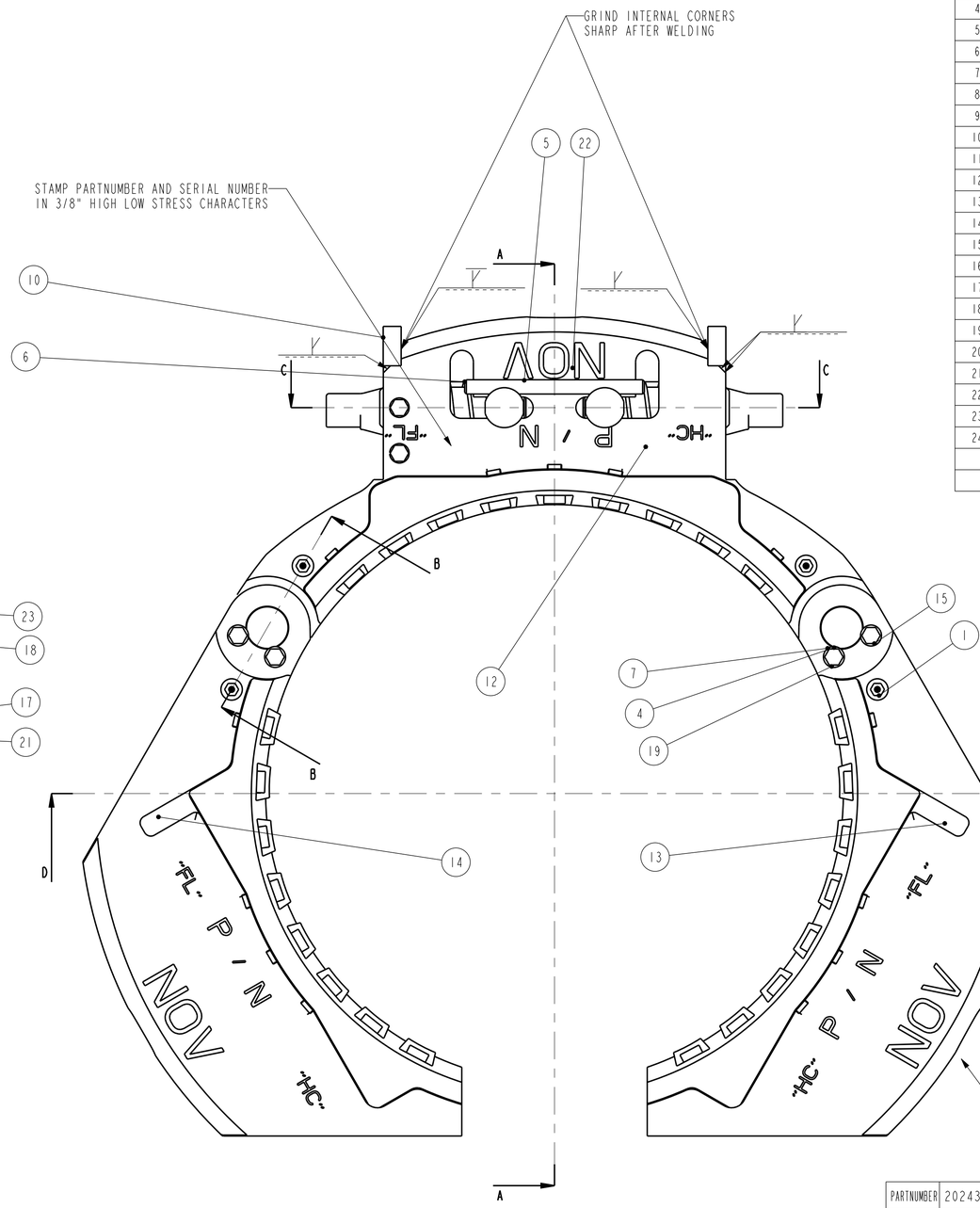
PARTNUMBER					UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL					TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.					BREAK SHARP CORNERS .010 ± .005	
COLOR					MACHINED SURFACES 250	
WEIGHT	Lbs kg				TORCHCUT SURFACES 1000	
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 2:5 PROJ.
NAME	B.v.d.P.	NAME	CdL	REV.	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
DATE	20-Apr-04	DATE	19-JAN-11	C		
		E.C.N.	0701273			

TITLE	SIZE	DRAWING NO.	SHEET
SLIP ASSEMBLY 6-5/8-16	D	202430-5	2 OF 2

ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	53201	GREASE FITTING, STRAIGHT
2	2	202289	HANDLE CENTERSLIPS
3	1	202290	RING,CENTERSLIPS
4	2	202370	SLIP HINGE PIN
5	2	202372	SLIP MOUNTING PIN
6	1	202373	BAR CENTER SLIPS
7	2	202374	WELD RING CENTER SLIPS
8	4	202393	SLIP SPRING
9	1	50004577	SHAFT CENTER SLIP PS 30
10	2	202287-T	PLATE-CENTERSLIPS
11	2	202294-1	COMPRESSION SPRING
12	1	202430-20M	CENTER SLIP MACHINING 20
13	1	202431_20M	LEFT -HAND SLIP MACHINING 20
14	1	202432_20M	RIGHT -HAND SLIP MACHINING 20
15	4	50006-04-C8D	SCREW,CAP-HEX HD (UNC 3/8")
16	2	50006-05-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	25	50108-7-S	SCREW,CAP-SOCKET HEAD (UNC 1/2"x0.875"")
18	4	50806-N-C	WASHER, FLAT
19	6	50906-C	WASHER, LOCK-REGULAR 0.375
20	1	51008-C	WASHER, LOCK-STEEL
21	25	51108-S	WASHER, LOCK-STAINLESS
22	1	51708-24-C	BOLT-SHOULDER SOCKET HEAD (UNC-3A)
23	16	979455-10	EXPANDER
24	128	INSERT	INSERT



SECTION A-A



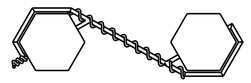
Assy part no.	Insert part no.	Basic Insert
202430-2	None	None
202430-2000	2635-25B-175	50004570-2000
202430-1875	2657-47B-150	50004570-1875
202430-1863	17080-47B-150	50004570-1863

△6

△6 NOTE
FIRST SET WITH MATERIAL CMS-05 SERIAL NUMBER ????

SLIP GROOVES WIDTH
EQUAL FOR ALL SLIPS

ALL SCREWS NEED TO BE LOCK WIRED AS SHOWN!

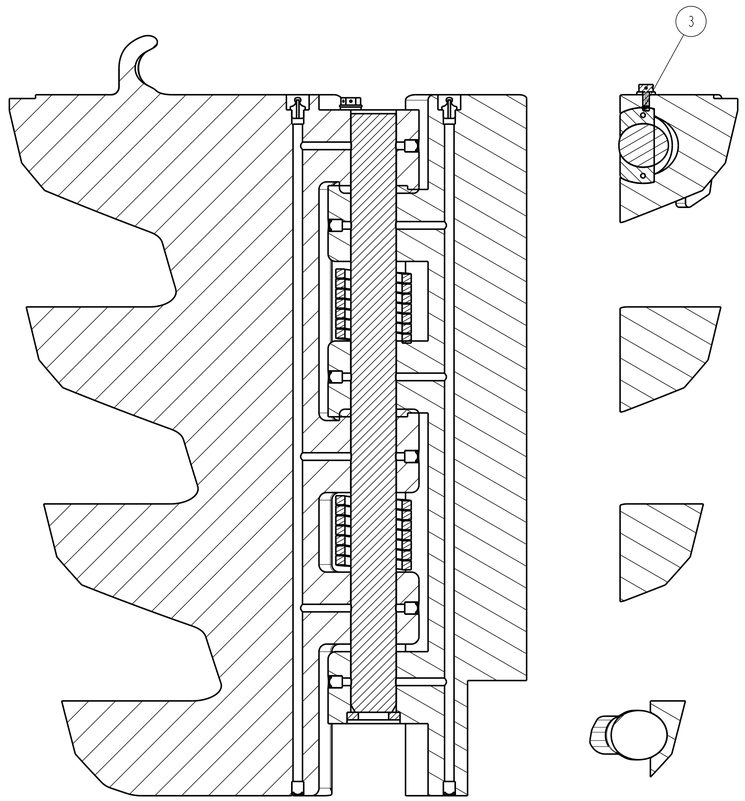


SCALE 2:1

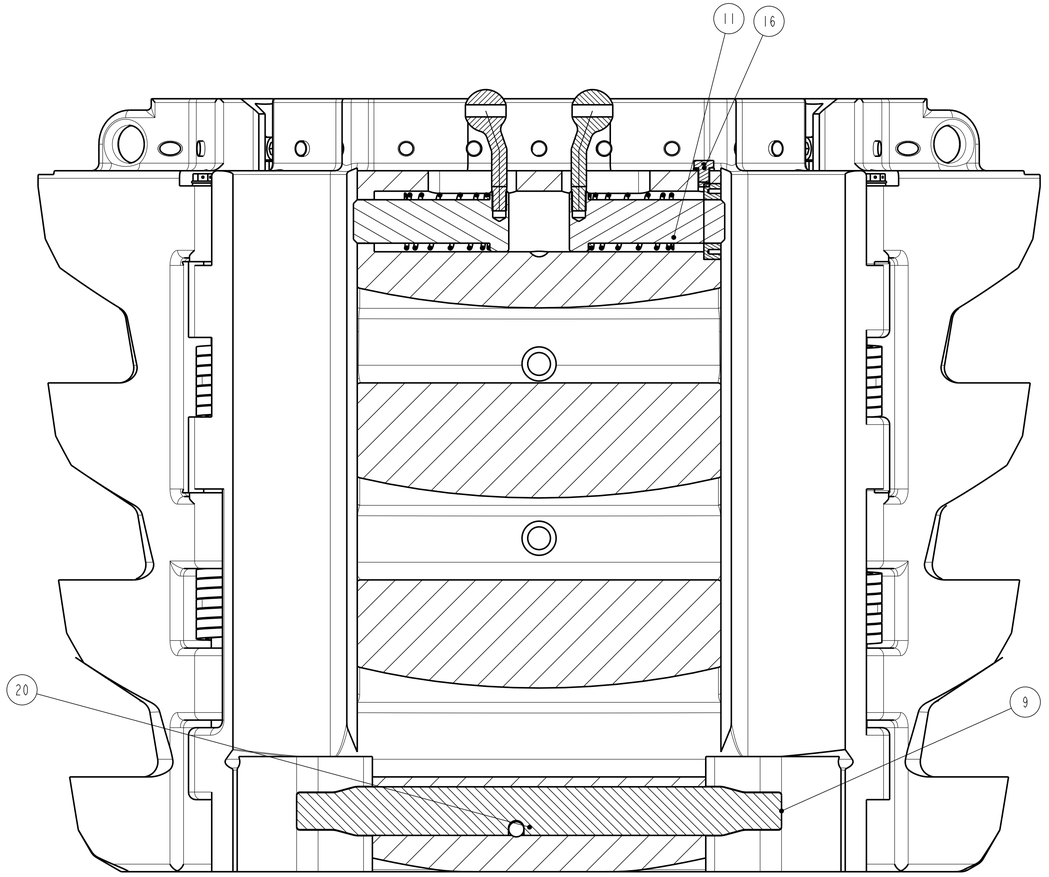
△6 REMOVED TOOLING HOLES
UPDATED TABLE
CHANGED MATERIAL

PARTNUMBER	202430-2	UNLESS OTHERWISE SPECIFIED		NOV NATIONAL OILWELL VARCO	
MATERIAL	SEE PARTS LIST	TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
SURF. FINISH / PAINTSPEC.	-	BREAK SHARP CORNERS .010 ± .005			
COLOR	-	MACHINED SURFACES 250			
WEIGHT	1581 Lbs *** kg	TORCHCUT SURFACES 1000			
		ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 2:5
NAME M.KALS		NAME KdL	REV.		PROJ.
DATE 24NOV1997		DATE 22JUL2010	G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)
		E.C.N. 0701088			
TITLE SLIP ASSEMBLY		SIZE D	DRAWING NO. 202430-2		SHEET 1 OF 3

PART NUMBER
202430-2

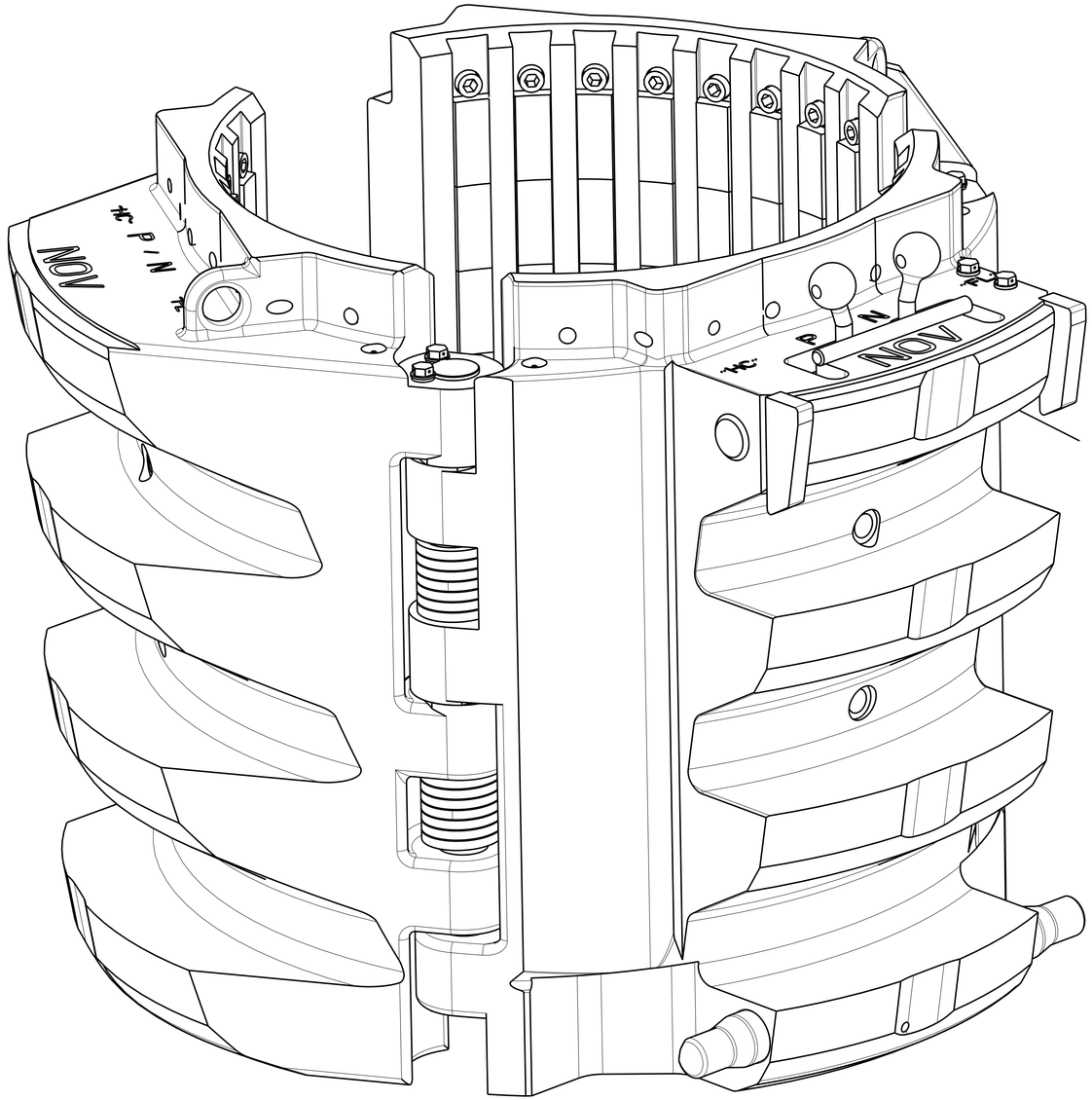


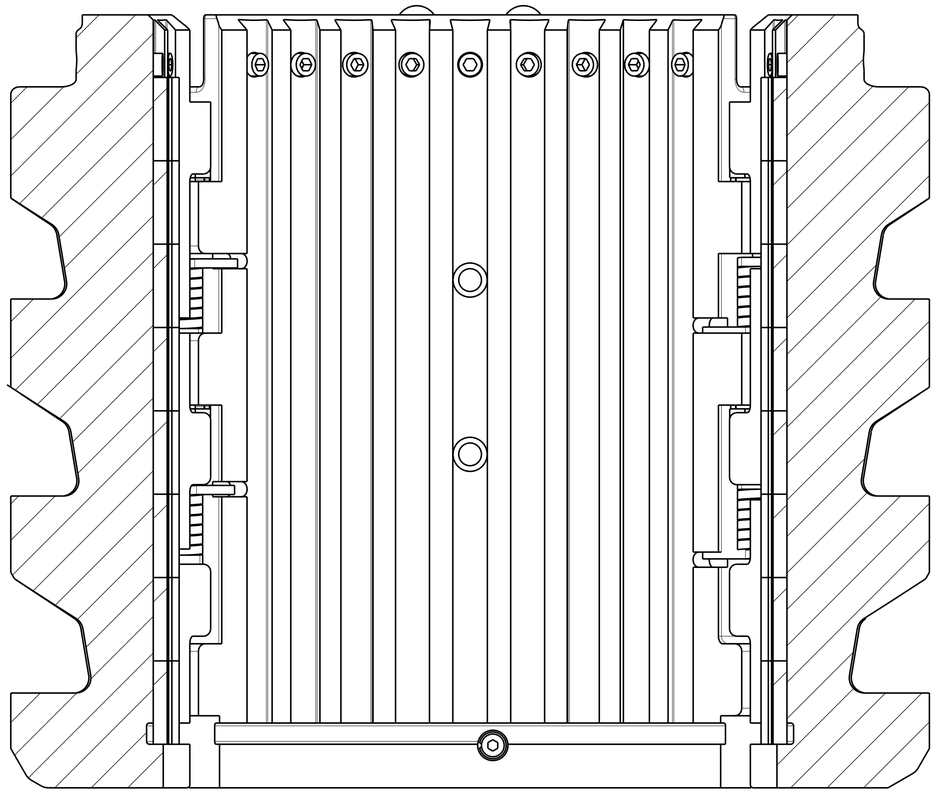
SECTION B-B



SECTION C-C

PARTNUMBER		UNLESS OTHERWISE SPECIFIED		NATIONAL OILWELL VARCO	
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE JOB FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.	
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005			
COLOR		MACHINED SURFACES 250			
WEIGHT	Lbs kg	TORCHCUT SURFACES 1000 ALL WELD SYMBOLS ACC. TO ISO			
ORIGINAL DOCUMENT	LATEST REVISION	DO NOT SCALE DOCUMENT		SCALE 2:5	PROJ.
NAME M.KALS	NAME KdL REV.				
DATE 24NOV1997	DATE 22JUL2010 G	THIS DOCUMENT IS PDMlink CONTROLLED		UNITS INCH (mm)	
	E.C.N. 0701088				
TITLE SLIP ASSEMBLY		SIZE D	DRAWING NO. 202430-2		SHEET 2 OF 3

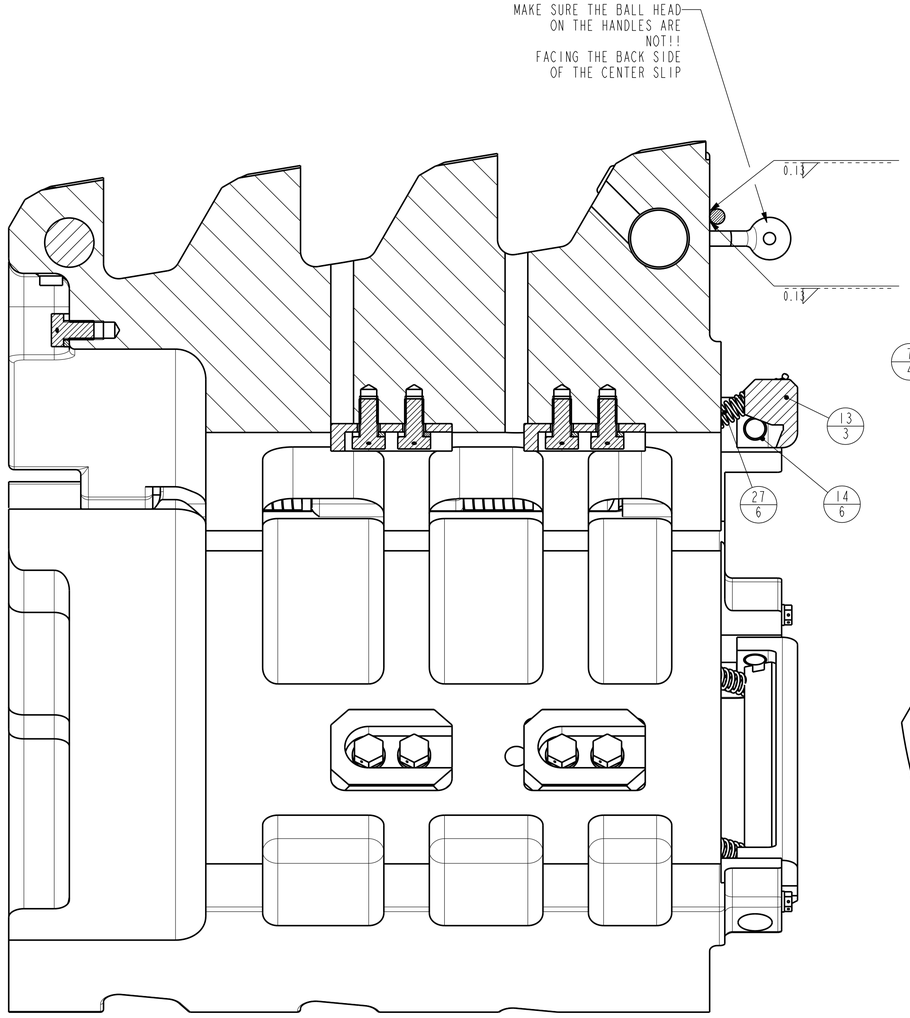




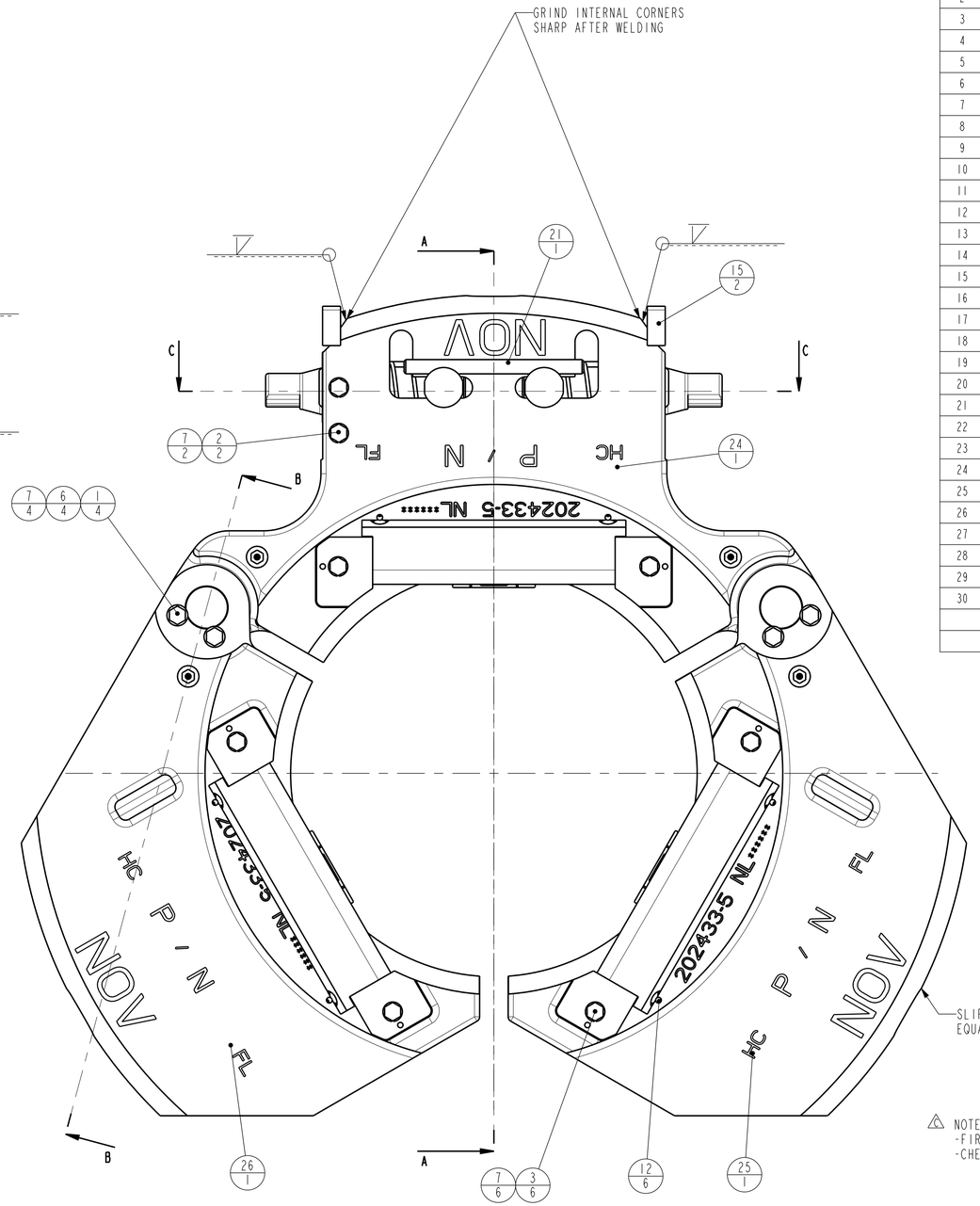
SECTION D-D

PARTNUMBER		UNLESS OTHERWISE SPECIFIED		NOV		
MATERIAL		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		NATIONAL OILWELL VARCO		
SURF. FINISH / PAINTSPEC.		BREAK SHARP CORNERS .010 ± .005		THIS DOCUMENT CONTAINS PROPRIETARY AND CONFIDENTIAL INFORMATION WHICH IS THE PROPERTY OF NATIONAL OILWELL VARCO, L.P., ITS AFFILIATES OR SUBSIDIARIES (ALL COLLECTIVELY REFERRED TO HEREINAFTER AS "NOV"). IT IS LOANED FOR LIMITED PURPOSES ONLY AND REMAINS THE PROPERTY OF NOV. REPRODUCTION, IN WHOLE OR IN PART, OR USE OF THIS DESIGN OR DISTRIBUTION OF THIS INFORMATION TO OTHERS IS NOT PERMITTED WITHOUT THE EXPRESS WRITTEN CONSENT OF NOV. THIS DOCUMENT IS TO BE RETURNED TO NOV UPON REQUEST OR UPON COMPLETION OF THE USE FOR WHICH IT WAS LOANED. THIS DOCUMENT AND THE INFORMATION CONTAINED AND REPRESENTED HEREIN IS THE COPYRIGHTED PROPERTY OF NOV.		
COLOR		MACHINED SURFACES 250				
WEIGHT	Lbs kg	TORCHCUT SURFACES 1000				
		ALL WELD SYMBOLS ACC. TO ISO				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 2:5	PROJ.
NAME M.KALS		NAME KdL	REV.			
DATE 24NOV1997		DATE 22JUL2010	G	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)	
		E.C.N. 0701088				
TITLE SLIP ASSEMBLY		SIZE D	DRAWING NO. 202430-2			SHEET 3 OF 3

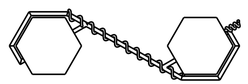
ITEM	QTY	PART NUMBER	DESCRIPTION
1	4	50006-04-C8D	SCREW,CAP-HEX HD (UNC 3/8")
2	2	50006-05-C8D	SCREW,CAP-HEX HD (UNC 3/8")
3	6	50006-08-C8D	SCREW,CAP-HEX HD (UNC 3/8")
4	12	50010-10-C8D	SCREW,CAP-HEX HD (UNC 5/8")
5	1	50010-8-C8D	SCREW,CAP-HEX HD (UNC 5/8")
6	4	50806-N-C	WASHER, FLAT
7	12	50906-C	WASHER, LOCK-REGULAR 0.375
8	12	50910-C	WASHER, LOCK-REGULAR 0.625
9	1	51008-C	WASHER, LOCK-STEEL
10	1	51010-C	WASHER, LOCK-STEEL
11	1	51708-16-C	BOLT-SHOULDER SOCKET HEAD (UNC-3A)
12	10	53201	GREASE FITTING, STRAIGHT
13	3	202282	LATCH PS21
14	6	202283	LATCH-PIN
15	2	202287-T	PLATE-CENTERSLIPS
16	2	202289	HANDLE CENTERSLIPS
17	1	202290	RING,CENTERSLIPS
18	2	202294-1	COMPRESSION SPRING
19	2	202370	SLIP HINGE PIN
20	2	202372	SLIP MOUNTING PIN
21	1	202373	BAR CENTER SLIPS
22	2	202374	WELD RING CENTER SLIPS
23	4	202393	SLIP SPRING
24	1	202433-5M	CENTER SLIP MACHINING 10-3/4
25	1	202434-5M	LEFT HAND SLIP MACHINING
26	1	202435-5M	RIGHT HAND SLIP MACHINING
27	6	979386-5	COMPRESSION SPRING
28	16	979455-10	EXPANDER
29	1	50004577	SHAFT CENTER SLIP PS 30
30	6	50008281	CARRIER RETAINING BLOCK



SECTION A-A



ALL SCREWS NEED TO BE LOCK WIRED AS SHOWN!!



SCALE 2:1

⚠ NOTES:
-FIRST SET WITH MATERIAL CMS-05 HAS SERIAL NUMBER; NL0123188
-CHECK FOR PART- AND SERIAL NUMBER IN EACH SLIP

PARTNUMBER	202433-5					
MATERIAL	SEE PART LIST ⚠					
SURF. FINISH / PAINTSPEC.	-					
COLOR	-					
WEIGHT	2019 lbs 916 kg					
ORIGINAL DOCUMENT		LATEST REVISION				
NAME	B.v.d.P.	NAME	CdL	REV.		
DATE	21-Apr-04	DATE	17-JAN-11	C		
		E.C.N.	0701273			

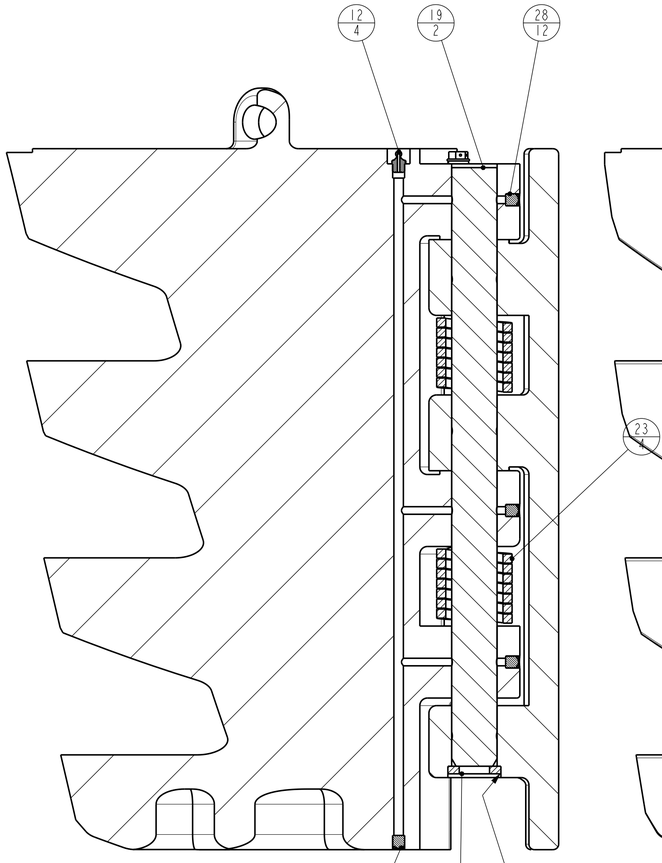
UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250 / 1000
TORCHCUT SURFACES

DO NOT SCALE DOCUMENT
THIS DOCUMENT IS DMS CONTROLLED

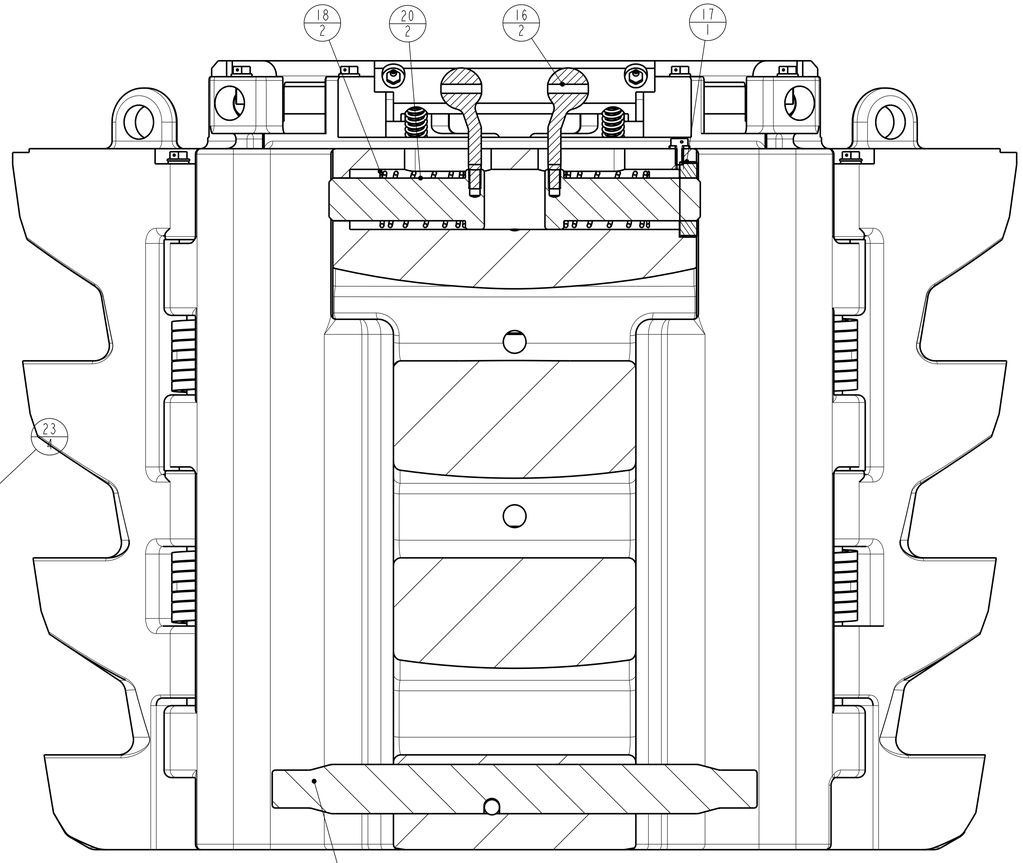
NATIONAL OILWELL VARCO

SCALE 2:5
UNITS INCH (mm)
PROJ.

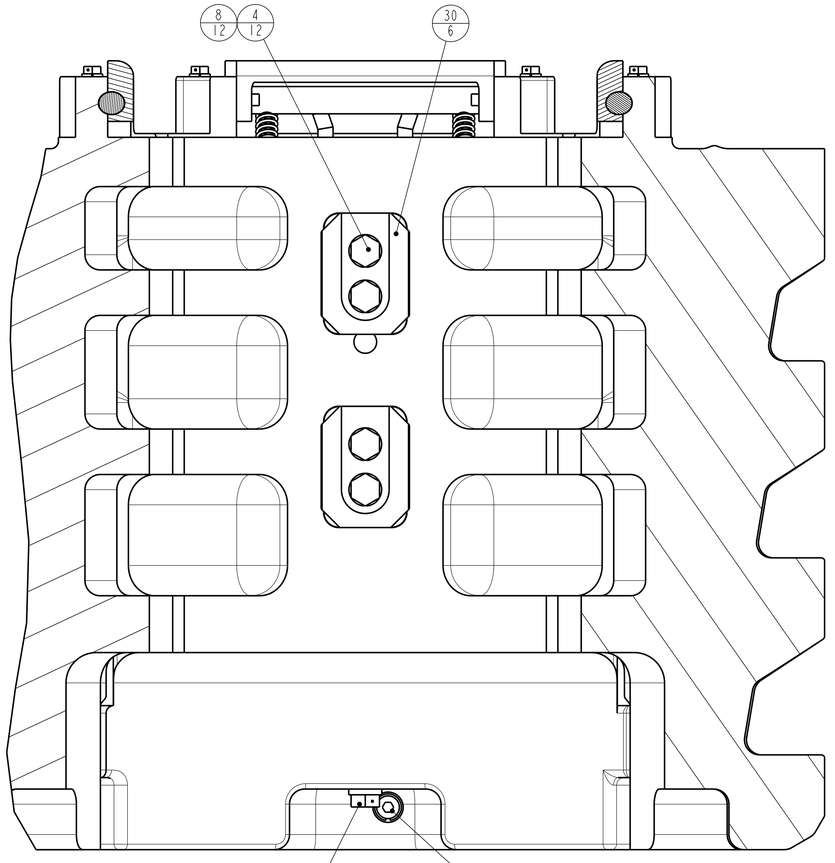
TITLE	SIZE	DRAWING NO.	SHEET
SLIP ASSEMBLY 2-3/8--10-3/4	D	202433-5	1 OF 2



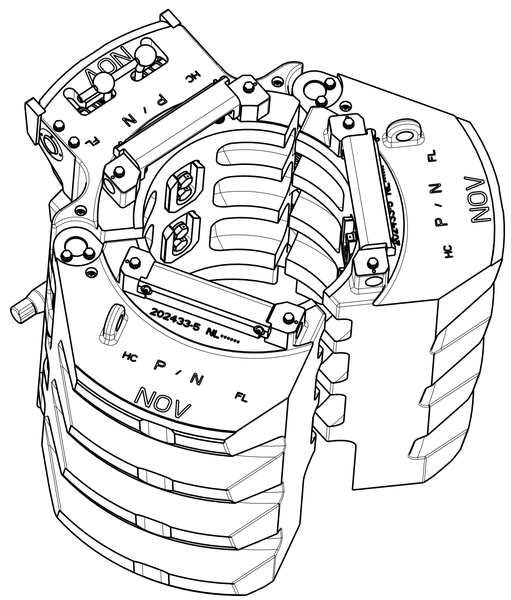
SECTION B-B



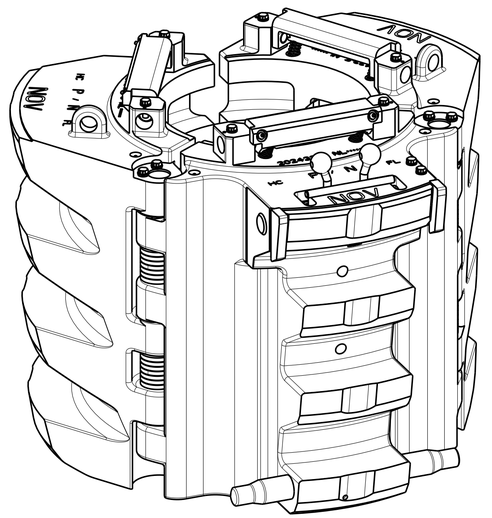
SECTION C-C



SECTION D-D



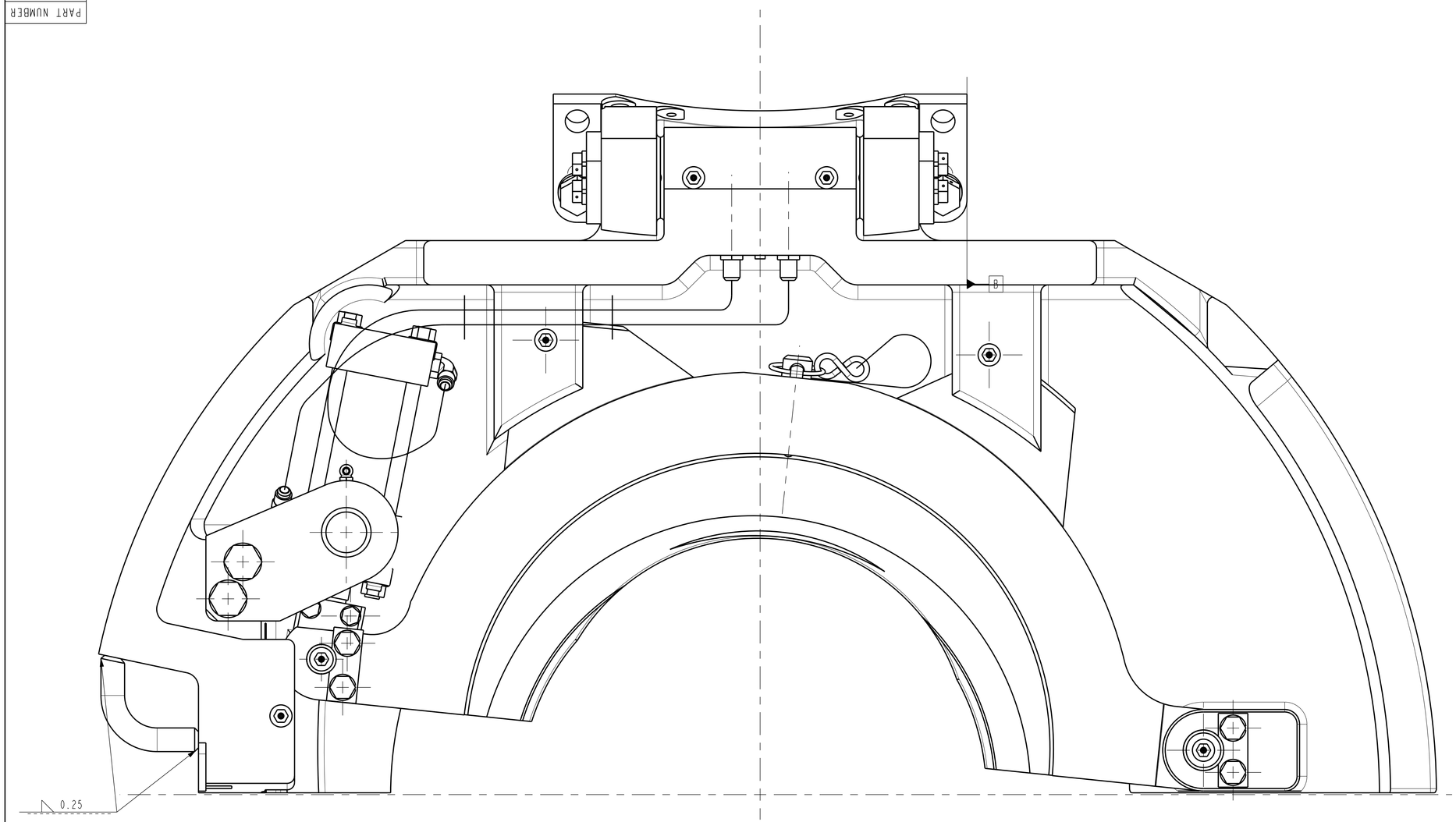
SCALE 1:5

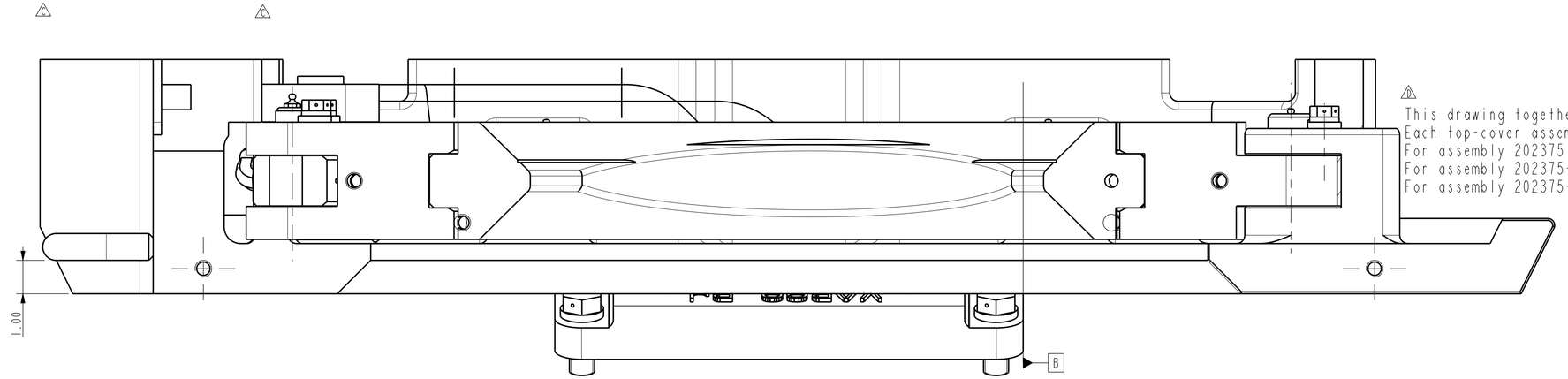


SCALE 1:5

PARTNUMBER						UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO
MATERIAL						TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.							
COLOR							
WEIGHT	Lbs kg						
ORIGINAL DOCUMENT		LATEST REVISION				DO NOT SCALE DOCUMENT	SCALE 2:5 PROJ.
NAME	B.v.d.P.	NAME	CdL	REV.			
DATE	21-Apr-04	DATE	17-JAN-11	C		THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
		E.C.N.	0701273				
TITLE SLIP ASSEMBLY 2-3/8--10-3/4					SIZE D	DRAWING NO. 202433-5	SHEET 2 OF 2

PART NUMBER
202375-1





ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
⚠1	11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202376M	LEFT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	5		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
⚠1	19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	9		51008-C	WASHER, LOCK-STEEL
⚠2	23	2		51012-C	WASHER, LOCK-STEEL
⚠1	24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	4		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

NOTES:
1: PARTNUMBER 202384-1 = RAM CYLINDER SUB-ASSY , CONSISTS
OF 1 pc. 202384 (= CYLINDER) AND 1 pc. 202263 (= KNUCKLE).
2: USED PARTS THAT ARE NOT SHOWN IN BOM ARE:
2 pc. 202391 = HOSE ASSEMBLY. SEE SHEET 3.
1 pc. 948042-83 = CHAIN. SEE SHEET 3.
⚠2 2 pc. 53300-525 = TY-RAP, SEE SHEET 3.

⚠1 1 pc. 201646= WARNING PLATE GENERAL MOVING PARTS

⚠1 4 pc. 53301-10-06= SCREW DRIVE TYPE U.

⚠
This drawing together with drawing 202375-2 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus a right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.

202375-1				
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

MATERIAL

	NAME	DATE	PROJ.
APPROVED	HT	3FEB00	
CHECKED	HK	3FEB00	SCALE 1:2
PREPARED	H.v.R.	11-Oct-01	UNITS INCH (MM)

WEIGHT 697.364 LBS/ KG

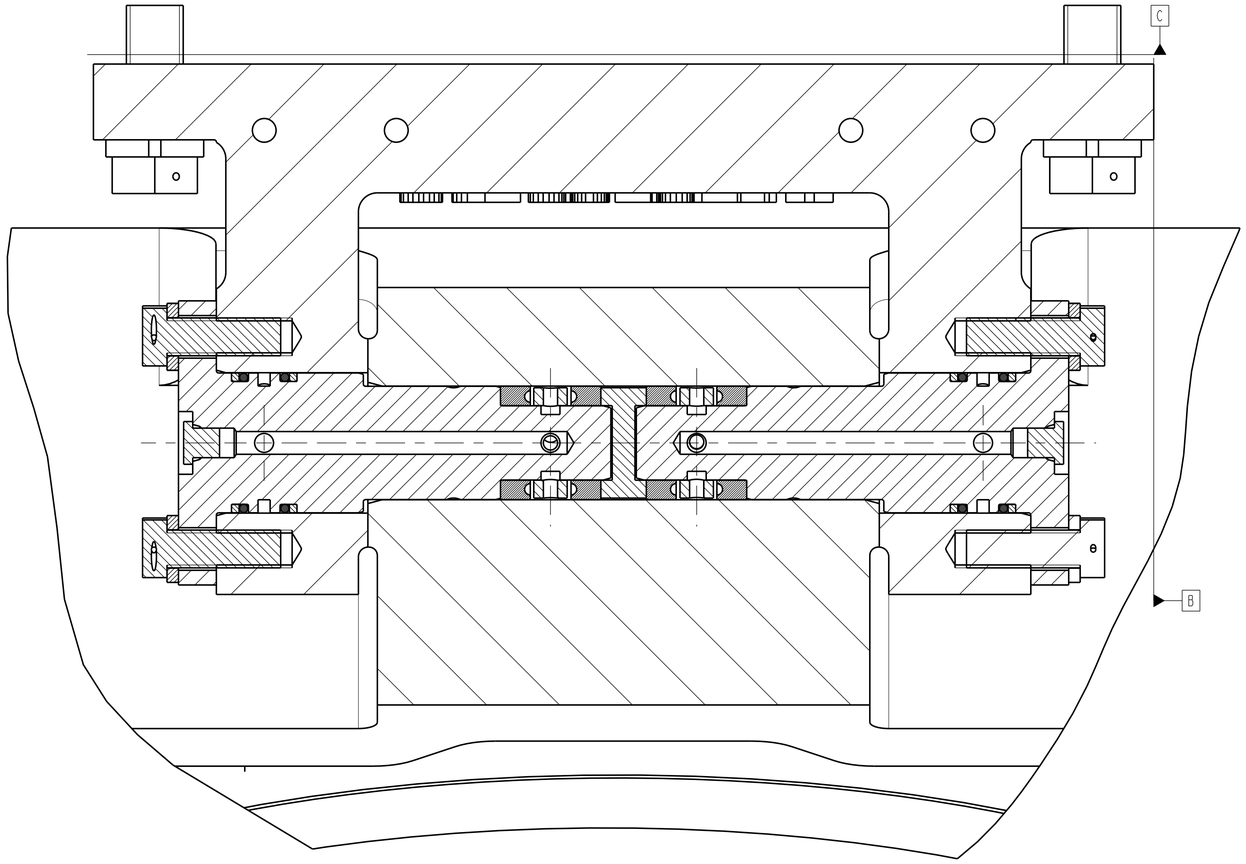
REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D	600543	CdL	110c101	AK
C	583101	LS	16JUN00	CdL
B	528102	RS	29MAY98	HvR
A	528101	HvR	3FEB00	HK

PROJE FILE NO.: 202375-1

TITLE	SIZE	DRAWING NO.	SHEET
Left-hand cover-plate assy	D	202375-1	of 3

REDRAWN / REPLACED BY:
REPLACES:

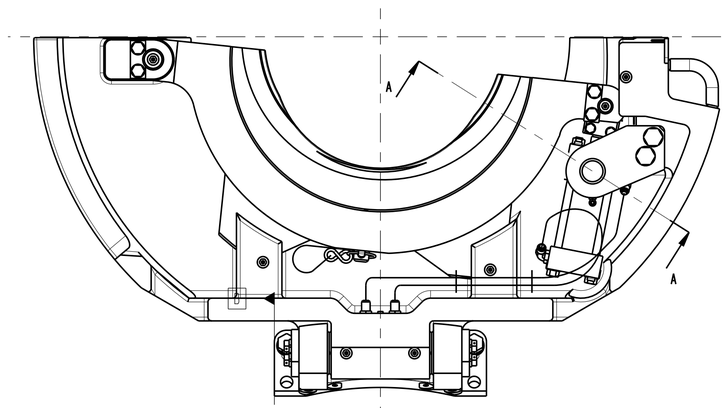
PART NUMBER
202375-1



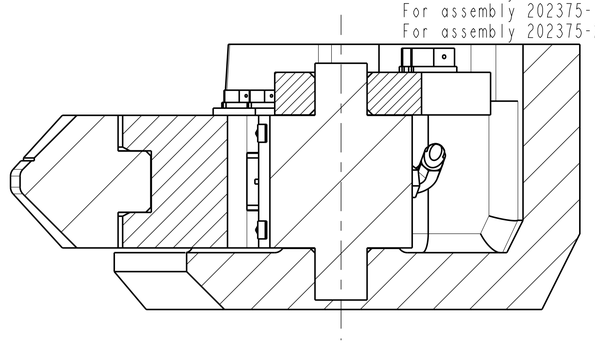
SECTION HINGE PIN-HINGE PIN
SCALE 1:1

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202376M	LEFT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	5		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	9		51008-C	WASHER, LOCK-STEEL
23	2		51012-C	WASHER, LOCK-STEEL
24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	4		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

⚠1
This drawing together with drawing 202375-2 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.



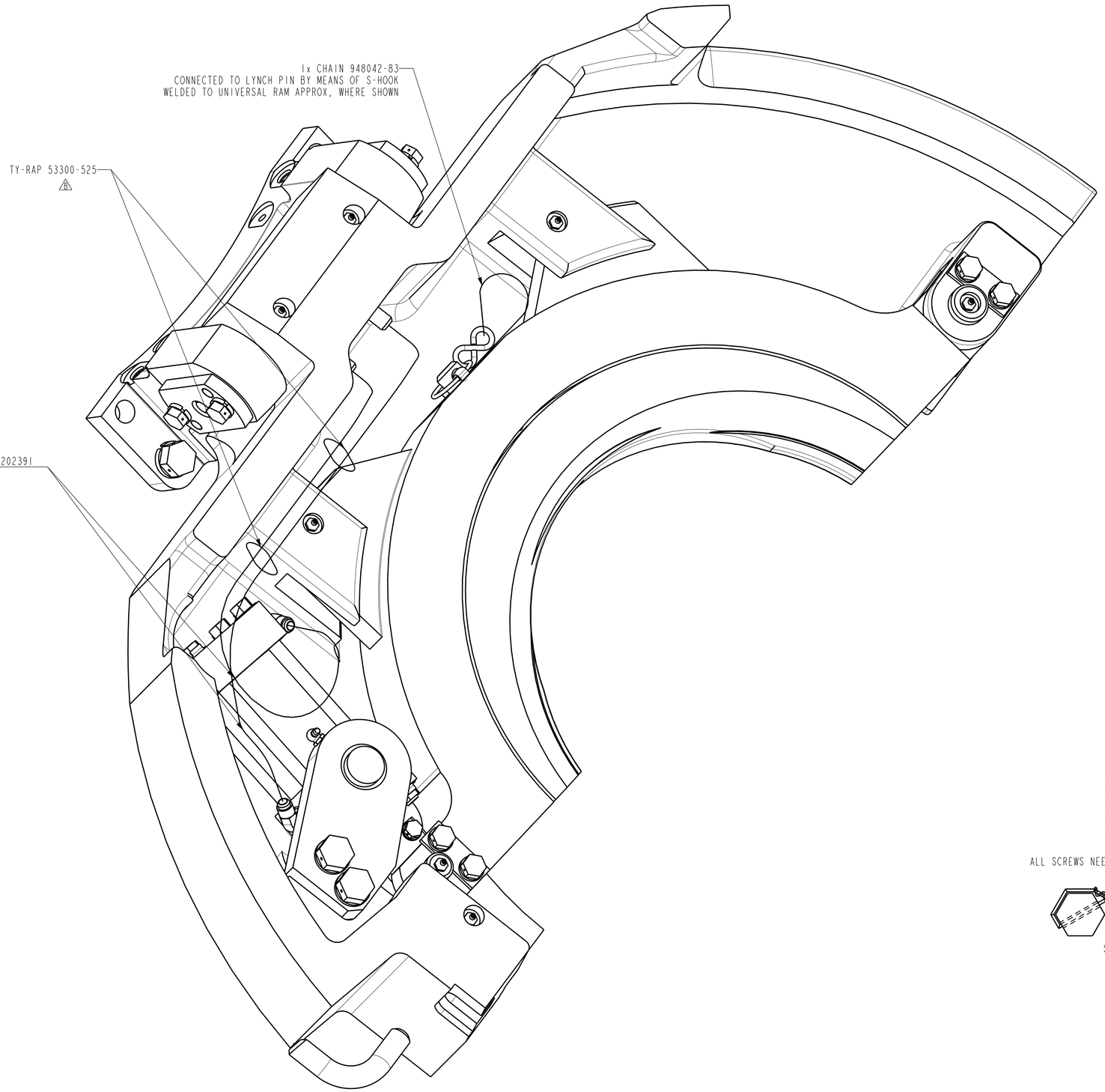
SCALE 1:5



SECTION A-A

202375-1					K					
PART NO.	QTY.	NEXT ASSY.		FINAL ASSY.	J					
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250	I					
					H					
					G					
					F					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER					E					
					D	600543	CdL	110c101	AR	
					C	583101	LS	16JUN00	CdL	
					B	528102	RS	29MAY98	HvR	
					A	528101	HvR	3FEB98	RR	
					REV.	E.C.N	NAME	DATE	CHECKED	
	NAME	DATE	PROJ.	MATERIAL	WEIGHT 697.364 LBS/ KG		PROJE FILE NO.: 202375-1			
APPROVED	HT	3FEB00								
CHECKED	HK	3FEB00	SCALE 1:2							
PREPARED	H.v.R.	11-Oct-01	UNITS INCH (MM)							
TITLE: Left-hand cover-plate assy				SIZE D	DRAWING NO. 202375-1				SHEET 2 OF 3	
REDRAWN / REPLACED BY:					REPLACES:					

PART NUMBER
202375-1



ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202376M	LEFT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	5		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	9		51008-C	WASHER, LOCK-STEEL
23	2		51012-C	WASHER, LOCK-STEEL
24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	4		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

⚠
This drawing together with drawing 202375-2 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.

ALL SCREWS NEED TO BE LOCK WIRED AS SHOWN!

SCALE 2:1

202375-1	1	202400(-)	202400(-)
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ™ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± 1
ANGLES ± .5° DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
APPROVED	HT	3FEB98
CHECKED	HK	3FEB98
PREPARED	H.v.R.	11-Oct-01

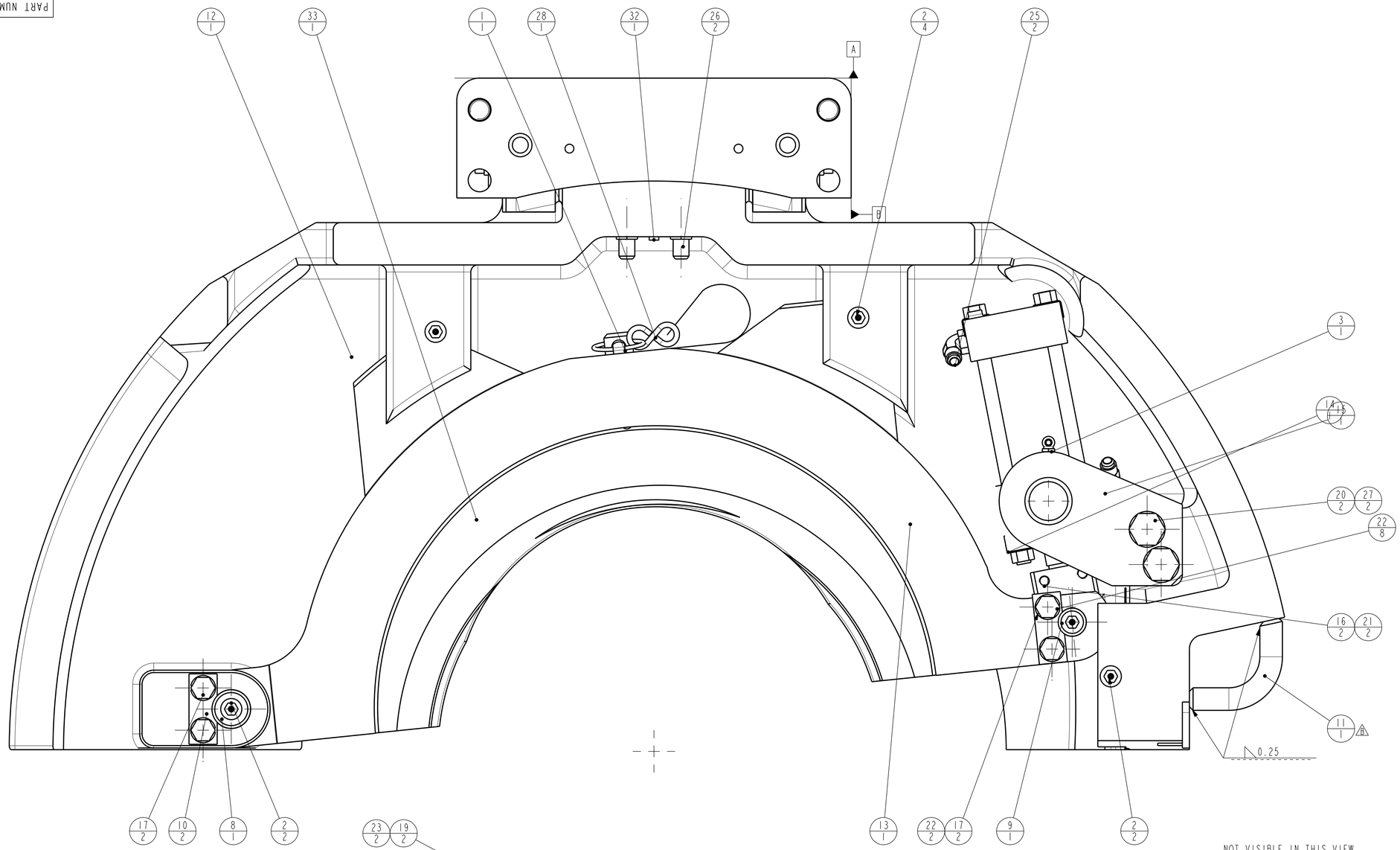
PROJ.
SCALE 1:2
UNITS INCH (MM)
MATERIAL
WEIGHT 697.364 LBS/ KG

REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D	600543	CdL	11Oct'01	AK
C	583101	L.S.	16JUN00	L.S.
B	528102	RS	29MAY98	HvR
A	528101	HvR	3FEB98	HK

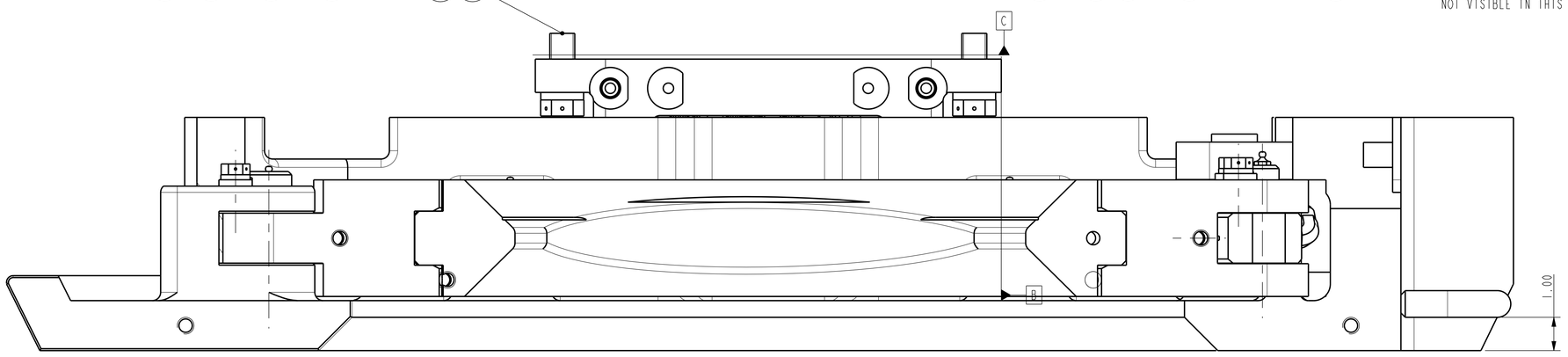
PROJE FILE NO.: 202375-1

TITLE: LEFT-HAND COVER PLATE ASSY
SIZE: D
DRAWING NO.: 202375-1
SHEET 3 OF 3
REDRAWN / REPLACED BY:
REPLACES:

PART NUMBER
202375-2



NOT VISIBLE IN THIS VIEW



ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
⚠B 11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202377M	RIGHT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	6		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
⚠B 19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	10		51008-C	WASHER, LOCK-STEEL
⚠B 23	2		51012-C	WASHER, LOCK-STEEL
24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	5		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

NOTES:
1: PARTNUMBER 202384-1 = RAM CYLINDER SUB-ASSY CONSISTS OF 1 pc. 202384 (=CYLINDER) AND 1 pc. 202263 (=KNUCKLE).
2: USED PARTS THAT ARE NOT SHOWN IN BOM ARE:
2 pc. 202391 = HOSE ASSEMBLY, SEE SHEET 3.
1 pc. 948042-83 = CHAIN, SEE SHEET 3.
2 pc. 53300-525 = TY-RAP, SEE SHEET 3.

⚠B 1 pc. 201646= WARNING PLATE GENERAL MOVING PARTS

⚠B 4 pc. 53301-10-06= SCREW DRIVE TYPE U

⚠C This drawing together with drawing 202375-1 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.

PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ
OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE	PROJ.
APPROVED	HT	29May98	
CHECKED	HvR	29May98	SCALE 1:2
PREPARED	M.KALS	11-Oct-01	UNITS INCH (MM)

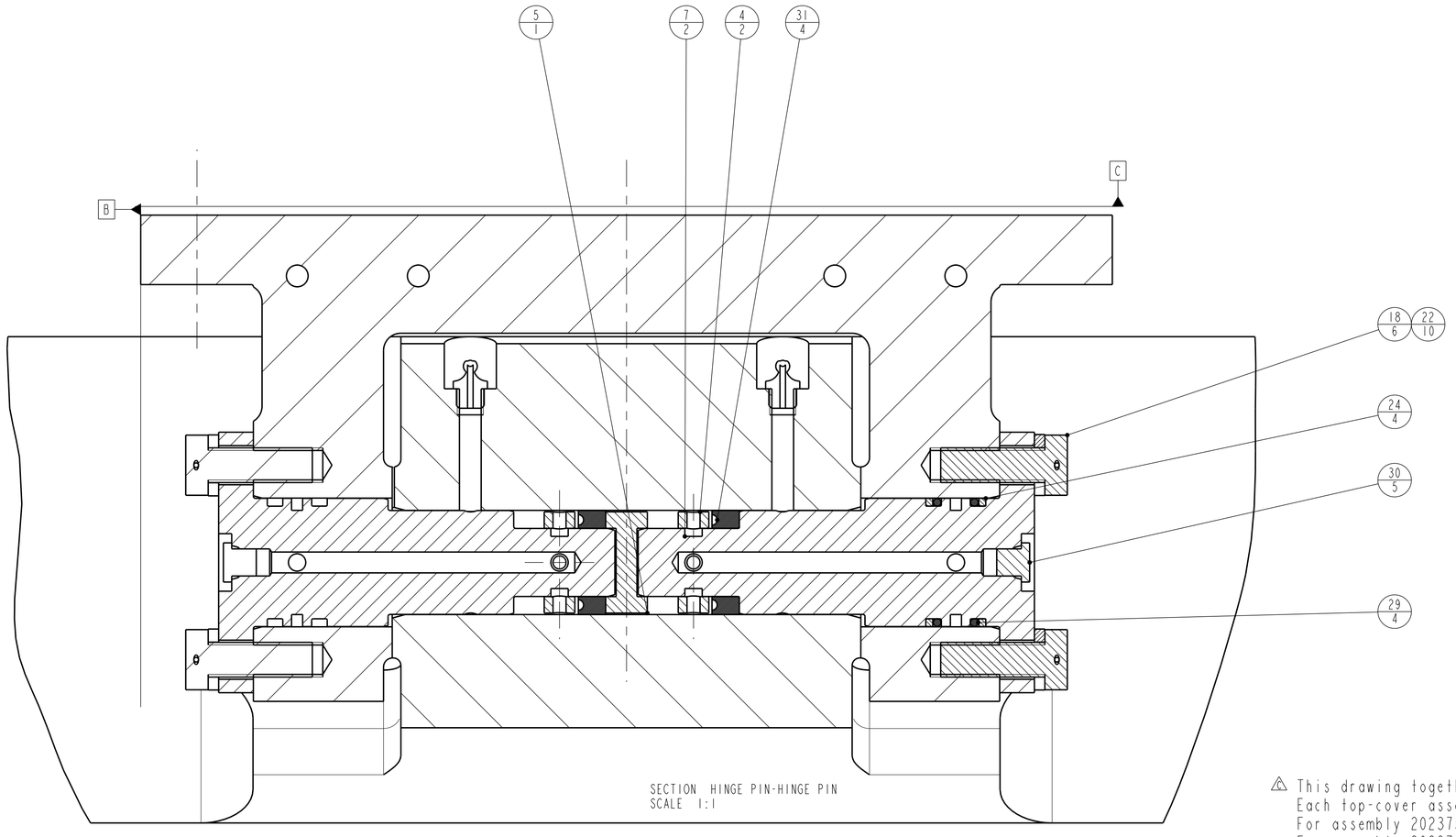
MATERIAL
WEIGHT 0.007 LBS/ KG

REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D				
C	600543	CdL	11Oct01	AK
B	583101	LS	20JUN00	LS
A	528101	RS	29May98	HvR

PROJE FILE NO.: 202375-2

TITLE: Right-hand cover-plate assy
SIZE: D
DRAWING NO.: 202375-2
SHEET 1 OF 3
REDRAWN / REPLACED BY:
REPLACES:

PART NUMBER



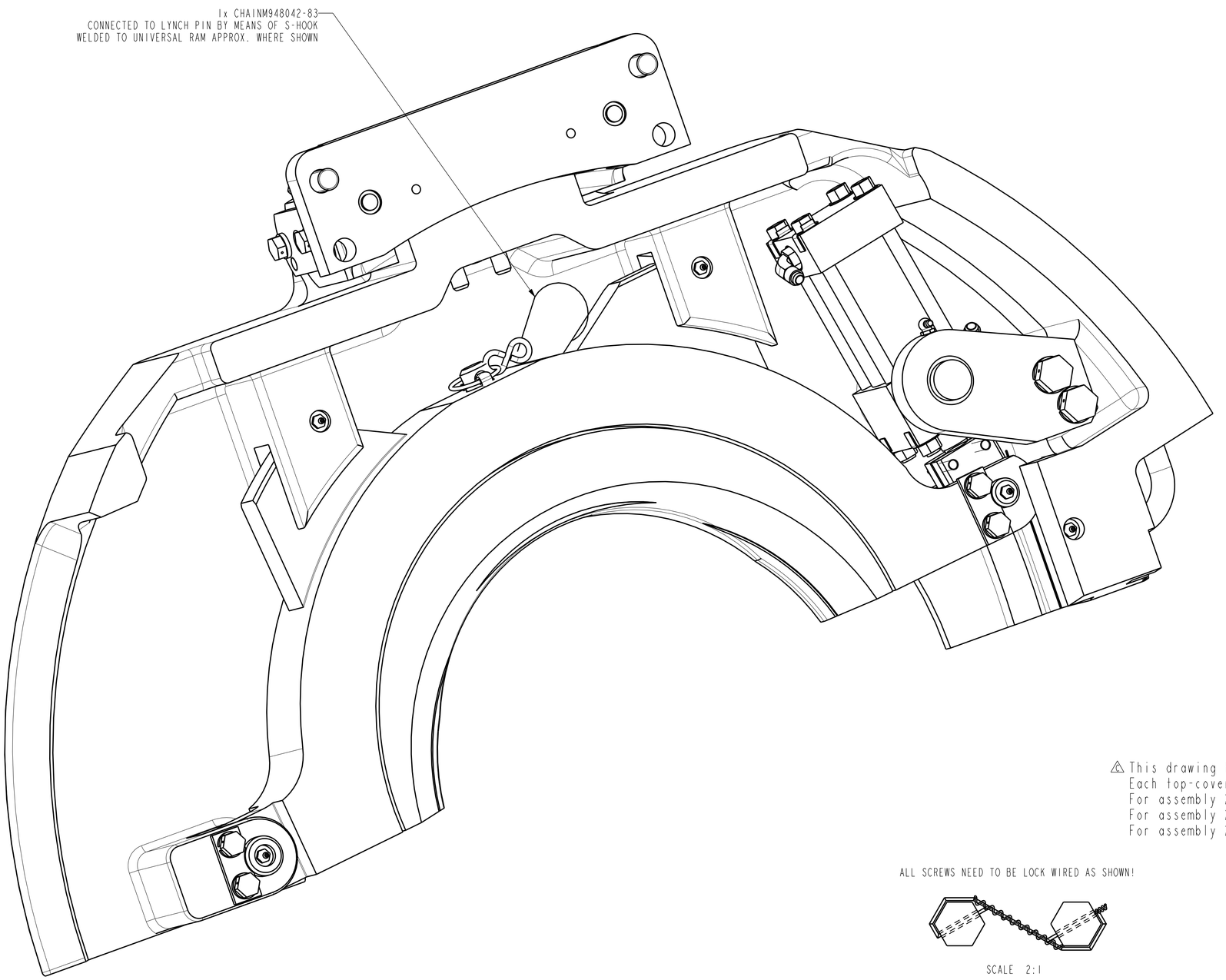
SECTION HINGE PIN-HINGE PIN
SCALE 1:1

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202377M	RIGHT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	6		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	10		51008-C	WASHER, LOCK-STEEL
23	2		51012-C	WASHER, LOCK-STEEL
24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	5		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

⚠ This drawing together with drawing 202375-1 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.

			202400 (-)		K					
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.		J					
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS			UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± 1 ANGLES ± .5° DEGREE		I					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER			BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250		H					
					G					
					F					
					E					
					D					
					C	600543	CdL	11Oct01	AK	
	NAME	DATE	PROJ.		B	583101	L.S.	20JUN00	L.S.	
APPROVED	H.T.	29-May-98		MATERIAL	A	528101	R.S.	29-May-98	H.v.R.	
CHECKED	H.v.R.	29-May-98	SCALE 1:2		REV.	E.C.N	NAME	DATE	CHECKED	
PREPARED	R.S.	11-Oct-01	UNITS INCH (MM)	WEIGHT 6808836 LBS/ KG	PROJE FILE NO.: 202375-2					
TITLE: Right-hand cover-plate assy				SIZE D	DRAWING NO. 202375-2			SHEET 2 OF 3		
REDRAWN / REPLACED BY:					REPLACES:					

PART NUMBER
202375-2



ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		7887	LYNCH PIN
2	8		53201	GREASE FITTING, STRAIGHT
3	1		53203	GREASE FITTING, 90 DEG.
4	2		202268	FLOW RING FOR HINGE PIN
5	1		202269	BACKUP RING FOR HINGE PIN
6	1		202382	HINGE BLOCK MACHINING PS30
7	2		202383	HYDRAULIC HINGE PIN
8	1		202388	RAM HINGE PIN
9	1		202389	KNUCKLE PIN
10	2		202390	PIN RETAINER
11	1		50004561	BAR FOR PS-30 TOPCOVER TO OPEN/CLOSE
12	1		202377M	RIGHT HAND COVER PLATE MACHINING PS30
13	1		202381-1M	UNIVERSAL RAM 16 TO 2-3/8
14	1		202384-1	HYDRAULIC CYLINDER PS30
15	1		202385M	CYLINDER MOUNTING PLATE
16	2		50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
17	4		50008-08-C8D	SCREW,CAP-HEX HD (UNC 1/2")
18	6		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
19	2		50012-16-C8D	SCREW,CAP-HEX HD (UNC 3/4")
20	2		50012-18-C8D	SCREW,CAP-HEX HD (UNC 3/4")
21	2		50906-C	WASHER, LOCK-REGULAR 0.375
22	10		51008-C	WASHER, LOCK-STEEL
23	2		51012-C	WASHER, LOCK-STEEL
24	4		51302-223	BACK UP RING FOR O-RING
25	2		56519-06-06-S	ELBOW 90 deg O_RING EXT.9/16UNF TO EXT.9/16
26	2		56529-06-06-S	CONNECTOR SAE O-RING -6 TO 37 JIC -6
27	2		939352-66	WASHER, LOCK-LIGHT 0.750
28	1		948051-2	S-HOOK
29	4		949708-223	O-RING ID 1.599/1.619 THC
30	5		979512-3	PLUG 7/16" - UNF + 'O' RING
31	4		979962-2538	HYDRAULIC U-CUP SEAL
32	1		979966-1	RELIEF VALVE 1/8"-27NPT
33	1		NONE	RAM INSERT SHOWN FOR REF. ONLY

HOSE ASSEMBLY (2x) 202391 AND TY-RAP 53300-525,
ARE NOT SHOWN ON DRAWING.
THE HOSE ARE FOR THE CONNECTION BETWEEN
THE HYDRAULIC CYLINDER AND THE HINGE BLOCK

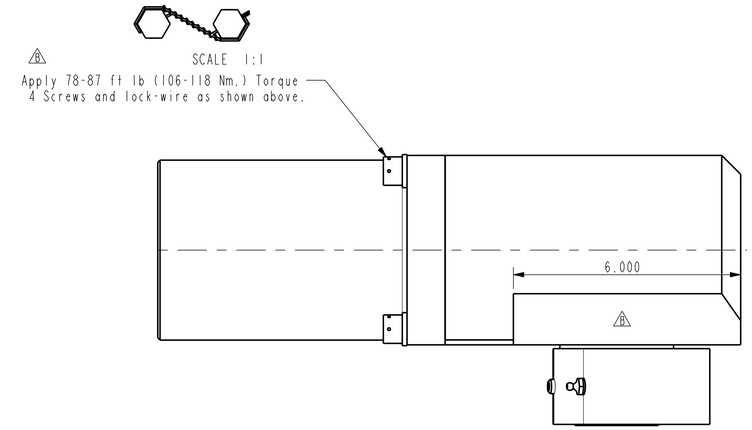
⚠ This drawing together with drawing 202375-1 applies to all 202375% top-cover assemblies
Each top-cover assembly consists out of a left-hand- plus right-hand- cover-plate assy
For assembly 202375 use specified steel fittings according the parts-list
For assembly 202375-1 use stainless steel hydraulic SAE fittings
For assembly 202375-2 use stainless steel Gyrolok fittings.

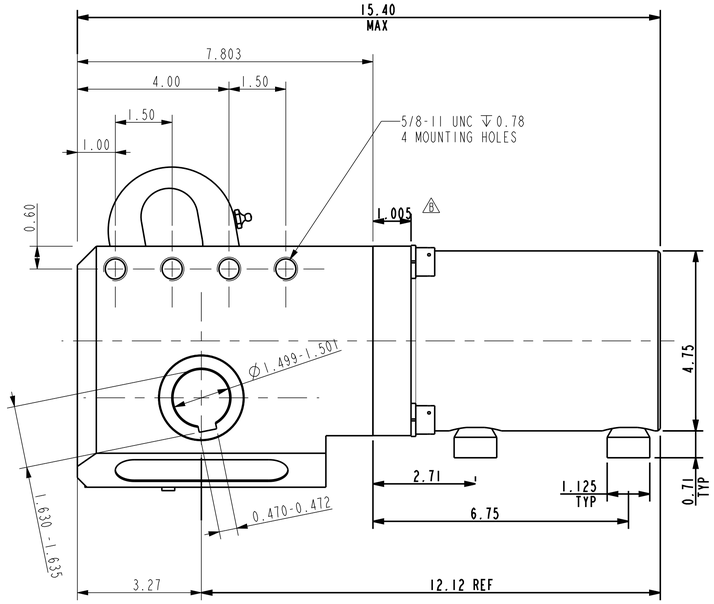
ALL SCREWS NEED TO BE LOCK WIRED AS SHOWN!

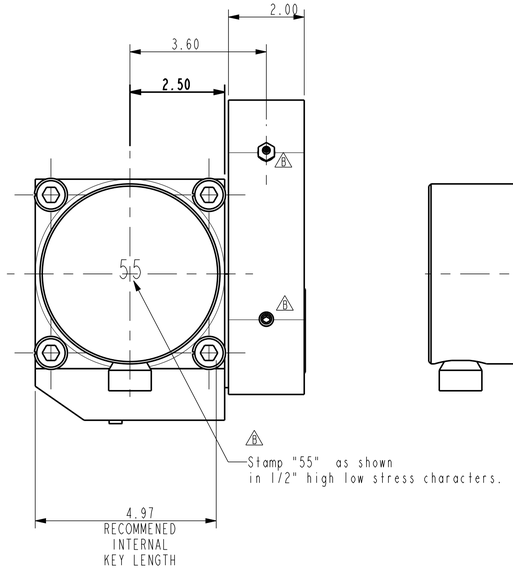
SCALE 2:1

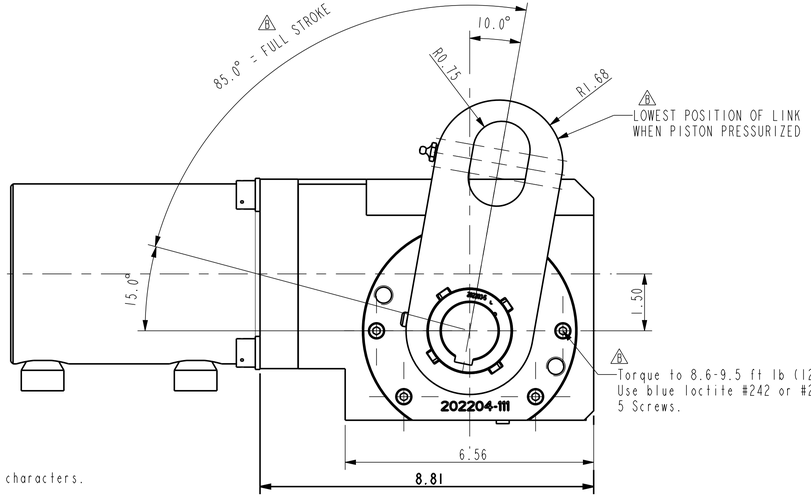
			202400 (-)		K				
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.		J				
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS			UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± 1 ANGLES ± .5° DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250	I					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER					H				
					G				
					F				
					E				
					D				
					C	600543	CdL	11Oct01	AK
	NAME	DATE	PROJ.		B	583101	L.S.	20JUN00	L.S.
APPROVED	H.T.	29-May-98		MATERIAL	A	528101	R.S.	29-May-98	H.v.R.
CHECKED	H.v.R.	29-May-98	SCALE 1:2		REV.	E.C.N	NAME	DATE	CHECKED
PREPARED	R.S.	11-Oct-01	UNITS INCH (MM)	WEIGHT 6808836 LBS/ KG	PROJE FILE NO.: 202375-2				
TITLE: Right-hand cover-plate assy				SIZE D	DRAWING NO. 202375-2			SHEET 3 OF 3	
REDRAWN / REPLACED BY:					REPLACES:				

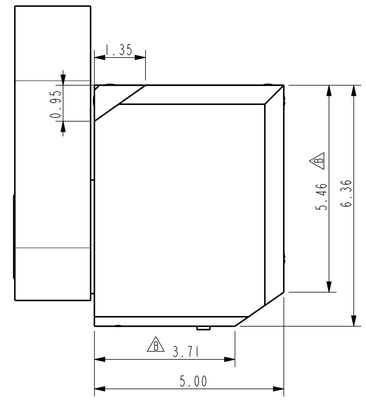
PART NUMBER
202203-55

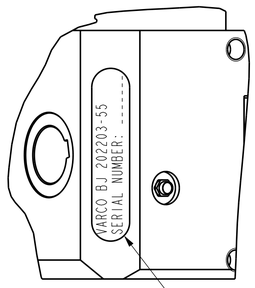




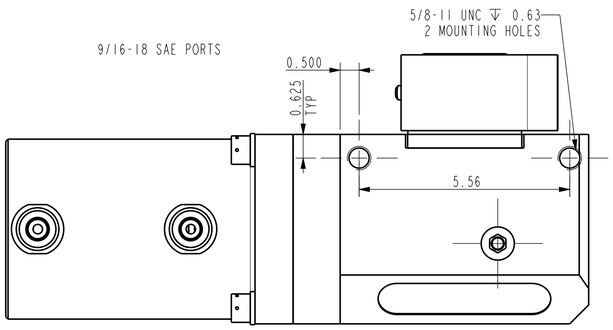








Stamp "VARCO BJ 202203-55"
"SERIAL NUMBER:" Followed by the manufacturer serial number
In 3/8" high low stress characters
located in shown recess.



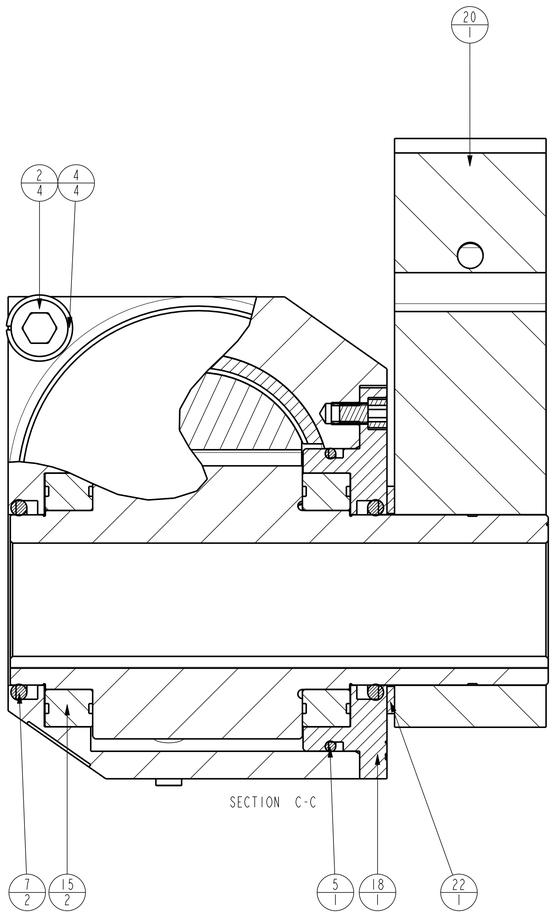
Notes:
-All dimensions on this drawing are reference dimensions
the exact dimensions are given on the machining drawings of each part.
-Use Tribol Molub Alloy 968 SF everywhere in gear chamber except for item 15, roller bearings. Pack item 15, roller bearings with Castrol AP2 grease.
-Sealkit part number 202203-41
-Test according to TSEL-0127
-Plug open ports
-Paint Red according to Paint Specification P001

202203-55					K		-	-	-	-
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.		J		-	-	-	-
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS			UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		I		-	-	-	-
					H		-	-	-	-
					G		-	-	-	-
					F		-	-	-	-
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER			BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250		E		-	-	-	-
					D		-	-	-	-
					C		-	-	-	-
	NAME	DATE	PROJ.	MATERIAL	B		601034	CdL	30JUL'03	PD
APPROVED	AK	29-Aug-02			A		600168	RB	18DEC'02	CdL
CHECKED	CdL	29-Aug-02	SCALE 1:2		REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	RB	29-Aug-02	UNITS INCH (MM)	WEIGHT LBS/ KG						

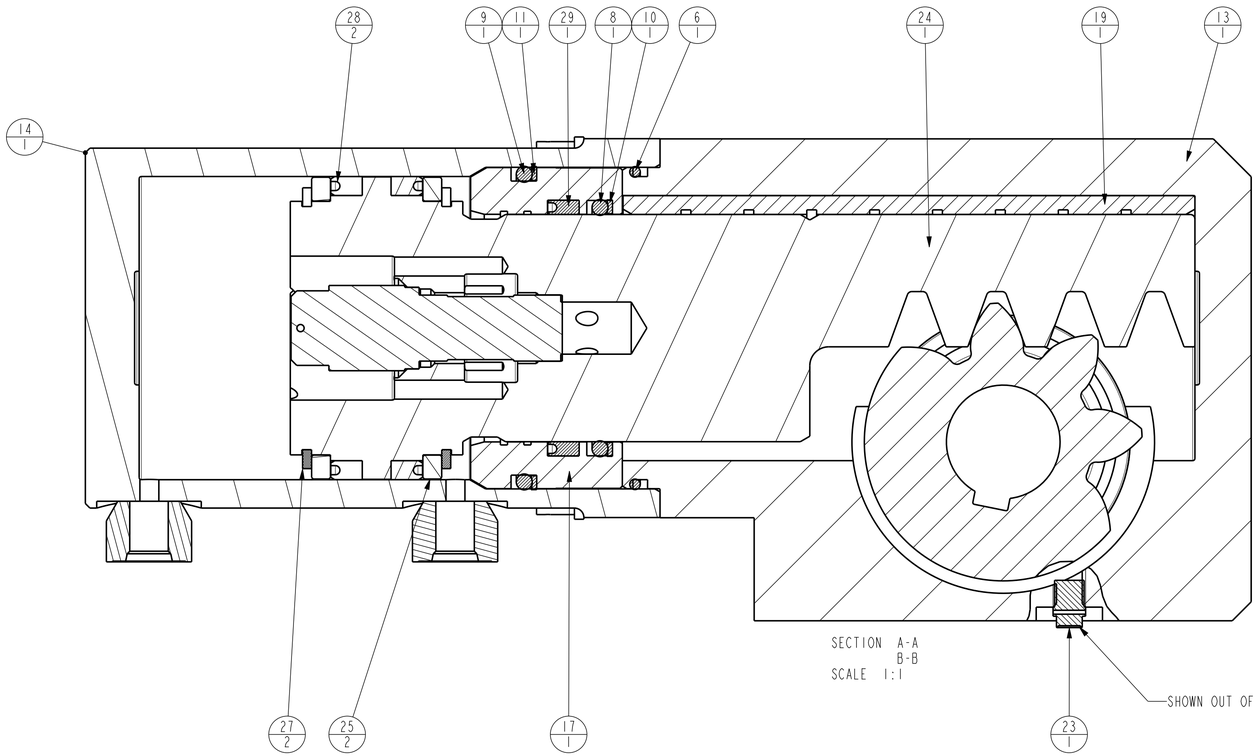
TITLE	SIZE	DRAWING NO.	SHEET
ACTUATOR LH PS INT. REL.	D	202203-55	OF 1 2
REDRAWN / REPLACED BY:		REPLACES:	

PART NUMBER
202203-55

	ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
A	1	5		50104-3-C	SCREW,CAP-SOCKET HEAD (UNC 1/4"x0.375")
A	2	4		50108-16-BD	SCREW,CAP-SOCK.HEAD BL.-OXIDE DRILLED 1/2"x2
A	3	1		50706-6-A-C	SOCKET HEAD SCREW 3/8"-16UNC-2A ,L= 0.75"
	4	4		50908-C	WASHER, LOCK-REGULAR 0.500
	5	1		51300-240-B	O-RING O 2-240 PARKER
	6	1		51300-242-B	O-RING O 2-242 PARKER
	7	2		51300-331-B	O-RING O 2-331 PARKER
	8	1		51300-337-B	O-RING O 2-337 PARKER
	9	1		51300-344-B	O-RING O 2-344 PARKER
	10	1		51301-337	BACKUP RING T 8-337 PARKER
	11	1		51301-344	BACKUP RING T 8-344 PARKER
A	12	1		53201	GREASE FITTING, STRAIGHT
	13	1		202203-101	HOUSING LEFT HAND
	14	1		202203-103M	Actuator barrel machining LH -55
	15	2		202203-43	ROLLER BEARING PINION
	16	1		202203-5	PINION LEFT HAND
	17	1		202204-110	BUSHING RACK
	18	1		202204-111	BEARING CAP
	19	1		202204-113	BEARING RACK
	20	1		202204-120	LINK ARM
	21	4		202204-121	KEY
	22	1		202226-1	CYLINDER HOUSING PROTECTION RING
	23	1		979966-1	RELIEF VALVE 1/8"-27NPT
	24	1		50004723	Piston/rack combination L.H.
	25	2		50004724	SEAL KEEPER RING
A	26	1		50004730	DIRECT ACTING RELIEF-VALVE
	27	2		59000192-85	RETAINING RING 85mm, DIN 471
A	28	2		59000211	PISTON SEAL, LOAD LOCKING
	29	1		59000212	SEAL, LOAD LOCKING
A	30	5		59000222-1	Thread_insert_1/4-20UNC_AMECOIL



SECTION C-C



SECTION A-A
B-B
SCALE 1:1

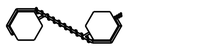
SHOWN OUT OF POSITION

202203-55					K		-	-	-	-
PART NO.	QTY.	NEXT ASSY.		FINAL ASSY.	J		-	-	-	-
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	I		-	-	-	-
					H		-	-	-	-
					G		-	-	-	-
					F		-	-	-	-
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250	E		-	-	-	-
					D		-	-	-	-
					C		-	-	-	-
	NAME	DATE	PROJ.	MATERIAL	B		601034	CdL	30JUL'03	PD
APPROVED	AK	29-Aug-02			A		600168	RB	29-Aug-02	CdL
CHECKED	CdL	29-Aug-02	SCALE 1:2		REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	RB	29-Aug-02	UNITS INCH (MM)	WEIGHT LBS/ KG						

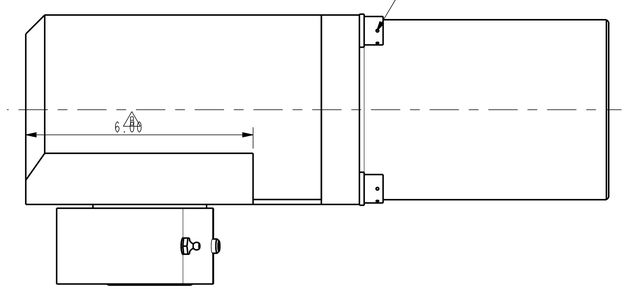
TITLE	SIZE	DRAWING NO.	SHEET
ACTUATOR LH PS INT. REL.	D	202203-55	OF 2 2
REDRAWN / REPLACED BY:		REPLACES:	

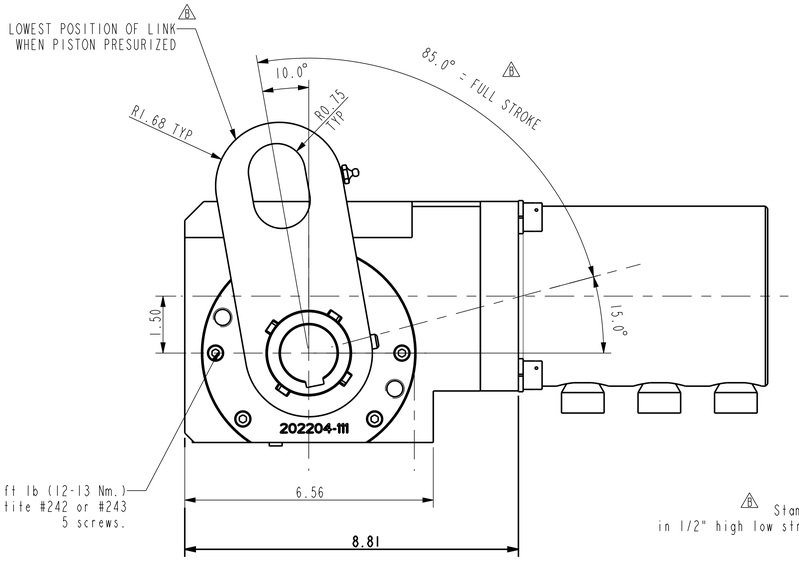
PART NUMBER
202204-55

SCALE 1:1

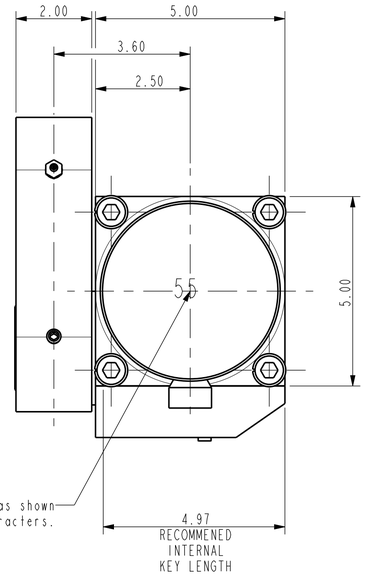


⚠8 Torque to 78-87 ft lb (106-118 Nm.) Torque
4 Screws and lock wire as shown above.

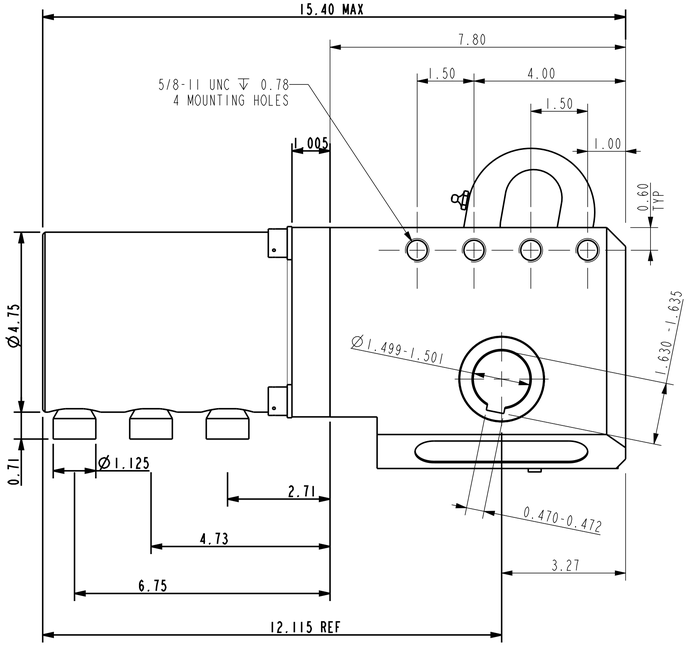


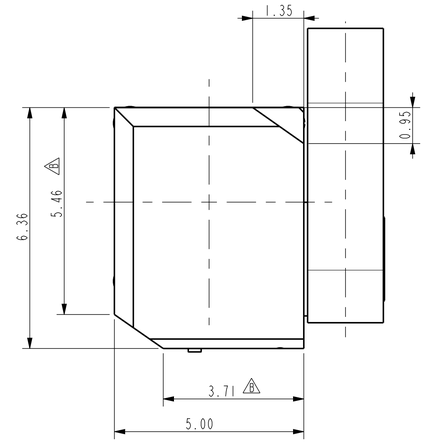


⚠8 Torque to 8.6-9.5 ft lb (12-13 Nm.)
Use blue loctite #242 or #243
5 screws.

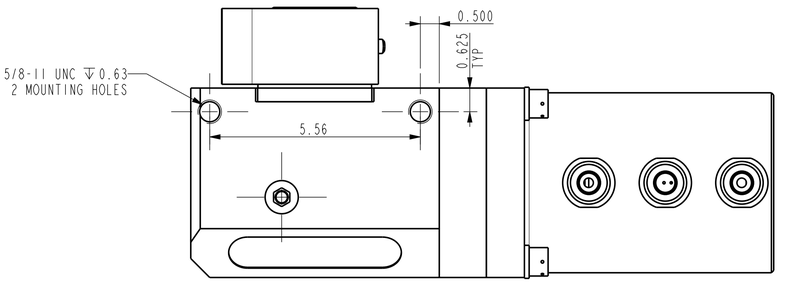


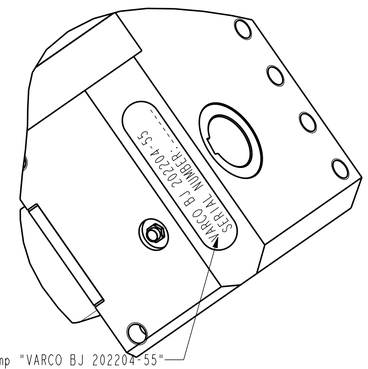
⚠8 Stamp "55" as shown
in 1/2" high low stress characters.





9/16-18 SAE PORTS





⚠8 Stamp "VARCO BJ 202204-55"
"SERIAL NUMBER:" Followed by the manufacturer serial number
In 3/8" high low stress characters
located in shown recess.

Notes: ⚠8
-All dimensions on this drawing are reference dimensions
the exact dimensions are given on the machining drawings of each part.
-Use Tribol Molub Alloy 968 SF everywhere in gear chamber except for item 13, roller bearings. Pack item 13, roller bearings with Castrol AP2 grease.
-Sealkit part number 202204-41
-Test according to TSEL-0127
-Plug open ports
-Paint Red according to Paint Specification P001

202204-55										
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	K		-	-	-	-
				J		-	-	-	-
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				I		-	-	-	-
				H		-	-	-	-
				G		-	-	-	-
				F		-	-	-	-
				E		-	-	-	-
				D		-	-	-	-
				C		-	-	-	-
				B		601034	CdL	31 JUL '03	PD
				A		600168	RB	26-Aug-02	CDL
				REV.		E.C.N	NAME	DATE	CHECKED

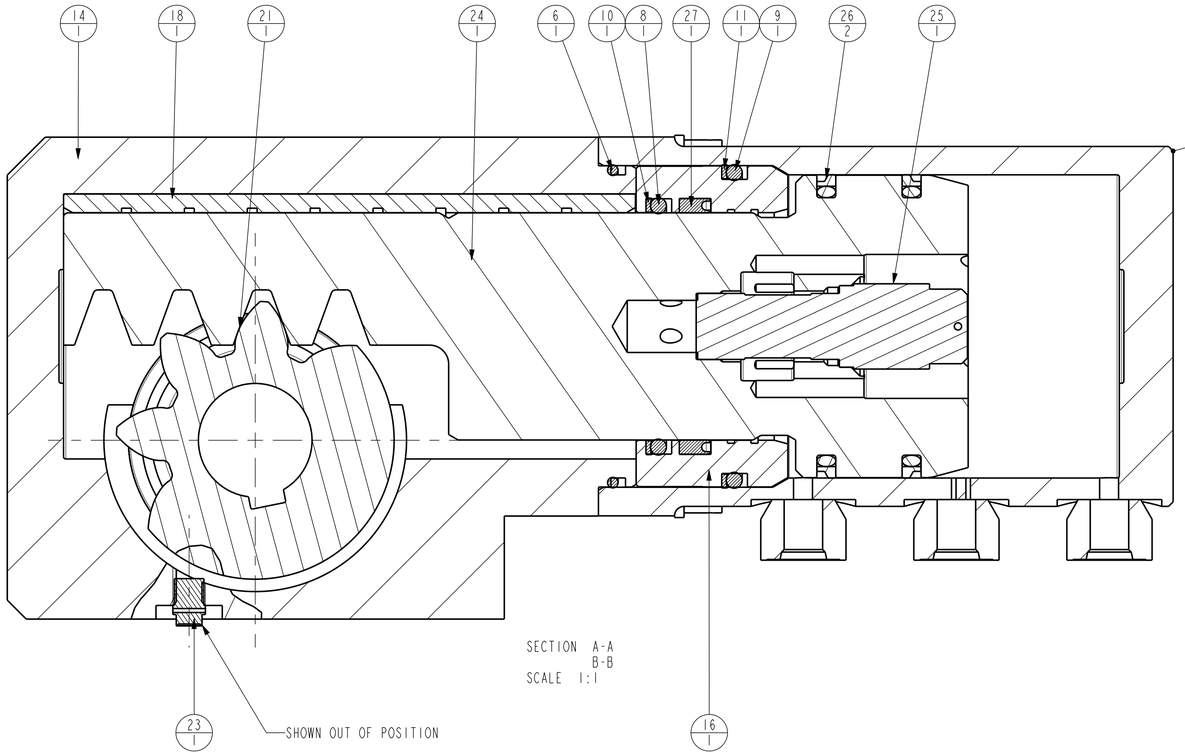
UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE	PROJ.
APPROVED	AK	26-Aug-02	
CHECKED	CDL	26-Aug-02	SCALE 1:2
PREPARED	RB	26-Aug-02	UNITS INCH (MM)

MATERIAL
WEIGHT LBS/ KG

TITLE: ACTUATOR RH PS INT. REL.
SIZE: D
DRAWING NO.: 202204-55
SHEET 1 OF 2
REDRAWN / REPLACED BY:
REPLACES:

PART NUMBER
202204-55



	ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
A	1	5		50104-3-C	SCREW,CAP-SOCKET HEAD (UNC 1/4"x0.375")
A	2	4		50108-16-BD	SCREW,CAP-SOCK.HEAD BL.-OXIDE DRILLED 1/2"x2
A	3	1		50706-6-A-C	SOCKET HEAD SCREW 3/8"-16UNC-2A ,L= 0.75"
	4	4		50908-C	WASHER, LOCK-REGULAR 0.500
	5	1		51300-240-B	O-RING O 2-240 PARKER
	6	1		51300-242-B	O-RING O 2-242 PARKER
	7	2		51300-331-B	O-RING O 2-331 PARKER
	8	1		51300-337-B	O-RING O 2-337 PARKER
	9	1		51300-344-B	O-RING O 2-344 PARKER
	10	1		51301-337	BACKUP RING T 8-337 PARKER
	11	1		51301-344	BACKUP RING T 8-344 PARKER
	12	1		53201	GREASE FITTING, STRAIGHT
	13	2		202203-43	ROLLER BEARING PINION
	14	1		202204-101	HOUSING RIGHT HAND
	15	1		202204-103	Actuator barrel machining RH-55
	16	1		202204-110	BUSHING RACK
	17	1		202204-111	BEARING CAP
	18	1		202204-113	BEARING RACK
	19	1		202204-120	LINK ARM
	20	4		202204-121	KEY
	21	1		202204-5	PINION RIGHT HAND
	22	1		202226-1	CYLINDER HOUSING PROTECTION RING
	23	1		979966-1	RELIEF VALVE 1/8"-27NPT
A	24	1		50004728	Piston/rack combination R.H.
A	25	1		50004730	DIRECT ACTING RELIEF-VALVE
A	26	2		59000013-400	4" OG type hydr.piston seal
	27	1		59000212	SEAL, LOAD LOCKING
A	28	5		59000222-1	Thread_insert_1/4-20UNC_AMECOIL

202204-55

PART NO. | QTY. | NEXT ASSY. | FINAL ASSY.

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

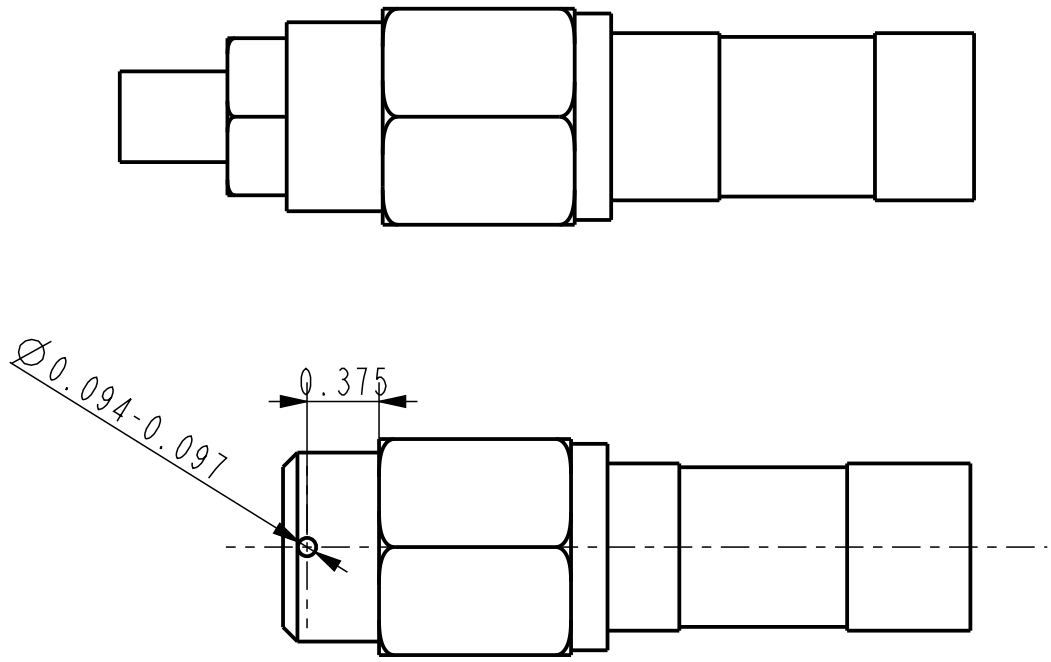
UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
APPROVED	AK	26-Aug-02
CHECKED	CdL	26-Aug-02
PREPARED	RB	26-Aug-02

PROJ.
SCALE 1:2
UNITS INCH (MM)
MATERIAL
WEIGHT LBS/ KG

REV.	E.C.N	NAME	DATE	CHECKED
K	-	-	-	-
J	-	-	-	-
I	-	-	-	-
H	-	-	-	-
G	-	-	-	-
F	-	-	-	-
E	-	-	-	-
D	-	-	-	-
C	-	-	-	-
B	601034	CdL	31JUL'03	PD
A	600168	RB	26-Aug-02	CdL

TITLE: ACTUATOR RH PS INT. REL.
SIZE: D
DRAWING NO.: 202204-55
SHEET 2 OF 2
REDRAWN / REPLACED BY:
REPLACES:



Note: (B)
Make from P.N.:59000199 (direct acting relief valve "RDFA-LAN" SUN)
(C) Set the valve relief pressure at 20.70±0.69MPa. / 3000±100psi.
Drill hole according to above view
Install Roll-pin P.N:51633-6-C
Unscrew the nut and cut off thread-end as shown in above view

PARTNUMBER	50004730
MATERIAL	
SURF. FINISH / PAINTSPEC.	Oil and netting
COLOR	-
WEIGHT	&mass &metricmass kg

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE

BREAK SHARP CORNERS .010 ± .005

MACHINED SURFACES 250

TORCHCUT SURFACES 1000

NATIONAL OILWELL VARCO

ORIGINAL DOCUMENT		LATEST REVISION		
NAME	CdL	NAME	CdL	REV.
DATE	12-Sep-05	DATE	12 Sept'05	C
		E.C.N.	0700178	

DO NOT SCALE DOCUMENT

THIS DOCUMENT IS PDMlink CONTROLLED

SCALE 1:1

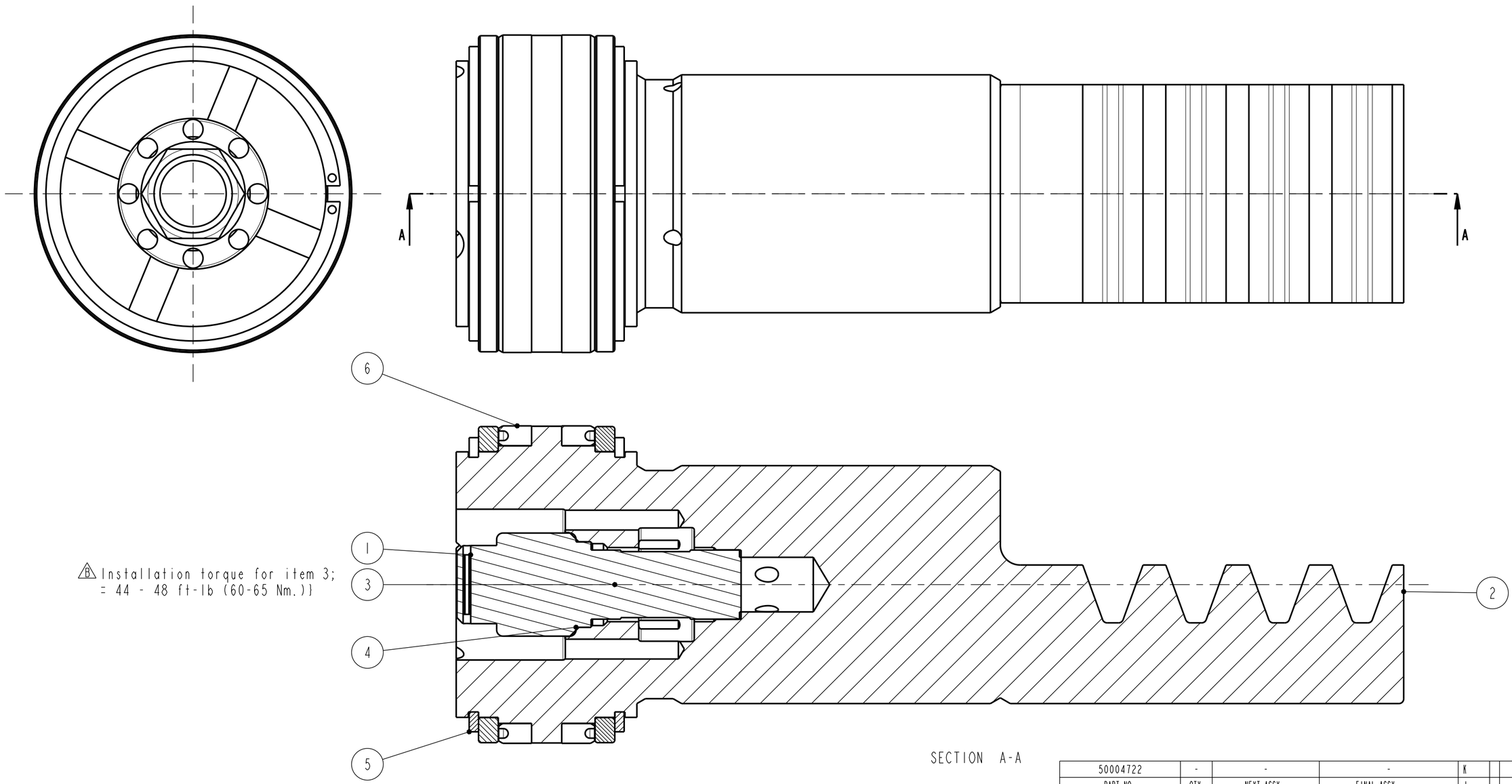
UNITS INCH (mm)

PROJ.

TITLE	SIZE	DRAWING NO.	SHEET
DIRECT ACTING RELIEF-VALVE	A	50004730	1 OF 1

PART NUMBER
50004722

	ITEM	QTY	PART NUMBER	DESCRIPTION
B	1	1	51633-6-C	Pin, roll 3/32 x 3/4
	2	1	50004723	Piston/rack combination L.H.
	3	2	50004724	SEAL KEEPER RING
B	4	1	50004730	DIRECT ACTING RELIEF-VALVE
	5	2	59000192-85	RETAINING RING 85mm, DIN 471
B	6	2	59000211	PISTON SEAL, LOAD LOCKING



B Installation torque for item 3; = 44 - 48 ft-lb (60-65 Nm.)]

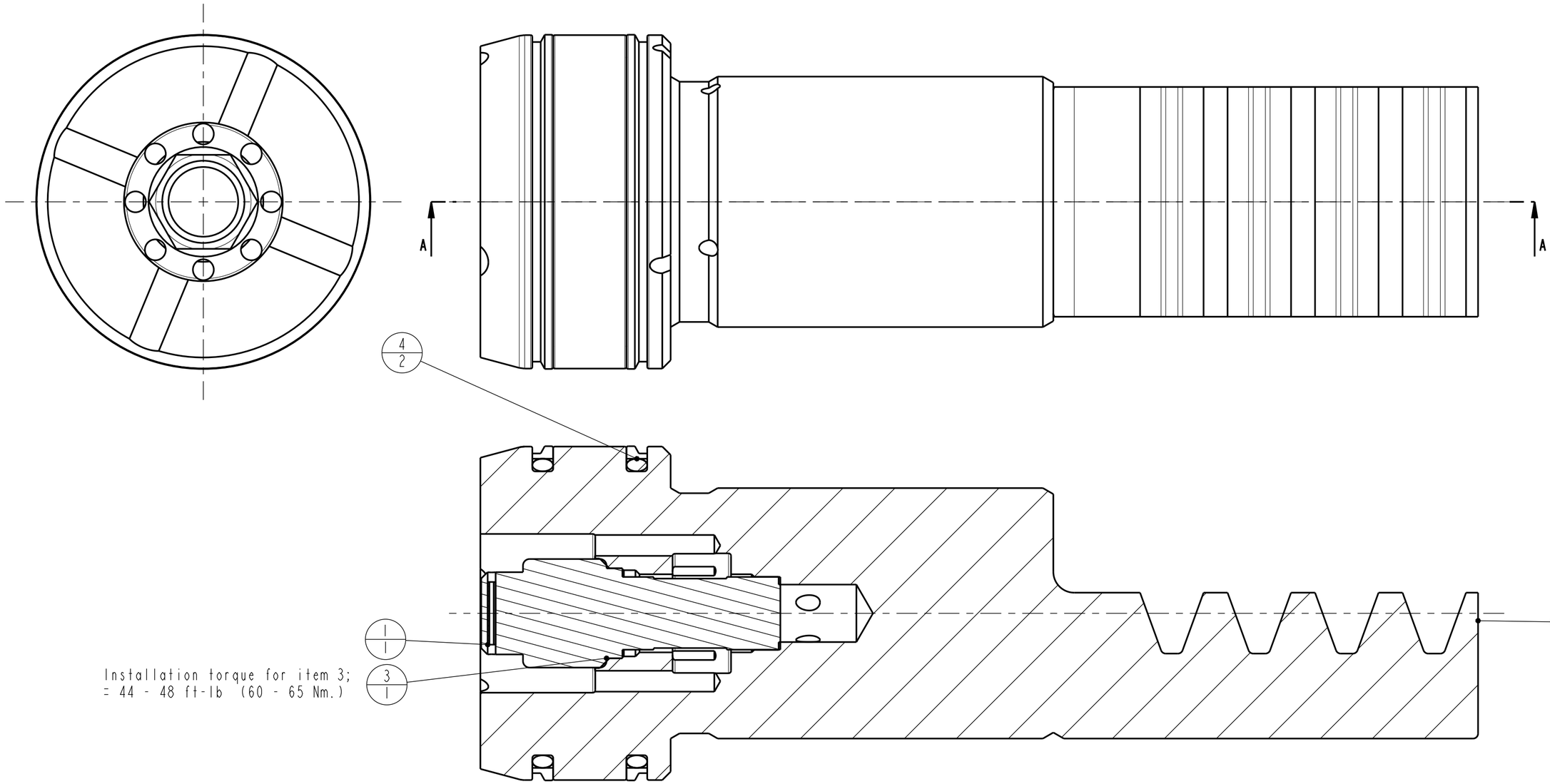
SECTION A-A

50004722	-	-	-	K		-	-	-	-
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	J		-	-	-	-
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS		UNLESS OTHERWISE SPECIFIED		I		-	-	-	-
		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		H		-	-	-	-
				G		-	-	-	-
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				F		-	-	-	-
		BREAK SHARP CORNERS .010 ± .005		E		-	-	-	-
		MACHINED SURFACES 250		D		-	-	-	-
				C		-	-	-	-
	NAME	DATE	PROJ.	MATERIAL		B		601034	CdL	8JUN'03	PD
APPROVED	AK	15APR02				A		600767	HvR	15APR02	CdL
CHECKED	CdL	15APR02	SCALE 1:1			REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	HvR	15APR02	UNITS INCH (MM)	WEIGHT	LBS/ KG						

TITLE	SIZE	DRAWING NO.	SHEET
PISTON-RACK ASSEMBLY L.H.	C	50004722	1 OF 1
REDRAWN / REPLACED BY:		REPLACES:	

PART NUMBER
50004727

	ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
B	1	1		51633-6-C	Pin, roll 3/32 x 3/4
	2	1		50004728	Piston/rack combination R.H.
B	3	1		50004730	DIRECT ACTING RELIEF-VALVE
B	4	2		59000013-400	4" OG type hydr.piston seal

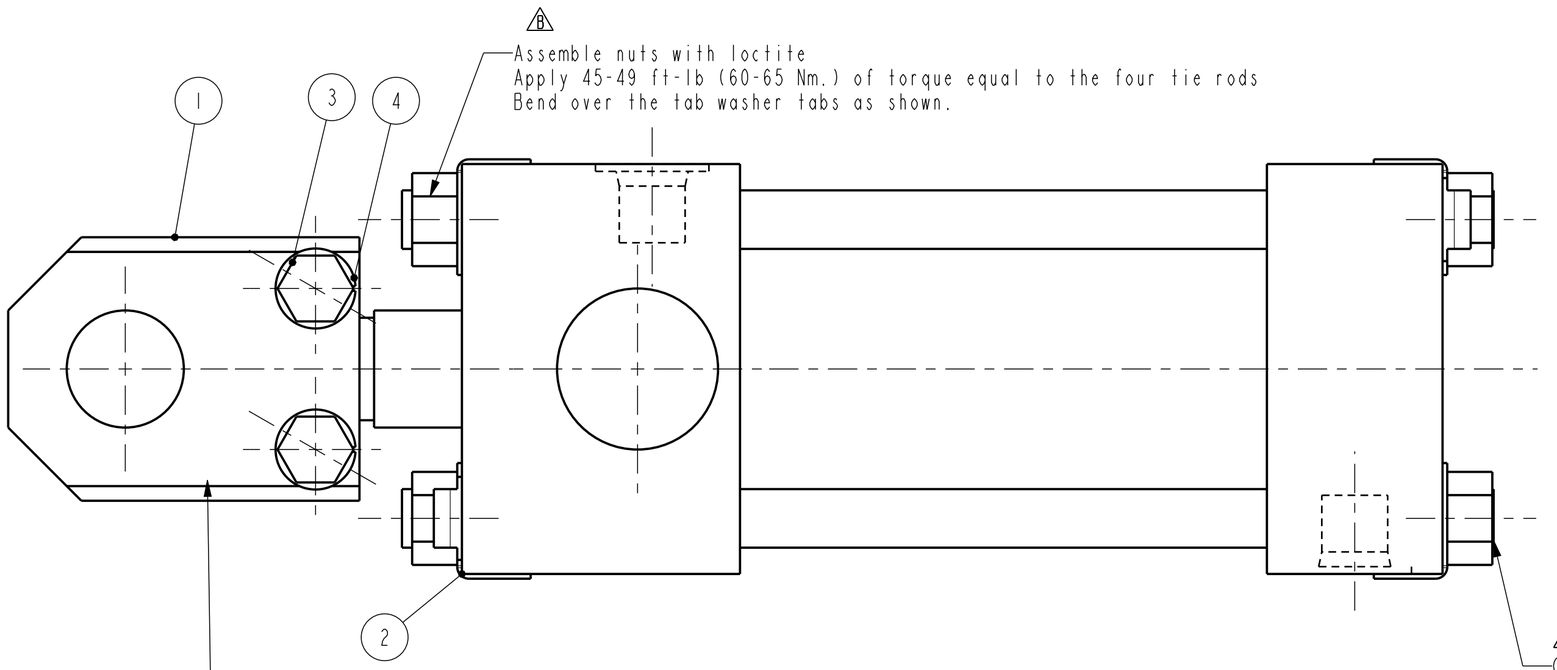


SECTION A-A

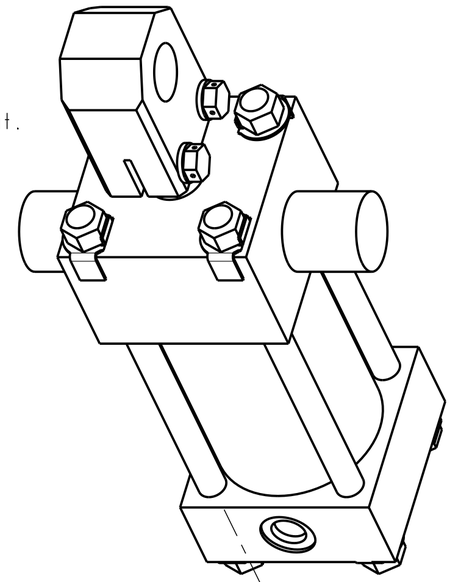
50004727	-	-	-	K		-	-	-	-
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.	J		-	-	-	-
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS		UNLESS OTHERWISE SPECIFIED		I		-	-	-	-
		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		H		-	-	-	-
				G		-	-	-	-
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				F		-	-	-	-
		BREAK SHARP CORNERS .010 ± .005		E		-	-	-	-
		MACHINED SURFACES 250		D		-	-	-	-
				C		-	-	-	-
	NAME	DATE	PROJ.	MATERIAL		B		601-034	CdL	8JUN'03	P-D
APPROVED	AK	29-Aug-02				A		600-168	RB	17DEC'02	CdL
CHECKED	CdL	29-Aug-02	SCALE 1:1			REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	RB	29-Aug-02	UNITS INCH (MM)	WEIGHT	LBS/ KG						

TITLE	SIZE	DRAWING NO.	SHEET
PISTON-RACK ASSEMBLY R.H.	C	50004727	OF 1 1
REDRAWN / REPLACED BY:		REPLACES:	

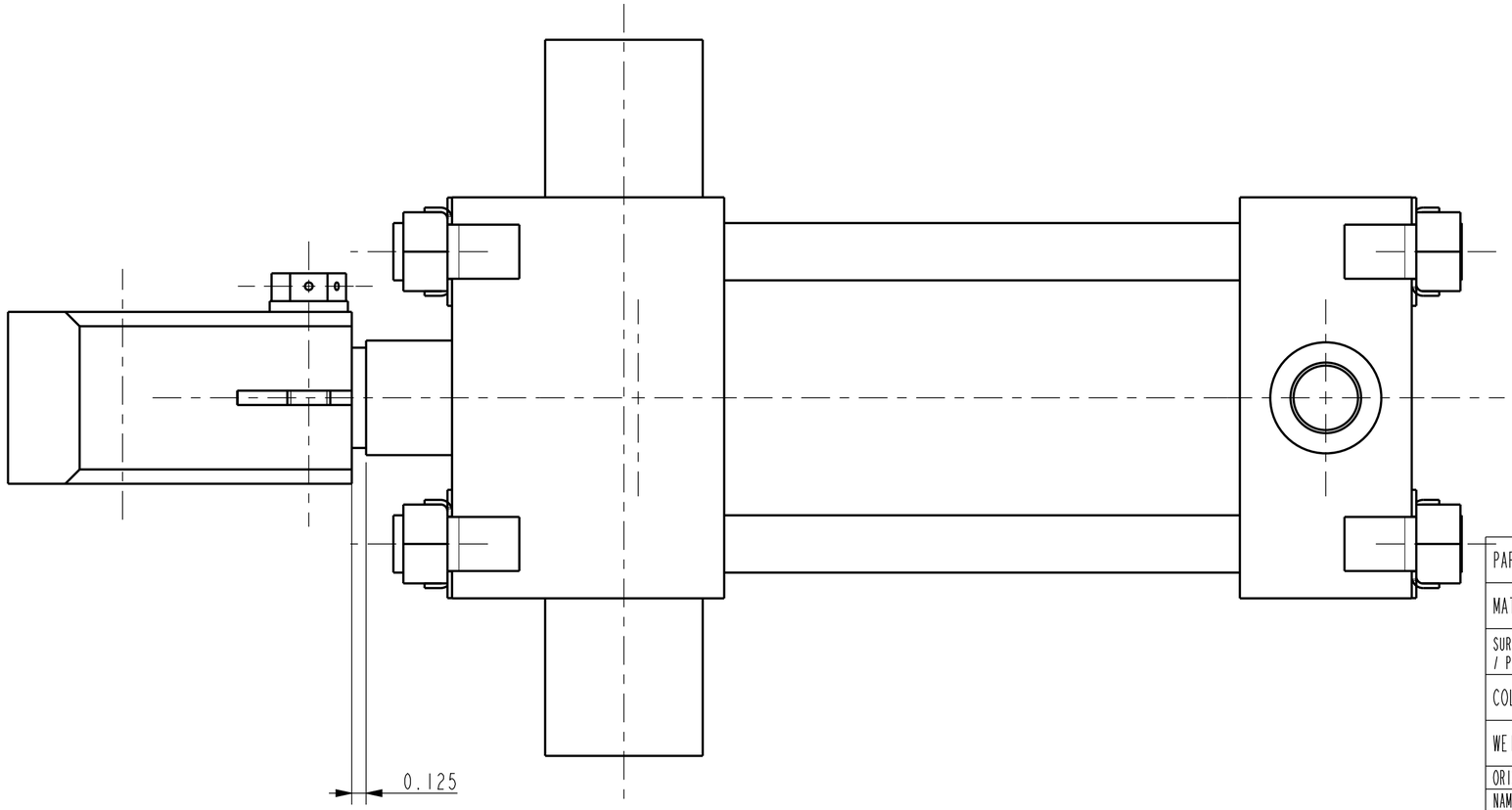
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	202263	KNUCKLE CENTERING DEVICE
2	1	202384	Hydraulic cylinder PS30
3	2	50006-12-C8D	SCREW,CAP-HEX HD (UNC 3/8")
4	2	50906-C	WASHER, LOCK-REGULAR 0.375



SCALE 1:1



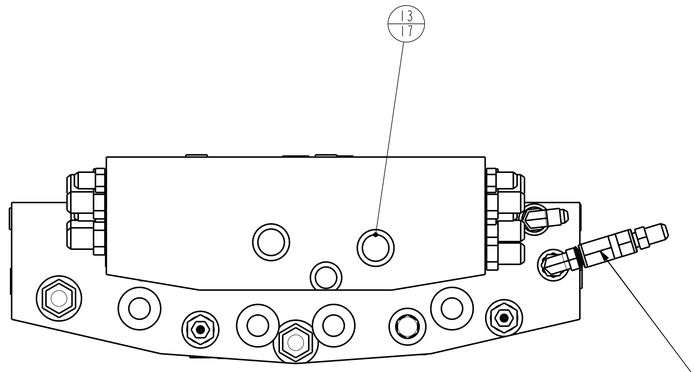
SCALE 1:2

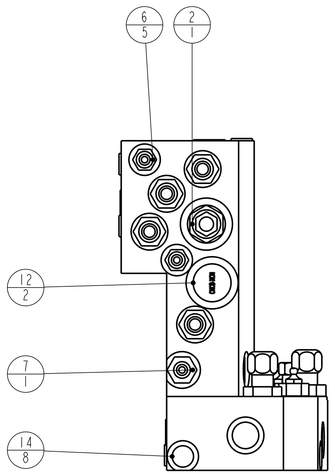


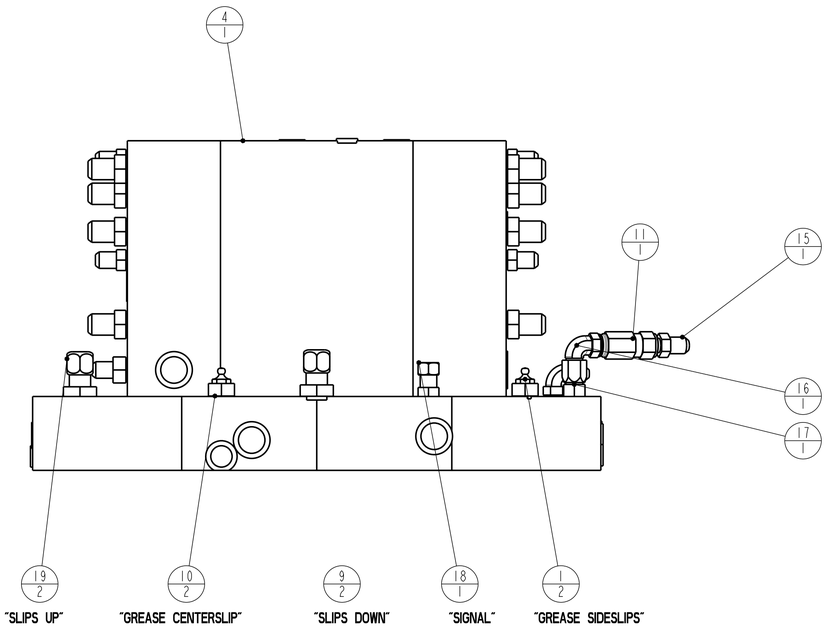
PARTNUMBER	202384-1					UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	NATIONAL OILWELL VARCO THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
MATERIAL							
SURF. FINISH / PAINTSPEC.	-						
COLOR	-						
WEIGHT	mass[.1][.1] kg						
ORIGINAL DOCUMENT		LATEST REVISION				DO NOT SCALE DOCUMENT	SCALE 1:1
NAME	CdL	NAME	CdL	REV.			PROJ.
DATE	16-Dec-03	DATE	16 Dec.'03	B		THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
		E.C.N.	601295				

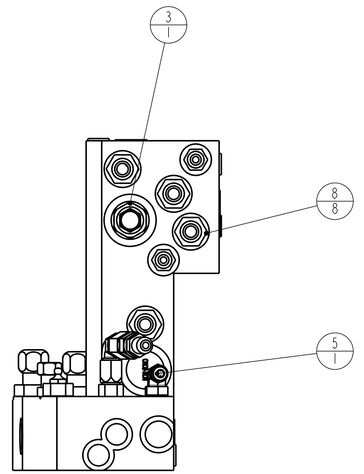
TITLE	SIZE	DRAWING NO.	SHEET
HYDRAULIC CYLINDER PS30	C	202384-1	1 OF 1

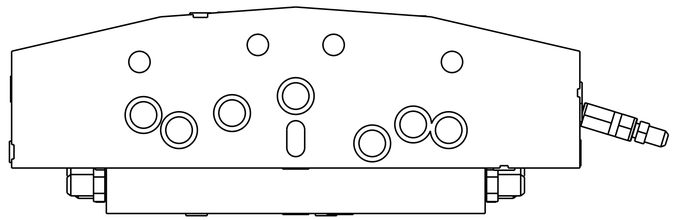
ITEM	QTY	PART NUMBER	SS EQUIVALENT	DESCRIPTION
1	2	53201	53201-C	GREASE FITTING, STRAIGHT
2	1	59000175		COUNTER BALANCE VALVE CACA-LHN
3	1	30107236-1AN		DIRECT ACTING SEQUENCE VALVE SCCA-LAN
4	1	50004590-M		Manifold Machining PS-30
5	1	56519-4-4-S	56519-4-4-C	ELBOW 90 deg O_RING EXT.7/16UNF TO EXT.7/16 JIC
6	5	56529-4-4-S	56529-4-4-C	CONNECTOR SAE O-RING -4 TO 37 JIC -4
7	1	56529-6-4-S	56529-6-4-C	CONNECTOR SAE O-RING -6 TO 37 JIC -4
8	8	56529-6-6-S	56529-6-6-C	CONNECTOR SAE O-RING -6 TO 37 JIC -6
9	2	56529-8-6-S	56529-8-6-C	CONNECTOR SAE O-RING -8 TO 37 JIC -6
10	2	56551-2-6-S	56551-2-6-C	ADAPTER NPTF/O-RING BOSS
11	1	59000142-1	59000142-1-1	in line check valve
△1 12	2	93547-1B30N		PILOT TO OPEN CHECK VALVE INT. DRAIN / CKCB-XCN
13	17	979512-2	979512-2-C	PLUG 9/16 - UNF + O-RING
14	8	979512-3	979512-3-C	PLUG 7/16" - UNF + 'O' RING
15	1	979532-2-4	979532-2-4-C	CONNECTOR BSP 1/8 #2 TO 37 JIC #4
16	1	979935-2-4	979935-2-4-C	ELBOW 90° O_RING EXT.1/8BSP TO EXT.7/16UNF
17	1	979942-4-4	979942-4-4-C	ORB SWIVEL ADAPTER
18	1	979958-4	979958-4-C	CAP NUT JIC 7/16-20 UNF
19	2	979958-6	979958-6-C	CAP NUT JIC 9/16-18 UNF

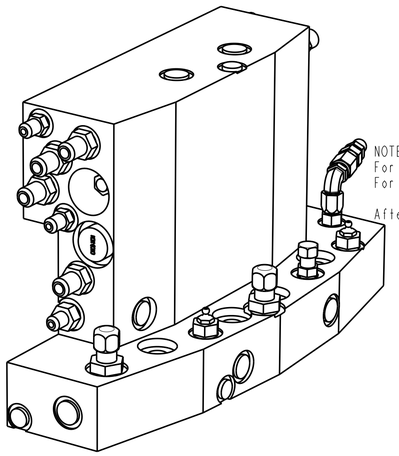


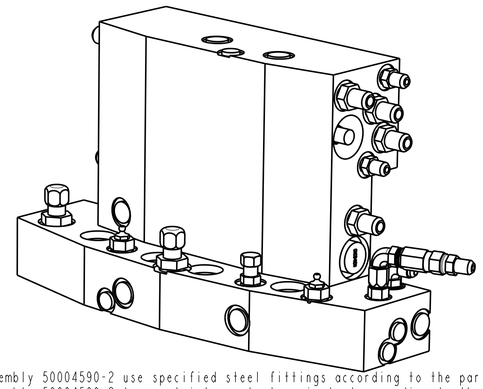










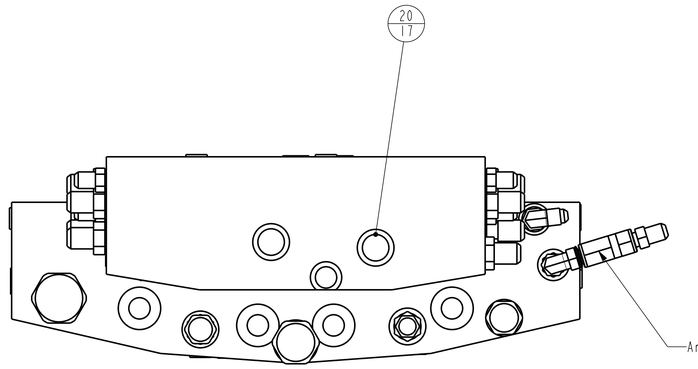


△1 NOTE:
For manifold assembly 50004590-2 use specified steel fittings according to the parts list
For manifold assembly 50004590-2-1 use stainless steel equivalent according to the parts list.

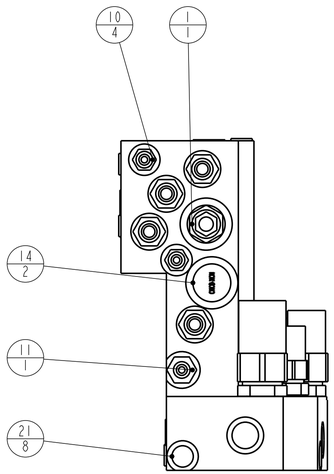
After pressure and functional tests plug all open ports to avoid contamination.

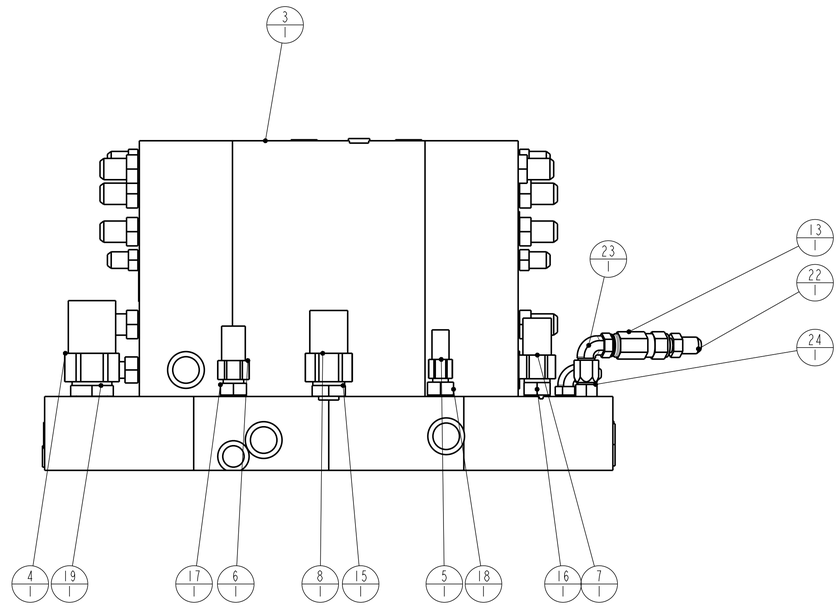
PARTNUMBER	50004590-2			UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO	
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		
SURF. FINISH / PAINTSPEC.	-			BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER	
COLOR	-			MACHINED SURFACES 250		
WEIGHT	77.0 lbs kg			TORCHCUT SURFACES 1000		
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2	PROJ.
NAME	BV	NAME	CdL	REV.		
DATE	05-Jan-04	DATE	5JAN04	C	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
		E.C.N.	601195			
TITLE Manifold Assembly PS-30 RST				SIZE D	DRAWING NO. 50004590-2_DMS	SHEET 1 OF 1

ITEM	QTY	PART NUMBER	SS EQUIVALENT	DESCRIPTION
1	1	59000175		COUNTER BALANCE VALVE CACA-LHN
2	1	30107236-1AN		DIRECT ACTING SEQUENCE VALVE SCCA-LAN
3	1	50004590-M		Manifold Machining PS-30
4	1	55909-12-12	55909-12-12-SS	MALE QUICK DISCONNECT FD45 -12
5	1	55909-2-2	S.S. Not available	MALE QUICK DISCONNECT FD45 -2
6	1	55909-4-4	55909-4-4-SS	MALE QUICK DISCONNECT FD45 -4
7	1	55909-6-6	55909-6-6-SS	MALE QUICK DISCONNECT FD45 -6
8	1	55909-8-8	55909-8-8-SS	MALE QUICK DISCONNECT FD45 -8
9	1	56519-4-4-S	56519-4-4-C	ELBOW 90 deg O_RING EXT.7/16UNF TO EXT.7/16 JIC
10	4	56529-4-4-S	56529-4-4-C	CONNECTOR SAE O-RING -4 TO 37 JIC -4
11	1	56529-6-4-S	56529-6-4-C	CONNECTOR SAE O-RING -6 TO 37 JIC -4
12	8	56529-6-6-S	56529-6-6-C	CONNECTOR SAE O-RING -6 TO 37 JIC -6
13	1	59000142-1	59000142-1-1	in line check valve
14	2	93547-1B30N		PILOT TO OPEN CHECK VALVE INT. DRAIN / CKCB-XCN
15	1	979504-3	979504-3-C	3/4"-16 SAE O-RING / 1/2" EXT. NPT
16	1	979504-4	979504-4-C	9/16"-18 SAE O-RING / 3/8" EXT. NPT
17	1	979504-6	979504-6-C	9/16"-18 SAE O-RING / 1/4" EXT. NPT
18	1	979504-8	979504-8-C	9/16"-18 SAE O-RING / 1/8" EXT. NPT
19	1	979504-12	979504-12-C	3/4"-16 SAE O-RING / 3/4" EXT. NPT
20	17	979512-2	979512-2-C	PLUG 9/16 - UNF + O-RING
21	8	979512-3	979512-3-C	PLUG 7/16" - UNF + 'O' RING
22	1	979532-2-4	979532-2-4-C	CONNECTOR BSP 1/8 #2 TO 37 JIC #4
23	1	979935-2-4	979935-2-4-C	ELBOW 90° O_RING EXT.1/8BSP TO EXT.7/16UNF
24	1	979942-4-4	979942-4-4-C	ORB SWIVEL ADAPTER



Arrow on Check-valve points towards the manifold-block





"SLIPS UP" QD-12

Add Dust-cap P.N:55915-12

"GREASE CENTERSLIP" QD-4

Add Dust-cap P.N:55915-4

"SLIPS DOWN" QD-8

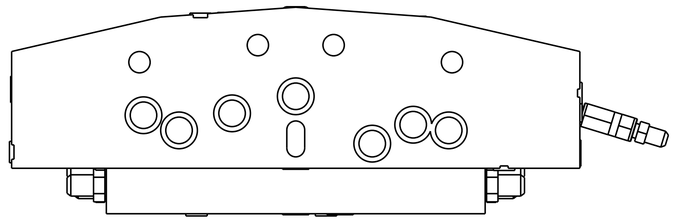
Add Dust-cap P.N:55915-8

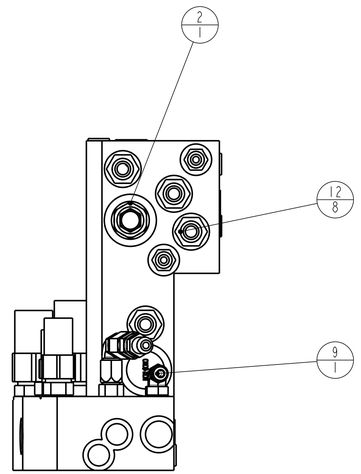
"SIGNAL" QD-2

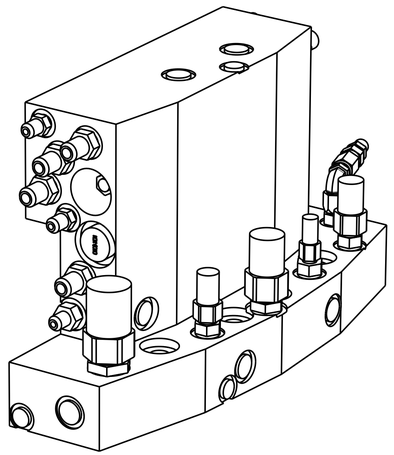
Add Dust-cap P.N:55915-2

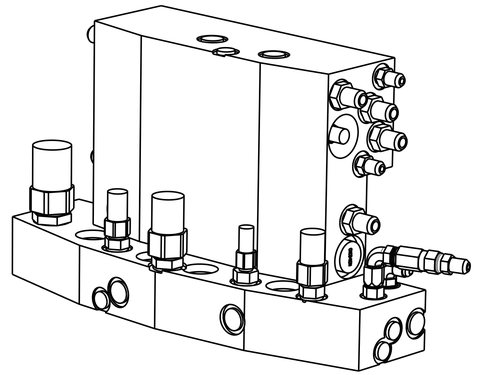
"GREASE SIDESLIPS" QD-6

Add Dust-cap P.N:55915-6





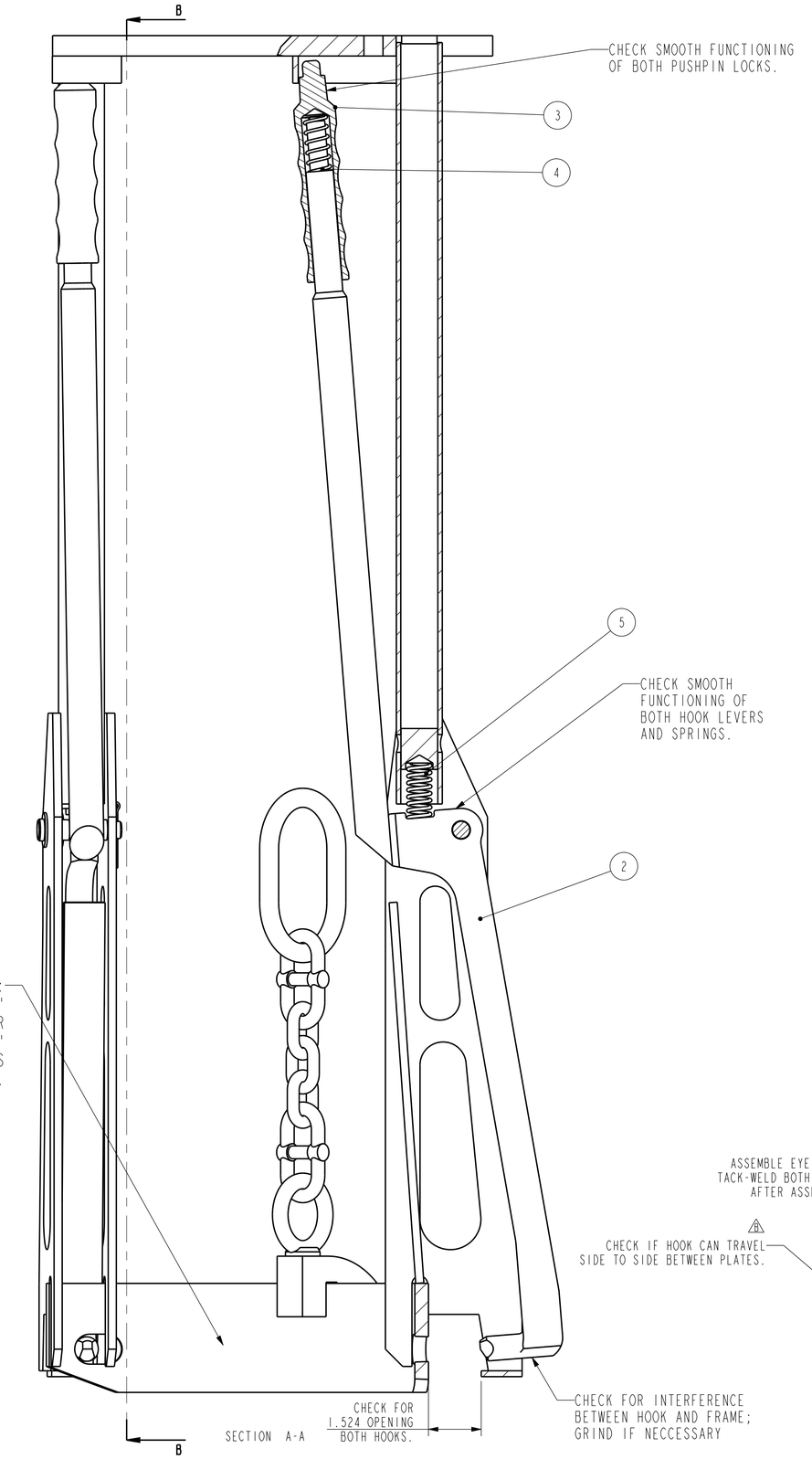


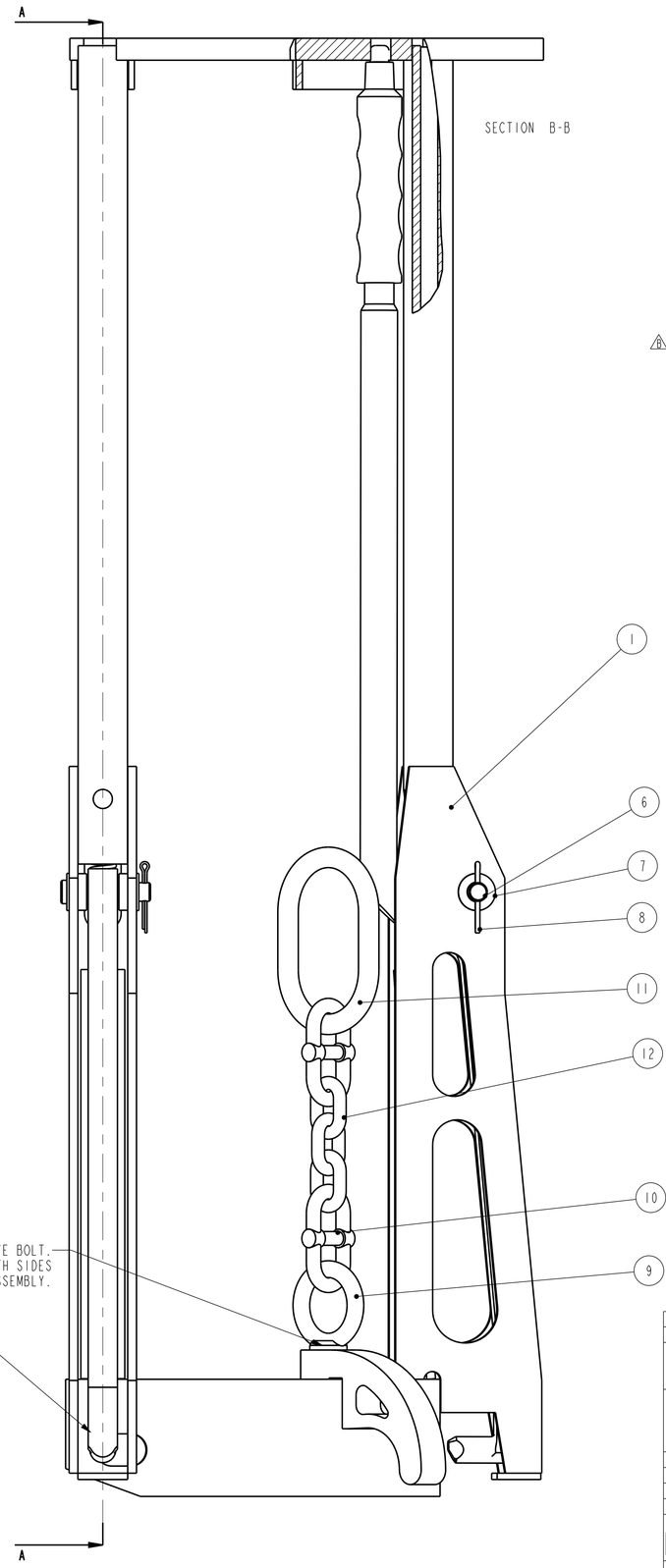


NOTE: ⚠
For manifold assembly 50004590 use specified steel fittings and Q.D.'s according to the parts-list
For manifold assembly 50004590-1 use stainless steel equivalent according to the parts-list
After pressure and functional tests plug all open ports to avoid contamination.

PARTNUMBER	50004590				UNLESS OTHERWISE SPECIFIED	NOV NATIONAL OILWELL VARCO
MATERIAL					TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	
SURF. FINISH / PAINTSPEC.	-				BREAK SHARP CORNERS .010 ± .005	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
COLOR	-				MACHINED SURFACES 250	
WEIGHT	78.9 Lbs kg				TORCHCUT SURFACES 1000	
ORIGINAL DOCUMENT		LATEST REVISION			DO NOT SCALE DOCUMENT	SCALE 1:2 PROJ.
NAME	BV	NAME	CdL	REV.		
DATE	05-Jan-04	DATE	5JAN04	C	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)
		E.C.N.	601195			
TITLE: Manifold Assembly PS-30					SIZE D	DRAWING NO. 50004590 SHEET 1 OF 1

PART NUMBER
50004550-30





ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		50004550-32	FRAME BOWL LIFTING TOOL PS30
2	2		50004550-23	HOOK BOWL LIFTING TOOL
3	2		50004550-25	LOCKPIN
4	2		200346	SPRING PIPE SENSOR D-12730
5	2		979386-5	COMPRESSION SPRING
6	2		56408-18-C	PIN, CLEVIS 2-1/4"
7	4		50808-N-C	WASHER, FLAT
8	2		51402-12	COTTER PIN 0.125X1.5
9	1		57000-10-14	EYE-BOLT SHOULDERED 5/8" UNC 1.3/4"LONG
10	2		59000062-5	CONNECTING LINK, 5/16" CROSBY
11	1		59000063-8	1/2" MASTERLINK, CROSBY
⚠A 12	1		59000064-5-40	CHAIN, 5/16"CROSBY, 40 SHACKLES

⚠A (40 SHACKLES)

NOTES:
- SAFE WORKING LOAD: 500 lbs.
- LOADTEST ASSEMBLY TO 2 TIMES S.W.L. (2 X 500 lbs).
- STAMP SERIAL NUMBER AT LOCATION SHOWN.
- SURFACE FINISH: RED-PAINT.
- ⚠B FUNCTION TEST ASSEMBLY ON HAND SLIP BOWL PARTNO.202362 IN PS 30 SLIP ASSY PARTNO. 202430-1.
  - PLACE BOWL IN SLIP ASSY, USING LIFTING TOOL.
  - REMOVE LIFTING TOOL FROM BOWL.
  - PLACE LIFTING TOOL ON BOWL AGAIN AND REMOVE BOWL OUT OF SLIP ASSY.

50004550-30			
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

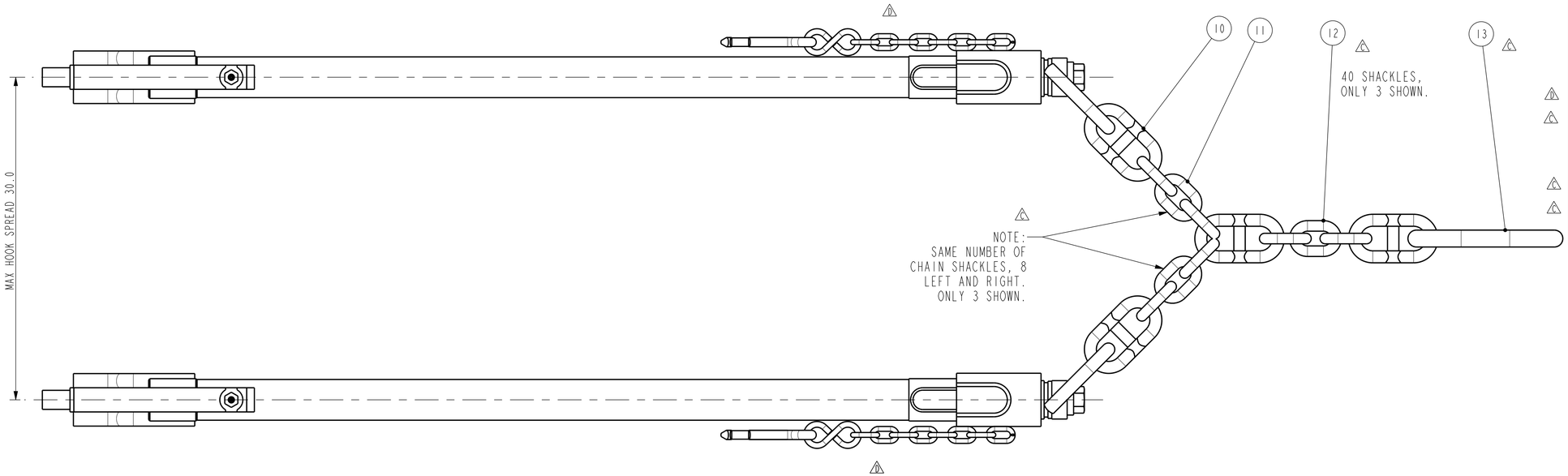
	NAME	DATE
APPROVED	A.K.	27-Jun-2001
CHECKED	A.K.	27-Jun-2001
PREPARED	P.D.	27-Jun-01

PROJ.
SCALE 1:2
UNITS INCH (MM)
MATERIAL
WEIGHT 54.682 LBS/ KG

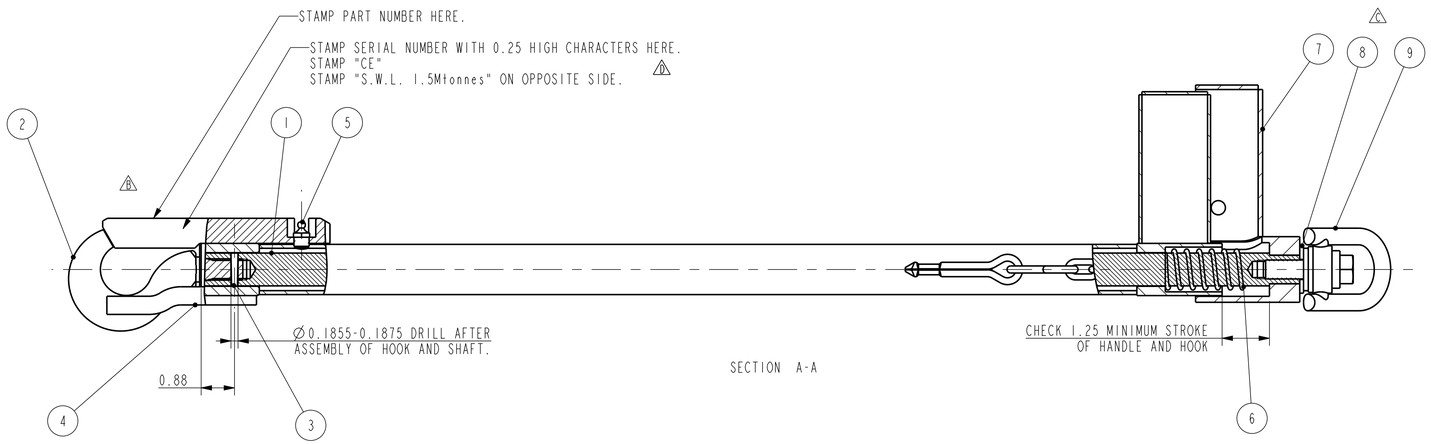
REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D				
C				
B	600443	P.D.	10-Aug-2001	A.K.
A	600372	P.D.	27-Jun-2001	A.K.

PROE FILE NO.: 50004550-30

TITLE: LIFTING TOOL HAND SLIP BOWL PS 30
SIZE: D
DRAWING NO.: 50004550-30
SHEET 1 OF 1
REDRAWN / REPLACED BY:
REPLACES:



ITEM	QTY.	DWG SIZE.	PART NUMBER.	DESCRIPTION.
1	2		50004551-1	SHAFT
2	2		50004551-2	HOOK, CROSBY
3	2		51503-7	PIN, GROOVED TAPER
4	2		50004551-3	HOUSING
5	2		53201	GREASE NIPPLE
6	2		980474	COMPRESSION SPRING.
7	2		50004551-4	HANDLE
8	2		50808-R-C	WASHER, 1/2" FLAT REGULAR.
9	2		980473-10	HOIST SWIVEL RING
10	4		59000062-5	CONNECTING LINK CROSBY
11	2		59000064-5-8	CHAIN 5/16" CROSBY, 8 SHACKLES
12	1		59000064-5-40	CHAIN 5/16" CROSBY, 40 SHACKLES
13	1		59000063-8	MASTER LINK 1/2" CROSBY.



SECTION A-A

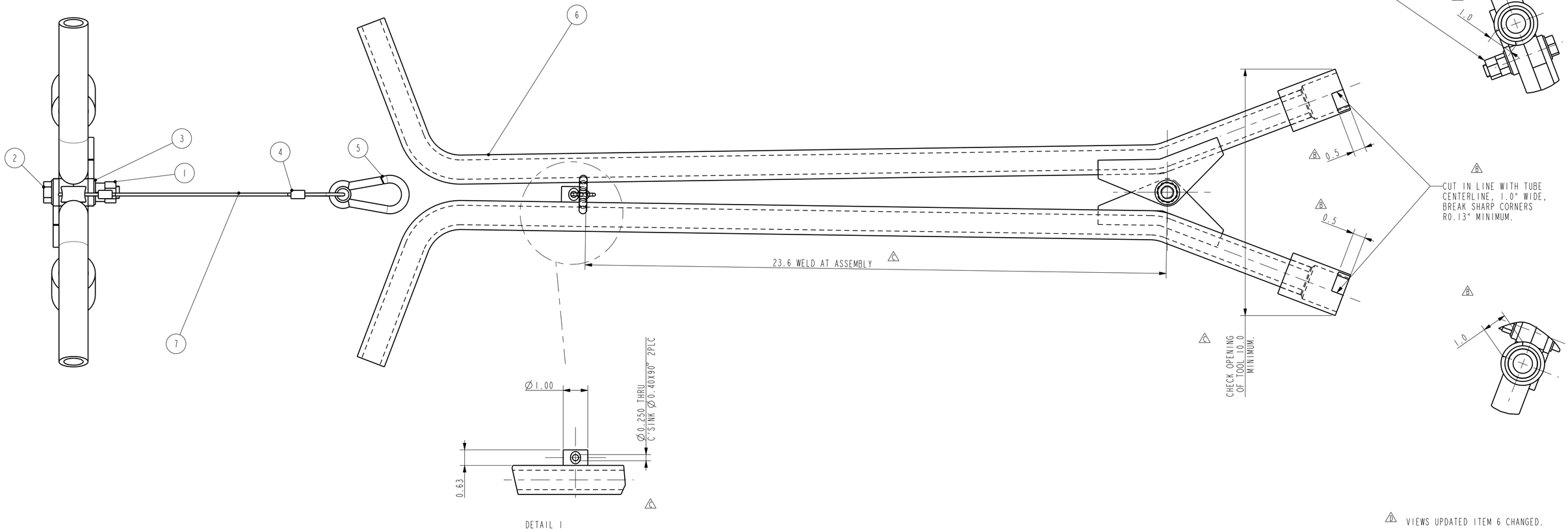
NOTE:
AFTER ASSEMBLY TEST FOR SMOOTH FUNCTIONING OF
SLIDING MECHANISM AND FULL 1.25" STROKE.
LOAD TEST TO 2 X S.W.L = 2 X 1.5Mtonne.
(TEST EACH HOOK TO 1.5Mtonne)
ASSEMBLE HOIST SWIVEL BOLT USING BEARING FIT LOCTITE,
ASSEMBLY TORQUE 28 ft lbs. MINIMUM.

PARTNUMBER	50004551			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.	P-001			BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	
COLOR	Red				
WEIGHT	27.649 lbs	12.541 kg			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2
NAME	P.D.	NAME	CdL	REV.		PROJ.
DATE	02-Jun-05	DATE	2 JUNE '05	D	THIS DOCUMENT IS PDMlink CONTROLLED	UNITS INCH (mm)
		E.C.N.	0700114			

TITLE	SIZE	DRAWING NO.	SHEET
SLIP LIFT HOOK	D	50004551	1 OF 1

PART NUMBER
50004552

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	2		50208	NUT, HEX-STANDARD-1/2-13
2	1		50008-22-C8	SCREW,CAP-HEX HD (UNC 1/2")
3	2		50808-N-C	WASHER, FLAT
4	2		979437-3	WIRE CLAMP
5	1		979855-4	SNAP HOOK STANDARD WITH CLOSED EYE
6	2		50004552-2	LEVER
7	1		979438-3	WIRE-ROPE 44" LONG

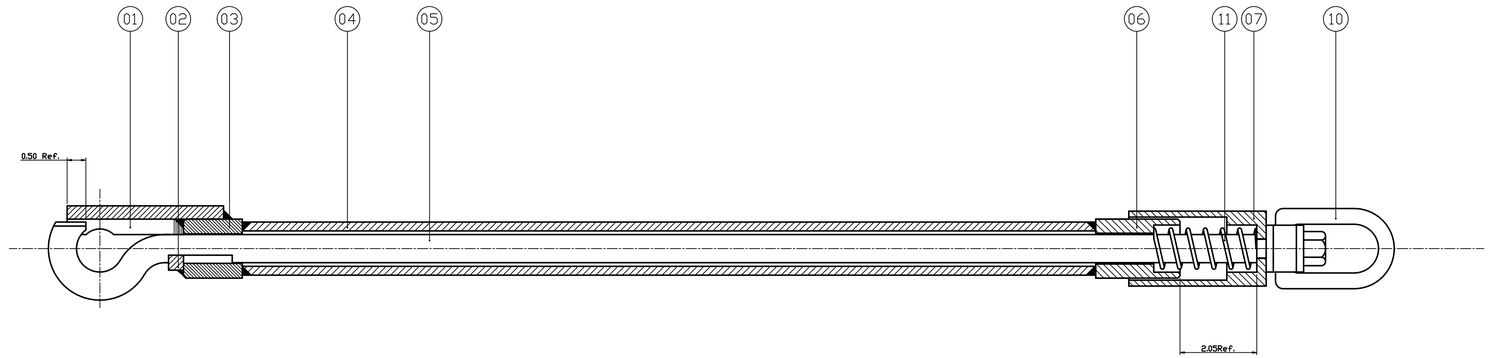


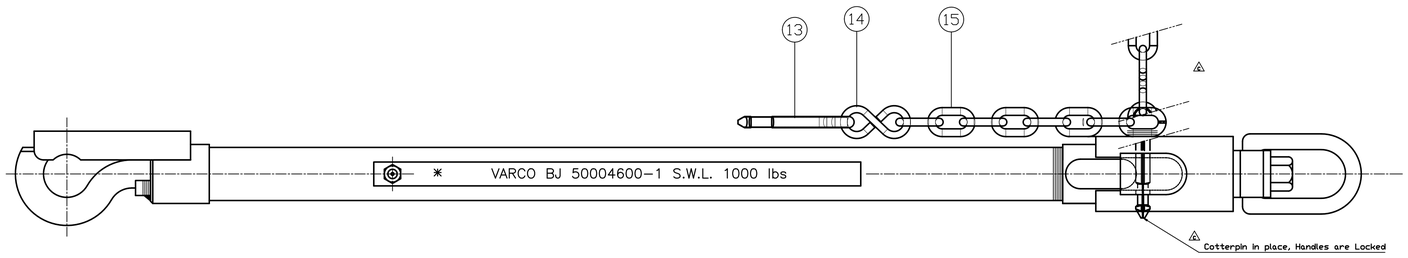
A VIEWS UPDATED ITEM 6 CHANGED.

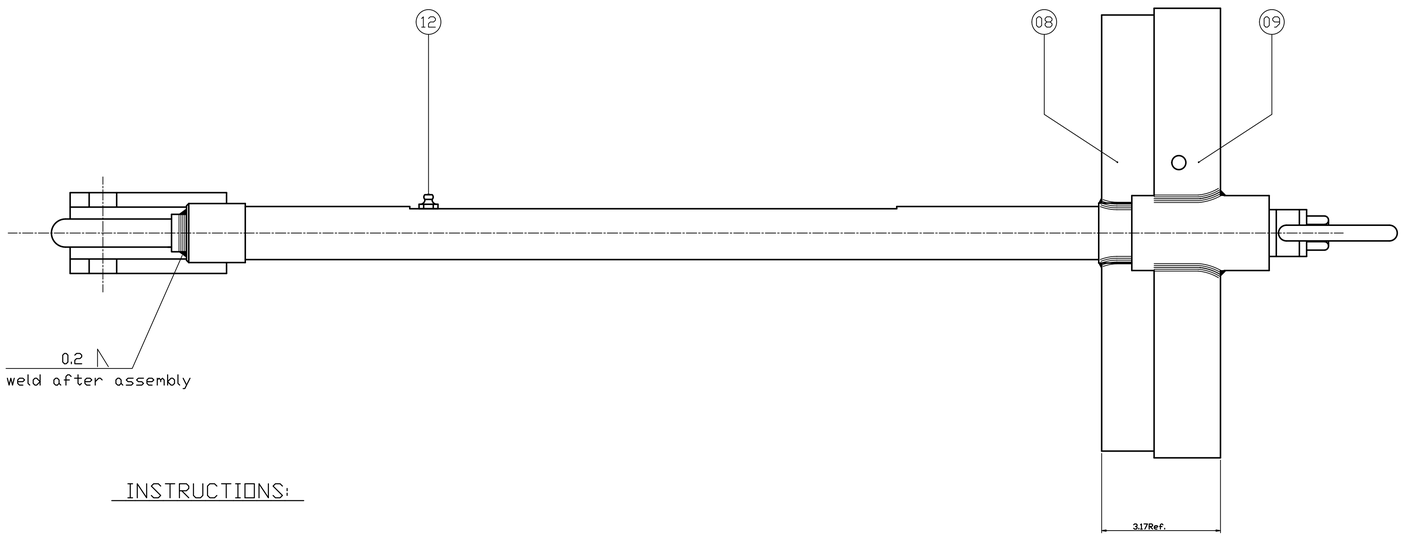
50004552					K					
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.		J					
Varco BJ OIL TOOLS ETTEN-LEUR, THE NETHERLANDS		UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE		I					
					H					
					G					
					F					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER		BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250			E					
					D		592904	P.D.	08-Sept-00	A.K.
					C		592903	P.D.	01-Aug-00	A.K.
					B		592902	P.D.	19-July-00	A.K.
					A		592901	P.D.	04-July-00	A.K.
					REV.		E.C.N	NAME	DATE	CHECKED
					PROJE FILE NO.:		50004552			
					WEIGHT 0.000 LBS/ KG					
TITLE: SLIP HANDLE OPERATING TOOL.					SIZE D	DRAWING NO. 50004552				SHEET 1 OF 1
REDRAWN / REPLACED BY:					REPLACES:					

PART NUMBER
50004600

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
01	1	D	50004600-0 △C	LATCH,ø55x10(mm)
02	1	D	50004600-2	STOP,10X10(mm)
03	1	D	50004600-3	GUIDE BOTTOM, ø40x10(mm)
04	1	D	50004600-4	SPACER,ø36x6(mm)
05	1	D	50004600-5	LIFTING BAR,ø19(mm)
06	1	D	50004600-6	GUIDE TOP,ø40x10(mm)
07	1	D	50004600-7	END STOP,ø50(mm)
08	2	D	50004600-8	LOW. HANDLE,48x20x2(mm)
09	2	D	50004600-9	UPP. HANDLE, PLATE 3(mm)
10	1	–	980473-10	HOIST SWIVEL RING
11	1	–	980474	COMPRESSION SPRING
12	1	–	53201	GREASE FITTING
13 △	1	–	50004950	LATCH RETAINER / COTTERPIN
14 △	1	–	948051-2	S-HOOK
15 △	1	–	59001008-4	CHAIN, STRAIGHT LINK , 8 LINKS







INSTRUCTIONS:

-LOADTEST 2 TIMES S.W.L.

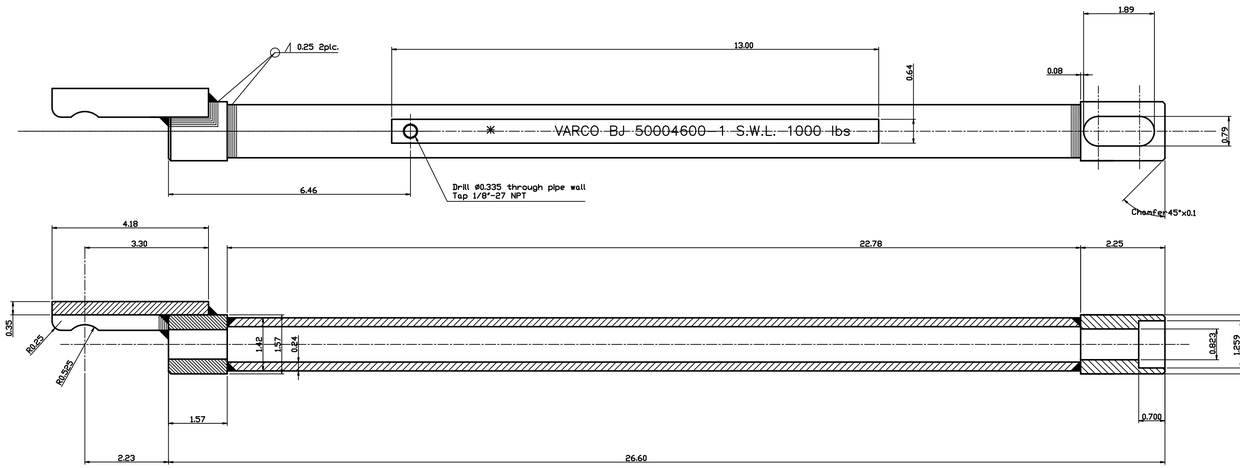
* -SERIAL NUMBER STAMPED IN 0.25" HIGH CHARACTERS

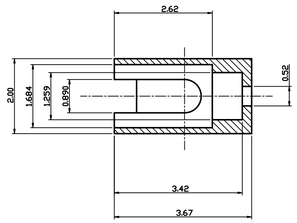
△C -CE marking STAMPED IN 0.25" HIGH CHARACTERS

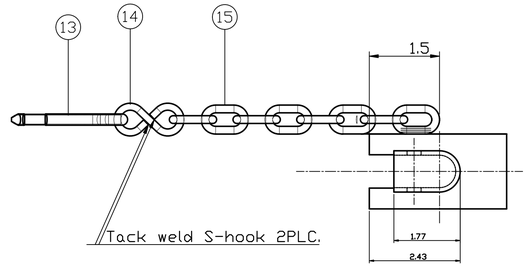
PARTNUMBER	50004600-1			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL	See dash numbers			TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL XXX ± .010 2 PLACE DECIMAL XX ± .03 1 PLACE DECIMAL X ± 1 ANGLES ± .5 DEGREE	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH/ PAINT SPEC	P-001			BREAK SHARP CORNERS .010-.005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	
COLOR	Red				
WEIGHT	20 LBS/	9 KG			
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2
NAME AK		NAME Cdl	REV.		PROJ.
DATE March 27'00		DATE 15 JUNE'05	C	THIS DOCUMENT IS PDM-LINK CONTROLLED	UNITS INCH (MM)
DRAWING TYPE MG		E.C.N. 0700120			
TITLE Lifting hook insert carriers PS21 & PS30				SIZE D	DRAWING NO. 50004600(-)
					SHEET 1 OF 2

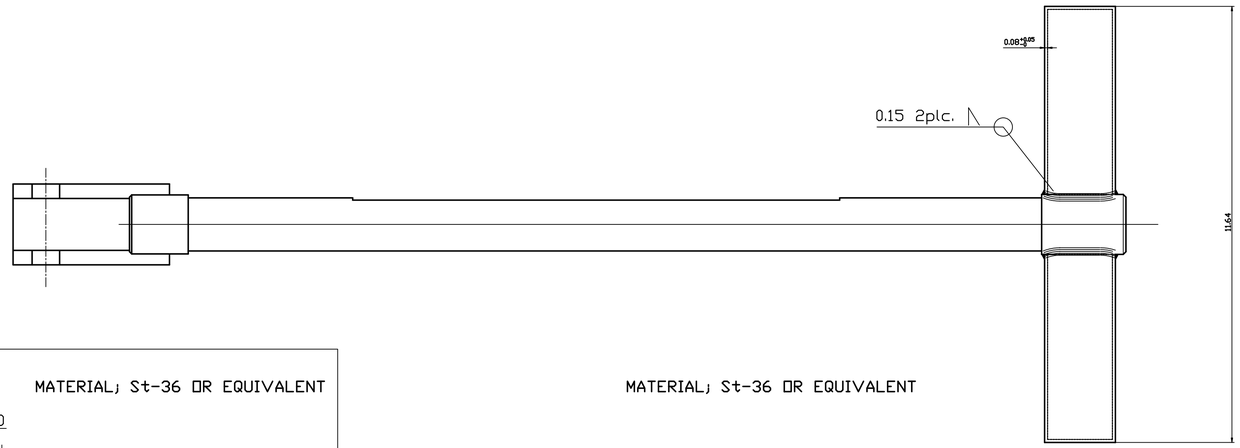
PART NUMBER
5000**4600**

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION

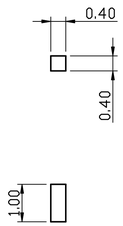




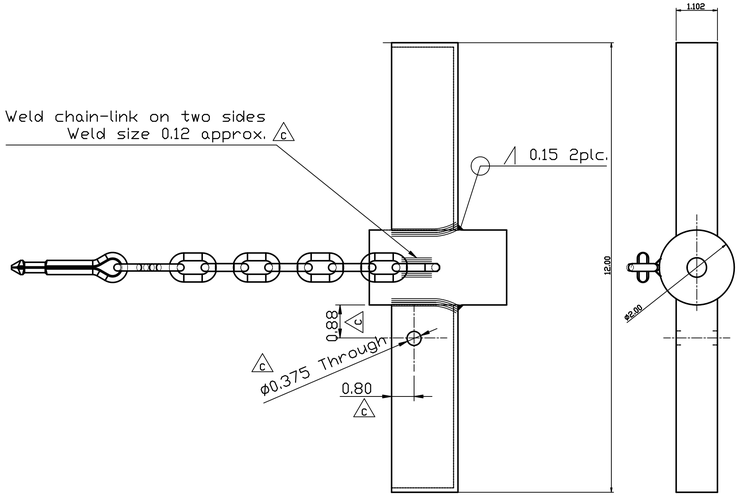




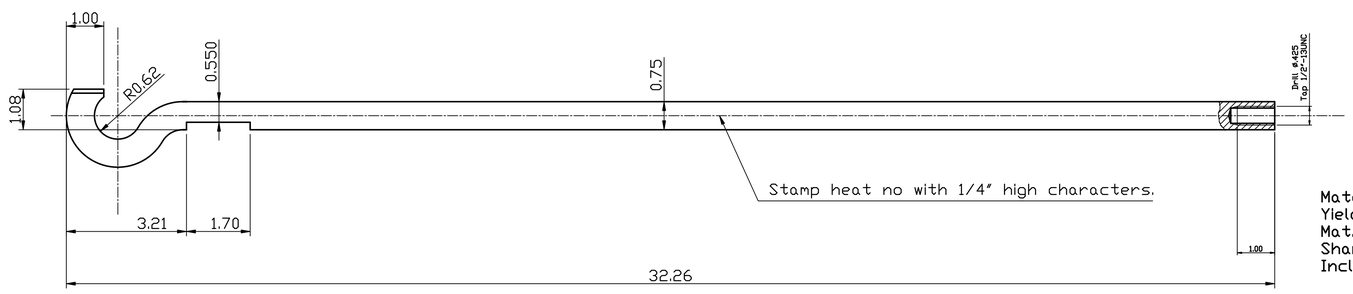
MATERIAL; St-36 OR EQUIVALENT



MATERIAL; St-36 OR EQUIVALENT



MATERIAL; St-36 OR EQUIVALENT

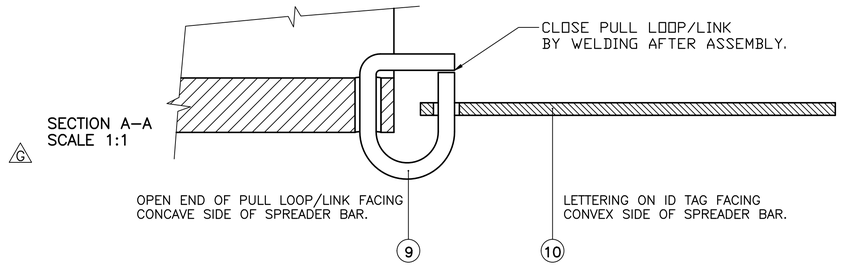


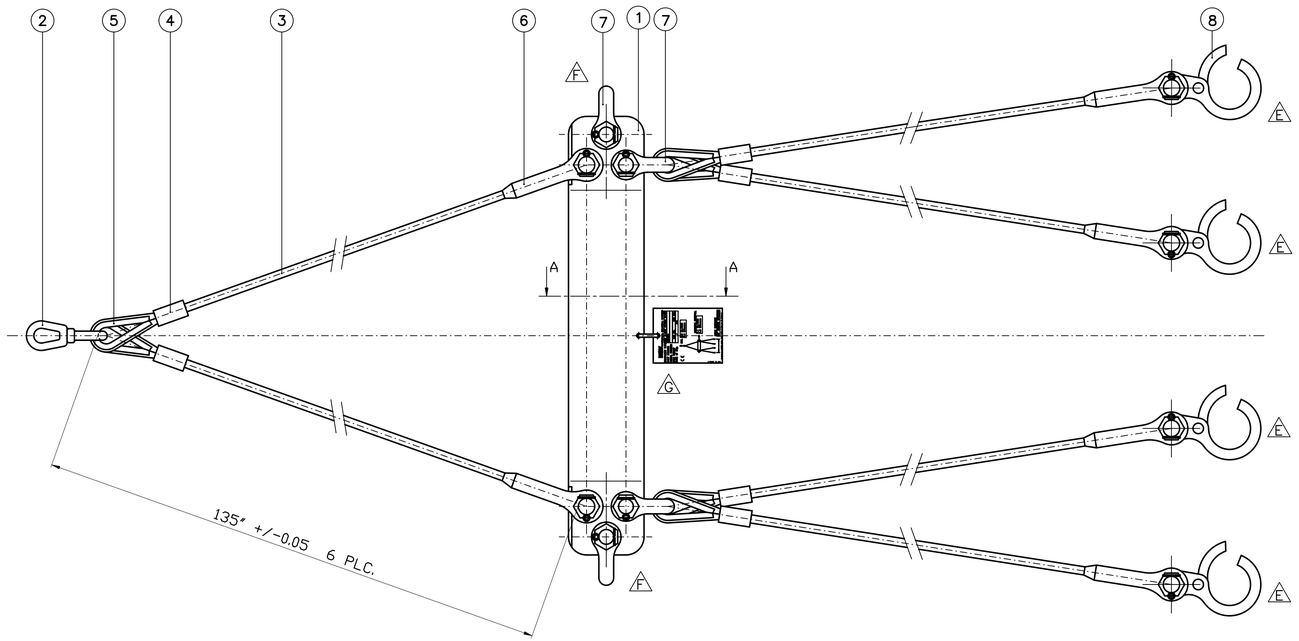
Material; St 52-3 U
Yield strength 345 N/mm2
Mat. no 1.0553
Sharpy 27 J @ 0 degrees Celsius
Including 3.1.B certificate

For bending purposes rod end can be heated below quecning temp to maintain physical mat. properties.

PARTNUMBER	50004600-1			UNLESS OTHERVISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL	See dash numbers			TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL XXX ± .010 2 PLACE DECIMAL XX ± .03 1 PLACE DECIMAL X ± .1 ANGLES ± 5 DEGREE	
SURF. FINISH/ PAINT SPEC	P-001			BREAK SHARPS CORNERS .010+.005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
COLOR	Red				
WEIGHT	20 LBS/ 9 KG				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2 PROJ.
NAME	AK	NAME	CdL	REV.	
DATE	March 27'00	DATE	15 JUNE'05	C	
DRAWING TYPE	MG	E.C.N.	0700120	THIS DOCUMENT IS PDM-LINK CONTROLLED	UNITS INCH (MM)
TITLE	Lifting hook insert-carriers PS21 & PS30	SIZE	D	DRAWING NO.	50004600(-) SHEET 2 OF 2

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1	C	200982	SPREADER BAR
2	1	–	979456–8	SWIVEL
3	6	–	979436–16	CABLE
4	6	–	979435–16	DUPLEX NON–TAPERED SLEEVE
5	6	–	939315–16	THIMBLE
B 6	6	A	200982–2	OPEN SWAGE SOCKET
F 7	4	–	979459–8	SHACKLE
E 8	4	A	980278	HOIST HOOK WITH LATCH
9	1	A	203239	PULL LOOP / LINK
G 10	1	B	200982–3	FMS LIFTING SLING ID TAG

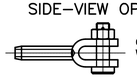




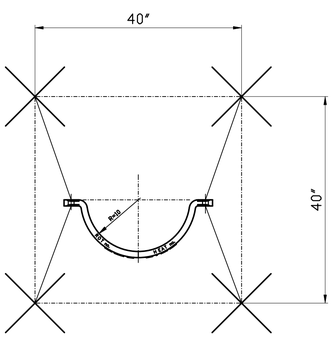
SIDE–VIEW SHACKLE

SHACKLES SECURED
WITH NUT AND SPLIT PIN.

SIDE–VIEW OPEN SWAGE SOCKET



OPEN SWAGE SOCKETS SECURED
WITH NUT AND SPLIT PIN.
B



MAXIMUM DISTANCE
BETWEEN LIFTED
POINTS = 40" SQUARE.
SWL = 6.0TON

NOTES:
G 1: LOAD TEST COMPLETE ASS'Y 2.0 TIMES SAFE WORKING LOAD OF 6.0 Short TONS.
2: ALL COMPONENTS ACC. DIN 50.049 3.1.B.
3: USE ONLY FOR LIFTING HOISTS WITH POINT OF GRAVITY IN CENTER OF 4 LIFTING POINTS.
4: ALWAYS USE ALL 4 LOWER CABLES TO LIFT HOIST.
G B C 5: STAMP ID TAG WITH SERIAL NUMBER AND DATE OF MANUFACTURING.
6: STAMP LIFTING SLING SPREADER BAR WITH ROT no. & HEAT no. E

PARTNUMBER	200982–1				
MATERIAL					
SURF. FINISH/ PAINT SPEC					
COLOR					
WEIGHT	300 LBS/ 136 KG				
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	H.v.R.	NAME	H.v.R.	REV.	
DATE	23 MAR 95	DATE	30 AUG 05	G	
DRAWING TYPE	AS	E.C.N.	700179		

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± 2 DEGREE
BREAK SHARP CORNERS .010-.005
MACHINED SURFACES 125
TORCH-CUT SURFACES 1000

DO NOT SCALE DOCUMENT
THIS DOCUMENT IS PDM–LINK CONTROLLED

SCALE NONE
UNITS INCH (MM)
PROJ.

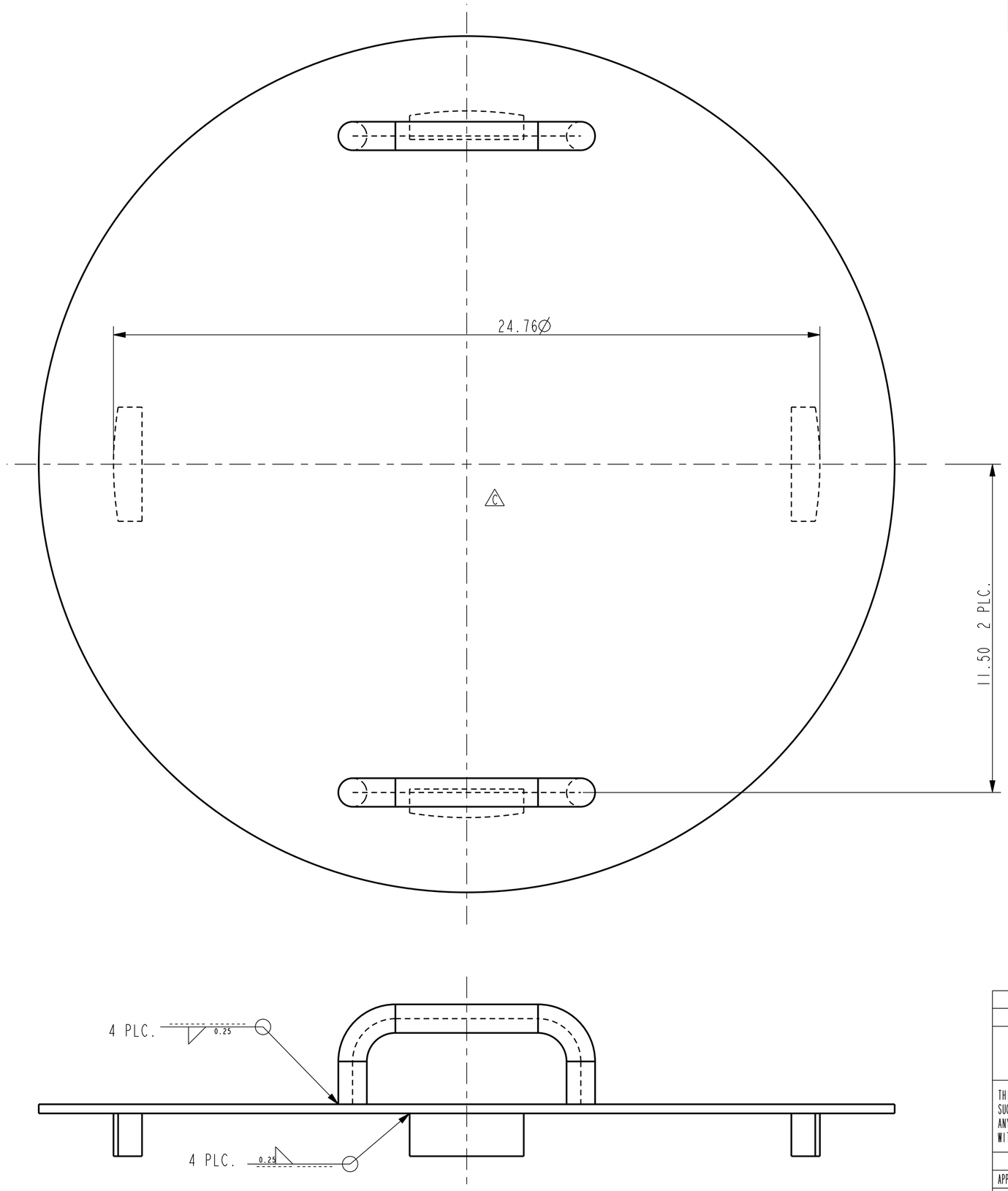
NATIONAL OILWELL VARCO

TITLE: FMS 4 WAY LIFTING SLING

SIZE D | DRAWING NO. 200982–1 | SHEET 1 OF 1

PART NUMBER
202458

ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	4		202458-3	BLOCK FOR CLOSED HATCH PLATE PS30
2	2		202458-2	HANDLE FOR CLOSED HATCH PLATE
3	1		202458-1	PLATE FOR CLOSED HATCH PLATE PS30



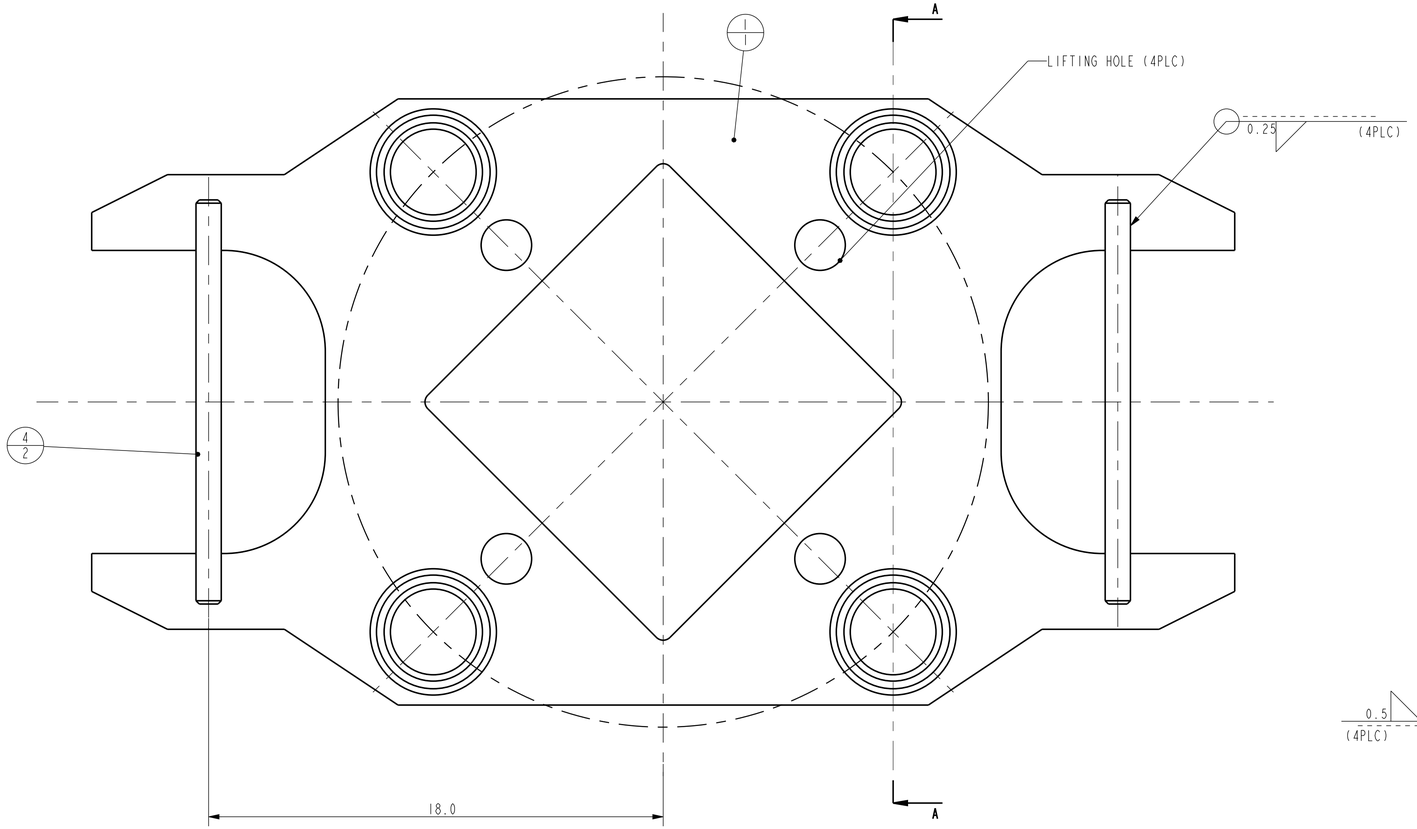
MARK PLATE WITH STAMPED 3/8" LETTERING "VARCO BJ 202458"

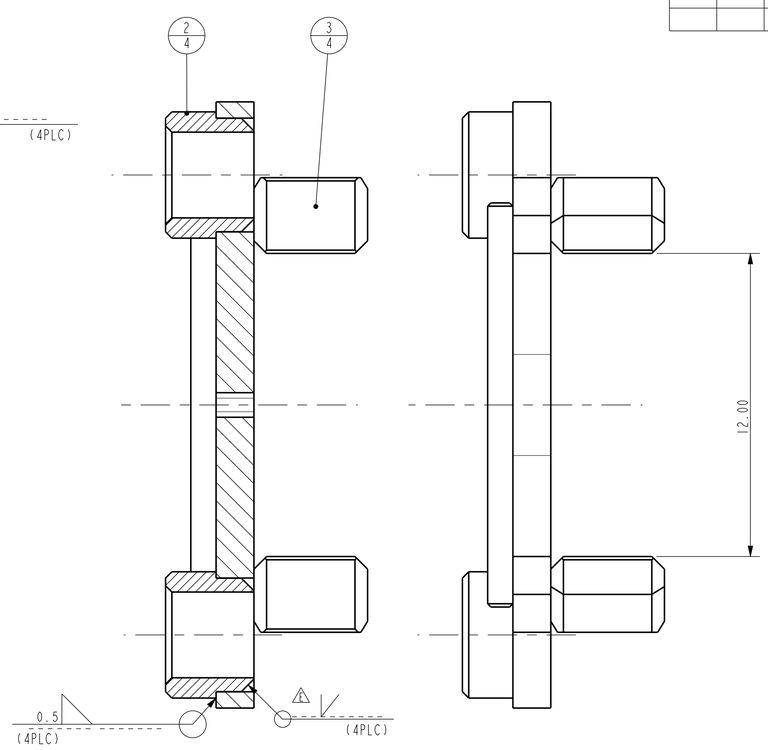
B

202458	--	--		202400(-)	K					
PART NO.	QTY.	NEXT ASSY.		FINAL ASSY.	J					
Varco BJ TM OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED	I					
				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE	H					
					G					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER				BREAK SHARP CORNERS .010 ± .005	F					
					E					
				MACHINED SURFACES 250	D					
					C		528103	HvR	18FEB99	HK
	NAME	DATE	PROJ.	MATERIAL	B		528102	HvR	4SEP98	HK
APPROVED	HT	15JAN98			A		528101	HvR	15JAN98	HK
CHECKED	HK	15JAN98	SCALE 1:3		REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	H.v.R.	15-Jan-98	UNITS INCH (MM)	WEIGHT 73.938 LBS/ KG	PRO/E FILE NO.:		202458			
TITLE: CLOSED HATCH PLATE PS30					SIZE C	DRAWING NO. 202458			SHEET OF 1 1	
REDRAWN / REPLACED BY:					REPLACES:					

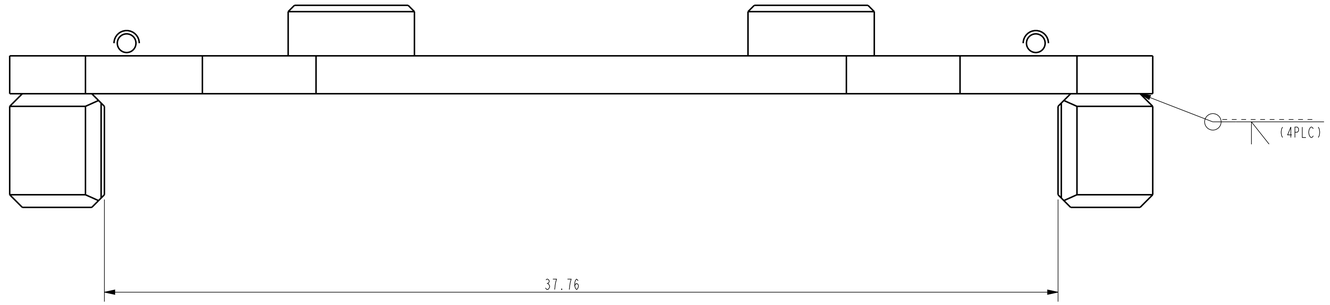
B

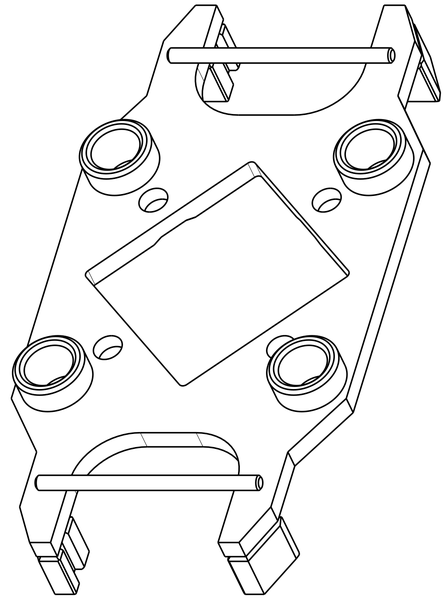
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	202459-1	BBP BASE PLATE
2	4	202459-2	BBP BUSHING
3	4	202459-3	BBP SIDE BLOCK
4	2	202459-4	BBP BAR



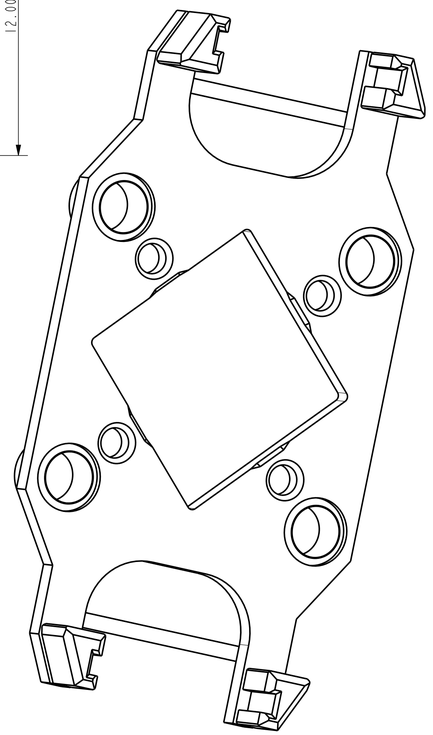


SECTION A-A





SCALE 1:5



SCALE 1:5

1 CORRECT WELD SYMBOL

PARTNUMBER	202459			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL				TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.	P-001				
COLOR	Red				
WEIGHT	276.9 Lbs kg				
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	H.v.R.	NAME	V1B	REV.	DO NOT SCALE DOCUMENT
DATE	21-Dec-05	DATE	03 Dec.'09	E	THIS DOCUMENT IS PDMlink CONTROLLED
		E.C.N.	070158		

SCALE 1:3 PROJ.

UNITS INCH (mm)

TITLE	SIZE	DRAWING NO.	SHEET
BIT BREAKER PLATE PS30	D	202459	1 OF 1

CODE	DESCRIPTION
A1	PORT CONNECTION FOR SLIPS SET
B1	PORT CONNECTION FOR SLIPS UP
S1	PORT CONNECTION FOR SIGNAL
F1, F2	FILTER
CV1, CV2	CHECK VALVE
DV1, DV2	DIRECTIONAL CONTROL VALVE
DV3, DV4	
DV5, DV6	
PC1,PC2	PILOT OPERATED PRESSURE REDUCING VALVE
PR1	PILOT OPERATED PRESSURE RELIEVE VALVE
PG1,2,3,4,5	PRESSURE GAUGE
⊘A1	PRESSURE GAUGE CONNECTION A1 SIGNAL (SLIPS DOWN)
⊘B1	PRESSURE GAUGE CONNECTION B1 SIGNAL (SLIPS UP)
ACCU	ACCUMULATOR CONNECTION
PS1	PRESSURE SWITCH LOW PRESSURE ALARM
PS2	PRESSURE SWITCH SLIPS UP
PS3	PRESSURE SWITCH SLIPS SET
PS4	PRESSURE SWITCH EMPTY GREASE BIN DETECTION
E9–E19	ELECTRICAL CABLING FOR PS–21/30 CONTROLS
E9	SLIPS UP
E10	SLIPS SET
E11	SLIPS SET DETECTION
E12	LOW PRESSURE ALARM DETECTION
E13	SLIPS UP DETECTION
E15	GREASE TO CENTER SLIP
E16	GREASE TO SIDE SLIPS
E17	EMPTY GREASE BIN DETECTION
E18	GREASE PUMP UP
E19	GREASE PUMP DOWN

HYDRAULIC LINES TO PS–21/30

GREASE LINES TO PS–21/30

01 – 15 0
16 – 35 +P
36 – 50 EARTH

MANUAL GREASE COMMAND

CYCLE COUNTER

GROUND TO RIG

GROUND STRIP

SLIP UP B1 — SET AT 1600 PSI

SLIP SET A1 — SET AT 1800 PSI

LOW PRESSURE ALARM — SET AT 2000 PSI

DV1 CETOPO5 · DV2 FLUSH VALVE 59000117–1 DM103LD · DV3 59000129 DM0551/2 CETOPO3 · DV4 CETOPO3 · DV5 CETOPO3 · DV6 CETOPO3

PC2 SET AT 1500 PSI · PC1 SET AT 2500 PSI · PC2 SET AT 1500 PSI · PR1 SET AT 1700 PSI

ACCU 50004441

CV2 CXCD–XCN T–15A

F1 5 GPM MIN. 10 GPM MAX.

GREASE BIN USING STANDARD GREASE BUCKETS.

GREASE PUMP DOWN · GREASE PUMP UP · GREASE IN · GREASE OUT CENTERSLIP · GREASE OUT L&R SLIP

PART NO.	QTY.	NEXT ASS'Y	FINAL ASS'Y

VarcoBJ — A Varco Company

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL XXX ± .010
2 PLACE DECIMAL XX ± .03
1 PLACE DECIMAL X ± 1
ANGLES ± .5 DEGREE
FRACTIONAL ± 1/64
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
PREPARED	I.S.	15 OCT 02
CHECKED	R.M.	15 OCT 02
APPROVED	K.d.L.	15 OCT 02

PROJ. · SCALE 1 : 4 · UNITS INCH (MM) · MATERIAL · WEIGHT LBS/ KG

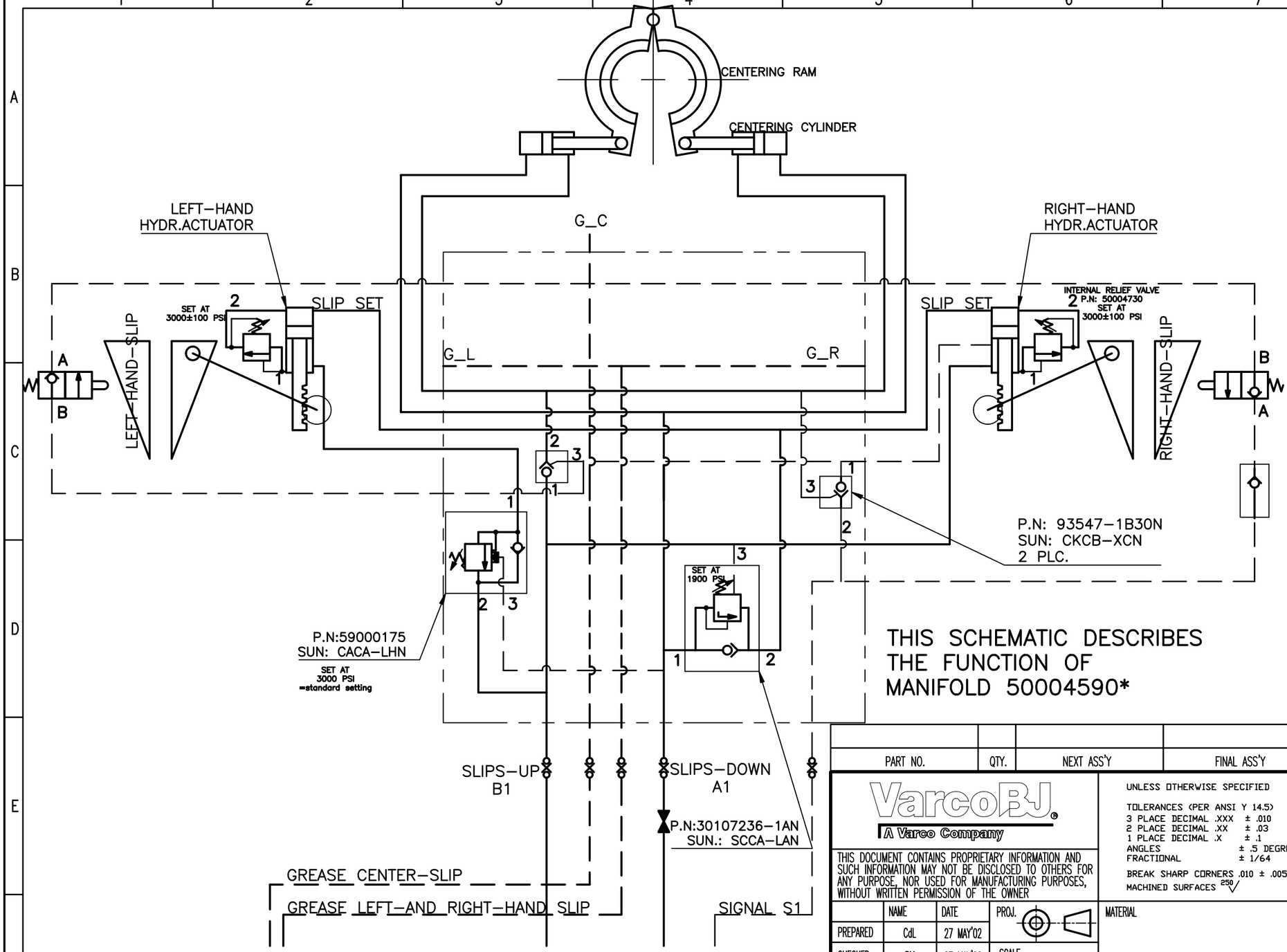
REV.	E.C.	NAME	DATE	CHECKED
C	601070	L.S.	31 MAR 03	R.M.
B	601028	L.S.	10 FEB 03	R.M.
A	600915	L.S.	15 OCT 02	R.M.

ACAD FILE NO. :

TITLE SCHEMATIC HUK CONTROLPLATE PS–21/30 WITH ELECTRIC VALVE

SIZE D · DRAWING NO. 50004446 · SHEET 1 OF 1

REDRAWN / REPLACED BY: · REPLACES:



THIS SCHEMATIC DESCRIBES
THE FUNCTION OF
MANIFOLD 50004590*

B
–ADDED PRESSURE SETTINGS
–ADJUSTED VALVE PART NUMBERS
–REMOVED DOTS ON CONNECTIONS

PART NO.	QTY.	NEXT ASS'Y	FINAL ASS'Y

VarcoBJ
A Varco Company

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
FRACTIONAL ± 1/64

BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE	PROJ.	MATERIAL
PREPARED	CdL	27 MAY'02		
CHECKED	RM	27 MAY'02	SCALE	
APPROVED	AK	27 MAY'02	UNITS INCH (MM)	WEIGHT LBS/ KG

REV.	E.C.	NAME	DATE	CHECKED
M				
L				
K				
J				
H				
G				
F				
E				
D				
C				
B	0700941	CdL	18–OCT–10	
A	600168	CdL	27 MAY'02	RM

ACAD FILE NO. :

TITLE HYDRAULIC SCHEMATIC PS30

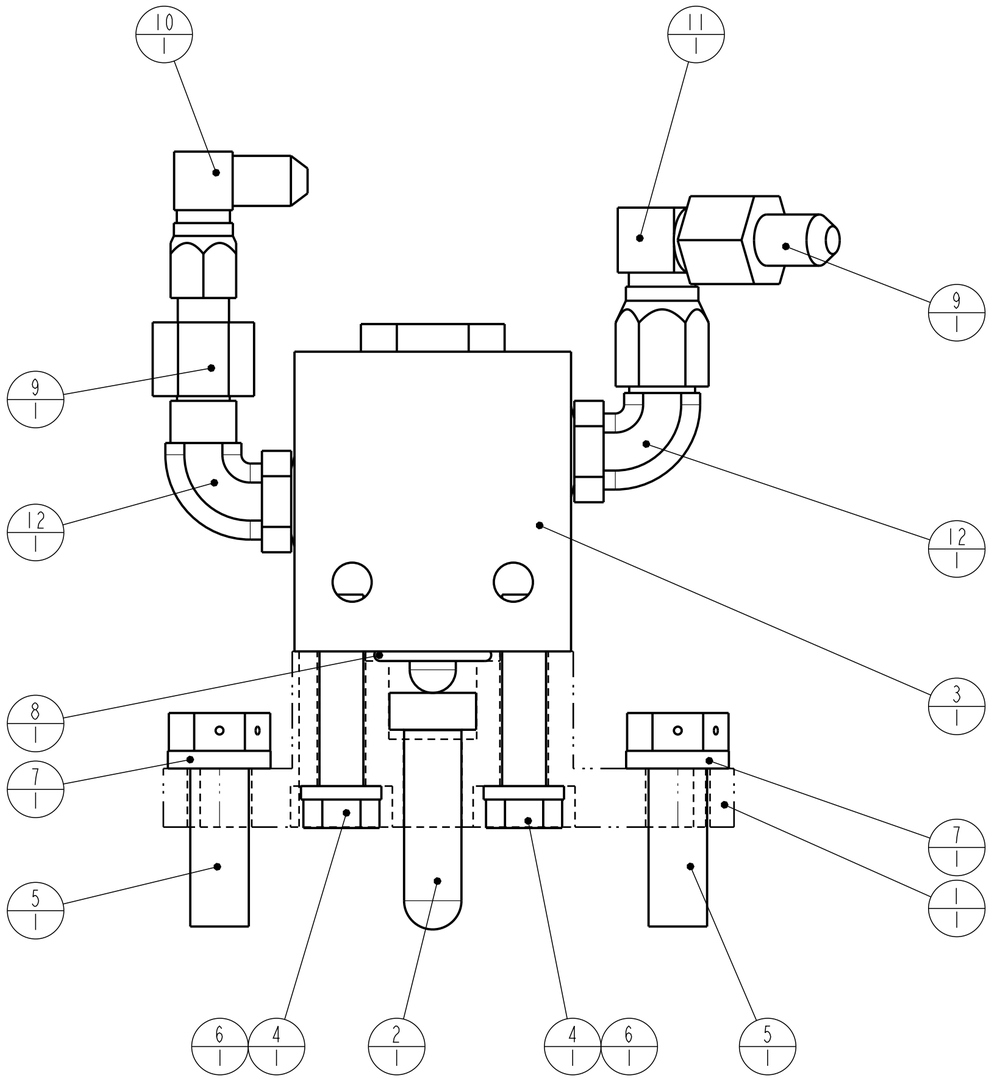
SIZE B | DRAWING NO. 50004725 | SHEET 1 OF 1

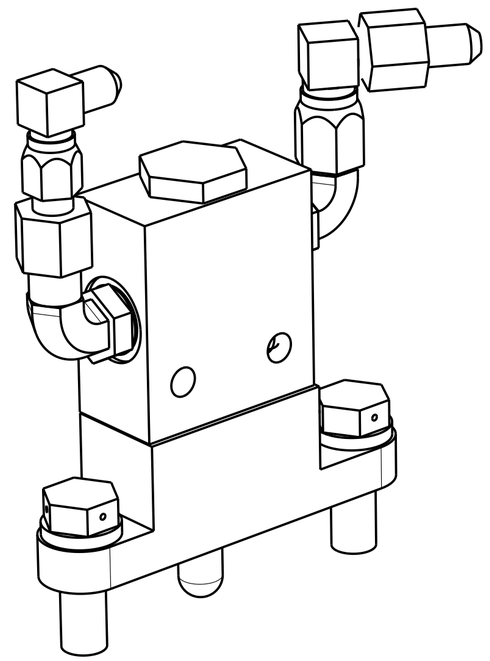
REDRAWN / REPLACED BY:

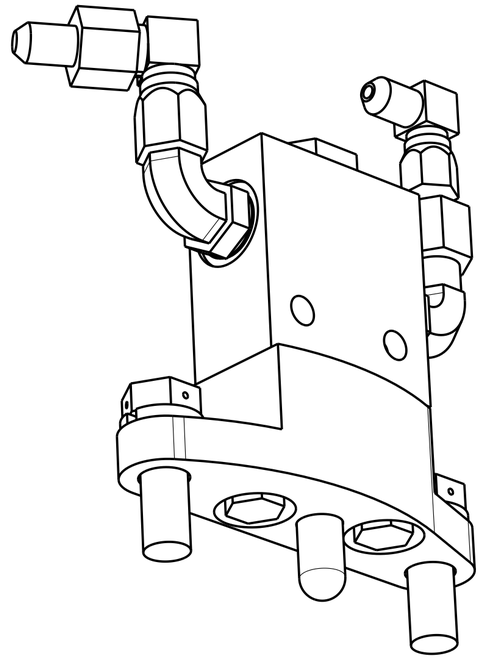
REPLACES:

PART NUMBER
50004591-1

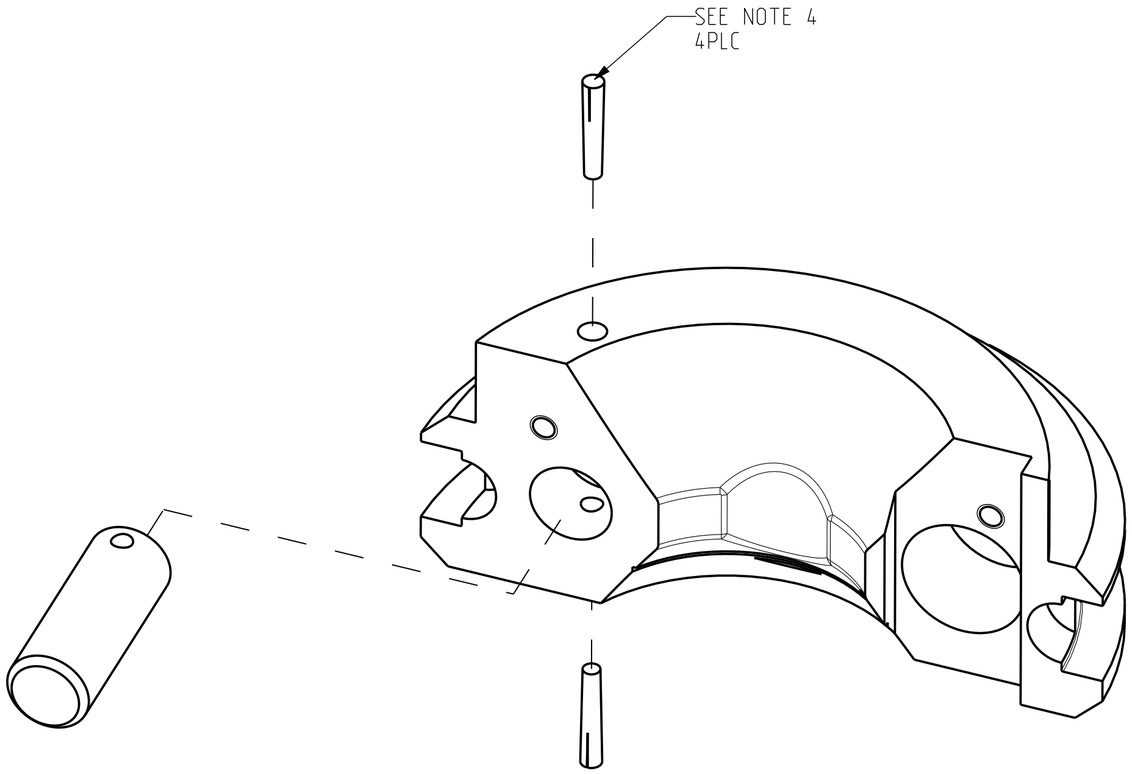
ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		50004579	Indicator valve support right
2	1		50004586	Indicator trigger pin
3	1		50004591	Indicator valve
4	2		50006-14-C8	SCREW,CAP-HEX HD (UNC 3/8")
5	2		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
6	2		51006-C	WASHER, LOCK-STEEL
7	2		51008-C	WASHER, LOCK-STEEL
8	1		51300-117-B	O RING O 2-117 PARKER
9	2		56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
10	1		56518-4-4-S	ELBOW 90degr 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
11	1		56518-6-6-S	ELBOW 90degr 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
12	2		979935-6-6	ELBOW 90° O_RING EXT.3/8BSP TO EXT.9/16UNF

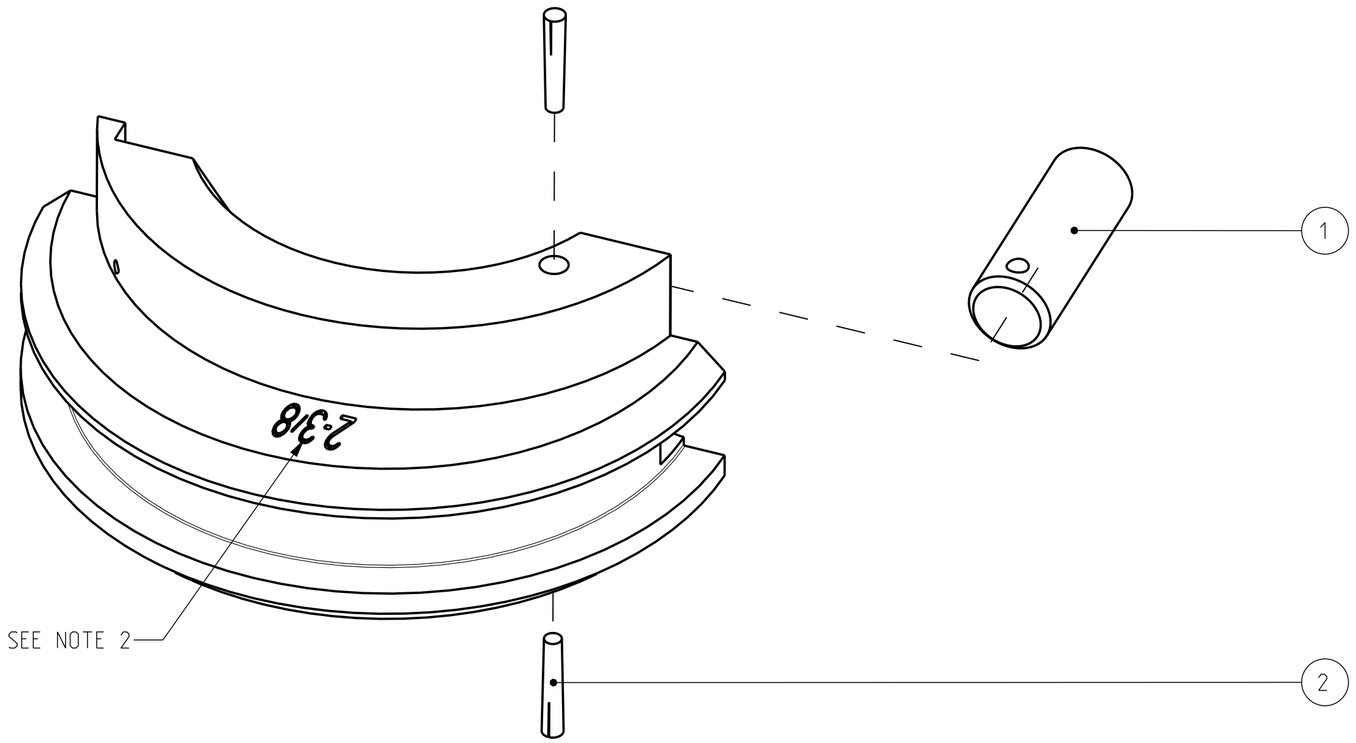






50004591-1					K					
PART NO.	QTY.	NEXT ASSY.		FINAL ASSY.	J					
Varco BJ IN OIL TOOLS ETTEN-LEUR, THE NETHERLANDS				UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250	I					
					H					
					G					
					F					
					E					
					D					
					C					
	NAME	DATE	PROJ.	MATERIAL	B					
APPROVED	AK	19-Jul-01			A		600332	BV	19JUL01	CDL
CHECKED	CDL	19-Jul-01	SCALE 1:1		REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	BV	19-Jul-01	UNITS INCH (MM)	WEIGHT 4.433 LBS/ KG	PRO/E FILE NO.:		50004591-1			
TITLE: Indicator Valve Assembly right				SIZE C	DRAWING NO. 50004591-1				SHEET OF 1 1	
REDRAWN / REPLACED BY:				REPLACES:						





RAM INSERT ASS'Y	MAKE FROM CSTG	ITEM 1 RAM PIN PN. 202392 REQ.	ITEM 2 GROOVED TAPER PIN PN. 51506-12 REQ.
50004525-238	50004525-238-C	Y	Y
50004525-238-SS	50004525-238-C-SS	Y	Y
50004525-288	50004525-238-C	Y	Y
50004525-288-SS	50004525-238-C-SS	Y	Y
50004525-350	50004525-350-C	Y	Y
50004525-350-SS	50004525-350-C-SS	Y	Y
50004525-400	50004525-350-C	Y	Y
50004525-400-SS	50004525-350-C-SS	Y	Y
50004525-450	50004525-450-C	N	N
50004525-450-SS	50004525-450-C-SS	N	N
50004525-500	50004525-500-C	N	N
50004525-500-SS	50004525-500-C-SS	N	N
50004525-550	50004525-550-C	N	N
50004525-550-SS	50004525-550-C-SS	N	N
50004525-568	50004525-550-C	N	N
50004525-568-SS	50004525-550-C-SS	N	N
50004525-588	50004525-550-C	N	N
50004525-588-SS	50004525-550-C-SS	N	N
50004525-614	50004525-600-C	N	N
50004525-614-SS	50004525-600-C-SS	N	N
50004525-650	50004525-600-C	N	N
50004525-650-SS	50004525-600-C-SS	N	N
50004525-663	50004525-663-C	N	N
50004525-663-SS	50004525-663-C-SS	N	N
50004525-700	50004525-700-C	N	N
50004525-700-SS	50004525-700-C-SS	N	N
50004525-763	50004525-763-C	N	N
50004525-763-SS	50004525-763-C-SS	N	N

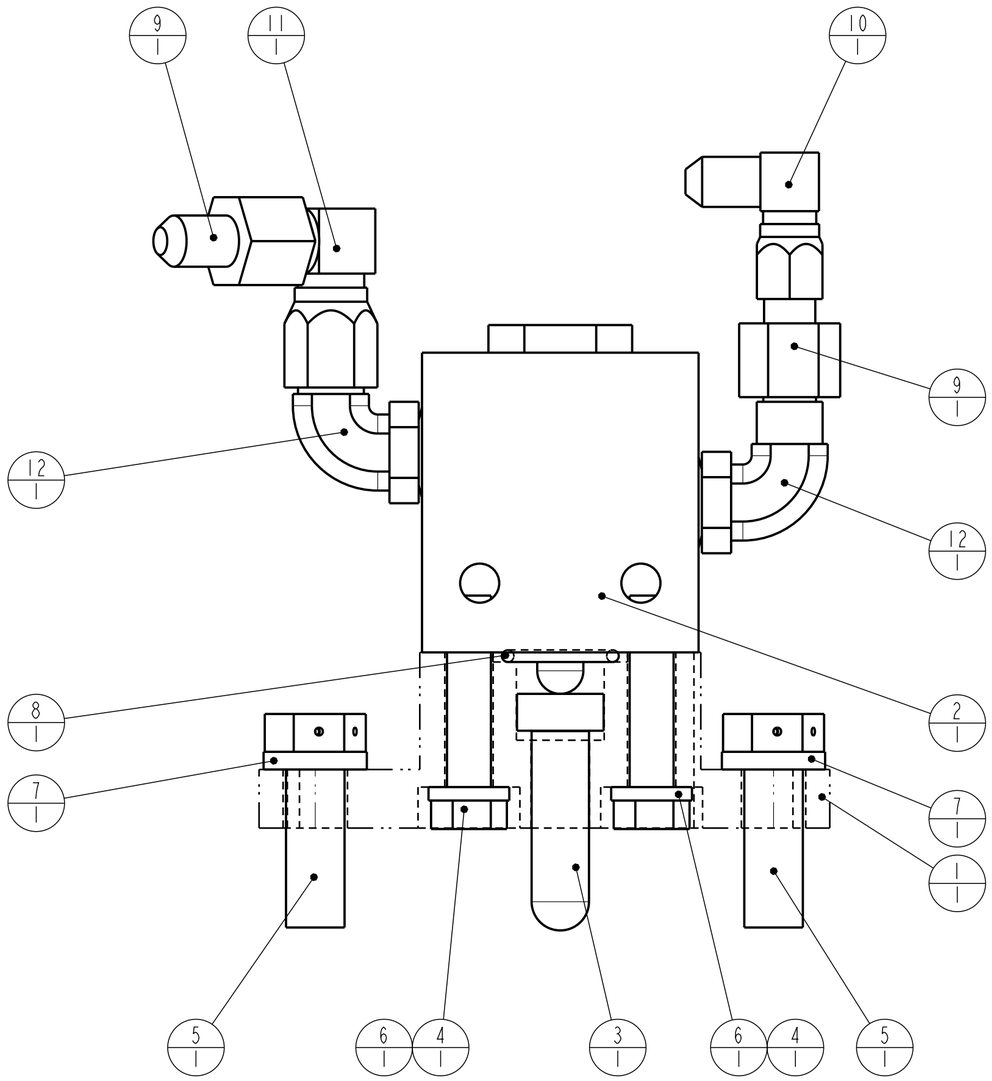
NOTES:
1. GRIND FLUSH WHEN ASSEMBLED.
2. INSERT 50004525-238 SHOWN AS REFERENCE.

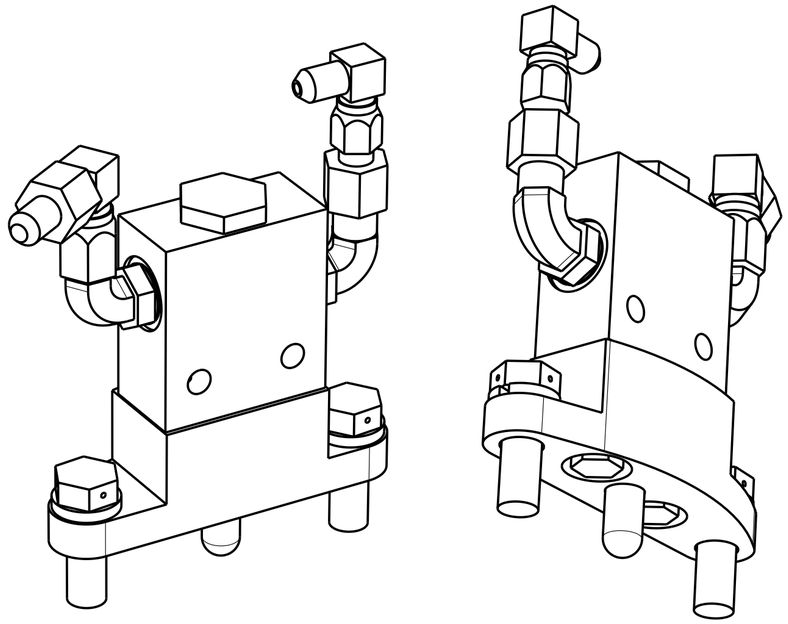
PARTNUMBER	50004525			UNLESS OTHERWISE SPECIFIED	NATIONAL OILWELL VARCO
MATERIAL	SEE ABOVE			TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250/ TORCHCUT SURFACES 1000/	THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
SURF. FINISH / PAINTSPEC.	STEEL PARTS TO BE PROTECTED WITH AQUASAFE 46 STAINLESS STEEL PARTS NEED NO PROTECTIVE COATING				
COLOR	-				
WEIGHT	100.6 Lbs 45.6 kg				
ORIGINAL DOCUMENT		LATEST REVISION		DO NOT SCALE DOCUMENT	SCALE 1:2
NAME	N.d.K.	NAME	N.d.K.	REV.	
DATE	29-Sep-03	DATE	29-SEP-03	A	
		E.C.N.	601235	THIS DOCUMENT IS DMS CONTROLLED	UNITS INCH (mm)

TITLE	SIZE	DRAWING NO.	SHEET
RAM INSERT WEARPIECE SET, PS21/30	C	50004525	1 OF 1

PART NUMBER
50004585-1

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		50004578	Indicator valve support left
2	1		50004585	Indicator valve
3	1		50004586	Indicator trigger pin
4	2		50006-14-C8	SCREW,CAP-HEX HD (UNC 3/8")
5	2		50008-12-C8D	SCREW,CAP-HEX HD (UNC 1/2")
6	2		51006-C	WASHER, LOCK-STEEL
7	2		51008-C	WASHER, LOCK-STEEL
8	1		51300-117-B	O RING O 2-117 PARKER
9	2		56517-6-4-S	REDUCER, 9/16-16JIC - 7/16-18JIC MALE
10	1		56518-4-4-S	ELBOW 90degr 7/16"-20JIC SWIVEL - 7/16-20JIC MALE
11	1		56518-6-6-S	ELBOW 90degr 9/16"-18JIC SWIVEL - 9/16"-18JIC MALE
12	2		979935-6-6	ELBOW 90° O_RING EXT.3/8BSP TO EXT.9/16UNF

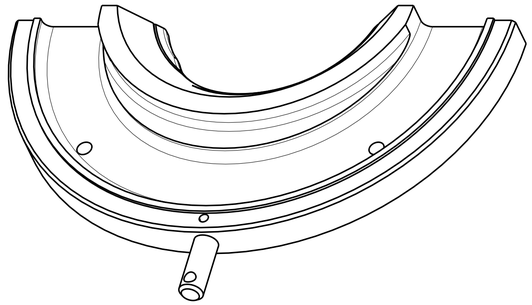




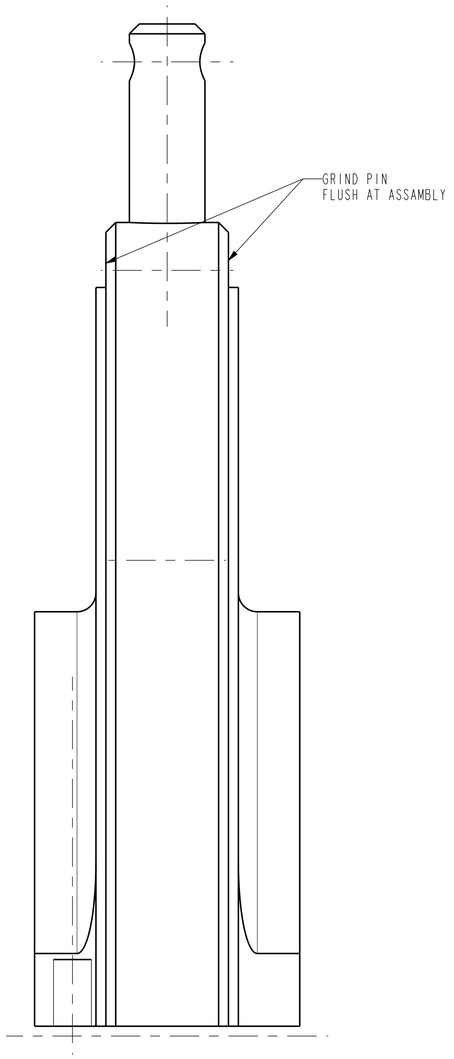
50004585-1					K					
PART NO.	QTY.	NEXT ASSY.		FINAL ASSY.	J					
Varco BJ IN OIL TOOLS ETTEN-LEUR, THE NETHERLANDS		UNLESS OTHERWISE SPECIFIED			I					
		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE			H					
THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER					G					
		BREAK SHARP CORNERS .010 ± .005			F					
		MACHINED SURFACES 250			E					
					D					
					C					
	NAME	DATE	PROJ.	MATERIAL	B					
APPROVED	AK	19-Jul-01			A		600332	BV	19JUL01	CDL
CHECKED	CDL	19-Jul-01	SCALE 1:1		REV.		E.C.N	NAME	DATE	CHECKED
PREPARED	BV	19-Jul-01	UNITS INCH (MM)	WEIGHT 4.433 LBS/ KG	PRO/E FILE NO.: 50004585-1					
TITLE: Indicator Valve Assembly left				SIZE C	DRAWING NO. 50004585-1				SHEET OF 1 1	
REDRAWN / REPLACED BY:				REPLACES:						

PART NUMBER
202386-775

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		202387	RAM INSERT PIN
2	1		202386-775M	RAM INSERT MACHINING 7-3/4
3	1		51506-12	PIN_GROOVED_TAPER-51506-12



SCALE 1:3



202386-775

PART NO. | QTY. | NEXT ASSY. | FINAL ASSY.

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

MATERIAL

	NAME	DATE
APPROVED	A.K.	02AUG00
CHECKED	C.d.L	02AUG00
PREPARED	C.d.L	02AUG00

PROJ. | SCALE 1:1 | UNITS INCH (MM)

WEIGHT 65.571 LBS/ KG

REV.	E.C.N	NAME	DATE	CHECKED
A	591501	BV	02AUG00	CDL

PROJE FILE NO.: 202386-775

TITLE: RAM INSERT ASSEMBLY 7-3/4

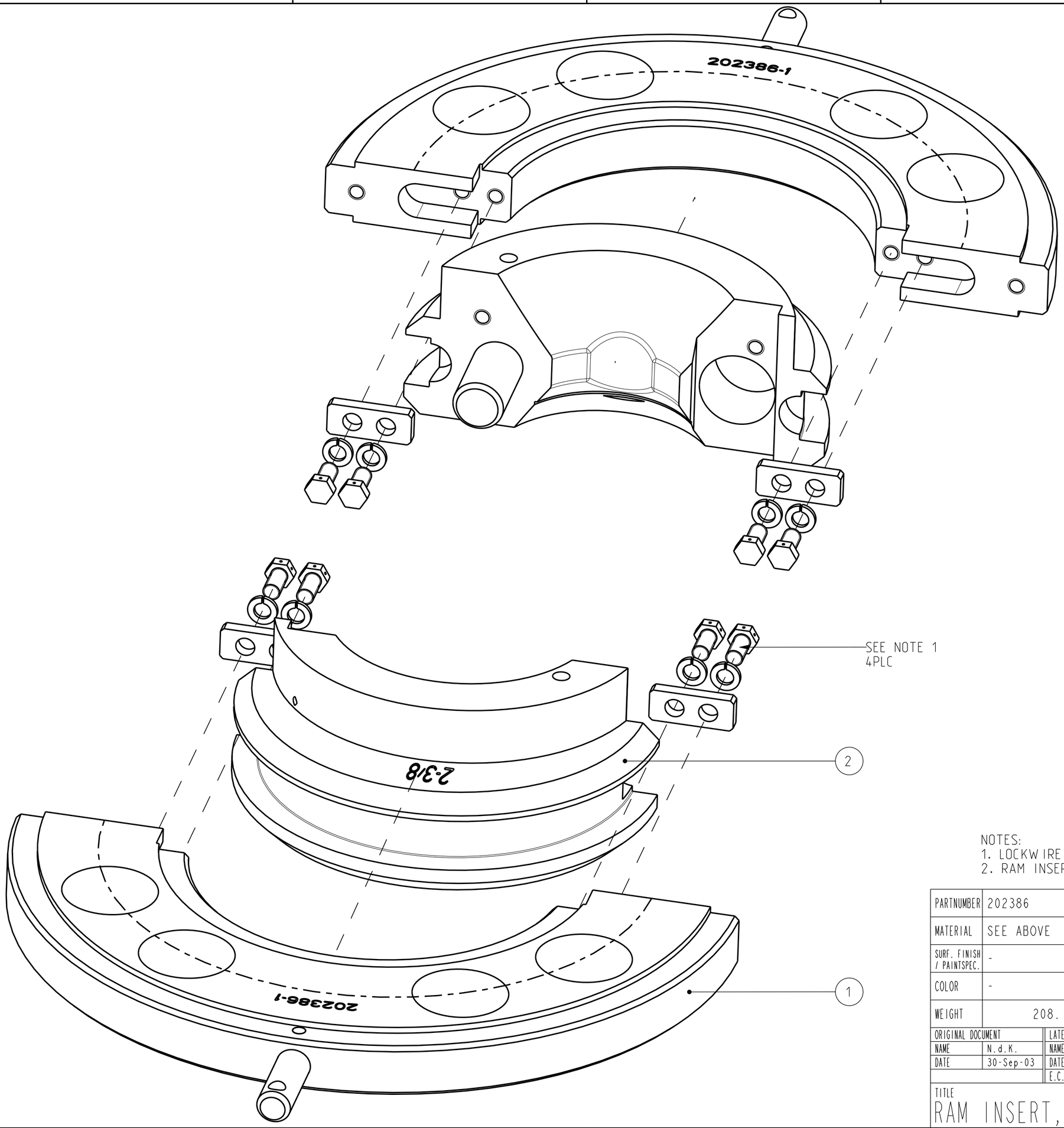
SIZE: D

DRAWING NO.: 202386-775

SHEET 1 OF 1

REDRAWN / REPLACED BY:

REPLACES:



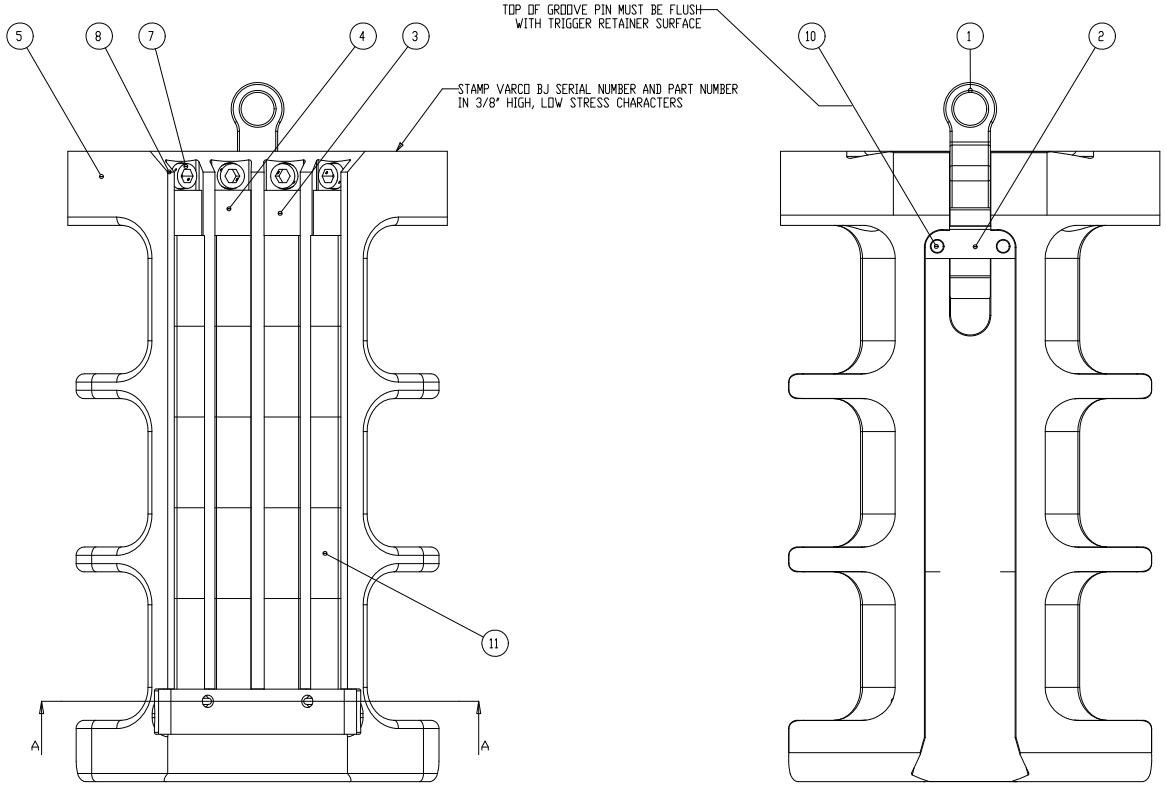
ITEM 1 KEEPER, ASS'Y PART NUMBER	+	ITEM 2 RAM INSERT WEARPIECE SET PART NUMBER	=	FINAL RAM INSERT ASS'Y PART NUMBER
202386-1	+	50004525-238	=	202386-238
202386-1	+	50004525-238-SS	=	202386-238-SS
202386-1	+	50004525-288	=	202386-288
202386-1	+	50004525-288-SS	=	202386-288-SS
202386-1	+	50004525-350	=	202386-350
202386-1	+	50004525-350-SS	=	202386-350-SS
202386-1	+	50004525-400	=	202386-400
202386-1	+	50004525-400-SS	=	202386-400-SS
202386-1	+	50004525-450	=	202386-450
202386-1	+	50004525-450-SS	=	202386-450-SS
202386-1	+	50004525-500	=	202386-500
202386-1	+	50004525-500-SS	=	202386-500-SS
202386-1	+	50004525-550	=	202386-550
202386-1	+	50004525-550-SS	=	202386-550-SS
202386-1	+	50004525-568	=	202386-568
202386-1	+	50004525-568-SS	=	202386-568-SS
202386-1	+	50004525-588	=	202386-588
202386-1	+	50004525-588-SS	=	202386-588-SS
202386-1	+	50004525-614	=	202386-614
202386-1	+	50004525-614-SS	=	202386-614-SS
202386-1	+	50004525-650	=	202386-650
202386-1	+	50004525-650-SS	=	202386-650-SS
202386-1	+	50004525-663	=	202386-663
202386-1	+	50004525-663-SS	=	202386-663-SS
202386-1	+	50004525-700	=	202386-700
202386-1	+	50004525-700-SS	=	202386-700-SS
202386-1	+	50004525-763	=	202386-763
202386-1	+	50004525-763-SS	=	202386-763-SS

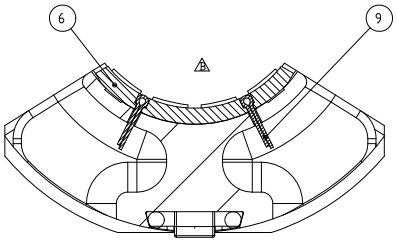
NOTES:
1. LOCKWIRE BOLTS
2. RAM INSERT 50004525-238 SHOWN AS REFERENCE

PARTNUMBER	202386			UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± .5 DEGREE BREAK SHARP CORNERS .010 ± .005 MACHINED SURFACES 250 TORCHCUT SURFACES 1000	NATIONAL OILWELL VARCO THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER
MATERIAL	SEE ABOVE				
SURF. FINISH / PAINTSPEC.	-				
COLOR	-				
WEIGHT	208.1 Lbs	94.4 kg			
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	N.d.K.	NAME	N.d.K.	REV.	
DATE	30-Sep-03	DATE	30-SEP-03	A	DO NOT SCALE DOCUMENT / SCALE 1:2 / PROJ.
		E.C.N.	601235		THIS DOCUMENT IS DMS CONTROLLED / UNITS INCH (mm)

TITLE	SIZE	DRAWING NO.	SHEET
RAM INSERT, ASS'Y PS-30	C	202386	1 OF 1

PART NUMBER
202369-ASSY





SECTION A-A

ITEM	QTY	DWG SIZE	PART NUMBER	DESCRIPTION
1	1		202280	LOCK TRIGGER
2	1		202281	TRIGGER RETAINER
3	3		50004563	FILLING FOR INSERT CARRRIER/SLIP
4	1		50004571	BASIC INSERT 1 3/8 HIGH
5	1		202369-1M/2M	INSERT CARRIER MACHINING 6-1/2" TO 5-5/8"
A 6	1		50004573-2	LOAD-RING INSERT CARRIER 5-1/2 - 6-5/8
7	4		50108-7-S	SCREW,CAP-SOCKET HEAD (UNC)
A 8	4		51108-C	WASHER, LOCK-STEEL
A 9	2		51403-10-S	COTTER PIN 3/16 X 1 1/4
10	2		51506-8	PIN_GROOVED_TAPER-51506-8
11	20		INSERT	INSERT

Assy part no.	Carrier machining	Insert part no	Basic insert
202369-1	202369-1M	None	None
202369-2	202369-2M	None	None
202369-650	202369-1M	2173-20	50004571-650
202369-614	202369-2M	2172-20	50004571-614

202369-ASSY	--	---	---
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL XXX ± .010
2 PLACE DECIMAL XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE	PROJ.
APPROVED	HT	2DEC97	
CHECKED	HvR	2DEC97	SCALE 1:2
PREPARED	H.v.R	27-JU-00	UNITS INCH MM

MATERIAL

WEIGHT 0.000 LBS/ KG

REV.	E.C.N	NAME	DATE	CHECKED
B	600671	CdL	3 May 02	AK
A	590101	BV	27-JUL-00	CDL

PROVE FILE NO.

TITLE: INSERT CARRIER ASSEMBLY

SIZE: D

DRAWING NO.: 202369(-) A

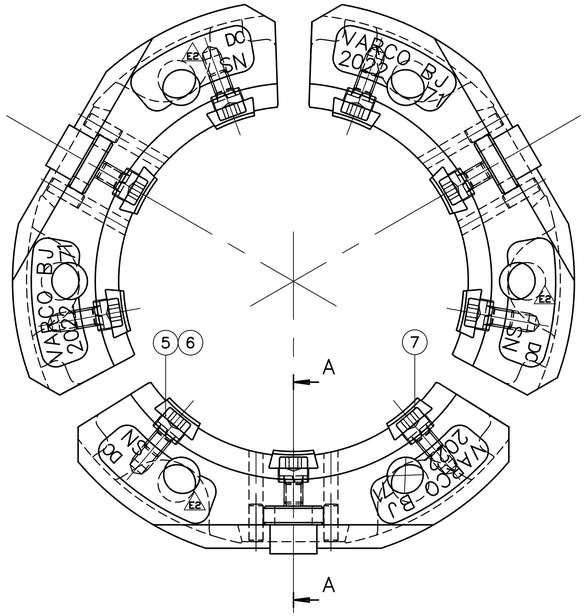
SHEET 1 OF 1

REDRAWN / REPLACED BY: 202369 A

REPLACES

PART NUMBER
202271(–)

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	3	D	SEE TABLE	INSERT CARRIER
2	3	B	202280	LOCK TRIGGER
3	3	A	202281	TRIGGER RETAINER
4	6	–	51506–8	GROOVE PIN
D1 5	9	–	50108–6–S	SCREW
6	9	–	51108–C	SPRING WASHER
B2 7	–	–	SEE TABLE	INSERT
E1 8	3	B	SEE TABLE	BASIC INSERT 2 3/4 HIGH



SECTION A–A

PART.NR.	CARRIER P/N WITHOUT INSERTS E3	INSERT P/N + QTY	BASIC INSERT E1
D2 202271–950	202271–2	2633–9B–24 E1	50004570–950
C1 202271–925	202271–2	2655–15B–18 E1	50004570–925
D3 202271–900	202271–1	2633–9B–24 E1	50004570–900
202271–875	202271–1	2655–15B–18 E1	50004570–875
E6 202271–863	202271–1	2653–15B–18	50004570–863
202271–850	202271–1	2652–15B–18 E1	50004570–850
E6 202271–825	202271–1	2638–15B–18	50004570–825
E6 202271–813	202271–1	2650–15B–18	50004570–813

NOTES:

B4 STAMP VARCO BJ SERIAL NUMBER AND PART NUMBER AND "100 TONS" IN 3/8" HIGH, LOW STRESS CHARACTERS E5 APPROX. AT PLACE LOCATED WITH "SN"

FITS IN SLIP ASS'Y 202250–1 (PS21) AND 202433–1 (PS30) E5

202271(–)	1	–	–
PART NO.	QTY.	NEXT ASS'Y	FINAL ASS'Y

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 125

	NAME	DATE
PREPARED	A.J.	11 JUN '96
CHECKED	H.v.R.	8 JULY '96
APPROVED	C.Q.	5 FEBR.'97

PROJ. | MATERIAL – | SCALE 1 : 2 | UNITS INCH (MM) | WEIGHT LBS/ KG

REV.	E.C.N.	NAME	DATE	CHECKED
M				
L				
K				
J				
H				
G				
F				
E	591501	M.d.K.	20 OCT.'00	C.d.L.
D	568201	HvR	21JAN99	HK
C	543901	F.Schmid	25 Sept'97	C.d.L.
B	X 516202	C.d.L.	1 NOV.'96	H.v.R.
A	X 516201 NR	A.J.	11 JUN '96	H.v.R.

ACAD FILE NO. : D2022711.DWG

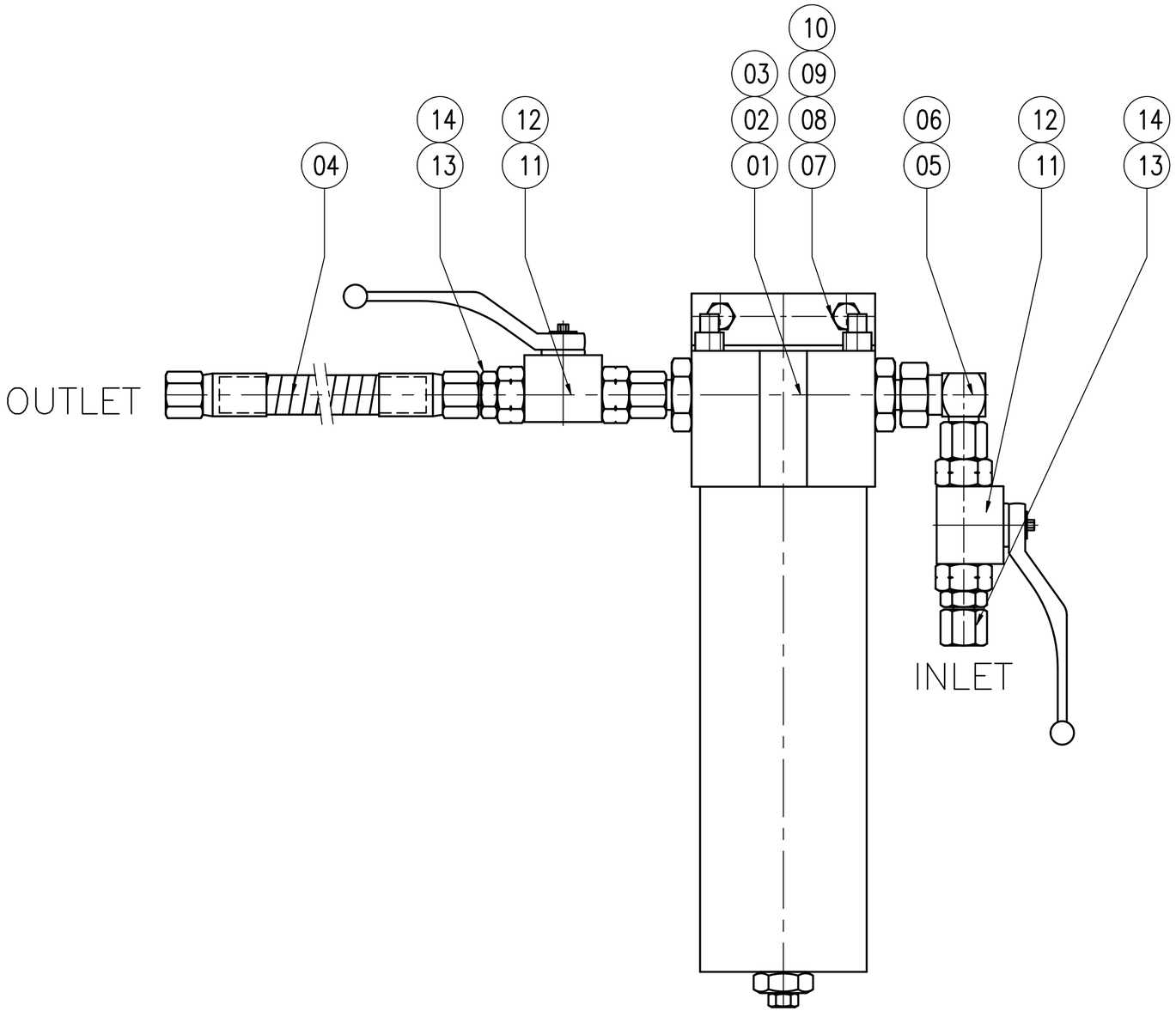
TITLE: INSERT CARRIER ASSEMBLY E5

SIZE D | DRAWING NO. 202271(–) | SHEET 1 OF 1

REDRAWN / REPLACED BY:

REPLACES:

PART NUMBER
204702



ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
01	1		980049-1	PARKER PRESSURE FILTER, 30P2 40W M2 50 NN 11
02	1		980051	PARKER MOUNTING BRACKET KIT 30P, TYPE 925563
03	1		980052-1	REPLACEMENT FILTER ELEMENT 30P2, MEDIA 40W
04	1		994037-40	HOSE ASSEMBLY 1/2", LENGTH 40"
05	2		56529-16-8-S	CONN. O-RING BOSS/37°, 1 5/16"-12 TO 3/4"-16
06	2		56518-8-8-S	ELBOW 90°, SWIVEL INT. 37°/37°, 3/4"-16
07	2		50006-8-C8D	SCREW CAP HEX-HEAD, 3/8-18 UNC-2A
08	2		50306-C	NUT, HEX JAM 3/8-16 UNC-2B
09	2		50806-N-C	3/8 WASHER, FLAT
10	2		50906-C	3/8 WASHER, LOCK-REGULAR
11	2	–	979552-2	BALL VALVE, 1/2-14 NPT
12	2	–	56566-8-8-S	ADAPTER EXT PIPE 1/2-14 NPT TO FEM.3/4-16 UNC
13	2	–	56501-8-8-S	CONNECTOR, EXT PIPE 1/2-14 NPT TO 3/4-16 UNC
14	2	–	979958-8	CAP NUT, SAE 37° 3/4-16 JIC

NOTE:
ITEM 03 IS A SPARE FILTER ELEMENT.

204702	1	–	–
PART NO.	QTY.	NEXT ASS'Y	FINAL ASS'Y

VarcoBJ
A Varco Company

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
FRACTIONAL ± 1/64

BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
PREPARED	L.S.	23 JUN 99
CHECKED	H.B.	23 JUN 99
APPROVED	L.Sp.	23 JUN 99

PROJ.
SCALE 1 : 2
UNITS INCH (MM)
MATERIAL
WEIGHT LBS/ KG

REV.	F.C.	NAME	DATE	CHECKED
M				
L				
K				
J				
H				
G				
F				
E				
D				
C				
B				
A	574201 NR	L.S.	23 JUN 99	H.B.

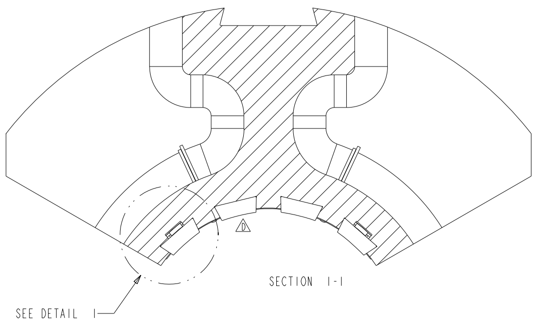
ACAD FILE NO. :

TITLE ASSEMBLY INLINE PRESSURE FILTER
PS-21/30 & BX-ELEVATOR

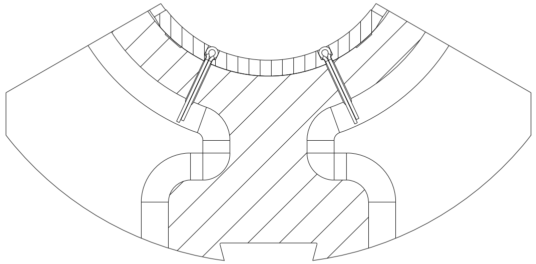
SIZE C | DRAWING NO. 204702 | SHEET 1 OF 1

REDRAWN / REPLACED BY:

REPLACES:

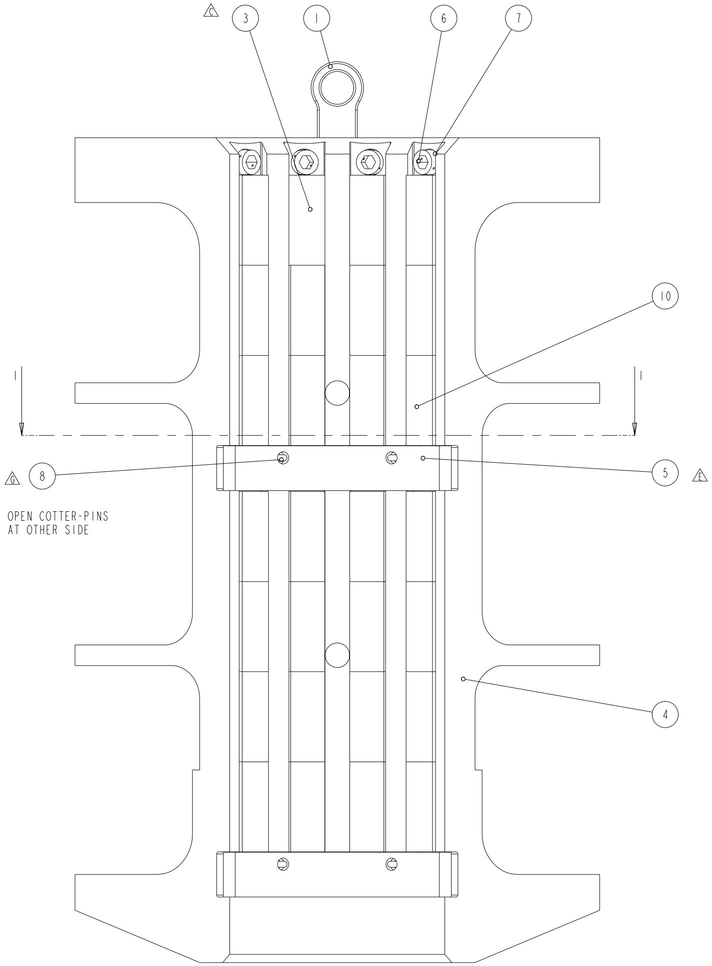


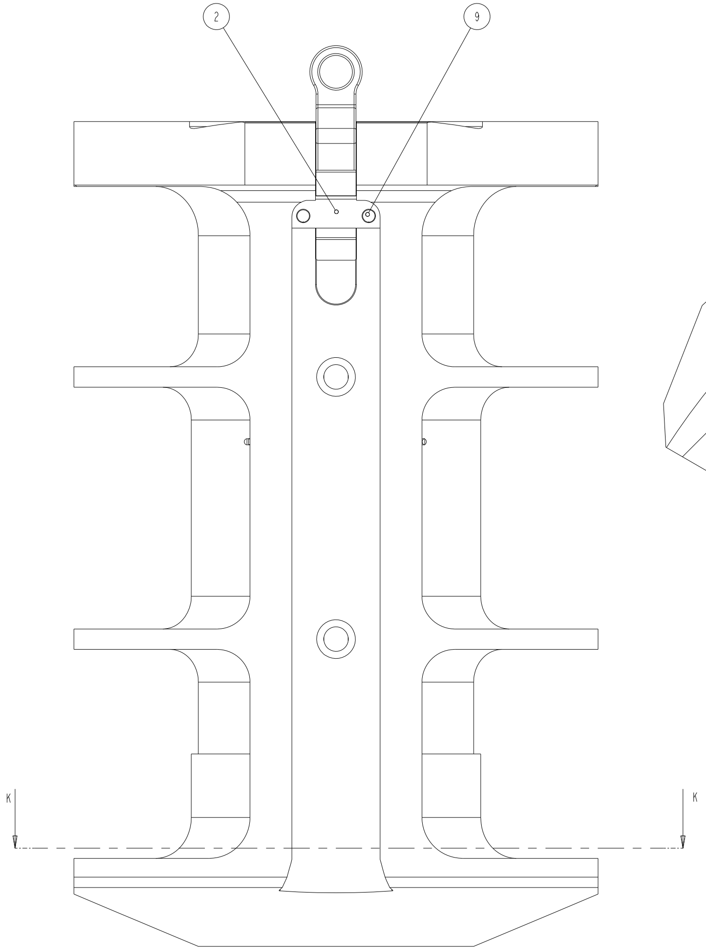
SECTION I-I

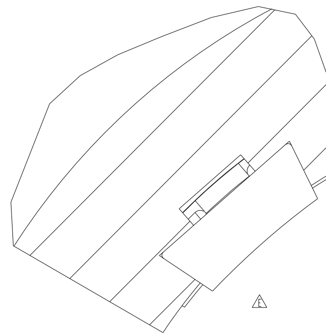


SECTION K-K

ITEM	QTY	DWG. SIZE	PART NUMBER	DESCRIPTION
1	1		202280	LOCK TRIGGER
2	1		202281	TRIGGER RETAINER
3	1		50004570	BASIC INSERT 2 3/4 HIGH
4	1		202445M	INSERT CARRIER MACHINING 7-5/8 TO 6-5/8
5	2		50004573-1	LOAD-RING INSERT CARRIER 6 5/8 - 7 5/8
6	4		50108-7-S	SCREW,CAP-SOCKET HEAD (UNC)
7	4		51108-S	WASHER, LOCK-STAINLESS
8	4		51403-16-S	COTTER PIN 3/16 X 2
9	2		51506-8	PIN_GROOVED_TAPER-51506-8
10	27		INSERT	INSERT







DETAIL I
SCALE 2:1

Assy part no.	Insert part no.	Basic insert
202445-1	None	None
202445-763	2633-27	50004570-763
202445-700	2623-27	50004570-700
202445-663	2632-27	50004570-663

202445-ASSY	--	---	---
PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco BJ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER

UNLESS OTHERWISE SPECIFIED
TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

	NAME	DATE
APPROVED	HT	2DEC97
CHECKED	HvR	2DEC97
PREPARED	M.KALS	08-Jun-00

PROJ. SCALE 1:2 UNITS INCH (MM)
MATERIAL
WEIGHT LBS/ KG

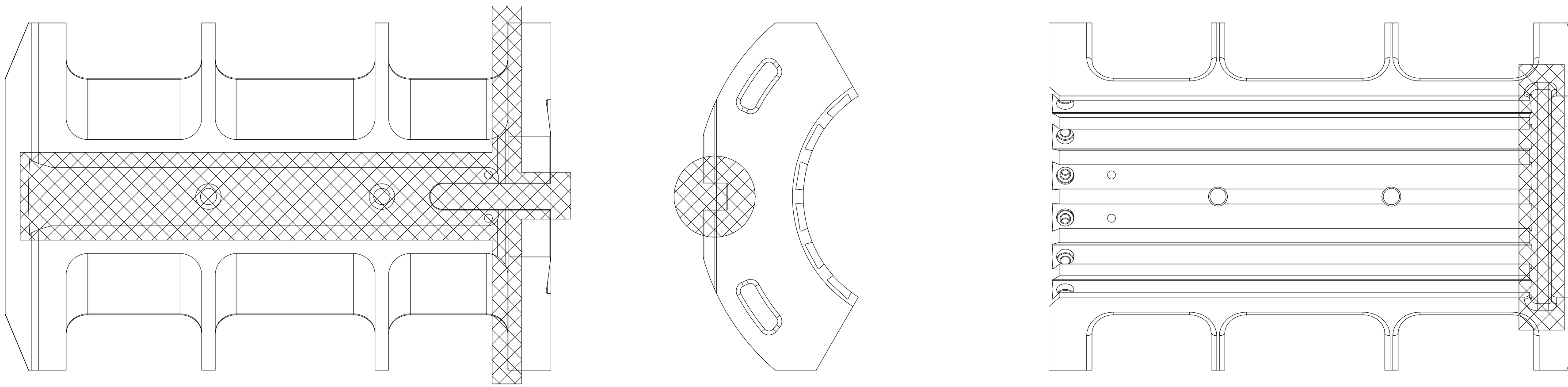
REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G	600303	E.F.	18May01	C.d.L.
F	600241	E.F.	22Mar01	C.d.L.
E	595401	L.S.	15SEP00	CdL
D	593601	BV	07AUG00	CDL
C	590101	CdL	8JUN'00	AK
B	528102	HvR	11JAN99	HK
A	528101	M.KALS	27NOV97	HvR

PRO/E FILE NO.: 202445-ASSY

TITLE INSERT CARRIER ASSEMBLY
SIZE D
DRAWING NO. 202445(-)
SHEET 1 OF 1

REDRAWN / REPLACED BY:
REPLACES:

PART NUMBER



APPLICABLE PARTNUMBERS:
202270(-)???202271(-)
202272(-)???202273(-)
202274(-)???202275(-)
202276(-)???202277(-)
202278(-)???202279(-)
202369(-)???202440(-)
202441(-)???202442(-)
202443(-)???202444(-)
202445(-)???202446(-)

PART QTY. NEXT ASSY. FINAL ASSY.

Varco® BJ TM
OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES .250

	NAME	DATE	PROJ.
APPROVED	HvR	7JAN99	
CHECKED	HR	7JAN99	SCALE 1:5
PREPARED	HvR	07-Jan-99	UNITS INCH

MATERIAL
CMS-02_CLASS135-125

WEIGHT 298.125 LBS/

REV.	E.C.N	NAME	DATE	CHECKED
A	528101	HvR	7JAN99	HK
B				
C				
D				
E				
F				
G				
H				
I				
J				
K				

PRO/E FILE NAME CA265

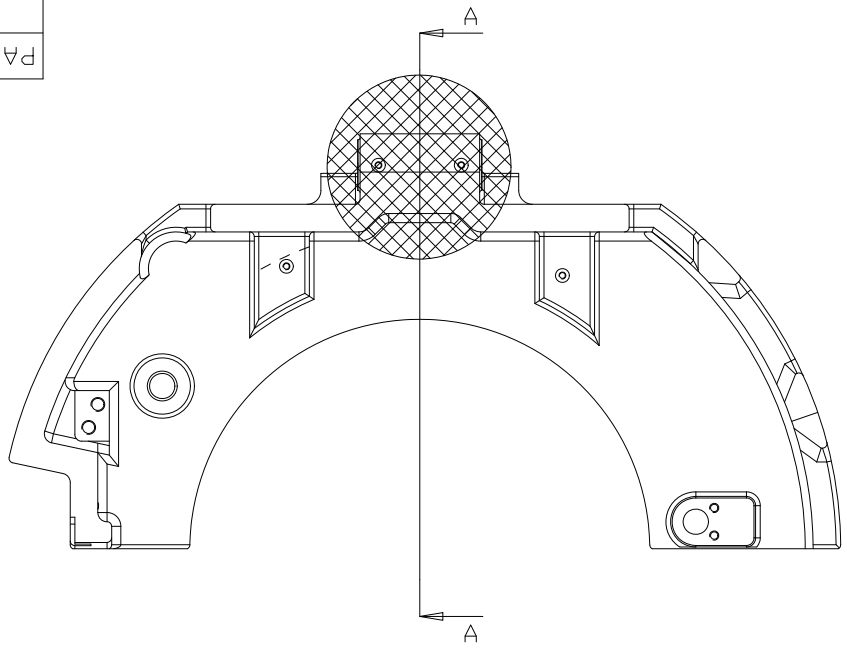
TITLE
CRITICAL AREAS PS21+3B INSERT CARRIERS

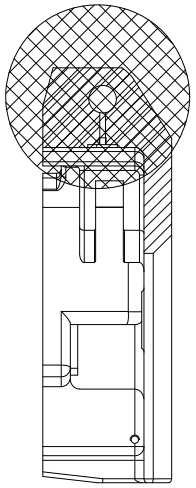
SIZE B DRAWING NO. CA265 SHEET 1 OF 1

REDRAWN / REPLACED BY:

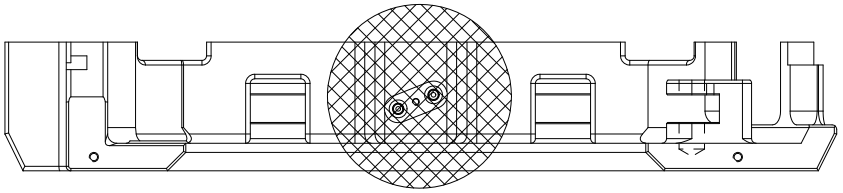
REPLACES:

PART NUMBER





SECTION A-A



PART QTY.		NEXT ASSY.	FINAL ASSY.							K
Varco. BJ TM OIL TOOLS		UNLESS OTHERWISE SPECIFIED								I
ETTEN-LEUR, THE NETHERLANDS		TOLERANCES (PER ANSI Y 14.5) 3 PLACE DECIMAL .XXX ± .010 2 PLACE DECIMAL .XX ± .03 1 PLACE DECIMAL .X ± .1 ANGLES ± 5 DEGREE								H
		BREAK SHARP CORNERS TO 1 THK								G
		MACHINED SURFACES 250								F
										E
										D
										C
	NAME	DATE	PROJ	MATERIAL						B
APPROVED		21DEC98		CMS-02						A
CHECKED	HR	21DEC98	SCALE 1:20							
PREPARED	REV.	21-Dec-98	UNITS INCH WEIGHT	415.740 LBS/						
REDRAWN / REPLACED BY:				REPLACES:						

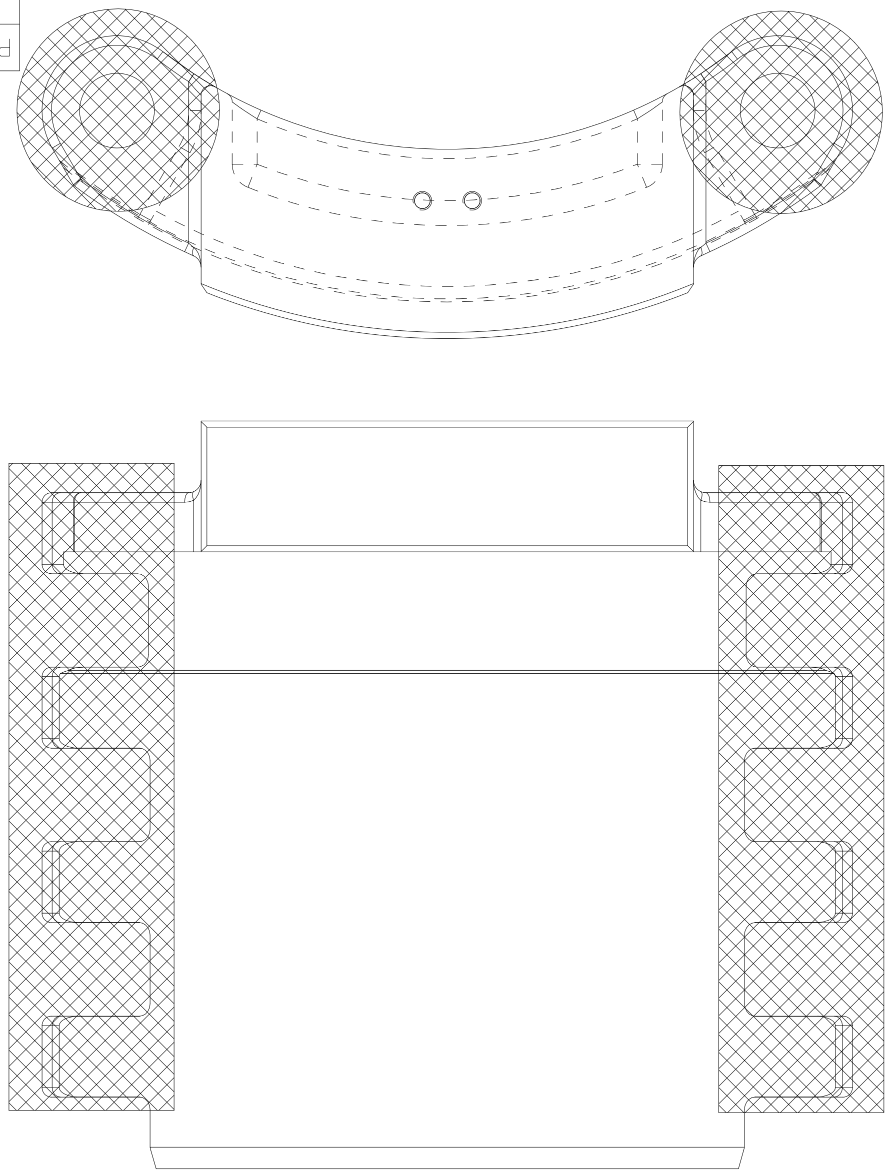
REV.	E.C.N	NAME	DATE	CHECKED
	528101	HVR	21DEC98	HK

PRO/E FILE CAP260

TITLE: CRITICAL AREAS PS3B COVERPLATE

SIZE D DRAWING NO. CAP260

SHEET 1 OF 1



PART NUMBER

PART	QTY.	NEXT ASSY.	FINAL ASSY.	

Varco® BJ™ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER

	NAME	DATE	PROJ.
APPROVED	HT	21DEC98	
CHECKED	HK	21DEC98	SCALE 4:5
PREPARED	DR.	21-Dec-98	UNITS INCH (MM)

MATERIAL
CMS02_CLASS 125-125

WEIGHT 280.300 LBS/

REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D				
C				
B				
A	528101	HvR	21DEC98	HK

PRO/E FILE NO. CA258

TITLE
CRITICAL AREAS PS30 DOOR

SIZE B

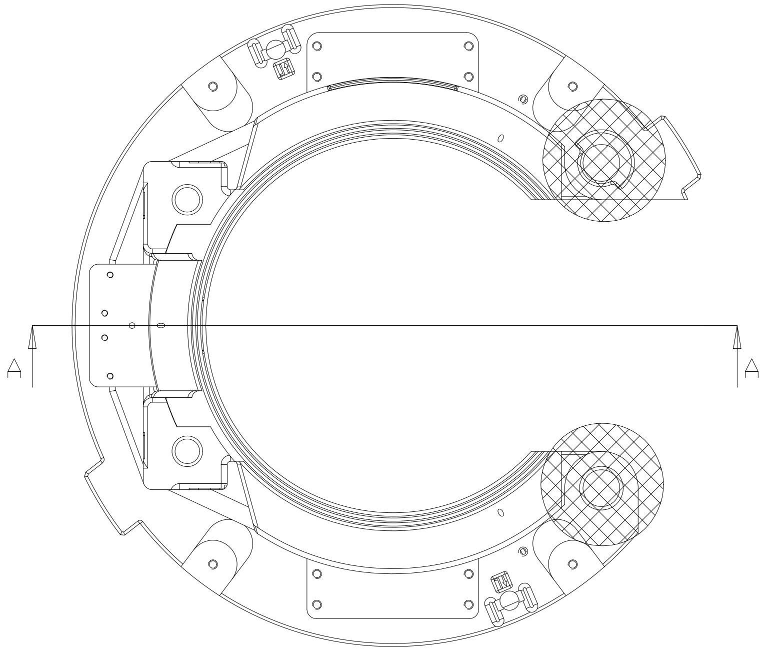
DRAWING NO. CA258

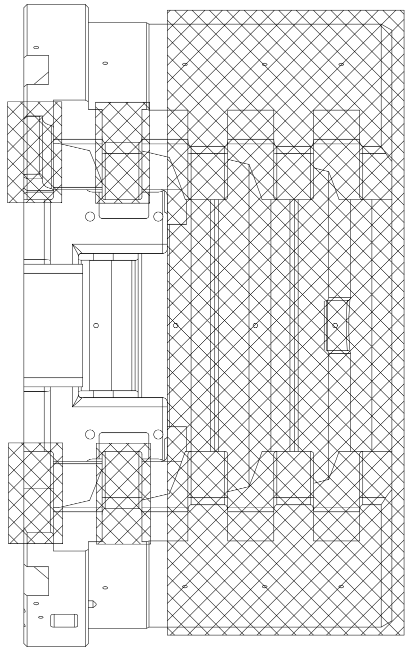
SHEET 1 OF 1

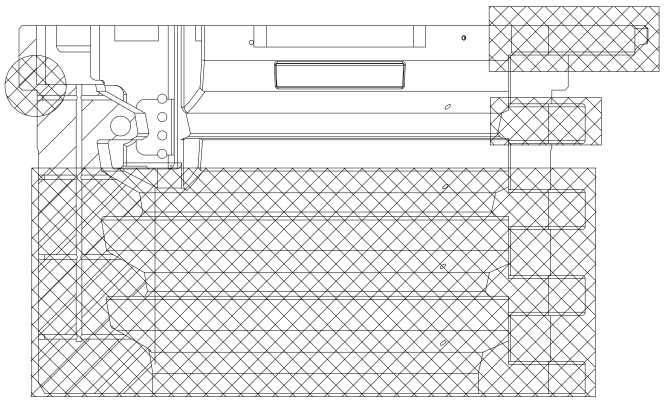
REDRAWN / REPLACED BY:

REPLACES:

PART NUMBER







SECTION A-A

PART NO.	QTY.	NEXT ASSY.	FINAL ASSY.

Varco® BJ™ OIL TOOLS
ETTEN-LEUR, THE NETHERLANDS

UNLESS OTHERWISE SPECIFIED

TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010 ± .005
MACHINED SURFACES 250

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SUCH INFORMATION MAY NOT BE DISCLOSED TO OTHERS FOR ANY PURPOSE, NOR USED FOR MANUFACTURING PURPOSES, WITHOUT WRITTEN PERMISSION OF THE OWNER

	NAME	DATE
APPROVED	HT	21DEC98
CHECKED	HK	21DEC98
PREPARED	HvR.	21-Dec-98

PROJ
SCALE 1:10
UNITS INCH

MATERIAL
CMS-02_CLASS 135-125
WEIGHT 5695.236 LBS/

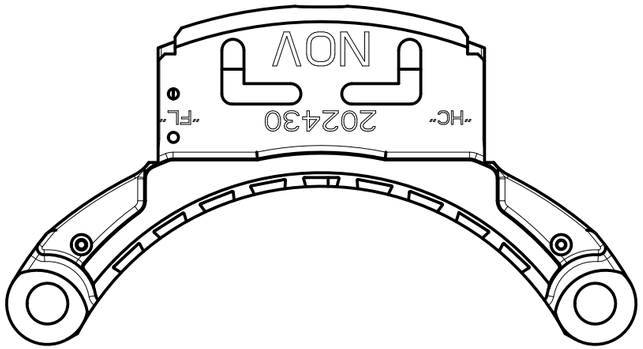
REV.	E.C.N	NAME	DATE	CHECKED
K				
J				
I				
H				
G				
F				
E				
D				
C				
B				
A	528101	HvR	21DEC98	HK

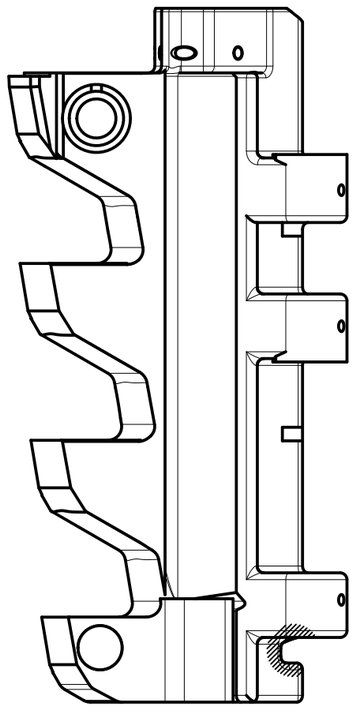
PRO/E FILE NAME: CA257

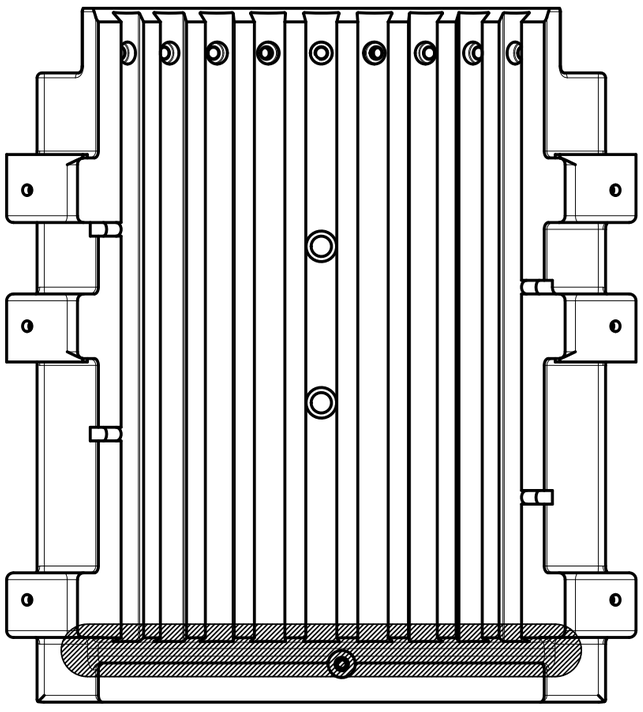
TITLE
CRITICAL AREAS PS30 BODY

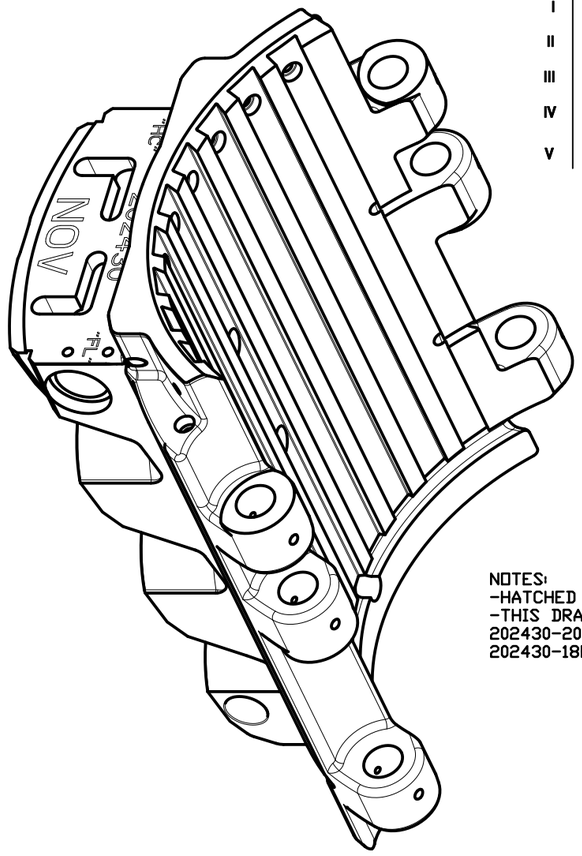
SIZE: B
DRAWING NO.: CA257
SHEET 1 OF 1

REDRAWN / REPLACED BY:
REPLACES:









Maximum permitted degree

Type	Discontinuity Descriptions	Critical areas	Noncritical areas
I	Hot tears,cracks	None	Degree III
II	Shrinkage	Degree II	Degree III
III	Inclusions	Degree II	Degree IV
IV	Internal chills chaplets	Degree I	Degree II
V	Porosity	Degree I	Degree II

NOTES:
-HATCHED AREAS ARE CONSIDERED CRITICAL
-THIS DRAWING IS VALID FOR PART NUMBER:
202430-20M
202430-18M

PARTNUMBER	—
MATERIAL	—
SURF. FINISH/ PAINT SPEC	—
COLOR	—
WEIGHT	— LBS/ — KG

ORIGINAL DOCUMENT		LATEST REVISION		REV.
NAME	CdL	NAME	CdL	—
DATE	31-OCT-07	DATE	31-OCT-07	
DRAWING TYPE	CA	E.C.N.	0700384	

UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010±.005
MACHINED SURFACES 250
TORCHCUT SURFACES 1000
ALL WELD SYMBOLS ACC. TO ISO

DO NOT SCALE DOCUMENT

THIS DOCUMENT IS DMS CONTROLLED

NATIONAL OILWELL VARCO

SCALE 1:5

UNITS INCH (MM)

PROJ.

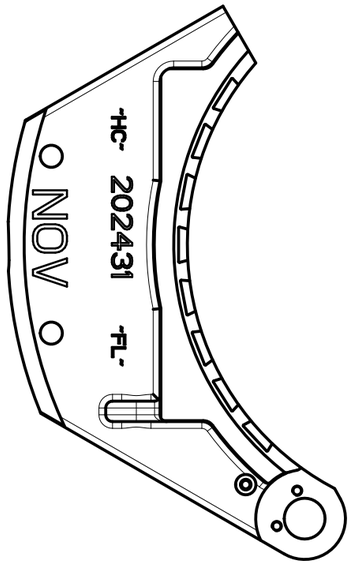
TITLE
CRITICAL AREA CENTER SLIP MACH. PS30

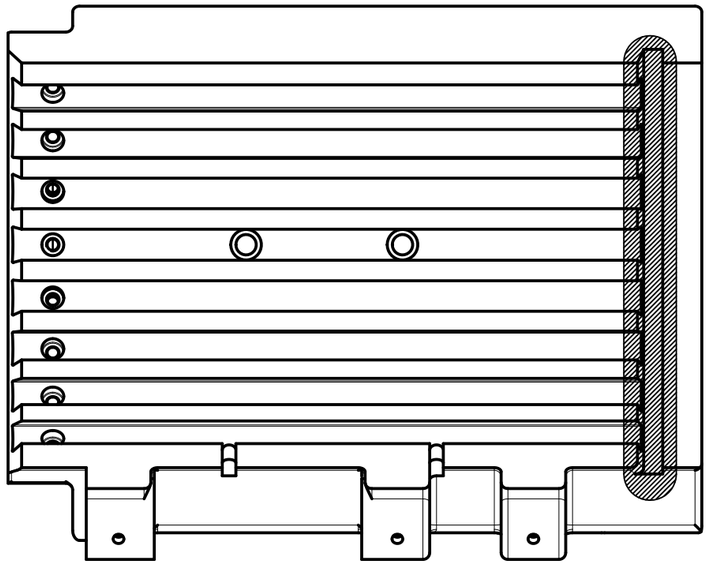
SIZE B

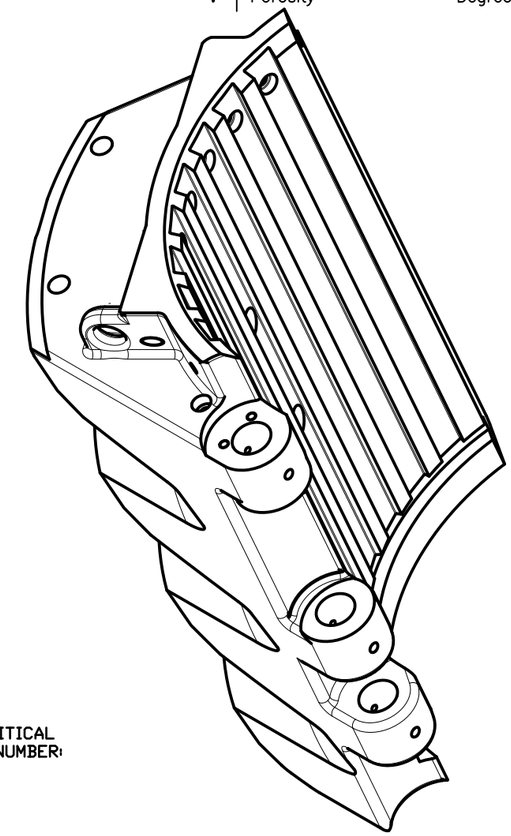
DRAWING NO. CA-330

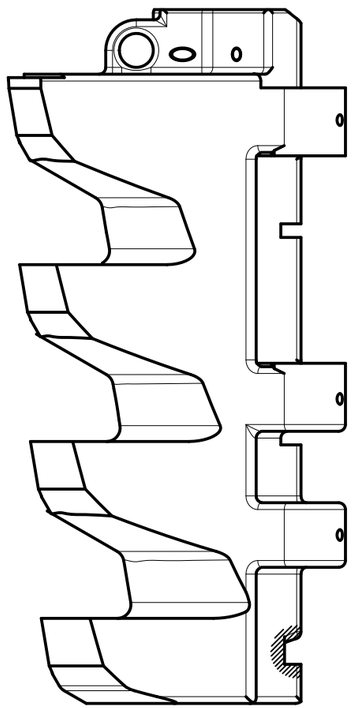
SHEET 1 OF 1

Type	Discontinuity Descriptions	Maximum permitted degree: Critical areas	Maximum permitted degree: Noncritical areas
I	Hot tears,cracks	None	Degree III
II	Shrinkage	Degree II	Degree III
III	Inclusions	Degree II	Degree IV
IV	Internal chills chaplets	Degree I	Degree II
V	Porosity	Degree I	Degree II









NOTES:
-HATCHED AREAS ARE CONSIDERED CRITICAL
-THIS DRAWING IS VALID FOR PART NUMBER:
202431-20M
202432-20M
202431-18M
202432-18M

PARTNUMBER	—				
MATERIAL	—				
SURF. FINISH/ PAINT SPEC	—				
COLOR	—				
WEIGHT	— LBS/	— KG			
ORIGINAL DOCUMENT		LATEST REVISION			
NAME	CdL	NAME	CdL	REV.	
DATE	01-NOV-07	DATE	01-NOV-07	—	
DRAWING TYPE	CA	E.C.N.	0700384		

UNLESS OTHERWISE SPECIFIED TOLERANCES (PER ANSI Y 14.5)
3 PLACE DECIMAL .XXX ± .010
2 PLACE DECIMAL .XX ± .03
1 PLACE DECIMAL .X ± .1
ANGLES ± .5 DEGREE
BREAK SHARP CORNERS .010±.005
MACHINED SURFACES 250
TORCHCUT SURFACES 1000
ALL WELD SYMBOLS ACC. TO ISO

DO NOT SCALE DOCUMENT

THIS DOCUMENT IS DMS CONTROLLED

NATIONAL OILWELL VARCO

SCALE 1:5

UNITS INCH (MM)

PROJ.

TITLE
CRITICAL AREA SIDE SLIP MACH. PS30

SIZE B

DRAWING NO. CA-331

SHEET 1 OF 1