# HYDRAULIC TRIPPER DYNAMOMETER
# ROPE LINE-PULL ACTIVATED
# INSTALLATION AND OPERATION MANUAL

| | |
|---|---|
| Model | DYNHRT3HYD |
| Serial Number | |
| | |

MAN-1127 Rev A



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### Revision History

| Version | Description |
|---|---|
| A | Initial Release |
| | |
| | |
| | |
| | |

# 1. IMPORTANT SAFETY NOTICES

Various notices may be presented in this manual to aid in understanding and operating the equipment or to protect personnel and equipment

**DANGER**: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

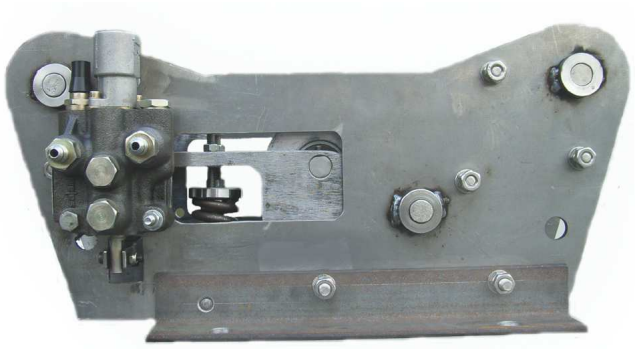
**WARNING**: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTE**: Indicates practices not related to personal injury.

| | |
|---|---|
| **WARNING**: | Prior to the operation of the crane the operator must read this manual carefully and thoroughly and shall ensure that all operational instructions and warnings are understood and complied with. |

| | |
|---|---|
| **WARNING**: | The safe operation of a crane is the sole responsibility of the operator, who must observe and obey all warnings and instructions and limitations established by LSI-Robway, the crane manufacturer and workplace safety regulations.<br><br>This device does not replace sound crane operation. The operator must operate the crane within safe loading limitations at all times. It is not intended to be a substitute for common sense and sound operating practices.<br><br>As this device is generally installed by other than LSI-Robway personnel, the end-user must be satisfy themselves it's correctness for application and working accuracy of operation.<br><br>This device interfaces with hoist-up hydraulic circuits to prevent further hoisting when the winch line-pull setting is exceeded. It is the client's responsibility to inform the operator of operational procedures following a trip situation.<br><br>Being a single purpose device specifically designed to react at a pre-adjusted setting of winch line-pull, it is not intended for cranes with multiple levels of RC.<br><br>The client (user) is responsible for product maintenance and must ensure its continued correct operation at all times.<br><br>It is recommended that the user checks the system's accuracy regularly (monthly) and logs the results to establish its reliability and to maintain the operator's confidence in it. |



*Model DYNHRT3HYD Hydraulic Tripper Dynamometer*

## 2. GENERAL DESCRIPTION

The DYNHRT3HYD is a member of the LSI-Robway dynamometer series and is specifically designed for interfacing with crane hydraulics to prevent further hoisting when the pre-set SWL trip setting has been exceeded.

**Notes:**

- **The DYNHRT3HYD is NOT an automatic safe load indicator. It is designed to trip ONLY at one pre-set winch linepull tension setting.**
- **LSI-Robway recommends that the DYNHRT3HYD only be used with a maximum of 2 parts of line due to various rope friction factors.**

The DYNHRT3HYD is a mechanical device designed to respond to increasing winch linepull and activate a dyno mounted hydraulic valve when the pre-set setting has been exceeded. It is designed to reset itself when the winch linepull has been reduced.

As this device directly monitors (senses) the winch rope and trips when a pre-set tension limit has been reached, then it's performance will be subject to the manner in which the crane is operated. The crane operator must avoid jerking actions such as 'snatching' and erratic behaviour. These actions will cause pre-mature tripping. Slower, smoother crane operation will be required to avoid the dynamometer tripping at lower values.

The DYNHRT3HYD requires little installation time or operator training.

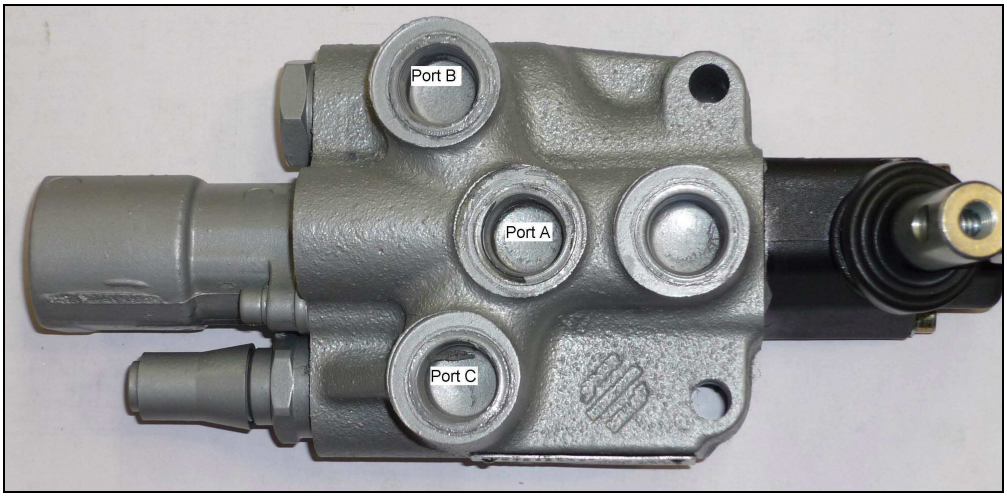
**Since the limit can be set to any load value between 1.8-6 metric tonne, it is the installer's responsibility to correctly set it for the required application.**

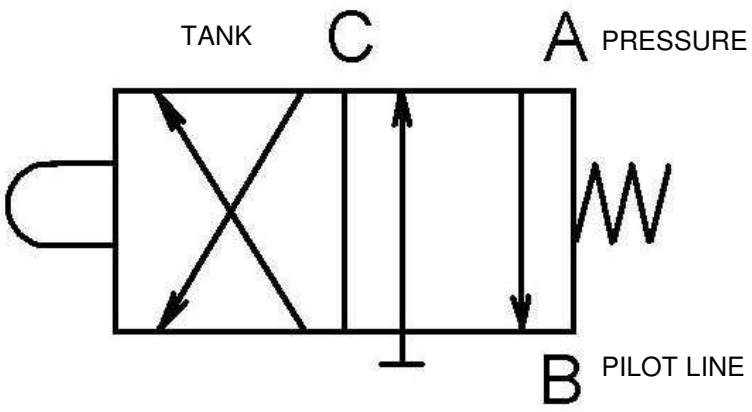
OPERATIONAL INSTRUCTIONS
This device, once installed and calibrated correctly is automatic in operation and requires no intervention from the crane operator, other than to lower the load and correct the overload situation.
The following section explains how the DYNHRT3HYD unit operates.

## 2.1. Activating or Tripping the DYNHRT3HYD

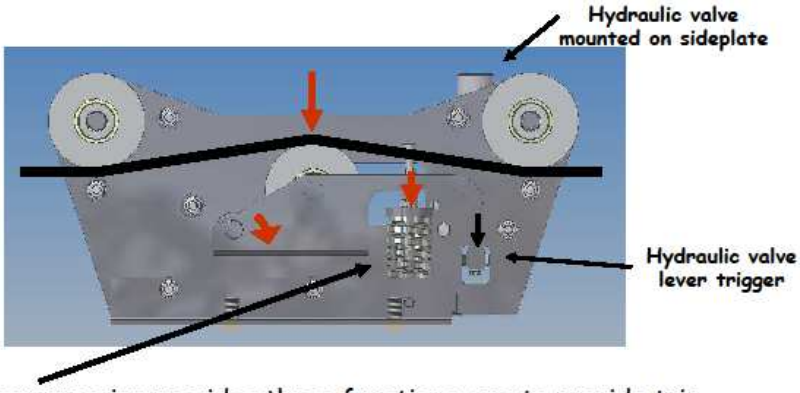
The Dyno hydraulic valve is activated when the hoist rope line pull exceeds a preset linepull setting which is site adjustable using test-weights to prove the trip point accuracy.

The trip-valve has 3 ports A, B & C which can be utilised by the installer as required.



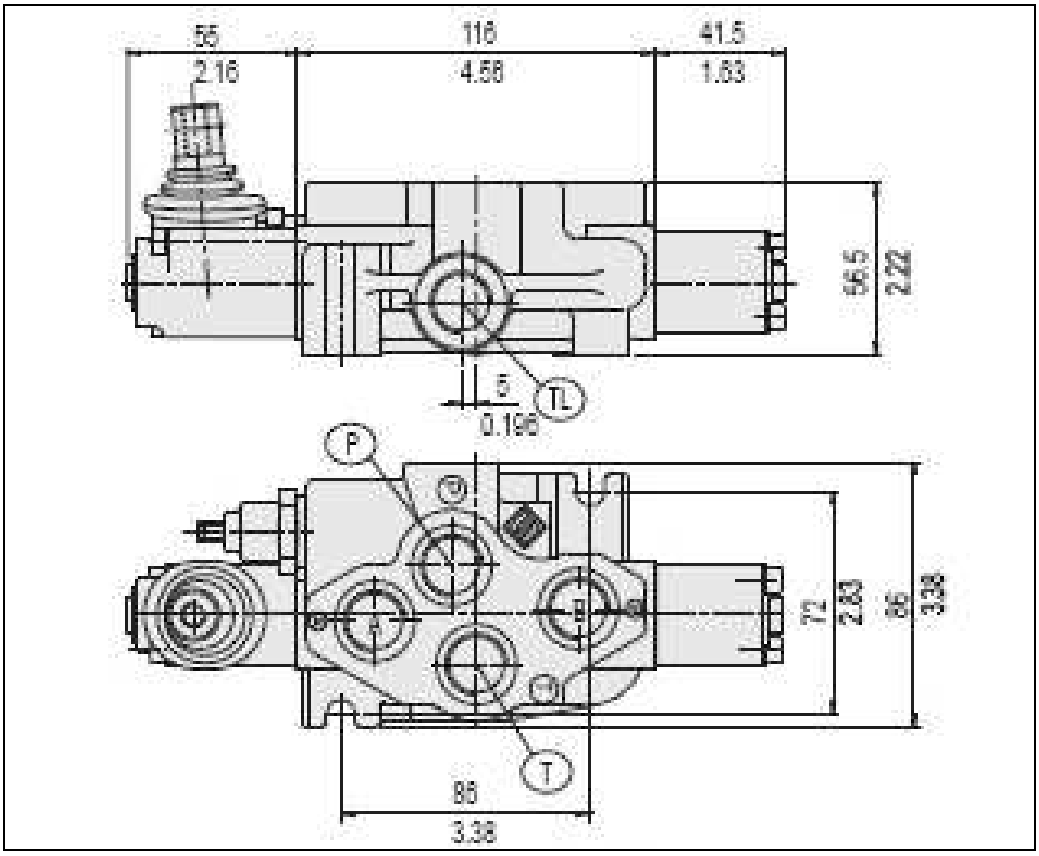

*Example hydraulic circuit*




The spring compression provides three functions, one to provide trip adjustment, second, to activate another lever (black arrow) to trigger a hydraulic valve if the rope tension exceeds the trip setting, and thirdly to provide an automatic re-setting feature. This arrangement provides very good re-tripping accuracy with wide ambient temperature working range.

*Hydraulic Dynomometer Operation*

## 2.2. Valve Dimensional drawing.




## 2.3. De-activating the DYNHRT3HYD.

The Dyno hydraulic valve is de-activated when the hoist rope line pull is less than the preset linepull setting.

# 3. SERVICE INSTRUCTIONS

The DYNHRT3HYD requires minor maintenance, however it should be checked regularly for any signs of damage or inability to operate correctly. Sheave bearings are fully enclosed and sealed for life, however the sheaves should be regularly inspected to ensure they continue to rotate freely. Any build-up of rope grease should be cleaned off to ensure it does not harden and interfere with the operation of the trigger linkage to the hydraulic valve.

The following sections should be read to understand the general concept of the installation and calibration procedure.

Suggested Maintenance schedule.

Weekly: visual check for built-up grease, tight sheave bearings, leaking hydraulic fittings. Rectify any problems or found faults.

Monthly: Trip test using either a known test-weight of a portable loadcell. Rectify if not tripping as required.

We also recommend that you read this manual in front of a working DYNHRT3HYD Tripper unit. This will provide better understanding of the operations much easier and will be remembered longer.

# 4. INSTALLATION INSTRUCTIONS

The following section covers installation of the DYNHRT3HYD Tripper unit in general terms.

## 4.1. DYNHRT3HYD System Components

### 4.1.1. The Dynamometer

The dynamometer is a 3 sheave device fitted to the boom and requires the winch hoist rope to be passed through it. The increasing winch linepull exerts a downwards force on the centre sheave assembly compressing a heavy duty compression spring, ultimately tripping the dynamometer mounted hydraulic valve which passes hydraulic pressure to tank causing loss of pressurised hydraulic flow to the winch up circuit, thus preventing further hoisting of the hook block.

### 4.1.2. Centre Sheave Assembly

The centre sheave assembly is part of a lever-arm which forces downwards onto a heavy duty compression load spring.

### 4.1.3. Compression Load Spring

The heavy duty compression load spring is fitted with an adjustable pre-load facility and provides accurate means to set the trip point. It also provides the return force to assist resetting the sensor following a trip when the overload has been released or reduced.

### 4.1.4. Hydraulic Trip Valve

The hydraulic trip valve (detent type) is activated by the centre sheave lever arm and can provide up to 45 litres flow rate per minute tank dump capacity following overload activation.

This flowrate has been determined satisfactory for the specific crane models of this order. If the device is relocated to other than these cranes then consult with LSI-Robway for installation design.

## 4.2. Installation

### 4.2.1. Dynamometer to Boom

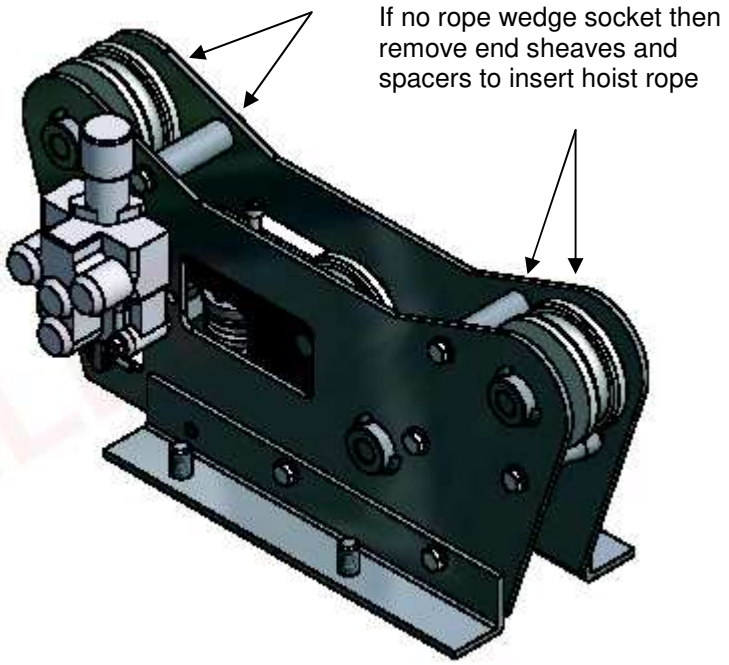
Ensure the dynamometer is solidly mounted to the boom and will not move (or vibrate) at maximum linepulls.
Ensure that the valve assembly is at the boom tip end.
Ensure the dynamometer is firmly mounted. Fit additional nitrite rubber packers if required so that there is no movement of the dynamometer relative to the boom.

### 4.2.2. Hoist rope insertion

Firstly, ensure the sheave groove is correct for the rope size. Various sizes from 14-25mmD are available.

The most convenient method to fit the hoist rope into the dynamometer is to remove the end sheaves and top two sideplate spacers. Ensure the stainless steel thrust washers are removed and stored for refitting. With the above parts removed, the hoist rope can be 'laid' into the dynamometer. Refit the end sheaves (with thrust washers) and the sideplate spacers. Refit the sheave shaft split pins and tighten the spacer bolts/nuts.

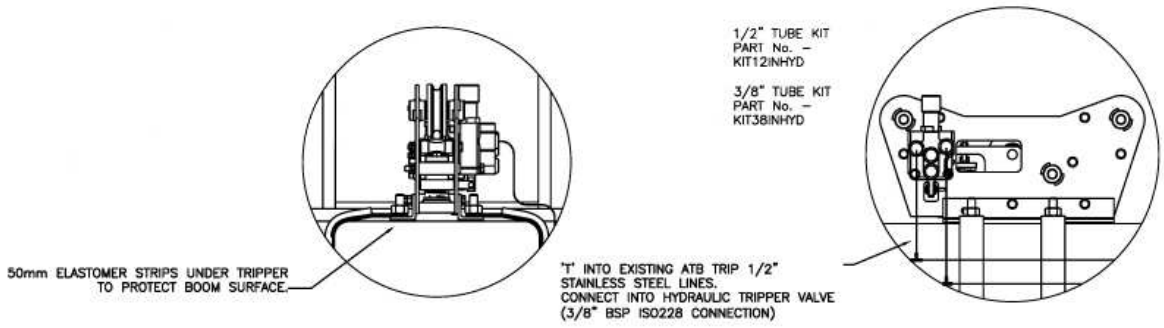
Alternatively, if the hoist rope is fitted with a wedge socket, then remove the wedge socket and 'thread' the hoist rope through the dynamometer and refit the wedge socket.



### 4.2.3. Hydraulic Connections

The DYNHRT3HYD Tripper unit is fitted with a special detenting valve requiring interconnection into the existing ATB (Anti-two Block) sensor hydraulic tubing (normally ½"). This interconnection is to be in parallel requiring two "T" pieces to be inserted into the two ½" stainless steel tubes, one each per tube in a convenient position to accept two new ½" lines from the Dynamometer Tripper unit.

Installation kits have been provided containing all parts necessary including adaptors, 45 degree elbows, tube nuts and sleeves and ½" tubing. The installer requires a tube cutter, flaring tool and tube bender.



# 5. CALIBRATING THE HYDHRT3HYD TRIPPER UNIT

After installing the DYNHRT3HYD unit, it must be calibrated to ensure accurate trip settings. The following section explains how this it is done.

Before setting the DYNHRT3HYD ensure all parts and hydraulic components have been correctly installed and bled of air with pressure tight connections.

**Only trained personnel should attempt to set trip settings.**

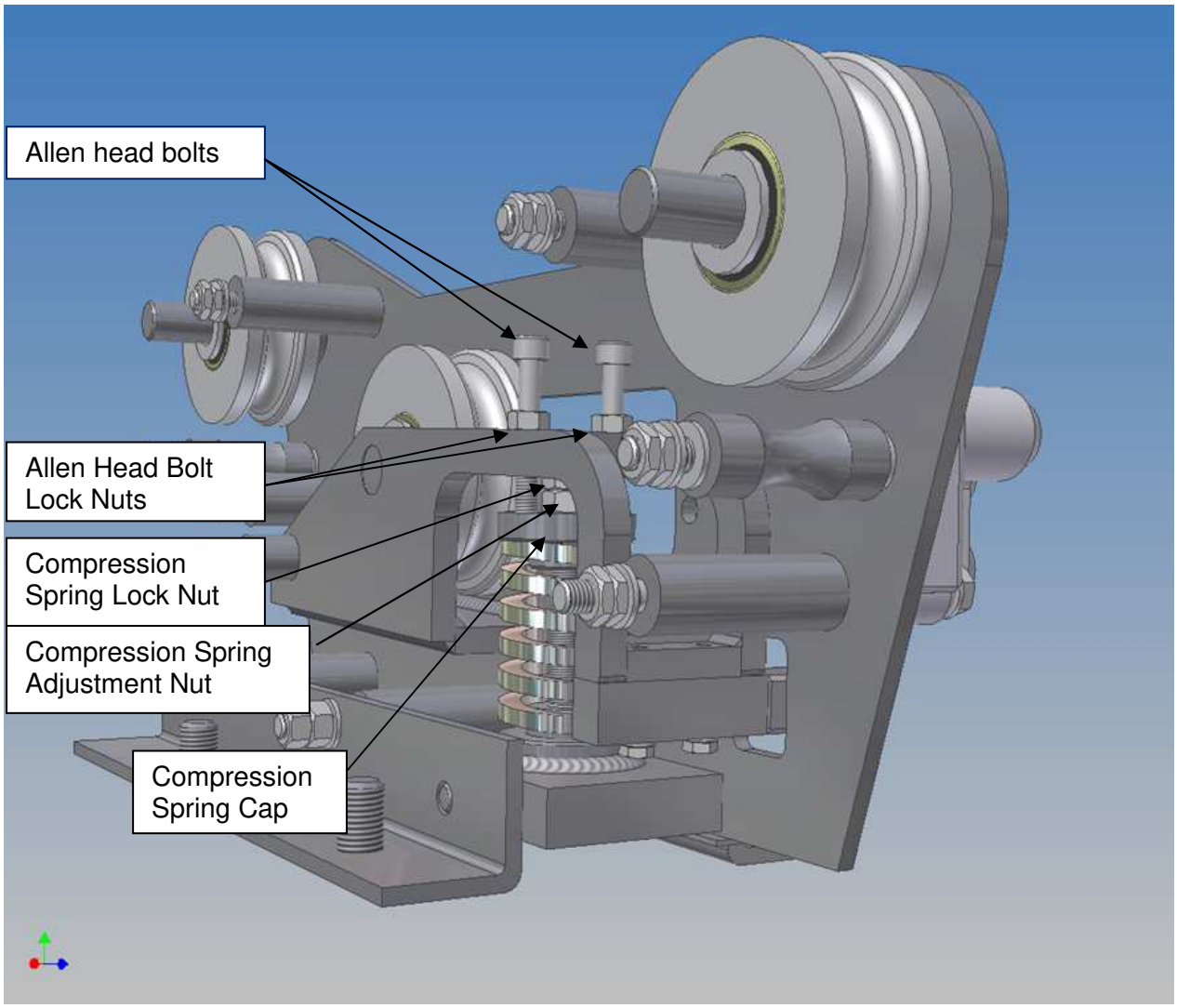
## 5.1. Preparation

When calibrating the DYNHRT3HYD:

- Verify required trip line pull setting:
  - Normally 2T for Baymaster installations (confirm before proceeding)
  - Normally 5T for Nautilus installations (confirm before proceeding
- Ensure availability of above test weights plus 5%
- Adjust Dynamometer tripper to trip out with above dynamic value plus 5% but not trip until this value is reached
- Repeat with 5% and without 5% to confirm correct action
- Confirm that the tripper valve de-activates after being activated

## 5.2. Compression Spring Adjustment

The purpose of the compression spring adjustment nut is to vary the point at which the valve will trip. The compression spring adjustment nut is locked with a compression spring lock nut. To further secure the compression spring there is a compression spring cap which is held in place with two allen head bolts locked by lock nuts. These 2 bolts MUST be adjusted to the same height each time the compression spring is adjusted.
Refer to drawing below.




## 5.3. Confirming Trip Point Procedure

Firstly, an understanding of STATIC and DYNAMIC loadings.

STATIC loading is stationary loading (that is no hoisting against gravity and without frictions).

DYNAMIC loading includes frictions and the load being raised against gravity. Both these factors ADD to linepull and need to be allowed for before causing the Hydraulic Tripper to trip.

The purpose of the Hydraulic tripper is to allow a certain line pull without causing the tripper to trip during normal operations BUT to trip should the line pull be exceeded during an actual lift (including dynamic factors).

Therefore the Tripper unit should be set to trip using a test weight of maximum line pull plus 5% so that the maximum line pull can be lifted without false tripping.

Example: -
Line pull of 2 tonnes, single part of line.

Adjust Tripper unit to allow 2t being raised but trip at 2.1 tonnes.

If the dynamometer is not tripping at the correct line pull, adjust using the following procedures. (Refer to picture on previous page.)

### 5.4. Procedure to Increase the Trip Point

- Loosen both lock nuts on allen head bolts.
- Loosen both allen head bolts.
- Loosen one allen head bolt enough to allow spanner access to compression spring adjustment nut and lock nut.
- Loosen compression spring lock nut.
- Tighten compression spring adjustment nut the (use ½ turn increment).
- Tighten compression spring lock nut.
- Tighten down both allen head bolts, ensuring that the cap holding the compression spring stays horizontal relative to dyno base.
- Tighten both lock nuts on allen head bolts.

Recheck the trip point, repeating above procedure as required.

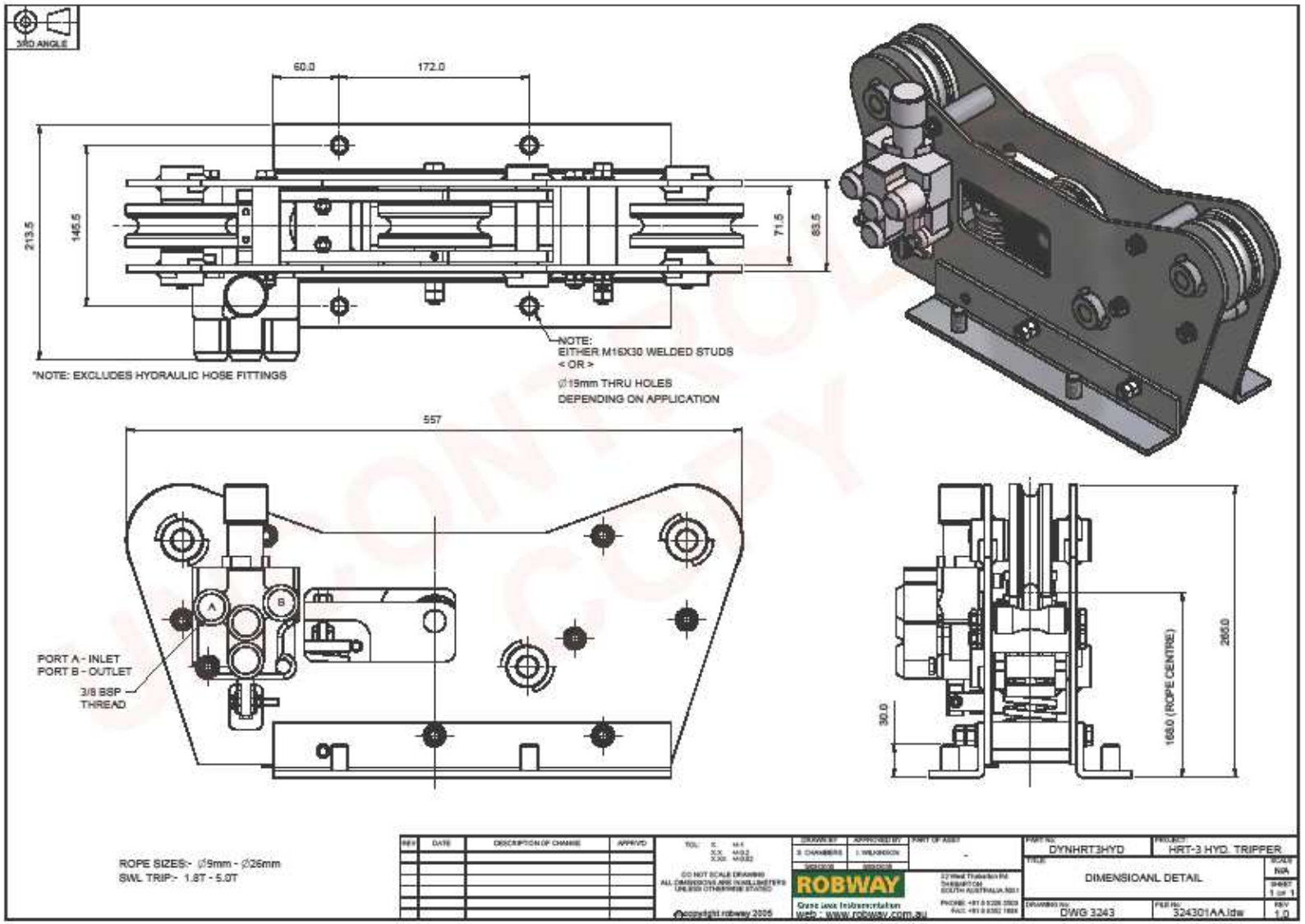
### 5.5. Procedure to Decrease the Trip Point

- Loosen both lock nuts on allen head bolts.
- Loosen both allen head bolts.
- Loosen one allen head bolt enough to allow spanner access to compression spring adjustment nut and lock nut.
- Loosen compression spring lock nut.
- Loosen compression spring adjustment nut the (use ½ turn increment).
- Tighten compression spring lock nut.
- Tighten down both allen head bolts, ensuring that the cap holding the compression spring stays horizontal relative to dyno base.
- Tighten both lock nuts on allen head bolts.

Recheck the trip point, repeating above procedure as required.

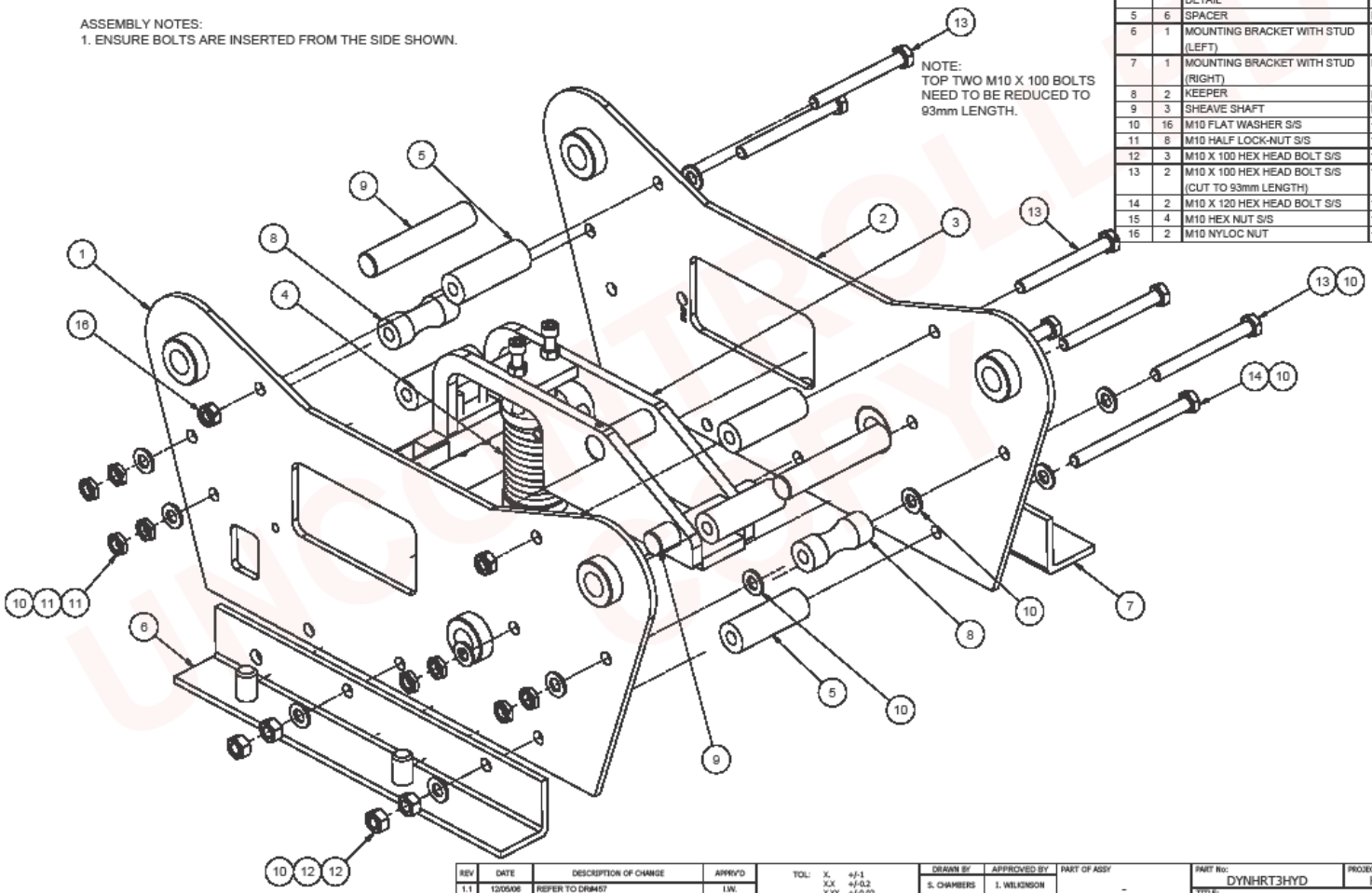
# 6. DRAWINGS

Typical drawings are included on the following pages.


3RD ANGLE
60.0
172.0
213.5
145.5
71.5
83.5
*NOTE: EXCLUDES HYDRAULIC HOSE FITTINGS
NOTE:
EITHER M16X30 WELDED STUDS
< OR >
Ø19mm THRU HOLES
DEPENDING ON APPLICATION
557
PORT A - INLET
PORT B - OUTLET
3/8 BSP
THREAD
30.0
168.0 (ROPE CENTRE)
265.0
ROPE SIZES:- Ø9mm - Ø26mm
SWL TRIP:- 1.8T - 5.0T
DYNHRT3HYD
HRT-3 HYD. TRIPPER
DIMENSIOANL DETAIL
DWG 3243
324301AA.idw
ROBWAY

ASSEMBLY NOTES:
1. ENSURE BOLTS ARE INSERTED FROM THE SIDE SHOWN.

NOTE:
TOP TWO M10 X 100 BOLTS NEED TO BE REDUCED TO 93mm LENGTH.



Parts List

| ITEM | QTY | DESCRIPTION | DWG No. | PART NUMBER |
|---|---|---|---|---|
| 1 | 1 | SIDE PLATE (LEFT) | DWG3226 | PLASL3226 |
| 2 | 1 | SIDE PLATE (RIGHT) | DWG0203 | PLASR3225 |
| 3 | 1 | ROCKER BOX SUB-ASSEMBLY DETAIL | DWG3244 | ROCBOX3244 |
| 4 | 1 | SPRING MOUNT SUB-ASSEMBLY DETAIL | DWG3245 | SPRAS3245 |
| 5 | 6 | SPACER | DWG0301 | SPAHRT06SS |
| 6 | 1 | MOUNTING BRACKET WITH STUD (LEFT) | DWG3246 | BRAML3246 |
| 7 | 1 | MOUNTING BRACKET WITH STUD (RIGHT) | DWG3247 | BRAMR3247 |
| 8 | 2 | KEEPER | DWG0300 | KEEHRT02SS |
| 9 | 3 | SHEAVE SHAFT | DWG0225 | SHAHRT12 |
| 10 | 16 | M10 FLAT WASHER S/S | - | WASFM10S |
| 11 | 8 | M10 HALF LOCK-NUT S/S | - | - |
| 12 | 3 | M10 X 100 HEX HEAD BOLT S/S | - | BOLM10100HSS |
| 13 | 2 | M10 X 100 HEX HEAD BOLT S/S (CUT TO 93mm LENGTH) | - | BOLM10100HSS |
| 14 | 2 | M10 X 120 HEX HEAD BOLT S/S | - | BOLM10120HSS |
| 15 | 4 | M10 HEX NUT S/S | - | NUTHM10SS |
| 16 | 2 | M10 NYLOC NUT | - | NUTNM10SS |

| REV | DATE | DESCRIPTION OF CHANGE | APPR'D |
|---|---|---|---|
| 1.1 | 12/05/06 | REFER TO DRW457 | I.W. |
| 1.2 | 02/05/06 | REFER TO DRW461 | I.W. |

TOL: X. +/-1, X.X +/-0.2, X.XX +/-0.02
DRAFTING STANDARD: AS1100
DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

| DRAWN BY | APPROVED BY | PART OF ASSY |
|---|---|---|
| S. CHAMBERS | I. WILKINSON | - |
| 14/07/2005 | 16/08/2005 | |

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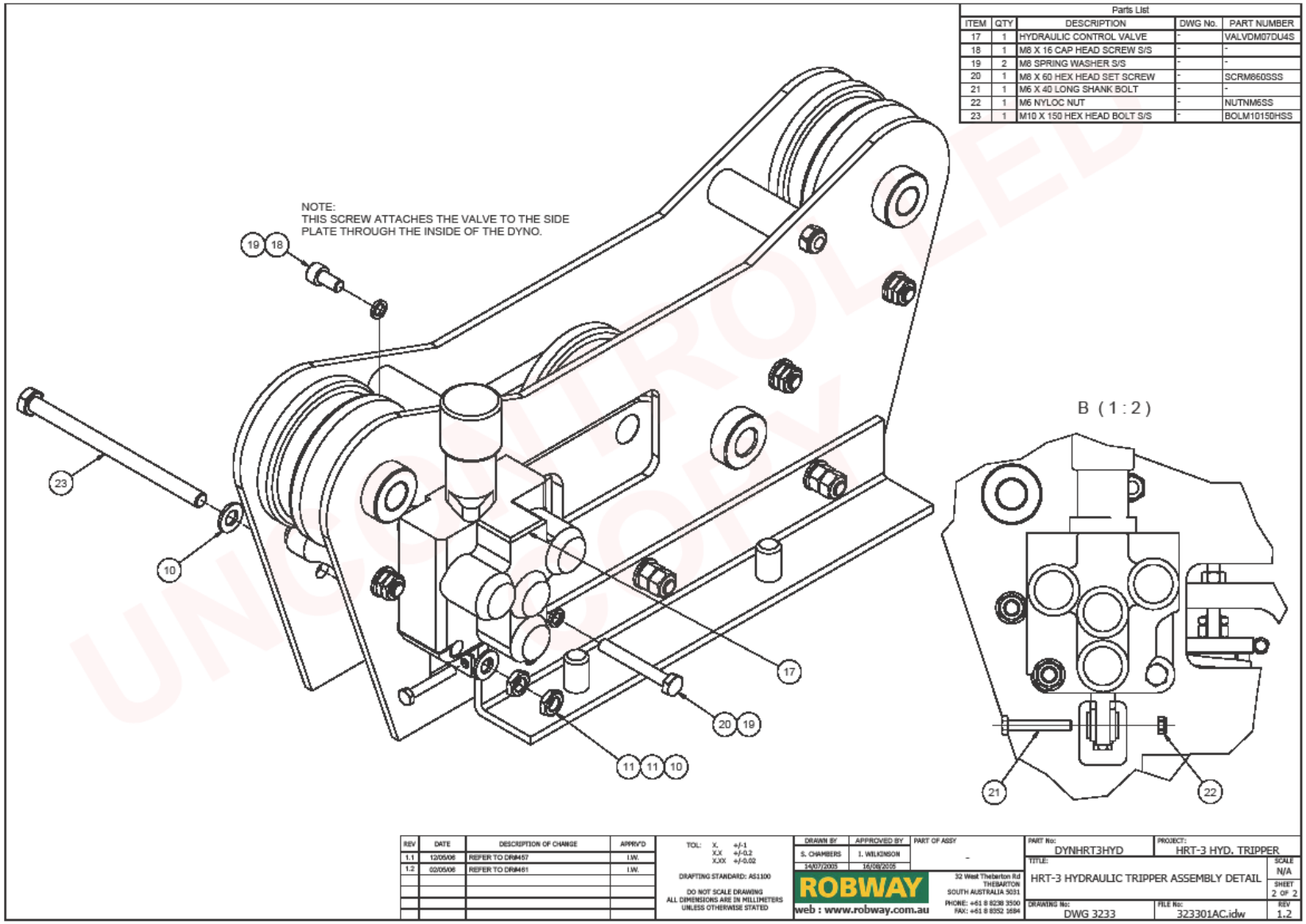
PART No: DYNHRT3HYD
PROJECT: HRT-3 HYD. TRIPPER
TITLE: HRT-3 HYDRAULIC TRIPPER ASSEMBLY DETAIL
SCALE: N/A
SHEET: 1 OF 2
DRAWING No: DWG 3233
FILE No: 323301AC.idw
REV: 1.2




Parts List

| ITEM | QTY | DESCRIPTION | DWG No. | PART NUMBER |
|---|---|---|---|---|
| 17 | 1 | HYDRAULIC CONTROL VALVE | - | VALVDM07DU4S |
| 18 | 1 | M8 X 16 CAP HEAD SCREW S/S | - | - |
| 19 | 2 | M8 SPRING WASHER S/S | - | - |
| 20 | 1 | M8 X 60 HEX HEAD SET SCREW | - | SCRM860SSS |
| 21 | 1 | M6 X 40 LONG SHANK BOLT | - | - |
| 22 | 1 | M6 NYLOC NUT | - | NUTNM6SS |
| 23 | 1 | M10 X 150 HEX HEAD BOLT S/S | - | BOLM10150HSS |

| REV | DATE | DESCRIPTION OF CHANGE | APPR'D |
|---|---|---|---|
| 1.1 | 12/05/06 | REFER TO DR#457 | I.W. |
| 1.2 | 02/05/06 | REFER TO DR#461 | I.W. |

TOL: X. +/-1
X.X +/-0.2
X.XX +/-0.02

DRAFTING STANDARD: AS1100

DO NOT SCALE DRAWING
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| 14/07/2005 | 16/08/2005 | |

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| PART No: | PROJECT: |
|---|---|
| DYNHRT3HYD | HRT-3 HYD. TRIPPER |

TITLE: HRT-3 HYDRAULIC TRIPPER ASSEMBLY DETAIL

SCALE: N/A
SHEET: 2 OF 2

| DRAWING No: | FILE No: | REV |
|---|---|---|
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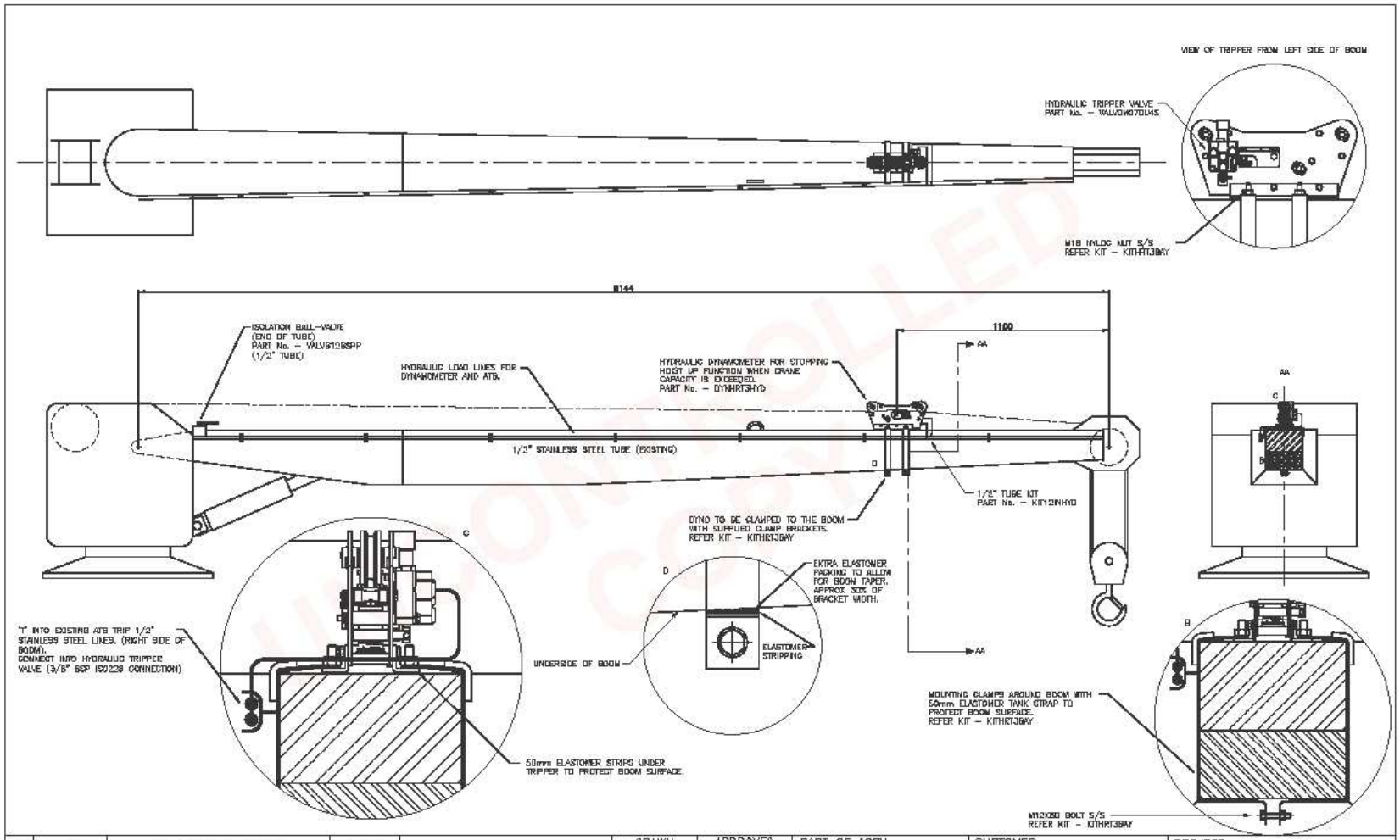


| REV | DATE | DESCRIPTION OF CHANGE | APPR'D |
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TOL: X +/– 1
X.X +/– 0.2
X.XX AS STATED

DO NOT SCALE DRAWING
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UNLESS OTHERWISE STATED

| DRAWN | APPROVED | PART OF ASSY |
|---|---|---|
| S. CHAMBERS | I. WILKINSON | – |
| 11/08/05 | 11/08/05 | |

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CUSTOMER: SAHID–BRUNEI
PROJECT: SHELL–BRUNEI
TITLE: HRT–3 HYDRAULIC TRIPPER INSTALLATION DETAIL FOR BAYMASTER CRANE S/No. 82158
SCALE N/A
SHEET 1 OF 1
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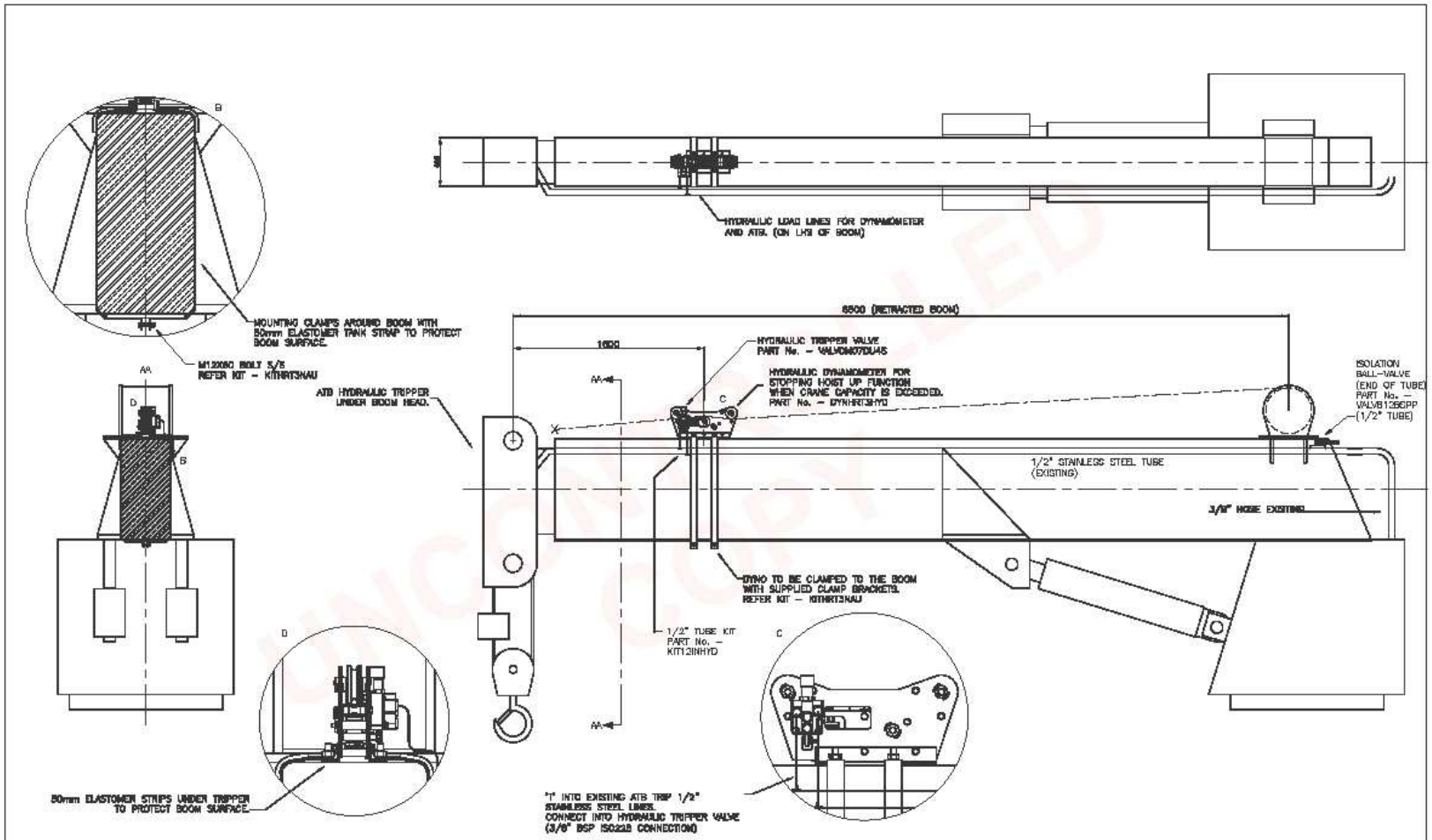
FILE No: 324901AB.DWG
REV 1.1

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X.XX AS STATED

DO NOT SCALE DRAWING
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

| DRAWN | APPROVED | PART OF ASSY |
|---|---|---|
| S. CHAMBERS | I. WILKINSON | — |
| 15/08/05 | 16/08/05 | |

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CUSTOMER: SAHID–BRUNEI
PROJECT: SHELL–BRUNEI
TITLE: HRT–3 HYDRAULIC TRIPPER INSTALLATION DETAIL FOR NAUTILUS 180BT3–56 S/No. 049206C
SCALE N/A
SHEET 1 OF 1
DRAWING No: DWG 3248
FILE No: 324801AB.DWG
REV 1.1