AUTOMATED MULTI PIPE ELEVATORS

AMP® Type Series
Hydraulic operated elevator [with optional rotators]

Elevator Rotator P/N

**Elevator Rotator** | **P/N** |
--- | --- |
Single Elevator Rotator (Double acting) | Depending on the used AMP® size, see chapter Rotator Packages Single Rotator. |
Single Elevator Rotator (Single acting) | Depending on the used AMP® size, see chapter Rotator Packages Single Rotator. |
Double Elevator Rotator | 645800 |
Revision history

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<td>B+VOT ROK, VE/AG/MH</td>
<td>Layout Update, Product family and options added to Document</td>
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<td>Address, Installation schematics and service update</td>
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<td>Forum B + V Oil Tools, OK, MH</td>
<td>Document Update, AMP -350-1 added to Type Series</td>
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Document Approval

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All data in this manual takes place using best knowledge. This manual is based on the latest product information that was available at the time of printing. Depending on ongoing technical improvements (ISO 9001), FORUM Handling Tools reserves the right to alter the design and specifications without notice. The values specified in this manual represent the nominal value of a unit produced in series. The values in individual units may have slight differences. Only with written consent from FORUM Handling Tools may the contents of this instruction manual be passed on to third persons. Procedure descriptions and explanations are not to be passed on to third persons. Copying or multiplying for internal use is permitted. We are grateful for suggestions and comments regarding this documentation or the product itself.

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A. General

I Basic Information

This operation maintenance manual (hereinafter-called OMM) refers to the Automated Multi Pipe Elevators (hereinafter-called AMP®) Type Series from FORUM Handling Tools for use on oil drilling platforms and rigs. This OMM covers several different FORUM Handling Tools models from the AMP® Type Series that are all common in use and operation. Most assembly, disassembly, and inspection procedures are the same for all models. If there are differences, they are called out separately within this OMM. When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. This OMM is intended for the operator of the AMP®. It is intended to ensure safe operation and must be read carefully and kept where it is accessible for AMP® users at all times. This OMM contains all information on safe and proper operation of the AMP®. Observation of these instructions is required for safe operation. In addition, it is necessary to observe all applicable national and local regulations [e.g. accident prevention regulations and environmental regulations] as well as the company’s own internal safety regulations. For installation, maintenance and repair work and proper training of the operating personnel, Forum recommends requesting service from FORUM Handling Tools itself.

II Intended Use

The AMP® handles 18° and 45° drill pipes and -tubing and 90° drill collar. The load capacity of the Elevator is designated by the Type Series model. The load capacity is limited in vertical direction only. The design of the bushing segments allows the AMP® to grip pipes with uniform radial pressure, ensuring a safe hold while minimizing the possibility of damage to the pipe. The Elevator is available for hydraulic power operation only. In addition to observing all instructions in this OMM, intended use also includes observing all prescribed assembly, disassembly, startup, operating, repair and maintenance work at the specified intervals as well as all safety precautions. The operation of the AMP® is allowed for the intended use only. All FORUM Handling Tools AMP® are designed in accordance with API 8C.

INFO

In this documentation, the abbreviation t and the word tons are used to describe short tons. If the metric ton is referred it will explicit be named in the text or the abbreviation ton.

1 sh ton = 2000 lb = 907,19 kg
1 metric ton = 2204,62 lb = 1000,00 kg

III Improper Use

INFO

Improper use of the equipment releases FORUM Handling Tools from any liability for personal injury or property damage resulting therefrom.

The AMP® is intended exclusively for lifting and holding the specified pipes in conjunction with the use of the FORUM Handling Tools products Elevator Rotator System. Refer to the specifications in chapter Technical Data.

The following is specifically prohibited:

- Use of bushings with pipe sizes for which use is not specified.
- Holding pipe with diameter for which use is not specified.
- Holding pipe taper for which use is not specified.
- Increasing the load limit of the AMP®.
- Every use of the AMP®, which is not intended.

Moreover, operation of the AMP® is prohibited under the following conditions:

- When the AMP® is used for applications other than intended.
- When the hydraulic equipment is not installed properly.
- When the AMP® or parts thereof are damaged or when the additional equipment is not installed properly.
- When protective or safety equipment is damaged, unusable, improperly installed or not present.
- When the AMP® is not operating properly.
- When humans or foreign objects or personnel are located in the hazard area of the AMP®.
- When conversions or modifications have been performed without previous, written approval by FORUM Handling Tools.
- When equipment not approved by FORUM Handling Tools are used.
- When the prescribed maintenance intervals have been exceeded.
- When replacement parts not approved by FORUM Handling Tools are used.
- When companies not authorized by FORUM Handling Tools have performed repair or service work on the equipment.

Observe also the chapter “Warranty and Liability”.

04-2022  PN 688000-D - Revision 12  AMP®
V  Warranty and Liability

V-01 Liability

The technical information, data and instructions for operation contained in this OMM correspond to the status at the time of print and are provided according to the best of our knowledge in consideration of our previous experience and expertise. We reserve all rights to make technical modifications within the scope of technical development of the Automated Multi Pipe Elevators treated in this OMM. Claims or entitlements cannot be deduced or derived from information, illustrations and/or descriptions in this OMM. FORUM Handling Tools is liable for all warranty obligations made within the scope of the contract for any faults or omissions on our part, excluding further claims. Claims for damages suffered are excluded regardless of the legal grounds. Translations are complete according to best knowledge. We cannot assume any liability for translation errors, even when the translation was performed at our order. Only the original text is binding. The original text language for FORUM Handling Tools documents is English. The descriptions and illustrations do not necessarily reflect the scope of delivery or any parts orders. The drawings and illustrations are not to scale.

V-02 Warranty

FORUM Handling Tools general terms of purchase and delivery apply. Purchasers recognize these conditions on the day the contract is signed, at the latest. The terms and duration of FORUM Handling Tools warranty are specified in the sales documents as well as the order confirmation. These will be submitted to the operating company as information at the time the contract is signed, at the latest. The manufacturer assumes no warranty whatsoever for damage or interruptions in operation resulting from failure to observe the operating instructions. The OMM is to be supplemented by the operating company with operating instructions based on existing national regulations on accident and environmental protection, including information on supervisory and reporting obligations taking into consideration operating peculiarities, e.g. in regard to work organization. Warranty claims/complaints within the scope of the guarantee and liability for personal injury and property damage are excluded, when such result from any of the following causes:

- Any use other than intended;
- Improper installation, operation, maintenance or repair;
- Operation with defective, improperly attached or non-operating safety and/or protective equipment;
- Failure to observe the instructions in the OMM regarding safe conduct;
- Impermissible structural and/or functional modifications;
- Use of replacement parts not approved by FORUM Handling Tools;
- Normal wear or insufficient inspection of components subject to wear;
- External effects or force majeure;
- Lubricating the Automated Multi Pipe Elevators with lubricants other than those recommended by FORUM Handling Tools.

INFO

Any structural or functional modification to the equipment by the operating company requires previous written approval by FORUM Handling Tools. Failure to obtain such approval voids the warranty as well as the declaration of conformity and releases FORUM Handling Tools from any product liability. All safety equipment must be reinstalled and checked by the operator for proper function.
VI Obligations of the Operating Company

VI-01 Planning and Checking Safety Measures
The obligation of the operating company to due diligence includes planning safety measures and supervising their observance. All personnel performing work on and with the AMP® must be trained by the operating company for the work performed on and with the AMP®. All personnel must have read and understood the OMM.

VI-02 Minimizing Risk of Injury
The following principles apply to minimize the risk of injury:
- Ensure that only qualified personnel perform work on the AMP®.
- The operating company must authorize the personnel for such work.
- The personnel must wear the prescribed protective equipment.
- Procedures, competencies and responsibilities must be clearly defined and established in the area of the AMP®. Proper behaviour in the event of a malfunction must be clear for everyone. The personnel must be given regular training.
- All WARNING signs and information on the AMP® must be complete and easily legible. For this purpose, WARNING signs and information are to be cleaned regularly and replaced as required.

VI-03 Trouble-free Operation
The following principles apply for trouble-free operation:
- Keep the complete OMM at the location where the AMP® is in operation where it is easily accessible for everyone and in an easily legible condition.
- Use the AMP® exclusively for its intended purpose.
- Use the AMP® only when it is in a perfect operating state.
- Before starting work, check to ensure that it is in a safe operating state and functioning properly.

VI-04 Requirements for Operator
Basic knowledge of safe handling and use of the AMP® includes knowledge of the general safety precautions. Ensure that the AMP® is operated only in compliance with the general safety precautions and other instructions in this OMM.

VI-05 Training
The operating company is obligated to organize and hold regular training to ensure that all personnel involved with transporting, installing, operating and/or servicing the AMP® is familiar with the required procedures and safety precautions.

VI-06 Minimum Qualifications
All work on the equipment requires special knowledge and qualifications on the part of the operating personnel. All personnel working on AMP® must have the following qualifications:
- Personal suitability for the work performed.
- Suitable qualifications for the work performed.
- Familiarity with the safety equipment and its function.
- Familiarity with this OMM – particularly the safety precautions – and all sections relevant for the work to be performed.
- Familiarity with the elementary instructions on operating safety and accident prevention.

In general, all employees must have one of the following minimum qualifications:
- Technical training for independent work on the AMP®.
- Sufficient qualifications for working on the AMP® under supervision and at the instructions of a trained specialist.
## User Groups

This OMM is subdivided into the following user groups:

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating personnel</td>
<td>Sufficiently trained in: Functional procedures on the equipment.</td>
</tr>
<tr>
<td></td>
<td>Operating procedures.</td>
</tr>
<tr>
<td></td>
<td>Knowledge:</td>
</tr>
<tr>
<td></td>
<td>Competency and responsibility in regard to the work to be performed.</td>
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<tr>
<td></td>
<td>Behaviour in emergencies.</td>
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<tr>
<td></td>
<td>Basic knowledge of:</td>
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<tr>
<td></td>
<td>Mechanics.</td>
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<tr>
<td></td>
<td>Hydraulic.</td>
</tr>
<tr>
<td>Service personnel</td>
<td>Authorizations (according to standards of safety engineering):</td>
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<tr>
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<td>Starting up equipment</td>
</tr>
<tr>
<td></td>
<td>Grounding equipment</td>
</tr>
<tr>
<td></td>
<td>Marking of equipment</td>
</tr>
<tr>
<td></td>
<td>Basic knowledge of installation and operation of the AMP®.</td>
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### Special Technical Knowledge

Only specially trained personnel should perform the following work:

<table>
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<th>Work Performed</th>
<th>Qualifications</th>
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<tbody>
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<td>Work on hydraulic system</td>
<td>Special knowledge and experience with work on hydraulic systems.</td>
</tr>
<tr>
<td>Work on mechanical parts</td>
<td>Personnel qualified or trained in industrial mechanics; work is to be performed only under supervision and on instructions of a person qualified in accordance with generally accepted codes of practice in industrial mechanics.</td>
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VIII  Safety Symbols
The safety precautions in this document contain standardized depictions and symbols. Three hazard classes distinguish depending on the probability of occurrence and severity of the consequences. Selection of the category depends on the probability of occurrence and the possible extent of damage.

**CAUTION**
Indication of recognizable hazard for humans or possible property damage. Failure to observe can lead to reversible injuries or property damage!
The symbol as specified in ANSI Z535.6 emphasizes the cause.
» Measures for avoiding are listed.

**WARNING**
Indication of recognizable hazard for humans.
Failure to observe can lead to irreversible injuries!
The symbol as specified in ANSI Z535.6 emphasizes the cause.
» Measures for avoiding are listed.

**DANGER**
Indication of imminent hazard for humans.
Failure to observe can lead to irreversible or lethal injuries!
The symbol as specified in ANSI Z535.6 emphasizes the cause.
» Measures for avoiding are listed.

VIII-01  Preliminary Safety Precautions
Safety precautions are given in the preceding form at the beginning of complete sections or sections. They apply for the entire section or the entire subsequent section.

VIII-02  Safety Precautions Relevant for Action
If a safety precaution applies only for one single action or a short series of actions, it is integrated into the text preceding the possible hazard point.
For example:
1. Attach hoisting gear to eye bolts in cover.

**CAUTION** Danger of pinching/crushing hands! The cover can fall shut when the retainer is not engaged. Never open the cover by hand.
2. Open the cover with a crane and suitable hoisting gear.
3. Unscrew the M10 bolts with a 17 mm box wrench.
4. ...

VIII-03  Instructions for Safe Procedure
Special work steps to ensure Safe Procedure are depicted as follows (example):

**Safe Procedure**
1. Shut off Equipment.
2. Disconnect supply lines.
3. Attach Equipment to crane.
4. ...
IX-01 Linguistic Conventions

This documentation uses terms and symbols intended to help you find information more easily, perform work steps more effectively and recognize dangerous situations more quickly. These symbols and terms are explained below:

All important text sections are printed in bold face.

- Lists without any necessary sequence are marked with a dash (−) at the left side of the column.
- Individual activities to be performed are indicated by a dot (−) to the left of the column.

Relevant consequences of an action or work step are marked with an arrow (>) in the left margin.

Sequential numbers (1, 2, 3 ...) in the left margin indicate enumerations in a certain sequence (e.g. a series of work steps).

For example:

1. Unscrew nuts on Equipment feet.
2. Lift Equipment.

For greater clarity, the illustrations are located in the right column with the text opposite or directly below the associated text section. Larger illustrations extending over the entire width of the page are located before the explanatory text. The illustrations are provided with captions in telegraph style.

Fig. 1: Illustration Example AMP®

INFO

Additional information and relationships requiring special attention are distinguished in this manner.

IX Personal Protective Equipment (PPE)

The following symbols located at appropriate points in the OMM indicate that it is mandatory to wear personal protective equipment:

- WEAR PROTECTIVE GLOVES!
- WEAR EYE PROTECTION!
- WEAR SAFETY SHOES!
- WEAR PROTECTIVE HELMET!
- WEAR EAR PROTECTION!
X Communication with FORUM Energy Technologies

X-01 Contact Worldwide

In the event of problems that cannot be solved with the aid of this OMM, please contact one of the following addresses.

<table>
<thead>
<tr>
<th>FORUM B + V Oil Tools GmbH</th>
<th>FORUM Handling Tools</th>
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<tr>
<td>Hermann-Blohm-Straße 2</td>
<td>1023 FORUM Drive</td>
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<td>20457 Hamburg</td>
<td>Broussard, LA 70518 USA</td>
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<td>Germany</td>
<td>Tel: + 1.337.373.1800</td>
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<tr>
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<td>Fax: + 49.40.37022.6899</td>
</tr>
<tr>
<td>E-Mail: <a href="mailto:oiltools@f-e-t.com">oiltools@f-e-t.com</a></td>
<td>Fax: + 49.40.37022.6893</td>
</tr>
<tr>
<td>web: <a href="http://www.f-e-t.com">www.f-e-t.com</a></td>
<td>web: <a href="http://www.f-e-t.com">www.f-e-t.com</a></td>
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FORUM ENERGY TECHNOLOGIES Drilling-Service-Standorte

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<tr>
<th>Email: <a href="mailto:ForumDP.Sales@f-e-t.com">ForumDP.Sales@f-e-t.com</a></th>
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<tr>
<td>Canada</td>
</tr>
<tr>
<td>Nr. 106, 3903 - 75 Ave</td>
</tr>
<tr>
<td>Leduc, Alberta T9E 0K3</td>
</tr>
<tr>
<td>Tel: + 1.780.980.0345</td>
</tr>
<tr>
<td>Fax: + 1.780.986.3278</td>
</tr>
<tr>
<td>United Arabic Emirates</td>
</tr>
<tr>
<td>Oilfields Supply Center</td>
</tr>
<tr>
<td>Building B-45</td>
</tr>
<tr>
<td>Jebel Ali Free Zone Dubai UAE</td>
</tr>
<tr>
<td>Tel: + 971.4.883.5266</td>
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### XI Abbreviations

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<th>Description</th>
<th>Abbr.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>Pneumatic Operated</td>
<td>°C</td>
<td>Degree Celsius</td>
</tr>
<tr>
<td>Csg</td>
<td>Casing</td>
<td>F</td>
<td>Degree Fahrenheit</td>
</tr>
<tr>
<td>DC</td>
<td>Drill Collars</td>
<td>ft</td>
<td>foot or feet</td>
</tr>
<tr>
<td>dia.</td>
<td>diameter</td>
<td>ft.lb</td>
<td>foot pounds (= torque)</td>
</tr>
<tr>
<td>DP</td>
<td>Drill Pipe</td>
<td>gpm</td>
<td>(US) gallon per minute</td>
</tr>
<tr>
<td>EU</td>
<td>External Upset</td>
<td>in</td>
<td>inch(es)</td>
</tr>
<tr>
<td>Hyd</td>
<td>Hydraulic Operated</td>
<td>kW</td>
<td>kilowatt</td>
</tr>
<tr>
<td>ID</td>
<td>inside diameter</td>
<td>kPa</td>
<td>kilo Pascal</td>
</tr>
<tr>
<td>IEU</td>
<td>Internal External Upset</td>
<td>kg</td>
<td>kilogram(s)</td>
</tr>
<tr>
<td>IU</td>
<td>Internal Upset</td>
<td>lb</td>
<td>pound(s)</td>
</tr>
<tr>
<td>OD</td>
<td>outside diameter</td>
<td>m</td>
<td>meter(s)</td>
</tr>
<tr>
<td>P/N</td>
<td>part number</td>
<td>mm</td>
<td>millimeter(s)</td>
</tr>
<tr>
<td>qty</td>
<td>quantity</td>
<td>Nm</td>
<td>Newton meter (= torque)</td>
</tr>
<tr>
<td>max</td>
<td>maximum</td>
<td>oz</td>
<td>ounce(s)</td>
</tr>
<tr>
<td>min</td>
<td>minimum</td>
<td>psi</td>
<td>pounds per square inch</td>
</tr>
<tr>
<td>no</td>
<td>number</td>
<td>sh T</td>
<td>short ton</td>
</tr>
<tr>
<td>Tbg</td>
<td>tubing</td>
<td>m t</td>
<td>Metric Ton</td>
</tr>
<tr>
<td>w/</td>
<td>with</td>
<td>RT</td>
<td>Rotary Table</td>
</tr>
<tr>
<td>w/o</td>
<td>without</td>
<td></td>
<td></td>
</tr>
<tr>
<td>w/Zip</td>
<td>with Zip groove</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 Description

The FORUM Handling Tools AMP® Elevators are designed with strength and safety factors in accordance with API Regulations Section 8C - and is to be used for handling long, heavy strings of pipes. All Elevators are made with a Latch and a Lock to secure the lock mechanism against accidental opening. When the doors and latch are open, the pipe is placed in the AMP®. When the pipe activates the automatic closing trigger, the AMP® automatically closes. When the AMP® is closed, a hydraulic cylinder moves out. This cylinder is an additional verification function (mechanical and visual). Not before the AMP® is properly closed and latched and the verification cylinder is completely moved out, the feedback signal (Elevator closed and latched) is given to the operator. The frame takes the load transferred through the bushing system and transfers it to the Elevator-Links.

INFO

The load can be hold by the bushing assembly after the AMP® has been closed and latched properly and the feedback signal has been registered by the system/operator. As long as the pipe load is hold by the AMP® bushings, the load sensor is activated, so the elevator cannot be opened (even by operation failure).

1.1 AMP® Main Assemblies

The AMP® consists of the assemblies described below.

INFO

Please note that this illustration does not reflect the scope of delivery (refer to Chapter „IV Potential Misuse”, on page 6). FORUM Handling Tools offers bushing assemblies as accessories to match the specific pipe diameters.

<table>
<thead>
<tr>
<th>Item</th>
<th>Name</th>
<th>Item</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AMP® Frame</td>
<td>3</td>
<td>AMP® Door right</td>
</tr>
<tr>
<td>2</td>
<td>Bushing system</td>
<td>4</td>
<td>Latch</td>
</tr>
<tr>
<td>5</td>
<td>AMP® Door left</td>
<td>6</td>
<td>(Hydraulic Assembly)</td>
</tr>
<tr>
<td>7</td>
<td>Single Elevator Rotator (optional)</td>
<td>7</td>
<td>Double Elevator Rotator (optional)</td>
</tr>
</tbody>
</table>

A catalog with complete general drawings and parts lists for the assemblies of the AMP® can be found in chapter 5 in this OMM.

1.2 Operational Environment

The AMP® is designed and constructed for use in the drilling industry on ships and platforms. The AMP® complies with the Machinery Directive 2006/42/EC. The AMP® is approved for operation in explosion hazard areas. For equipment containing any hydraulic powered parts, the directive 2014/34/EU “Equipment and protective systems in potentially explosive atmospheres” applies. The corresponding ATEX certificates are present in the Data book. The Classification according to CE (with reference to the ATEX guideline) is as followed:

**CE** II 2G IIB T5 for hydraulic and pneumatic equipment with

- **CE- marking (with reference to the ATEX guideline)**
- Marking of the equipment for the Ex- range
- II Equipment Group (II)
- 2 Equipment Category
- G For explosive mixtures of air and combustible gases, mists or vapors (G)
- IIB Category for Gases
- T5 Temperature class

![Fig. 2: AMP® with single Rotator Assembly](image-url)
1.3 Assemblies and Components

**AMP® Frame [with door and Latch incorporation]**

The AMP® frame is made of high quality, heat-treated and tested steel castings or forgings to meet the high demands and satisfy the strong safety requirements.

**Bushing System**

The design of the bushing segments allows the AMP® to grip casing with uniform radial pressure, ensuring a safe hold while minimizing the possibility of damage to the pipes.

- The bushings can be mounted individually or connected as assembly using the bushing transport ring.
- The AMP® can be converted for use as casing, drill pipe, drill collar or tubing elevator, and can be operated easily by one man due to replaceable bushing segments and a positive locking mechanism.
- The AMP® is available for hydraulic power bushing operation only. The equipment is approved for operation in explosion hazard areas.

**AMP® Hydraulic Box and Link Adapter**

The hydraulic box contains all the hydraulic components needed to control the AMP®. To enable access to all hydraulic components, the hydraulic box can be opened easily via a door at the rear of the AMP®.

The Elevator-Link Adapters and Link Blocks secure the AMP® to the Elevator-Links. The design enables quick conversion for using the AMP® with a Single Rotator.
Hydraulic Assembly
Double acting hydraulic cylinders open and close the doors and the Latch. For this purpose, it is necessary to supply pressure alternately to the hydraulic connections.

- The AMP® has four connections on the rear.
  - A/P Pressure Line (AMP® Close)
  - B/T Return Line (AMP® Open)
  - C/XP Feedback (AMP® Closed/Load Sensor)
  - FL Signal for Rotator.

- All hydraulic connections have a coupling bushing and a plug coupling with quick connection couplings, 3/8” and 1/4”.
  - The used coupling by FORUM Handling Tools meets the ISO 16028 standard and are ideal for interchangeability with other manufacturers. This feature include the ability to connect with virtually no air inclusion or disconnect with little or no spillage.
  - 3045 psi (210 bar) maximum operating pressure for all sizes (connected and disconnected)
  - Push-to-connect
  - Standard sleeve-locking equipment prevents accidental disconnection

Additional Features:

- Closing trigger 1:
  - When the pipe hits the trigger, at first a hydraulic signal is automatically given to close the right, secondly the left door and finally to close the Latch. When the AMP® is fully closed and latched, a hydraulic closing signal (feedback signal) is given.

- AMP® Load Sensor 2:
  - When the AMP® is loaded while lifting a tubular, it is not possible to open the AMP® by mistake. The load sensor prevents opening with tubular weights higher than approximately 170 kg (depending which bushing type and sizes are installed).

- Closing signal:
  - The AMP provides a hydraulic closing confirmation signal to its controls, when it is properly closed and latched. As soon as the AMP is loaded and the load sensor becomes active, the confirmation pressure level increases to indicate the status of the load sensor.

INFO

- Cleaning
  - Always clean the quick coupling thoroughly before connecting it to its counterpart.
1.4 Technical Data

1.4.1 AMP® Type series Technical Data

<table>
<thead>
<tr>
<th>Name</th>
<th>AMP® 350-2</th>
<th>AMP® 500-1</th>
<th>AMP® 500-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>9(\frac{1}{8})&quot; - 20&quot;</td>
<td>2(\frac{1}{4})&quot; - 11&quot;</td>
<td>9(\frac{1}{8})&quot; - 22&quot;</td>
</tr>
<tr>
<td>Capacity</td>
<td>350 tons - 90°</td>
<td>500 tons - 18°</td>
<td>500 tons - 90°</td>
</tr>
<tr>
<td>Partnumber</td>
<td>638200-Y.10</td>
<td>648100-Y.10</td>
<td>648200-Y.10</td>
</tr>
<tr>
<td>Rotation System</td>
<td>See chapter Rotator Packages Single Rotator.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bushing Assembly</td>
<td>638206-BC</td>
<td>648006-BC</td>
<td>648206-BC</td>
</tr>
<tr>
<td>Hook Up Kit</td>
<td>648100-HUK</td>
<td>648100-HUK</td>
<td>648100-HUK</td>
</tr>
<tr>
<td>Weight kg</td>
<td>1020[2248]</td>
<td>855[1885]</td>
<td>1310[2888]</td>
</tr>
</tbody>
</table>
| Elevator Links | 2\(\frac{1}{8}\)" - 3\(\frac{3}{8}\)" | 3\(\frac{1}{4}\)" - 4\(\frac{1}{4}\)" | 3\(\frac{1}{8}\)" - 4\(\frac{3}{4}\)"

<table>
<thead>
<tr>
<th>Name</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
</table>
| Size          | 2\(\frac{3}{8}\)" - 11" | 2\(\frac{3}{8}\)" - 11" | 4\(\frac{1}{8}\)" to 9\(\frac{1}{8}\)" | 4\(\frac{1}{8}\)" to 9\(\frac{1}{8}\)"
| Capacity      | 750 tons - 18°   | 1000 tons - 18°  | 1250 tons - 18°  | 1500 tons - 18°  |
| Partnumber    | 678100-Y.10     | 618100-Y.10     | 688000-Y.10     | 688000-Y-1500.10 |
| Rotation System | See chapter Rotator Packages Single Rotator. |                     |                   |                   |
| Bushing Assembly | 678 106-BC   | 618 106-BC      | 688 006-BC      | 688 006-BC      |
| Hook Up Kit   | 648100-HUK     | 648100-HUK      | 648100-HUK      | 648100-HUK      |
| Elevator Links | 4\(\frac{1}{8}\)" - 5\(\frac{3}{8}\)" | 4\(\frac{1}{8}\)" - 5\(\frac{3}{8}\)" | 5\(\frac{1}{8}\)" - 6\(\frac{1}{8}\)" | 5\(\frac{1}{8}\)" - 6\(\frac{1}{8}\)"

INFO

The term Bore Code and „BC“ is a placeholder for various pipe-types with different diameters. A list of bore codes can be found in the FORUM Handling Tools General Catalog.

General Data (Valid for AMP Type Series)

- **Working pressure**: Min 140 bar (2030 Psi), Max 210 bar (3046 Psi)
- **Maximum allowed pressure**: 210 bar (3046 Psi)
- **Minimum required Oil clearness**: NAS 9
- **Required Flow rate**: Min 6 Gpm (22.7 l/m), Max 10 Gpm (37.9 l/m)
- **Temperature working range**: - 20°C to + 50°C

*Temperatur working range from - 40°C to + 60° (- 40° F to +140° F) on request.*
1.4.1.1 AMP® Dimensions

Fig. 11: AMP® Main Dimensions
## Main Dimensions [inch/mm]

<table>
<thead>
<tr>
<th></th>
<th>A.1</th>
<th>B</th>
<th>C</th>
<th>C.1</th>
<th>C.2</th>
<th>C.3</th>
<th>C.4</th>
<th>C.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP 350-2</td>
<td>27.20</td>
<td>18.11</td>
<td>47.36</td>
<td>45.55</td>
<td>18.39</td>
<td>27.20</td>
<td>53.54</td>
<td>24.53</td>
</tr>
<tr>
<td>AMP 500-1</td>
<td>22.64</td>
<td>18.32</td>
<td>38.90</td>
<td>37.09</td>
<td>14.69</td>
<td>22.40</td>
<td>43.03</td>
<td>18.81</td>
</tr>
<tr>
<td>AMP 500-2</td>
<td>30.75</td>
<td>18.91</td>
<td>50.18</td>
<td>48.37</td>
<td>18.98</td>
<td>29.39</td>
<td>54.50</td>
<td>23.30</td>
</tr>
<tr>
<td>AMP 750-1</td>
<td>26.97</td>
<td>22.52</td>
<td>43.52</td>
<td>41.67</td>
<td>17.15</td>
<td>24.53</td>
<td>48.90</td>
<td>22.52</td>
</tr>
<tr>
<td>AMP 1000-1</td>
<td>26.97</td>
<td>22.52</td>
<td>43.52</td>
<td>41.67</td>
<td>17.15</td>
<td>24.53</td>
<td>48.90</td>
<td>22.52</td>
</tr>
<tr>
<td>AMP 1250-1</td>
<td>28.19</td>
<td>25.39</td>
<td>46.50</td>
<td>44.69</td>
<td>18.15</td>
<td>26.54</td>
<td>52.40</td>
<td>24.06</td>
</tr>
<tr>
<td>AMP 1500-1</td>
<td>28.19</td>
<td>25.39</td>
<td>46.50</td>
<td>44.69</td>
<td>18.15</td>
<td>26.54</td>
<td>52.40</td>
<td>24.06</td>
</tr>
</tbody>
</table>

## Single Rotator Center of Gravity - COG [inch/mm]

<table>
<thead>
<tr>
<th></th>
<th>A.2</th>
<th>A.3</th>
<th>A.4</th>
<th>B.1</th>
<th>B.2</th>
<th>C.6</th>
<th>C.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP 350-2</td>
<td>33.86</td>
<td>0.02</td>
<td>0.18</td>
<td>9.87</td>
<td>9.87</td>
<td>2.25</td>
<td>1.37</td>
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<td>AMP 500-1</td>
<td>30.47</td>
<td>0.02</td>
<td>0.62</td>
<td>9.72</td>
<td>9.57</td>
<td>1.42</td>
<td>1.20</td>
</tr>
<tr>
<td>AMP 500-2</td>
<td>38.58</td>
<td>0.01</td>
<td>0.30</td>
<td>10.35</td>
<td>10.35</td>
<td>1.73</td>
<td>0.39</td>
</tr>
<tr>
<td>AMP 750-1</td>
<td>32.01</td>
<td>0.01</td>
<td>0.52</td>
<td>12.08</td>
<td>12.08</td>
<td>1.23</td>
<td>0.51</td>
</tr>
<tr>
<td>AMP 1000-1</td>
<td>32.01</td>
<td>0.01</td>
<td>0.52</td>
<td>12.08</td>
<td>12.08</td>
<td>1.23</td>
<td>0.51</td>
</tr>
<tr>
<td>AMP 1250-1</td>
<td>34.41</td>
<td>0.02</td>
<td>0.69</td>
<td>13.75</td>
<td>13.75</td>
<td>1.12</td>
<td>0.44</td>
</tr>
<tr>
<td>AMP 1500-1</td>
<td>34.41</td>
<td>0.02</td>
<td>0.69</td>
<td>13.75</td>
<td>13.75</td>
<td>1.12</td>
<td>0.44</td>
</tr>
</tbody>
</table>
### 1.4.1.2 AMP® weights

#### Weight without bushings

<table>
<thead>
<tr>
<th>AMP®</th>
<th>AMP® 350-2</th>
<th>AMP® 500-1</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
</table>

#### Weight with bushings

<table>
<thead>
<tr>
<th>P/N</th>
<th>Bushing Size</th>
<th>Taper</th>
<th>AMP® 350-2</th>
<th>AMP® 500-1</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>678106-101</td>
<td>2(^\circ) EU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>195 [420]</td>
<td>n/a</td>
<td>284 [620]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-102</td>
<td>2(^\circ) EU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>185 [400]</td>
<td>n/a</td>
<td>280 [510]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-105</td>
<td>3(^\circ) EU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>176 [380]</td>
<td>n/a</td>
<td>273 [600]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-106</td>
<td>4(^\circ) EU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>166 [360]</td>
<td>n/a</td>
<td>265 [580]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-107</td>
<td>4(^\circ) EU + IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>160 [350]</td>
<td>n/a</td>
<td>260 [570]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-109</td>
<td>4(^\circ) EU &amp; 5° IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>157 [340]</td>
<td>n/a</td>
<td>255 [560]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-111</td>
<td>5(^\circ) IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>149 [320]</td>
<td>n/a</td>
<td>245 [540]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-112</td>
<td>6.906°, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>130 [300]</td>
<td>n/a</td>
<td>220 [490]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-112HB</td>
<td>6.906°, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>130 [300]</td>
<td>n/a</td>
<td>220 [490]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-114</td>
<td>6(^\circ) IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>133 [290]</td>
<td>n/a</td>
<td>227 [500]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-115</td>
<td>5(^\circ) IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>148 [320]</td>
<td>n/a</td>
<td>243 [530]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-117</td>
<td>5.68° HWDP, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>150 [330]</td>
<td>n/a</td>
<td>247 [540]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-118</td>
<td>5(^\circ) IEU, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>154 [330]</td>
<td>n/a</td>
<td>239 [520]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-121</td>
<td>6(^\circ) Knobby, DP</td>
<td>18&quot;</td>
<td>n/a</td>
<td>132 [290]</td>
<td>n/a</td>
<td>227 [500]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-122</td>
<td>4(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>158 [340]</td>
<td>n/a</td>
<td>270 [590]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-128</td>
<td>6(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>155 [340]</td>
<td>n/a</td>
<td>256 [560]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-127</td>
<td>6(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>152 [330]</td>
<td>n/a</td>
<td>252 [550]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-126</td>
<td>6(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>150 [330]</td>
<td>n/a</td>
<td>249 [540]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-189</td>
<td>6(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>148 [320]</td>
<td>n/a</td>
<td>245 [540]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-194</td>
<td>8(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>135 [290]</td>
<td>n/a</td>
<td>225 [490]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-195</td>
<td>8(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>130 [280]</td>
<td>n/a</td>
<td>220 [480]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-196</td>
<td>8(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>125 [270]</td>
<td>n/a</td>
<td>216 [470]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-198</td>
<td>9° DC</td>
<td>90°</td>
<td>n/a</td>
<td>115 [250]</td>
<td>n/a</td>
<td>207 [450]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-199</td>
<td>9(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>110 [240]</td>
<td>n/a</td>
<td>196 [430]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-202</td>
<td>10° DC</td>
<td>90°</td>
<td>n/a</td>
<td>105 [230]</td>
<td>n/a</td>
<td>185 [400]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-203</td>
<td>9(^\circ) DC</td>
<td>90°</td>
<td>n/a</td>
<td>108 [230]</td>
<td>n/a</td>
<td>191 [420]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>680006-229</td>
<td>7° Cig</td>
<td>90°</td>
<td>n/a</td>
<td>144 [310]</td>
<td>n/a</td>
<td>220 [480]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-231</td>
<td>7(^\circ) Cig</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>207 [450]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-234</td>
<td>8(^\circ) Cig</td>
<td>90°</td>
<td>n/a</td>
<td>119 [260]</td>
<td>n/a</td>
<td>185 [400]</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-236</td>
<td>9(^\circ) Cig</td>
<td>90°</td>
<td>301 [660]</td>
<td>101 [220]</td>
<td>470 [1030]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-238</td>
<td>10(^\circ) Cig</td>
<td>90°</td>
<td>290 [630]</td>
<td>n/a</td>
<td>456 [1000]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-239</td>
<td>11(^\circ) Cig</td>
<td>90°</td>
<td>278 [610]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-242</td>
<td>13° Cig</td>
<td>90°</td>
<td>261 [570]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-243</td>
<td>13(^\circ) Cig</td>
<td>90°</td>
<td>255 [560]</td>
<td>n/a</td>
<td>402 [880]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-245</td>
<td>16° Cig</td>
<td>90°</td>
<td>210 [460]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-247</td>
<td>18° Cig</td>
<td>90°</td>
<td>164 [360]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-248</td>
<td>18(^\circ) Cig</td>
<td>90°</td>
<td>n/a</td>
<td>257 [560]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-249</td>
<td>20° Cig</td>
<td>90°</td>
<td>111 [240]</td>
<td>n/a</td>
<td>211 [460]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-255</td>
<td>14° Cig</td>
<td>90°</td>
<td>246 [540]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-259</td>
<td>13(^\circ) Cig</td>
<td>90°</td>
<td>252 [550]</td>
<td>n/a</td>
<td>396 [870]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>P/N</td>
<td>Bushing Size</td>
<td>Taper</td>
<td>AMP® 350-2</td>
<td>AMP® 500-1</td>
<td>AMP® 500-2</td>
<td>AMP® 750-1</td>
<td>AMP® 1000-1</td>
<td>AMP® 1250-1</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>-------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>638206-264</td>
<td>13°, Csg</td>
<td>90°</td>
<td>229 [500]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>638206-265</td>
<td>9°, Csg</td>
<td>90°</td>
<td>299 [650]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>155 [340]</td>
</tr>
<tr>
<td>678106-276</td>
<td>4°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>267 [580]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-284</td>
<td>6°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>246 [540]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>678106-286</td>
<td>6°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>243 [530]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-287</td>
<td>6°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>222 [480]</td>
</tr>
<tr>
<td>688006-293</td>
<td>8°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>197 [430]</td>
</tr>
<tr>
<td>678106-295</td>
<td>8°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>212 [460]</td>
<td>n/a</td>
<td>n/a</td>
<td>190 [410]</td>
</tr>
<tr>
<td>678106-296</td>
<td>8°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>206 [450]</td>
<td>n/a</td>
<td>n/a</td>
<td>185 [400]</td>
</tr>
<tr>
<td>678106-298</td>
<td>9°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>185 [400]</td>
<td>n/a</td>
<td>n/a</td>
<td>161 [350]</td>
</tr>
<tr>
<td>678106-301</td>
<td>10°, DC</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>172 [370]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-312</td>
<td>9°, Csg</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>167 [360]</td>
</tr>
<tr>
<td>678106-532</td>
<td>8°, RRT</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>218 [480]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>648006-538</td>
<td>9°, RRT</td>
<td>90°</td>
<td>n/a</td>
<td>100 [220]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-540</td>
<td>9°, RRT, Csg</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>159 [350]</td>
</tr>
<tr>
<td>678106-545</td>
<td>8° SC, RRT</td>
<td>90°</td>
<td>n/a</td>
<td>n/a</td>
<td>217 [470]</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>688006-713</td>
<td>6°, IEU, DP</td>
<td>45°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>203 [440]</td>
</tr>
<tr>
<td>688006-714</td>
<td>6°, IEU, DP</td>
<td>45°</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>211 [460]</td>
</tr>
</tbody>
</table>
1.5 Optional Accessories

To ease the handling and to support the AMP® functions following accessories are available for the AMP®. Please contact your local FORUM Handling Tools representative for detailed information.

- **Grease Pump**
  - Manual operated: P/N 755667-3
  - Pneumatic operated: P/N 776810
  - Pneumatic operated (ATEX): P/N 775810-A
  Grease pumps to apply lubricant to the lubrication points.

- **Control Manifold for AMP®**
  - P/N 645002-EL
  Control Manifold for Rotator: P/N 678190-EL
  The Control Manifold allows simple and convenient control of the AMP® and the Rotator. The control Manifold contains all controls and regulating elements required for operation of the AMP® and the Rotator.

- **Transport Tool**
  - P/N 678133
  The optional Transport Tool enables the changes of a complete set of bushings with one task.

- **Hook Up Kit / Elevator Tool Kit**
  The Hook Up Kit (P/N 648100-HUK) for the AMP® contain equipment required by the customer for transport, setup and startup. The kits consists of following Items:
  - Manual operated Grease pump: P/N 755667-3
  - Pneumatic operated Grease pump: P/N 776810
  - Pneumatic operated (ATEX) Grease pump: P/N 775810-A
  - Control Manifold Rotator: P/N 645002-EL
  - Control Manifold AMP®: P/N 678190-EL
  - Transport Tool: P/N 678133
  - Hook Up Kit / Elevator Tool Kit: P/N 648100-HUK

### 1.5.1 Recommended consumables

#### 1.5.1.1 Hydraulic Fluid

FORUM Handling Tools recommends use of the following hydraulic fluids under various ambient conditions:

<table>
<thead>
<tr>
<th>Brand</th>
<th>Flash point [°F/(°C)]</th>
<th>Above -4 °F</th>
<th>Flash point [°F/(°C)]</th>
<th>Below -4 °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aral</td>
<td>435.2 (224)</td>
<td>Aral Vitam GF 46</td>
<td>392 (200)</td>
<td>Aral Vitam GF 32</td>
</tr>
<tr>
<td>Castrol</td>
<td>392 (200)</td>
<td>Hyspin AWS-46</td>
<td>366.8 (186)</td>
<td>Hyspin AWS-32</td>
</tr>
<tr>
<td>Gulf</td>
<td>410 (210)</td>
<td>Harmony 46AW</td>
<td>395.6 (202)</td>
<td>Harmony 32AW</td>
</tr>
<tr>
<td>Shell</td>
<td>424.4 (218)</td>
<td>Telus 46</td>
<td>408.2 (209)</td>
<td>Telus 32</td>
</tr>
<tr>
<td>Finke</td>
<td>572 (300)</td>
<td>Aviaticon HY-HE-46</td>
<td>509 (265)</td>
<td>Aviaticon HY-HE-32</td>
</tr>
<tr>
<td>Fuchs</td>
<td>428 (220)</td>
<td>Renolin MR 10</td>
<td>410 (210)</td>
<td>Renolin MR 15</td>
</tr>
</tbody>
</table>

#### 1.5.1.2 Lubricants

FORUM Handling Tools recommends use of the following lubricants for effective lubrication under various ambient conditions:

<table>
<thead>
<tr>
<th>Brand</th>
<th>Name</th>
<th>Temperature range</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finke</td>
<td>Aviaticon XRF Low-Viscosity Lubricant</td>
<td>-20 °C to +29 °C (-4 °F to +84.2 °F)</td>
<td>NLGI 0</td>
</tr>
<tr>
<td>Fuchs</td>
<td>NESSOS SF0 EP Lubricant for non-oil tight gear trains</td>
<td>-20 °C to +29 °C (-4 °F to +84.2 °F)</td>
<td>NLGI 0 DIN 51825 GPOF-25</td>
</tr>
</tbody>
</table>

* For temperatures above +30 °C (+86 °F) FORUM Handling Tools recommends using lubricants in consistency class NLGI 2.

---

INFO

The specified lubricants are obtainable through FORUM Handling Tools. Contact your local representative.
1.6 Elevator Rotator Systems

1.6.1 Single Elevator Rotator System

The FORUM Handling Tools Elevator Rotators are designed to be used for rotating an elevator. The control manifold delivered by FORUM Handling Tools can be used to control the rotation angle. For use with the AMP® specially designed Adapter Kits based on the type series must be installed. The rotation system is useable on both sides of the AMP, for a max. flexibility.

Technical Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Single /Double Elevator Rotator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partnumber</td>
<td>See chapter Rotator Packages Single Rotator.</td>
</tr>
<tr>
<td>Working pressure</td>
<td>210 bar (3,045 PSI)</td>
</tr>
<tr>
<td>Max. Pressure</td>
<td>300 bar (4,350 PSI)</td>
</tr>
<tr>
<td>Required Flow rate</td>
<td>2.2 to 10 GPM (8.3 - 37.9 Lpm)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20°C to +80°C (-4°F to 176°F)</td>
</tr>
<tr>
<td>Active rotation angle:</td>
<td>Single acting rotator 0° to +90° (-55° floating)</td>
</tr>
<tr>
<td></td>
<td>Double acting rotator -55° to 90°</td>
</tr>
<tr>
<td>Weight</td>
<td>215.47 kg [475.03] (Single acting Rotator)</td>
</tr>
<tr>
<td></td>
<td>185.30 kg [408.52 lbs] (Double acting Rotator)</td>
</tr>
</tbody>
</table>

Fig. 16: Single Elevator Rotator Link Bushing

Fig. 17: Rotator Adapter

Fig. 18: AMP® with Single Rotator

Fig. 19: FORUM Handling Tools Single Elevator Rotator System Main Dimensions
### 1.6.1.2 Rotator Packages Single Rotator

#### Rotator Package 678810-.....10

<table>
<thead>
<tr>
<th>Elevator</th>
<th>Package P/N</th>
<th>Description</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP® 350-2</td>
<td>678810-350.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 350</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 500</td>
<td></td>
</tr>
<tr>
<td>AMP® 500-1 AMP® 500-2</td>
<td>678810-500.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 750 -1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 750-1 AMP® 1000-1</td>
<td>678810-750.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 750</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 1250-1</td>
<td>678810-1250.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 1500-1</td>
<td>678810-1500.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1250</td>
<td></td>
</tr>
</tbody>
</table>

#### Rotator Package 678811-.....10

<table>
<thead>
<tr>
<th>Elevator</th>
<th>Package P/N</th>
<th>Description</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP® 350-2</td>
<td>678811-350.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 350</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 500</td>
<td></td>
</tr>
<tr>
<td>AMP® 500-1 AMP® 500-2</td>
<td>678811-500.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 500</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 750 - 1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 750-1 AMP® 1000-1</td>
<td>678811-750.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 750</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 1250-1</td>
<td>678811-1250.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 750</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1250</td>
<td></td>
</tr>
<tr>
<td>AMP® 1500-1</td>
<td>678811-1500.10</td>
<td>Link Adapter</td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bushing 1000 - 1500</td>
<td></td>
</tr>
</tbody>
</table>
1.6.2 Double Elevator Rotator System

The FORUM Handling Tools Elevator Rotators are designed to be used for rotating an elevator. The control manifold delivered by FORUM Handling Tools can be used to control the rotation angle. For use with the AMP® specially designed Adapter Kits based on the type series must be installed.

1.6.2.1 Main Dimensions and Technical data

Technical Data

<table>
<thead>
<tr>
<th>Name</th>
<th>Double Elevator Rotator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partnumber</td>
<td>645 800</td>
</tr>
<tr>
<td>Working pressure = Max. Pressure</td>
<td>210 bar (3,045 PSI)</td>
</tr>
<tr>
<td>Required Flow rate</td>
<td>2.2 to 10 GPM</td>
</tr>
<tr>
<td></td>
<td>(8.3 - 37.9 Lpm)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>- 20°C to + 80°C</td>
</tr>
<tr>
<td></td>
<td>(- 4°F to 176°F)</td>
</tr>
<tr>
<td>Rotation Angle</td>
<td>240°</td>
</tr>
<tr>
<td></td>
<td>(+120° doors up / -120° doors down)</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Long lever</td>
<td>560 kg (1,234 Lb)</td>
</tr>
<tr>
<td>Short Lever</td>
<td>540 kg (1,234 Lb)</td>
</tr>
</tbody>
</table>

Main Dimensions

![Double Elevator Rotator System Main Dimensions](image)

Fig. 20: FORUM Handling Tools Double Elevator Rotator System Main Dimensions

1.6.2.2 Modification Kit for Double Elevator Rotator

<table>
<thead>
<tr>
<th>Elevator</th>
<th>Adapter for double Elevator Rotator</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP® 350</td>
<td>on request</td>
</tr>
<tr>
<td>AMP® 500</td>
<td>on request</td>
</tr>
<tr>
<td>AMP® 750</td>
<td>on request</td>
</tr>
</tbody>
</table>
1.7 **Equipment Markings**

The markings serve for traceability and provide general information about the component/equipment. All markings are in compliance to the latest API 8C and at least include the following information:

**General Markings according to API 8C**
- API Stamp (API monogram, spec, license)
- Manufacturer’s specifications (FORUM logo)
- Production Date (Month / Year)
- Part number (marking P/N before the part number)
- Serial number (marking S/N before the serial number)
- Load Rating
- Equipment weight
- CE-ATEX marking (II 2G IIB T5 / T6)
- Country of manufacture

The email address of the manufacturer is given on the support sticker if service is required.

![Fig. 22: Contact with Technical Support](image)

![Fig. 23: Position of Technical Support Sticker](image)

![Fig. 24: Position of Equipment Markings](image)
2 Safety

SAFETY IS EVERYONE'S RESPONSIBILITY BUT IT STARTS WITH YOU!

The AMP® is designed and produced with consideration of all required safety precautions. Failure to observe the safety precautions and operating instructions specified in this OMM can lead to hazardous situations when operating the AMP®. While it is not possible to eliminate all hazardous situations with awareness and instruction from this OMM, good judgement should be used at all times surrounding the use of the AMP®. The AMP® should only be used for its intended purpose. Rectify all faults immediately, which could have a negative effect on the AMP® safety.

2.1 General Safety Precautions

Ensure that work on the AMP®, particularly installation, maintenance and repair work, is performed only by personnel with the necessary qualifications and who are familiar with the associated risks (chapter VI Obligations of the Operating Company, on page 7). For safe and proper operation of the AMP®, it is essential that all personnel working on the AMP® take the prescribed safety measures and observe the safety precautions specified in this OMM. Before switching on and before working on the AMP® always ensure that no one is put in a hazardous situation. All safety features must be installed completely before switching on the AMP®.

Safety features may be released only when:

1. The entire AMP® is switched off.
2. Switching back on unintentionally is not possible.

The AMP® contains components subject to wear. After longer periods of operation, the safety can be reduced due to wear. Service the AMP® regularly in compliance with the maintenance chart (chapter 6.3 Inspections, on page 65) to ensure that all safety requirements are always fulfilled. Check the specified wear limits regularly. Replace worn or defective parts immediately with new parts. If safe operation is not able to guarantee, switch off the AMP® and secure it against being switched back on unintentionally. Advise the responsible service organization. Rectify every fault, which affects the safety, immediately.

INFO

The operating company is responsible for ensuring safe and correct use of the equipment within the sense of the hazard and risk analysis. The operating company is also obligated to issue and supervise observance of operating instructions on safe use as well as to observe the instructions in this OMM.

2.2 Safety Equipment

The AMP® is equipped with various safety features for protection of the operating personnel:

- During operation, all moving parts are secured against reaching in by screwed covers.
- The hydraulic lines are connected with safety quick-release couplings.
- Hazard points on the AMP® are marked with signs indicating the type and consequences of a hazard as well as measures to prevent it.
- All components, particularly parts requiring replacement during conversion work when changing pipe sizes, are equipped with threaded holes for screwing in load bolts or with fixed load bolts.
- External hoses are provided with a chafe guard.
- The complex structure of the hydraulic circuit prevents opening of the AMP® when it is under load.

Never remove the safety equipment or replace it with safety equipment not approved by FORUM Handling Tools. Failure to observe this instruction can lead to hazardous situations for which FORUM Handling Tools cannot be held responsible.

Always keep all safety equipment in working condition and check integrity regularly.

![AMP® Hazardous Locations](image)

WARNING

Reuse of safety components can cause accidents.

- Never reuse safety-relevant parts (such as securing cables or plates, discs or washers).
- Replace such components with new safety parts.
2.3 Safety Precautions

The safety precautions in this OMM are using standardized depictions and symbols. Examples of the symbols and terms used in this OMM are explained below. They are shown wherever possible hazards are present.

2.3.1 Warning Signs

⚠️ DANGER
Suspended load!
This indicates injury risks from transporting heavy components.

⚠️ DANGER
Tipping hazard for components!
This indicates injury risks from tipping components.

⚠️ WARNING
Danger of pinching/crushing hands!
This indicates injury risks from moving parts, which pose a hazard of pinching or crushing hands.

⚠️ WARNING
Danger of pinching/crushing feet!
This indicates injury risks from moving parts, which pose a hazard of pinching or crushing feet.

⚠️ WARNING
Danger of pinching/crushing body!
This indicates injury risks from moving parts, which pose a hazard of pinching or crushing the body.

⚠️ WARNING
Separated hydraulic lines pose an injury hazard!
This symbol marks areas where injuries are possible from disconnecting hydraulic lines in which the pressure has NOT been relieved.

⚠️ WARNING
Defective hydraulic lines pose an injury hazard!
This symbol marks areas where injuries are possible from defective hydraulic lines.

⚠️ WARNING
Health hazards from service products!
This symbol warns of health hazards resulting from contact of service products (e.g. lubricants, hydraulic fluids) with the skin, mucous membranes, eyes and respiratory paths.

⚠️ CAUTION
Risk of stumbling/tripping!
This symbol warns of tripping hazards, which can lead to stumbling resulting in injuries.
2.3.2 Warning and Safety Signs on AMP®

Warning and safety stickers indicate hazardous points on the AMP®.

INFO

Ensure that warning and safety signs are always present and readable. They must be in an easily legible state and replaced as required. Refer to our Service department with the part numbers given on this page.
**SAFETY**

1. **WARNING**
   - Danger of pinching/crushing hands!
   - Fig. 27: WARNING sign "Hazard – Hand Injury" ANSI Z535.4 - P/N 671640-1

2. **WARNING**
   - Danger of pinching/crushing body!
   - Fig. 28: WARNING sign "Body crushing" ANSI Z535.4 - P/N 671641

3. **WARNING**
   - Warning against unintended closing!
   - Fig. 29: WARNING sign "Closing" ANSI Z535.4 P/N 671639

4. **WARNING**
   - Warning against unintended movements!
   - Fig. 35: P/N 645814

5. **Technical Support**
   - Fig. 31: Support sticker P/N 613129

6. **Don’t Touch**
   - Fig. 32: Don’t Touch - P/N 611524

7. **Lifting Point**
   - Fig. 33: Lifting Point - P/N 671646

8. **Grease Daily**
   - Fig. 34: Lifting Point - P/N 671646
2.4 Safety Precautions for Protection against Remaining Hazards

The AMP® was designed and produced in consideration of the safety precautions specified in EC Directive 2006/42/EC on Machinery. The AMP® may be used only for:

- Its intended purpose (refer to chapter “II Intended Use”, on page 5).
- When it is in a technically safe state.

Nevertheless, it is not possible to completely exclude all hazardous situations which could arise when the Equipment is used. Reference is made to these remaining risks at the beginning of each section and at the corresponding points in the description and measures for avoiding these risks are explained.

**WARNING**

Mechanically generated sparks.

During some troubleshooting tasks, like such as clamping components, the use of metal equipment can generate sparks.

- The use of metallic tools in hazardous areas must be prohibited by the operating company.
- Only use non-metallic tools for loosening of clamping components.

**INFO**

The operating company is responsible for ensuring that all personnel working on the AMP® is familiar with the remaining risks and observe the appropriate safety precautions.

### 2.4.1 Incorrect Handling of Hydraulic Equipment

**WARNING**

Defective hydraulic lines pose an injury hazard!

Hydraulic lines are subjected to wear and may be damaged during operation.

- Route hydraulic lines safely and check regularly for damages.
- Provide lines with chafe protection.
- Replace defective lines immediately.

**WARNING**

Separated hydraulic lines pose an injury hazard!

Hydraulic fluid can escape under high pressure.

- Always relieve pressure in hydraulic equipment before working on equipment.
- Check hydraulic connections regularly to ensure that they are properly fastened.

**WARNING**

Hydraulic fluid can pose a health hazard!

Hydraulic fluids can lead to skin and eye injury and poisoning symptoms upon contact.

- Avoid direct contact with hydraulic fluids.

WEAR EYE PROTECTION!

WEAR PROTECTIVE GLOVES!

Weak hydraulic lines due to incorrect routing or damages can burst under load. The hydraulic fluid then escapes under pressure resulting in a powerful jet, which can lead to skin or eye injury.

For this reason always

- Lay hydraulic lines so that they are not kinked or pinched.
- Check regularly for damage and replace as required.

Always wear your personal protective equipment.

Hydraulic system safety instructions
1. Release the pressure in all lines carrying hydraulic oil prior to any maintenance and repair work.
   » Lower all hydraulically controlled components to the ground.
   » Move all control levers of the hydraulic control valves several times.

2. Hydraulic oil escaping under high pressure can penetrate the skin and cause serious injuries. Always consult a doctor immediately even if the wound seems insignificant – otherwise serious infections could set in!

3. Replace the hose or line if one of the problems mentioned below is detected.
   » Damaged or leaky hydraulic seals.
   » Worn or torn shells or uncovered reinforcement branches.
   » Expanded shells in several positions.
   » Foreign bodies jammed or stuck in protective layers.

4. Re-tighten leaking screwed fittings and hose connections only when the system is not under pressure; i.e. release the pressure before working on pressurized lines!

5. Never weld or solder damaged or leaking pressure lines and screw connections. Replace damaged parts with new ones!

6. Never search for leaks with your bare hands, always wear protective gloves!
   » Use paper or wood to check for minor leaks.

7. Leaks and damaged pressure lines have to be repaired or replaced immediately.

### 2.4.2 Danger of Pinching/Crushing

**WARNING**

**Danger of pinching/crushing hands!**
Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.
» NEVER reach between moving components.

**WARNING**

**Danger of pinching/crushing feet!**
Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.
» NEVER stand below moving components.

**WARNING**

**Danger of pinching/crushing body!**
Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.
» NEVER stand between moving components.

During assembly, set-up and conversion work as well as during operation, pinching/crushing hazards are possible. Pay attention to hands, feet and body when performing the work specified. Always ensure that no one is in a hazardous position.
» Always wear your personal protective equipment.
2.5 Human Error
Ignorance of hazards, inattentiveness and limited reactions can lead to hazard situations while working with the AMP®.

Safe Work
1. All personnel working with the AMP® are responsible for paying attention to their colleagues.
2. Consumption of alcohol and drugs is prohibited.
3. Work on the AMP® is not permissible after taking medication, which reduces reactions.
4. AT LEAST visual contact must exist between the operator in the doghouse and the personnel at the AMP®, to allow communication via hand signals.
5. Always keep your personal protective equipment in perfect condition.
6. All personnel working on the AMP®, must be familiar with and observe the safety precautions in this instruction manual and on the equipment.
7. Observe the instructions for handling and maintenance intervals specified in this OMM.
8. Keep a copy of this OMM near the equipment, where it is accessible at all times.

2.6 Organisational Measures
The operating company is responsible for ensuring that all legally and officially prescribed approvals for operation of the equipment are present in compliance with national laws and regulations.

The required personal protective equipment (chapter „IX Personal Protective Equipment (PPE)“, on page 10) must be provided by the company operating the equipment.

All safety features present must be checked regularly in compliance with national and local requirements.

Warning signs and safety notices on the AMP® must be easily legible at all times and replaced as required.

The operating instructions must be kept so that they are available to those operating the AMP® at all times.

Personal Protective Equipment
The required Personal Protective Equipment (PPE) must be used when operating the AMP®. This is to be provided by the operating company.

The following PPE is recommended:
- Oil resistant protective clothing,
- Protective gloves,
- Eye protection,
- Safety shoes,
- Protective helmet.

All parts of the protective equipment must be checked regularly for damage in compliance with the specific national regulations and replaced as required.
Transport / Setup

Ensure that only sufficiently qualified and trained personnel accomplish setup and installation work.

Read these instructions carefully before setting up the equipment and putting it into service.

WEAR PROTECTIVE HELMET!

WEAR PROTECTIVE GLOVES!

WEAR SAFETY SHOES!

DANGER
Suspended load!
The falling load can cause severe, even lethal injuries.

Never stand beneath or in the swing area of lifted loads or loads suspended from a crane.

3.1 Delivery
The AMP® and all accessory parts are shipped in a transport crate. Instructions for safe transport are attached to the transport crate. Transport the packed equipment as specified in these instructions.

3.2 Scope of Delivery

INFO
The contract documents and shipment papers specify the precise scope of delivery. Check these documents carefully on delivery. In the event of any discrepancies, please contact the FORUM Handling Tools representative (see „X-01 Contact Worldwide“, on page 11).

The scope of delivery includes all components required for the intended operation of the AMP®.

Unpacking and Disposal of Packing Material
Remove the transport packaging and transport aids before hoisting the equipment to final site.

INFO
Do not remove transport retainers!
Remove transport retainers only at the installation site just before start up.

Check scope of delivery

1. Is any transport damage visible?
2. Is the shipment complete? Compare the scope of delivery with the specifications in the shipping documents.

If the AMP® has been damaged during transport or the shipment is incomplete, please notify the manufacturer immediately (see „X-01 Contact Worldwide“, on page 11).
Dispose of the packaging material ecologically in compliance with all applicable regulations.
3.3 Transport

INFO

Internal transport and Safe Lifting Points!

Lifting point locations especially bores for load hooks are marked on the AMP®.

- Make Sure all load hooks are fully installed in the lifting point.
- Use a pallet for transport.
- Thus, the safe transport of FORUM Handling Tools equipment is ensured.

» Detailed weight specifications are given in the Chapter „1.4 Technical Data“, on page 17

Principles for transport

1. Dimension all transport routes sufficiently.
2. Always use pallets for longer transport distances.
3. The total weight (object to be transported + means of transport, e.g. forklift) must not exceed the supporting capacity of the subsurface.
4. Ensure that only sufficiently qualified personnel perform such work.
5. Ensure that visual and audio contact exists between the crane operator and operating personnel.
6. Secure the area against not authorized entry. If necessary mark the area with information signs to warn of maintenance and repair work.
7. Secure moving parts in suitable manner
8. Use only approved slinging and transport equipment, which is in perfect condition and suitable for the intended purpose. Observe specified load limits.
10. Never stand under suspended loads.
11. Transport the AMP® carefully. Do not fasten, lift or pull equipment on parts, which are not suitable for transport. Avoid sudden stops.
12. Always use hoisting equipment (slings, hoisting cables, shackles, etc.), which has been inspected and is sufficiently dimensioned.
13. Ensure that all installation and hoisting procedures comply with recognized rules of practice and industrial standards.
3.4 Lifting arrangements

This chapter shows safe lifting arrangements for the main assemblies. It may show the AMP® in different assembled states, refer to the suitable set-up chapter for assemble tasks.

**Hoist the equipment safely**

1. Attach the AMP® only at the attachment points provided for transport.
2. Only use approbate lifting material with a load carrying capacity suitable to the weight of the elevator.
3. Attach and tension the hoisting ropes so that they are straight without kinks.
4. Use hoisting cables and load hooks with sufficient supporting capacity.

**INFO**

Lifting angle limited to 45°!
The hoisting eyes installed are suitable for 1500 kg each. Therefore, the lifting angle of the hoisting equipment might not succeed 45°.

**DANGER**

Safe Lifting!

» Always install load hooks completely to lifting points before lifting the AMP®.

3.4.1 Rotator Lifting arrangement

**Warning**

Be aware that the correct size of Rotator Link Bushing is used.

» It is off-limits to use the Single Elevator Rotator with a not matching component size (i.e. 4 1/4" bushing assembly with a 4 3/4" Link), as the clearance between the rotator link bushing and Link diameter must be exact. The Rotator Elevator-Link Bushing must not be too close to the Elevator-Link as the Single Rotator cannot move up and down.

» Never operate the Single Elevator Rotator without or with incorrect Link Bushing.

3.4.1.1 Single Rotator

1. Fasten the lifting material on Single Rotator lifting points.
2. Lift the Single Rotator slightly to tension the lifting material.

**WARNING** Danger of collision with swinging loads! Ensure that no one is present in the swing range of the AMP®.

3. Lift the Single Rotator
4. Move the Single Rotator to the installation location.
5. Set the Single Rotator down carefully on a suitable subsurface.

---

**Fig. 38:** Hoisting points - Single Rotator
### 3.4.2 AMP® Lifting arrangement

1. Fasten the lifting material on AMP® lifting points.
2. Lift the AMP® slightly to tension the lifting material.

⚠️ **WARNING** Danger of collision with swinging loads! Ensure that no one is present in the swing range of the AMP®.

3. Lift the AMP®.
4. Move the AMP® to the installation location.
5. Set the AMP® down carefully on a suitable subsurface.

---

### 3.4.3 AMP® Bushing lifting arrangement

1. Fasten the lifting material on Bushing segment.
2. Lift the Bushing segment slightly to tension the lifting material.

⚠️ **WARNING** Danger of collision with swinging loads! Ensure that no one is present in the swing range of the Bushing segment.

3. Lift the segment.
4. Move the segment to the installation location.
5. Set the segment down carefully on a suitable subsurface.
3.5 Setup

**WARNING** Pinching/crushing hazard from lowering!
Severe pinching/crushing up to loss of limbs.
» Never step over edge of Rotary Table with feet.

**WARNING** Danger of pinching/crushing hands!
Moving parts pose a hazard during assembly, set-up and conversion work as well as during operation.
» Never reach between moving components.

**WARNING** Never operate the AMP® without bushings.

3.5.1 Mounting the AMP® to Elevator-Links

**Preparation**
1. Remove the transport packaging and transport aids from the AMP®.
2. Position the AMP® on the rig near the Elevator-Links.

**Procedure**
1. Place the AMP® on a plane surface.
2. Open the Link Adapter 1 by removing the upper Link Block screw.
3. Move the Link Block 2 upwards.
4. Carefully guide the Elevator-Link to the AMP® 3. Make sure, the Elevator-Link is mounted and placed correctly.

**WARNING** Pinching and crushing!
Always guide Elevator-Links from the outside of the Lifting ear opening of the AMP®. Use ropes to adjust the Elevator-Links.

5. Move Link Block upwards and secure with Link Block screw 4.
6. Tighten screw with 309 lb ft / 419 Nm.
7. Repeat step 2 to 6 on the other side of the AMP®.

**Removal**
1. Perform the installation tasks in reversed order.
### 3.5.2 Installation of the Single Elevator Rotator

In order to install the Single Elevator Rotator for each FORUM Handling Tools AMP® Type Elevator, Rotator Adapter are available which must be installed. A set of Elevator Rotator Adapter consists of one segments.

**WARNING**

Never operate the rotator without suitable elevator rotator adapter!

#### Equipment

- Approbate lifting equipment to lift the Single Elevator Rotator.
- Screw wrench.

#### Procedure

1. Place the elevator on a plane surface.

2. Remove the standard Elevator Link adapter.

3. Install the approbate Elevator Rotator adapter to the AMP®. Tighten all screws.

4. Carefully guide the link to the elevator. Make sure, the Elevator Link is mounted and placed correctly.

**WARNING** Pinching and crushing!

Always guide Elevator-Links from the outside of the Lifting ear opening of the AMP®. Use ropes to adjust the Elevator-Links.

5. Put up the Elevator Rotator adapter to the AMP® and Tighten the screw.
6. Attach the Single Elevator Rotator to a crane ⑥.

7. Lift the Single Rotator gently.

8. Open upper Elevator-Link attachment ⑦ of Single Rotator.

**WARNING** Be aware that the correct size of Rotator Link Bushing is used. It is off-limits to use a Rotator Bushing assembly for 4.3/4” Elevator-Links with a 4.5/8” Elevator-Link and vice versa. There must be enough clearance between the Rotator Bushing and diameter of the attached Elevator-Link. Never operate the Single Elevator Rotator without or with incorrect Rotator Bushing.

9. Slowly lift and guide the Single Elevator Rotator towards the Elevator Link and AMP®.

10. Connect the Single Rotator with the Hydraulic Supply.

11. Apply pressure to the Single Rotator and align the arm of the Single Rotator to the Rotator Adapter.

12. Lift the Single Elevator Rotator above the Link Block. Position the Single Rotator arm in the recess of the Rotator Adapter ⑧.

13. Place and tighten screw, nut and washer ⑨.


» The Single Elevator Rotator is installed to the AMP®.

**Removal**

1. Perform the installation tasks in reversed order.

**NOTE** Positioning of the Single Rotator!

Make sure the Single Rotator arm is pointing downwards. This is the only way to pull out the Single Rotator out of the Rotator Adapter safely.

Fig. 49: Installation step V

Fig. 50: Installation step VI

Fig. 51: Installation step VII

Fig. 52: Installation step VIII
3.5.3 Installation the Double Elevator Rotator

In order to install the Double Elevator Rotator for each FORUM Handling Tools AMP® type elevator rotator adapter are available which must be installed.

A set of elevator rotator adapter consists of one pair segments.

⚠️ WARNING
NEVER operate the rotator without suitable elevator rotator adapter!

**Tools**
- Appropriate lifting equipment to lift the Double Elevator Rotator
- Screw wrench

**Installation**

2. Place the elevator on a plane surface.
3. Install the appropriate elevator rotator adapter to the AMP® to ensure safe fitting of the rotator.
4. Remove screws 1, 2 in securing adapter 3 and remove securing adapter 3.

5. Install adapter plate 4 and securing adapter 3 from elevator rotator to AMP®.
6. Attach adapter plate 4 and securing adapter 3 with screws. Tighten screw with 231 lbf-ft / 313 Nm.

7. Move the lower opening of the links y over the lifting ears of the AMP®.

⚠️ WARNING Pinching and crushing!
The links must be handled and guided from the outside of the Lifting ear opening of the VES SD. Use ropes to adjust the links.

---

Fig. 53: Removing the AMP® securing adapter

Fig. 54: Installation of the elevator Rotator adapter to the AMP®

Fig. 55: Mounting the AMP® to elevator links
8. Attach elevator rotator to crane.
9. Lift elevator rotator carefully to the AMP®.
10. Position lower attachment bracket of elevator rotator in elevator securing adapter.

11. Install the Locking Pin in adapter plate.
12. Install the bolt and secure it with the locking pin.
13. Repeat steps 7 - 11 on the other side of the AMP®.
14. Secure the elevator links with safety rope on elevator rotator top.

» The Double Elevator Rotator is installed to the AMP®.

⚠️ WARNING
Never use the lifting eyes for carrying the elevator/rotator-system.
The eyebolts on top of the Double Elevator Rotation System must never be used for lifting the elevator!
The eyebolts are only attachment points for handling the elevator.
» Lifting the elevator/rotator-system is allowed in links only.

**Removal**
1. Perform the installation tasks in reversed order.
3.6 Installation Checklist

The AMP® has to be installed as shown in the OMM.

**Recommended Checks for general equipment**

| OK | There are no foreign objects in the working area of the AMP®. |
| OK | Lifting equipment has been removed. |
| OK | All assemblies, parts, areas and surfaces which have to be lubricated, are lubricated. |
| OK | All hydraulic lines are aligned correctly. |
| OK | The right size Bushing is in use and secured with Bushing Retainer. |
| OK | There are no loose fittings, hoses, valves and screws. |
| OK | All warning signs are present and readable. |
| OK | No visual damages recognizable. |
| OK | The AMP® is mounted properly to Elevator-Links. |
| OK | All transport tools have been removed. |

**Recommended Checks for additional equipment**

| OK | Lifting equipment has been removed. |
| OK | No visual damages recognizable. |
| OK | There are no loose screws, washers, parts or components. |
| OK | All assemblies, parts, areas and surfaces which have to be lubricated, are lubricated. |
| OK | All transport tools have been removed. |
| OK | The Elevator Rotator is installed correctly [if applicable]. |
| OK | The Control Unit is placed and installed correctly [if applicable]. |
| OK | The right size Bushing Assembly is in use [if applicable]. |
| OK | Both Bushing segments have the identical serial number [if applicable]. |

**INFO**

The Installation Checklist shown above contains only essential points and main contents of an Installation process. Check at least the mentioned points on your AMP®. For further questions or complete Installation Checklists (templates), please contact the Technical Support from FORUM Handling Tools.
COMMISSIONING / OPERATION
4 Commissioning and Operation

Ensure that the AMP® is operated only by personnel trained for this work and familiar with the risks involved in operating the AMP®.

Read these instructions carefully before setting up the equipment and putting it into service.

INFO
FORUM Handling Tools recommends having the AMP® put into service by FORUM Handling Tools.

WEAR PROTECTIVE GLOVES!
WEAR EYE PROTECTION!
WEAR SAFETY SHOES!
WEAR PROTECTIVE HELMET!

4.1 Commissioning

4.1.1 Safety checks before initial operation

Safety checks before initial operation
1. All covers are attached and completely screwed down.
2. All screw connections tightened properly.
3. All screw retainers are present.
4. Serial numbers of Bushing segments are identical.
5. All components correspond to type/size of pipe used.
6. All hydraulic connections are correctly connected and securely laid.
7. No hydraulic lines damaged.
8. All lubrication points lubricated properly.

4.1.2 Energizing the AMP®

WARNING
Hydraulic fluid can pose a health hazard!
Hydraulic fluid can injure the skin, mucous membranes or eyes on contact.
» Do not touch hydraulic fluids.
» Always wear appropriate protective equipment.

NOTE During installation, when setting up and taking down as well as during operation of the AMP® ensure that the hydraulic lines do not chafe. If necessary, provide hydraulic lines with chafe guard.

INFO
Bleeding
The hydraulic system in the AMP® is bled at the factory. Ensure that the rig’s own supply connections are bled before connecting the AMP®.

INFO
Cleaning
Always clean the quick coupling thoroughly before connecting it to its counterpart.

WARNING
Defective hydraulic lines pose an injury hazard!
» Route hydraulic lines safely and check regularly for damage.
» Provide lines with chafe protection.
» Replace defective lines immediately.

WARNING
Separated hydraulic lines pose an injury hazard!
» Hydraulic fluid can escape under high pressure.
» Always relieve pressure in hydraulic equipment before working on AMP®.
» Check hydraulic connections regularly to ensure that they are properly fastened.
4.1.2.1 Installation Schematic (with Single Rotator)

This illustration shows a typical arrangement of the AMP®. The particular arrangement may vary according to individual requirements.

**INFO**

- Hydraulic pressures
  - 140 - 210 bar (2030 - 3046 psi): Operating pressure (Line A/P, B/T, C1, C2)
  - 85 bar (1233 psi): Feedback pressure (Line C/XP)
  - 110 bar (1595 psi): Feedback pressure load sensor activated (Line XP)
  - 140 - 210 bar (2030 - 3046 psi): Floating pressure (Line FL)

**Electric connection**

- S1: Signal - AMP® open
- S2: Signal - AMP® closed
- S3: Feedback - AMP® closed
- S4: Feedback - Load Sensor activated
- S6: Signal - Rotate up
- S7: Signal - Rotate down

**Caption**

- P: Pressure Supply
- T: Tank / Return
- A: Elevator Close
- B: Elevator Open
- C: Feedback Closed / Load Sensor
- FL: Float Signal Pilot Line
- C1: Rotate Up
- C2: Rotate Down
- X: Float Signal Pilot Port

- General setup*
- Optional float configurations, where the float port is not present on the swivel.*

- Hydraulic Power Unit
- Driller’s Cabine
- Driller’s Cabine
- Swivel

- supplied by others
- supplied by FET
- Electrical Lines
- Hydraulic Lines

*The lines 1 and 2 never exist at the same time. Depending on local conditions (customer side), either the line 1 or exists.
4.2 Commissioning Checklist

FORUM Handling Tools strongly recommends accomplishing the commissioning with the FORUM Handling Tools Commissioning Service.

Prior to use of the FORUM Handling Tools following checks must be carried out:

- **OK** Operating personnel is aware of all dangers regarding handling the FORUM Handling Tools AMP® and its additional equipment.
- **OK** The entire operating personnel went through the OMM.

Check Installation and Lubrication

- **OK** AMP® and all additional components are installed as shown in chapter 3.
- **OK** The Installation Checklist has been filled out completely. No fields are left blank and no fields have the status NOK.
- **OK** All parts, components (lifting equipment, etc.) not required for the actual operation have been removed.
- **OK** There are no people in the working area.
- **OK** All assemblies, parts, areas and surfaces which have to be lubricated, are lubricated.

Hydraulic Characteristics

- **OK** Operating pressure: 140 bar (2030 PSI) - 210 bar (3046 PSI)
- **OK** Volumetric flow: 22.7 l/min (6 GPM) - 37.9 l/min (10 GPM)
- **OK** Min. required hydraulic Oil clearness: NAS 9
- **OK** Correct Hydraulic connection/line arrangement.

Function Test AMP®

- **OK** The doors close after supplying pressure to connection “A”.
- **OK** The doors open after supplying pressure to connection “B”.
- **OK** Feedback signal appears when doors and Latch have been closed. Line “C/XP” - 85 bar (1233 PSI).
- **OK** Feedback signal appears when doors and Latch have been closed and load sensor is actuated. Line “C/XP” - 110 bar (1595 PSI).
- **OK** Rotate the AMP® using the Single Rotator. Close the doors. The AMP® is now in Float mode. Check that the AMP® now automatically lowers to a horizontal position.

Function Test Rotator

- **OK** The Rotator begins to rotate upwards after supplying pressure to connection “C1”.
- **OK** The Rotator begins to rotate downwards after supplying pressure to connection “C2” (double acting). The Rotator begins to rotate downwards after releasing pressure from connection “C1” (single acting).

INFO

This commissioning Checklist contains only essential points and main contents of an internal commissioning. Check at least the mentioned points on your AMP®. For further questions or complete Commissioning Checklists (templates), please contact the Technical Support from FORUM Handling Tools.


### Operational Safety

1. The Checklists to verify correct installation and commissioning have been fully processed and completed. There are no points on the lists that would have to be answered with NOK.
2. Do not touch the AMP® while in operation.
3. During operation, keep a safe distance from the AMP®.
4. All screw retainers present.
5. All hoses have to be laid so that they cannot interfere with your work or that you can stumble upon them.
6. FORUM Handling Tools recommends to have the AMP® operated by the driller.
7. No foreign objects obstruct the view between the operating personnel at the borehole and the operator in the drilling cabin.
8. Never open the AMP® when the pipe load is hold by the AMP®.
9. The Feedback appears when it have to appear.

### 4.3.1 Space Requirement

During operation, the AMP® is connected to the Top drive in vertical drilling direction via Elevator-Links.

---

#### Operational Safety

- **WARNING**
  - Danger of pinching/crushing body!
  - The body may fall shut.
  - Do not step between the unsecured shells of the open body.
  - Do not remove the spreading equipment BEFORE closing the body and securing it with the hinge pin.

- **WARNING**
  - Danger of pinching/crushing feet!
  - Transporting and setting down heavy components.
  - Never step below moving equipment parts.

- **WARNING**
  - Separated hydraulic lines pose an injury hazard!
  - Do not fix any disconnected hydraulic lines without depressurizing the complete hydraulic system and all hydraulic lines and couplings.

- **WARNING**
  - Defective hydraulic lines pose an injury hazard!
  - Protect yourself from leaks.

- **WARNING**
  - Hydraulic fluid can pose a health hazard!
  - Hydraulic fluids can lead to skin and eye injury and poisoning symptoms upon contact.
  - Avoid direct contact with hydraulic fluids.

---

#### Maintenance work

- Enough space around the AMP® is required for safe maintenance work.

#### Lifting and Operation

- Always ensure a sufficient distance to the AMP® during operation.
4.3.2 Handling the Drill String

1. Lower the AMP® to the height of the pipe string. The doors of the AMP® are closed. The AMP® is positioned horizontally.

2. Apply pressure to port “B”, to open the doors of the AMP®.

3. Rotate the AMP® upwards by applying pressure to port C1 of the Single Rotator. Based on your individual circumstances, the AMP® is rotated by up to 90 °.

4. Lower the rotated AMP® under the Tooljoint of the pipe string. Place the pipe string in the AMP® so that the Tooljoint protrudes from the AMP®.
5. Lift the rotated AMP® gently. Apply pressure to port “A”, the AMP closes automatically when the trigger pin is actuated by the pipe body. The closed doors release a signal on the “FL” line, which switches the Rotator to float mode.

6. Lift the AMP® gently. The AMP® slowly absorbs the entire load of the pipe string and switches the load sensor at a load of about 140 kg (weight depends on used tubular type and installed bushings). Now, it is impossible to open the AMP®.
4.3.3 Unconventional Opening

In cases of a blocked opening function, the opening of the AMP® can be enforced. Press the emergency valve which is located at the rear door. The actuation of this valve enables a direct bypass of the load sensor system. Eliminate the malfunction. Carry out a function test before continue with standard operation.

**WARNING**

Danger of crushing!

When the pressure signal appears, the door will open, even under load.

4.3.4 Installation and change of AMP® Bushings

Make sure to be installed AMP® Bushings match with the expected load. Use pairing Bushings with the same size and serial number only. A set of bushings consists of five segments.

**WARNING**

NEVER operate the AMP® without bushings!

Preparations

1. Place the AMP® on a plane surface.

Bushing Installation

1. Before installing the new bushings, the seating area in the AMP® have to be cleaned and lubricated 1.

2. Position and tighten the bushing lifting tool in the bores of the bushings segments.

3. Attach hoisting equipment to the lifting tool.

4. Position and centre the attached bushing segments over the AMP® 2.
5. Lower the bushing segments carefully into the AMP®. Make sure all segments are placed and aligned properly.

6. Place all three Bushing Retainers and secure them with the Retainer Bolts and washers.

INFO

Function Test of the Load Sensor
Check the load sensor after installing a new Bushing Assembly. Place a weight of approx. 150 kg on top of bushing no. 1 for testings.

» Watch the segment 1 sagging down. Try to open the AMP®, which must not be possible.

Bushing Removal
1. Perform installation tasks in reversed order.

4.3.4.1 Limiting the Single Rotator
The maximum movement of the Single Elevator Rotator can be limited using the adjustment screw.

1. Locate adjustment screw at the bottom of the Single Rotator.

2. Untighten screw and jamnut to full extend to enable a 90° movement (see illustration).

3. Tighten screw and jamnut to limit the movement.

4. Secure adjusted place with jamnut.
4.3.4.2 Adjustments on Single Rotator

Hydraulic Components

1 - Load Retention [Valve No.2.1]
Keeps the doors of the AMP® open.

- Enhance pressure (load to be hold).
- Reduce pressure (load to be hold).

2 - Load Retention [Valve No.2.2]
Keeps the doors of the AMP® close.

- Enhance pressure (load to be hold).
- Reduce pressure (load to be hold).

3 - Directional Control [Valve No.1]
Closing sequence of the left door and right door.

- Enhance pressure - Left door will close earlier.
- Reduce pressure - Left door will close later.

4 - Pressure Control [Valve No.3]
NOTE Never enhance pressure above the max value of 90bar!
Pressure for feedback for Elevator closed and latched.

- Reduce pressure.
- Enhance pressure.

5 - Directional Control [Valve No. 2a]
NOTE The minimum setting of 130 bar must never be undercut!
Pressure on XP.

- Reduce setup to decrease the required XP pilot pressure.
- Enhance setup to increase the required XP pilot pressure.

6 - Throttle Control [Valve No. 17]
- Open bypass- Activation of Triger function.
- Close bypass- Deactivation of Triger function.

7 - Pressure control valve [Valve No. 4]
NOTE Never enhance pressure above the max value of 110 bar!
Pressure for feedback “load sensor activated”.

- reduce pressure
- increase pressure

8 - Directional Control [Valve No. 1]
Opening sequence of the left door and latch.

- Reduce pressure - left door opens earlier.
- Enhance pressure - Guide Plates retract later.

Fig. 70:  AMP® Valve Block I

Fig. 71:  AMP® Valve Block II

INFO

The Valve No shown in square brackets [] are reflecting the position of the valve in hydraulic schematic for easy identification.
4.3.4.3 Adjustments on Double Rotator

Hydraulic Components
Pressure line: male coupling.
Return line: female coupling.

⚠️ WARNING If the rotation system is connected correctly, it will move upward (doors upwards)

Change the direction of rotation.
» Be sure changing direction of rotation is necessary!
» Make sure both sides of the Rotation system are being set up in the same direction
» There is no switch for changing directions in the Control Switch

1. Open the door by removing securing pin.
2. Pull the cotter spring pin out of the securing plate.
3. Lift up the securing plate.
4. The direction in which the lever has to be pushed is visible. It is marked which rotation direction the system will have after switching.
5. Push the lever into the new position.

⚠️ WARNING Always check if the rotation direction is the same at both sides!

6. Check both sides have the same rotational direction.
7. Close the rotation system and secure the door with the safety pin.
8. After using the rotation system always check if the system has been reset to the "door up" position, to make sure the Elevator will work properly when used again.

⚠️ WARNING If the two sides of the rotation system are not turning into the same direction, damage can be caused to the Elevator and the Rotation System.
In this case all equipment has to be inspected in a FORUM Handling Tools authorized work shop.

Float Mode
For switching the rotation system into ‘float mode”, e.g. for easier installation of the Rotator.

9. Set the hydraulic block in to “Float ON” position. To turn the valve, the tool from the Elevator P/N 775813 can be used.
10. Make sure to bring the system back into the “Float OFF” position.

⚠️ Note Make sure both Rotation Systems are in the same position.
SERVICE
5 Service

Please refer to the Technical Drawing Package 688000-TDP for respective drawings and parts lists

INFO

Please contact the FORUM Handling Tools Technical Support or one of the authorized service companies to order replacement parts or in the event of any questions.

Operational safety and readiness of the AMP® does not only depend on your skills, but also on maintenance and servicing the AMP®. Insist on using original spare parts when carrying out maintenance and repair work. This ensures operational safety and readiness of your AMP® and maintains its value.

5.1 Malfunction

If a malfunction occurs or the AMP® does not operate as expected, troubleshoot as follows:

1. Check hydraulic connections and hydraulic lines.
2. Check the present necessary hydraulic pressure.
3. Check that the required components correspond to the used pipe size.
4. Check for proper lubrication of the AMP®.
5. Check feedback for proper function.
6. Collect all information on the malfunction and define the problem.
7. Attempt to find a quick solution to the problem.
8. Check the last changes/modifications.
9. Isolate the problem.
10. Replace any defective components.

INFO

In the event of problems, which cannot be remedied with the aid of this OMM, please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (see “Contact Worldwide” on page 11).

5.2 Repair

5.2.1 Repair by Customer

It is only permissible for the customer/company operating the AMP® to replace defective parts with OEM (Original Equipment Manufacturer) parts approved by FORUM Handling Tools in conformance with the present operating instructions. Use of parts not approved by FORUM Handling Tools voids the warranty, especially parts that do not comply with the standard 2014/34/EC - ATEX Directive of Equipment for use in hazardous areas.

5.2.2 Repair by Manufacturer

Ensure that only FORUM Handling Tools or an authorized service company performs any repair work required on the AMP®.

INFO

Please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (see “Contact Worldwide” on page 11) to perform repair or maintenance work.

5.3 Drawing, Parts List and Spare Parts

INFO

Please contact the FORUM Handling Tools Technical Support or one of the authorized service companies (see “Contact Worldwide”) to order replacement parts or in the event of any questions.
6 Inspection / Maintenance
This chapter contains important information on how to service your AMP® safely, correctly and economically. It helps to avoid dangerous situations and reduce repair costs and downtimes. Furthermore, the reliability and the service life of the AMP® will be increased by following the instructions in this OMM.

Ensure that only sufficiently qualified and trained personnel accomplish maintenance work.

WEAR EYE PROTECTION!

WEAR PROTECTIVE HELMET!

WEAR PROTECTIVE GLOVES!

WEAR SAFETY SHOES!

Instructions for inspection and maintenance

1. In the event of visible damage or excessive wear contact the FORUM Handling Tools Service Department or an authorized repair company.

2. Ensure that exclusively the FORUM Handling Tools Service Department or an authorized repair company observing the FORUM Handling Tools welding instructions performs welding work on cast parts.

3. Ensure that all other maintenance work is performed only by personnel trained for this work and familiar with the risks involved in operating the equipment.

4. Ensure that all repair work not performed by FORUM Handling Tools is nevertheless accomplished in compliance with the manufacturer’s specifications and instructions.

5. Small cracks and irregularities, which do not affect the safety or proper operation of the AMP® can be removed by grinding (Refer to Critical Areas).

6. Always check the repaired part in a suitable manner to ensure that the defect has been remedied.

Prerequisites for maintenance work

1. Ensure that the AMP® is set down on a good supporting surface so that it could not tip.

2. Provide for sufficient lighting at the workplace.

3. The AMP® must be removed from the Elevator-Links.

4. Ensure that AMP® is disconnected from hydraulic system.

WEARING EYE PROTECTION!

Health hazards from service products!
Service products (lubricants, oil) cause irritation of the eyes and skin.
» Always wear your personal protective equipment.
6.1 Cleaning
The operating conditions and operating environment result in contamination on the AMP®. Remove this contamination regularly to prevent incrustation and to ensure safe operation of the AMP®. Clean contamination from drilling from the AMP® regularly. The AMP® should be cleaned thoroughly at the end of each shift at the latest. FORUM Handling Tools recommends cleaning the AMP® with a high-pressure steam cleaner.

6.2 Lubrication
INFO
The specified lubricants can be obtained through FORUM Handling Tools. Contact your local representative.

Lubrication Points
The AMP® is supplied with grease via lubrication nipples by a manual or pneumatic grease gun.

1. Latch
2. Hinge Pins (2x)
3. Latch Pin
4. Trigger System
5. Rotator pins

Fig. 74: Lubrication points I

Fig. 75: Lubrication points II

Fig. 76: Lubrication points III
6.3 Inspections
FORUM Handling Tools recommends performing inspections in compliance with API RP 8B at specified intervals and in inspection categories. Otherwise, the frequency of required inspections depends on the conditions of use of the AMP®.

Before inspection, remove all foreign material such as dirt, paint, lubricants, oil, abrasion, etc. from the affected parts. Use suitable methods such as stripping off paint, steam cleaning or sand blasting.

Document the scope and results of the performed tests after an inspection.

In the event of cracks, excessive wear, etc. contact FORUM Handling Tools or an authorized service company.

**INFO**
The specified maintenance intervals are recommended for the FORUM Handling Tools AMP® during its service life. The necessity of inspections depends primarily on the following conditions:

- Ambient conditions
- Load cycles
- Regulatory requirements
- Period of use
- Tests
- Repairs
- Overhauls

### Inspection intervals

<table>
<thead>
<tr>
<th>Category</th>
<th>Intervals</th>
<th>Preparatory measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Daily</td>
<td>AMP® mounted to Elevator-Links.</td>
</tr>
<tr>
<td>II</td>
<td>Weekly</td>
<td>AMP® mounted to Elevator-Links.</td>
</tr>
</tbody>
</table>
| III      | Semiannually | AMP® removed from Elevator-Link.  
           |           | AMP® partly dismantled. |
| IV       | Annually  | AMP® removed from Elevator-Link.  
           |           | AMP® completely dismantled. |

**INFO**
The above-mentioned inspection intervals refer to a 100% use of the AMP® on each day of a week (24/7). Personal inspection intervals may vary according to the type and extent of use and may need to be adjusted. All inspection categories are in accordance with the latest API RP 8B.

Ensure that only sufficiently qualified and trained personnel accomplish maintenance work.

6.3.1 Inspection of Hydraulic Equipment
Check the hydraulic equipment daily for leakages. If leakages occur internally or externally contact FORUM Handling Tools or an authorized service company.

6.3.2 Inspection Following Critical Loads
Perform an inspection IMMEDIATELY following any critical or unexpected loads. Critical loads could be:

- Loads resulting from shock when the drill pipe wedges.
- Pulling wedged drill strings.
- Holding heavy drill pipes / drill strings.
- Jarring.
- Operation at very low ambient temperatures (< - 20°C to - 4°F).

6.3.3 Inspection Following Removal
Generally the AMP® should be inspected immediately before it is taken out of service temporarily or stored. Moreover it should be inspected before putting back into service.

- It is necessary to disassemble the AMP® in an appropriately equipped workshop to check for excessive wear, deformation, cracks and other damage.
- Perform repair work only in compliance with the manufacturer’s recommendations. These are available from FORUM Handling Tools.
- Ensure that only FORUM Handling Tools or an authorized service company in compliance with the welding specifications issued by FORUM Handling Tools accomplishes welding work on cast parts.
- If the field inspection indicates that further inspection work is required, remove the AMP® and have it inspected in an appropriately equipped workshop.
6.4 Inspection Categories

6.4.1 Inspection Category I
Observe the AMP® during operation. Recognizing inadequate performance and apparent defects is the goal of this category.

Scope/Prerequisites/Procedure:
- Daily visual inspection of the AMP® for damages and defects during operation. Repair them if necessary.
- Functional test.
- A person with appropriate expertise must carry out the test.

6.4.2 Inspection Category II
The inspection of category II includes all inspections of inspection category I and additional tests.

Scope/Prerequisites/Procedure:
- Checking the state of lubrication, the condition of the entire AMP® and the settings of all valves.
- A person with appropriate expertise must carry out the test.

6.4.3 Inspection Category III
The inspection of category III includes all inspections of inspection category II and additional tests.

Scope/Prerequisites/Procedure:
- Non-Destructive Testing (NDT) of selected critical areas and verification of all wear limits.
- Before carrying out an NDT test, remove all foreign material such as dirt, paint, lubricants, oil and abrasion from the affected parts. Use suitable methods such as pickling, steam cleaning and sandblasting.

6.4.4 Inspection Category IV
The inspection of category IV includes all inspections of inspection category III and additional tests.

Scope/Prerequisites/Procedure:
- Before carrying out an NDT test, remove all foreign material such as dirt, paint, lubricants, oil and abrasion from the affected parts. Use suitable methods such as pickling, steam cleaning and sandblasting.
- Non-destructive material testing (NDT) of all critical areas and replacement of selected consumables and hydraulic components.

6.4.5 Inspection intervals and Inspection tasks

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Task</th>
<th>Daily</th>
<th>Weekly</th>
<th>Semiannually</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Function test and ongoing observation.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Functionality of Feedback.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Checks for cracks and loose fittings/hoses.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Checks for signs of deformations and leakages.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Check for signs of wear and corrosion.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Check for no loose components and presence of all warning signs.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Check for state of lubrication and conservation.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Check all possible settings (eg, valves) on the AMP®.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Checking the condition of the overall structure (Rotary Table, hydraulic system) and the interaction of all components and possible attachments with the AMP®.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Checking wear limits (component measurement).</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>NDT tests of selected components (AMP® is largely disassembled).</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Complete NDT test of all critical areas (AMP® is completely disassembled).</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Exchange of selected hydraulic components.</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Replacement of wear-intensive components (recommended spare parts).</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

INFO

NDT Non-destructive testing
- Magnetic Particle Inspection (MPI)
- Ultrasonic Measurement Methods (UT)
- Eddy Current Testing (ET)
- Dye Penetrant Inspection (DPI)
6.4.6 Inspection Checklist

INFO

The following checklist serve as a copy template for inspections to be performed in compliance with API RP 8B. Performed inspections must always be documented and stored safely.

Ensure that only sufficiently qualified and trained personnel accomplish maintenance work.

AMP Model: ____________________________
Serial number: __________________________

☐ Inspection Category I
Date / Place of Inspection:  
Result: OK  
Name of Inspection Operator / Supervisor:  
Sign:  

☐ Inspection Category II
Date / Place of Inspection:  
Result: OK  
Name of Inspection Operator / Supervisor:  
Sign:  

☐ Inspection Category III
Date / Place of Inspection:  
Result: OK  
Name of Inspection Operator / Supervisor:  
Sign:  

☐ Inspection Category IV
Date / Place of Inspection:  
Result: OK  
Name of Inspection Operator / Supervisor:  
Sign:  

Remarks: ____________________________

Remarks: ____________________________

Remarks: ____________________________

Remarks: ____________________________
6.5 Measuring of Wear

6.5.1 Wear at the Tool Joint of a Drill Pipe (18°)

The elevator wear is measured directly at the pipe inlet of the elevator. The maximal wear at the bore is:
Nominal pipe size + 0,25 inch.

The following table shows the minimum required Tool Joint diameter, depending on the Centre Bore. As soon as the Tool Joint diameter falls below the rating line, the bushing/Elevator or the pipe has to be changed (Contact FORUM Handling Tools or a FORUM Handling Tools authorized Repair Centre).

Fig. 77: Minimum A for Tool Joints
6.5.2 Wear at the Tool Joint of a Drill Pipe (90°)

The Elevator wear is measured directly at the pipe inlet of the Elevator. The maximal wear at the bore is:

- Max. Wear „B“ for A < 10°: 0.061“ [1.55 mm].
- Max. Wear „B“ for A > 10°: 0.095“ [2.41 mm].
- A = API Bore, refer to table located below.

![Illustration of Elevator wear](image)

The following table shows the minimum required Tool Joint diameter, depending on the Centre Bore..

<table>
<thead>
<tr>
<th>Tubing Size/Type</th>
<th>API Bore</th>
<th>100</th>
<th>150</th>
<th>175</th>
<th>250</th>
<th>350</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1250</th>
<th>1500</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.050 PLAIN</td>
<td>1.125</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.050 UPSET</td>
<td>1.422</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>1.315 PLAIN</td>
<td>1.390</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.315 UPSET</td>
<td>1.578</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1.660 PLAIN</td>
<td>1.736</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>1.660 UPSET</td>
<td>1.922</td>
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<tr>
<td>1.900 PLAIN</td>
<td>1.976</td>
<td></td>
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<tr>
<td>1.900 UPSET</td>
<td>2.203</td>
<td></td>
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<tr>
<td>2.375 PLAIN</td>
<td>2.451</td>
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<tr>
<td>2.375 UPSET</td>
<td>2.703</td>
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<tr>
<td>2.87 PLAIN</td>
<td>2.952</td>
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<tr>
<td>2.87 UPSET</td>
<td>3.203</td>
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</tr>
<tr>
<td>3.500 PLAIN</td>
<td>3.578</td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>3.500 UPSET</td>
<td>3.839</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>4.000 PLAIN</td>
<td>4.078</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.000 UPSET</td>
<td>4.359</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>4.500 PLAIN</td>
<td>4.604</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>4.500 UPSET</td>
<td>4.859</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.000 PLAIN</td>
<td>5.111</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.000 UPSET</td>
<td>5.617</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.750 PLAIN</td>
<td>5.870</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Min Tool Joint / Coupling OD

"Minimum Required Tubing Coupling OD in [mm]"

Load (tons)

<table>
<thead>
<tr>
<th>Load (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
</tr>
<tr>
<td>6.61</td>
</tr>
</tbody>
</table>

The Elevator wear is measured directly at the pipe inlet of the Elevator. The maximal wear at the bore is:

- Max. Wear „B“ for A < 10°: 0.061“ [1.55 mm].
- Max. Wear „B“ for A > 10°: 0.095“ [2.41 mm].
- A = API Bore, refer to table located below.

![Illustration of Elevator wear](image)
<table>
<thead>
<tr>
<th>Tubing Size/Type</th>
<th>API Bore</th>
<th>Load (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td></td>
<td></td>
</tr>
<tr>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Min Tool Joint / Coupling OD**

"Minimum Required Tubing Coupling OD in [mm]"

<table>
<thead>
<tr>
<th>Tubing Size/Type</th>
<th>API Bore</th>
<th>Load (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.000 UPSET</td>
<td>6.123</td>
<td>6.62 [0.17]</td>
</tr>
<tr>
<td>6.625 PLAIN</td>
<td>6.756</td>
<td>7.26 [0.18]</td>
</tr>
<tr>
<td>7.000 UPSET</td>
<td>7.196</td>
<td>7.64 [0.19]</td>
</tr>
<tr>
<td>7.625 PLAIN</td>
<td>7.768</td>
<td>8.27 [0.21]</td>
</tr>
<tr>
<td>8.000 UPSET</td>
<td>7.895</td>
<td>8.41 [0.21]</td>
</tr>
<tr>
<td>8.799 PLAIN</td>
<td>8.355</td>
<td>8.35 [0.21]</td>
</tr>
<tr>
<td>9.133 UPSET</td>
<td>8.464</td>
<td>8.96 [0.23]</td>
</tr>
<tr>
<td>9.862 PLAIN</td>
<td>8.811</td>
<td>9.28 [0.24]</td>
</tr>
<tr>
<td>10.000 UPSET</td>
<td>9.666</td>
<td>9.66 [0.25]</td>
</tr>
<tr>
<td>10.937 PLAIN</td>
<td>9.540</td>
<td>10.04 [0.26]</td>
</tr>
<tr>
<td>11.062 UPSET</td>
<td>9.970</td>
<td>10.28 [0.26]</td>
</tr>
<tr>
<td>12.075 PLAIN</td>
<td>10.033</td>
<td>10.53 [0.27]</td>
</tr>
<tr>
<td>12.857 UPSET</td>
<td>10.160</td>
<td>10.66 [0.27]</td>
</tr>
<tr>
<td>15.000 PLAIN</td>
<td>10.413</td>
<td>10.91 [0.28]</td>
</tr>
<tr>
<td>15.625 UPSET</td>
<td>10.793</td>
<td>11.29 [0.29]</td>
</tr>
<tr>
<td>17.050 PLAIN</td>
<td>10.919</td>
<td>11.42 [0.29]</td>
</tr>
<tr>
<td>17.750 UPSET</td>
<td>11.173</td>
<td>11.67 [0.3]</td>
</tr>
<tr>
<td>18.750 PLAIN</td>
<td>11.932</td>
<td>12.43 [0.32]</td>
</tr>
<tr>
<td>19.875 UPSET</td>
<td>12.058</td>
<td>12.56 [0.32]</td>
</tr>
<tr>
<td>21.475 PLAIN</td>
<td>12.944</td>
<td>13.44 [0.34]</td>
</tr>
<tr>
<td>21.875 PLAIN</td>
<td>13.508</td>
<td>13.56 [0.34]</td>
</tr>
<tr>
<td>23.375 PLAIN</td>
<td>13.564</td>
<td>13.56 [0.34]</td>
</tr>
<tr>
<td>24.975 PLAIN</td>
<td>14.197</td>
<td>14.70 [0.37]</td>
</tr>
<tr>
<td>26.175 PLAIN</td>
<td>15.210</td>
<td>15.71 [0.4]</td>
</tr>
<tr>
<td>27.000 PLAIN</td>
<td>16.222</td>
<td>16.72 [0.42]</td>
</tr>
<tr>
<td>28.000 PLAIN</td>
<td>17.651</td>
<td>18.47 [0.44]</td>
</tr>
<tr>
<td>29.000 PLAIN</td>
<td>18.247</td>
<td>18.75 [0.48]</td>
</tr>
<tr>
<td>30.000 PLAIN</td>
<td>18.882</td>
<td>19.38 [0.49]</td>
</tr>
<tr>
<td>20.000 UPSET</td>
<td>20.272</td>
<td>20.77 [0.53]</td>
</tr>
<tr>
<td>21.500 PLAIN</td>
<td>21.790</td>
<td>22.29 [0.57]</td>
</tr>
<tr>
<td>22.000 UPSET</td>
<td>22.295</td>
<td>22.8 [0.58]</td>
</tr>
<tr>
<td>23.500 PLAIN</td>
<td>23.621</td>
<td>24.12 [0.61]</td>
</tr>
<tr>
<td>24.000 UPSET</td>
<td>24.315</td>
<td>24.82 [0.63]</td>
</tr>
<tr>
<td>24.500 PLAIN</td>
<td>24.820</td>
<td>25.32 [0.64]</td>
</tr>
<tr>
<td>26.000 UPSET</td>
<td>26.335</td>
<td>26.64 [0.68]</td>
</tr>
<tr>
<td>28.000 PLAIN</td>
<td>28.355</td>
<td>28.86 [0.73]</td>
</tr>
<tr>
<td>30.000 PLAIN</td>
<td>30.375</td>
<td>30.88 [0.78]</td>
</tr>
<tr>
<td>32.000 PLAIN</td>
<td>32.395</td>
<td>32.9 [0.84]</td>
</tr>
<tr>
<td>36.000 PLAIN</td>
<td>36.435</td>
<td>36.94 [0.94]</td>
</tr>
</tbody>
</table>

**Tubing Size/Type**

**API Bore**

**Load (tons)**

**Minimum Required Tubing Coupling OD in [mm]**

**Inspection/Maintenance**
6.5.3 Wear data for components

Check the wear limits as specified in the inspection checklists.

6.5.4 Minimum ear dimensions

Minimum ear dimensions are only valid when the elevator is in otherwise good condition, does not have excessive wear, cracks or other defects, or previous weld repair and has not been misused. This inspection criterion cannot determine the overall condition of the elevator and its suitability for continued use.

![Fig. 79: Minimum ear dimensions](image_url)

<table>
<thead>
<tr>
<th>Elevator Type [P/N]</th>
<th>AMP® 350-2</th>
<th>AMP® 500-1</th>
<th>AMP® 500-2</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Dimension A</td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
</tr>
<tr>
<td></td>
<td>110.5</td>
<td>4.35</td>
<td>149</td>
<td>5.87</td>
<td>140</td>
<td>5.51</td>
<td>189.25</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Elevator Type [P/N]</th>
<th>AMP® 500-1</th>
<th>AMP® 350-2</th>
<th>AMP® 500-2</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge-pin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A Hinge Pin Diameter New Min.</td>
<td>58</td>
<td>2.28</td>
<td>60</td>
<td>2.36</td>
<td>70.0</td>
<td>2.76</td>
<td>70.0</td>
</tr>
<tr>
<td>A Hinge Pin Diameter worn Max</td>
<td>57.6</td>
<td>2.27</td>
<td>58.96</td>
<td>2.32</td>
<td>69.7</td>
<td>2.74</td>
<td>69.7</td>
</tr>
<tr>
<td>B Bore Diameter New max.</td>
<td>58</td>
<td>2.28</td>
<td>60</td>
<td>2.36</td>
<td>70</td>
<td>2.76</td>
<td>70</td>
</tr>
<tr>
<td>B Bore Diameter Worn max.</td>
<td>58.76</td>
<td>2.31</td>
<td>60.94</td>
<td>2.40</td>
<td>70.66</td>
<td>2.78</td>
<td>70.66</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Elevator Type [P/N]</th>
<th>AMP® 500-1</th>
<th>AMP® 350-2</th>
<th>AMP® 500-2</th>
<th>AMP® 750-1</th>
<th>AMP® 1000-1</th>
<th>AMP® 1250-1</th>
<th>AMP® 1500-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latch-pin</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>A Latch Pin Diameter New Min.</td>
<td>45</td>
<td>1.77</td>
<td>45</td>
<td>1.77</td>
<td>60</td>
<td>2.36</td>
<td>50</td>
</tr>
<tr>
<td>A Hinge Pin Diameter worn Max</td>
<td>44.6</td>
<td>1.76</td>
<td>45.11</td>
<td>1.74</td>
<td>59.6</td>
<td>2.35</td>
<td>49.7</td>
</tr>
<tr>
<td>B Bore Diameter New max.</td>
<td>45</td>
<td>1.77</td>
<td>45</td>
<td>1.77</td>
<td>60</td>
<td>2.36</td>
<td>50</td>
</tr>
<tr>
<td>B Bore Diameter Worn max.</td>
<td>45.76</td>
<td>1.80</td>
<td>45.89</td>
<td>1.81</td>
<td>60.76</td>
<td>2.39</td>
<td>50.66</td>
</tr>
</tbody>
</table>

All kind of repairs not performed by FORUM Handling Tools should nevertheless be done in accordance with their methods and procedures or with their agents. Minor cracks or defects, which may be removed without reducing safety or operation of the, can be removed by grinding (Refer to critical areas). Following the repair, the parts should again be inspected by an appropriate method to insure that the defect has been completely removed.
6.5.5 Wear Check for bushings

Normal wear of bushings and elevator ears caused by usage will eventually reduce the load capacity of elevators. The existence of cracks or the appearance of defects can indicate severe deterioration and even failures. Prompt attention is required either to remove the elevator from service immediately or to undertake appropriate repair.

A wear condition in its early stages is common. Frequently, it results in a tool joint sticking to the elevator. Elevators showing hammer marks around the top of the bore should be closely examined to determine whether it is the elevator, the tool joint or both are faulty.

To identify the conditions of the 18° Elevator taper gauges are available for all FORUM Handling Tools Elevators (P/N 600018). A set of gauges consists of an 18° gauge (GOOD) and a 15° gauge (BAD)

How to check the bushing or Bore Code of the Elevator the correct way

1. Fit the gauge to the inner bore of the bushing.
2. Push the gauge against the bushing and start to move the gauge downwards until the chamfer touches the 18° shoulder or the bore.
3. Check the result as follows.

Check of results

1. Using the GOOD gauge: If the gauge sits directly on the bushing without showing any clearance between gauge and bushing, the bushing is OK.
2. If the gauge shows space between the gauge and the bushing, you have to check with the second gauge.
3. Using the BAD 15° gauge: If the gauge shows any clearance between gauge and bushing, the bushing is OK.
4. If the gauge sits directly on the bushing without showing any space between gauge and bushing or BC, take the elevator out of service.

⚠️ CAUTION The results have to be evaluated in a conservative way.

» If the taper is less than 15° take the elevator out of service or exchange the bushing.
» If the taper is between 18° and 15°, reduce the elevators load capacity to 90%.

⚠️ CAUTION Never use the elevator without a bushing.
6.6 Critical Areas

INFO

Minor cracks or defects in critical and non-critical areas, which may be removed without reducing safety or operation of the Equipment, can be removed by grinding and blending. However, grinding should not exceed \( \frac{3}{16} \)" (4.8 mm) deep or 25% of the original material thickness on cast surfaces. Machined surface discontinuities or discontinuities beyond acceptable depths should be evaluated by FORUM Handling Tools or a FORUM authorized repair facility.
7 Storage / Disposal

This section deals with procedures to be taken to the storage of the AMP® after decommissioning. The goal is to protect the AMP®, environment and people from damages. Therefore, FORUM Handling Tools recommends reading and implementing the following procedure accurately.

7.1 Storage of the entire AMP®

Storage procedure

1. Clean the AMP®. FORUM Handling Tools recommends the use of a high pressure cleaner.
2. Store the AMP® in the Transport Rack (P/N 774003), or on an even, supporting surface.
   » Observe the weight specifications in the technical data.
3. Ensure that the AMP® is stored so that no person can be injured by moving parts or sharp edges.
4. Secure the AMP® with tensioning cables or in another manner to prevent it from slipping or tipping when moved.
5. Lubricate the AMP® as described in section „6.2 Lubrication“, on page 64.
6. Conserve all bare metal surfaces.
   FORUM Handling Tools recommends the use of a lubricant or Tectyl.
   » These surfaces should be checked periodically to be sure that no corrosion has occurred.
7. Protect the AMP® against water penetration with a plastic tarp.

INFO

Always store the AMP® in the Transport Rack (P/N 774003), with all locking and safety mechanisms in place. Do not place the AMP® on a surface, which is not load rated for the weight of the AMP® (see chapter „4.1 Commissioning“, on page 47).

7.1.1 Initial Storage

The AMP® is packaged at the factory in such manner that all components can withstand ambient temperatures from -20 °C to +40°C. Conventional outside storage shall not require additional precaution for a period up to 3 months from the shipment date.

7.1.2 Storage beyond 3 Months

While storage conditions vary in humidity, temperature and exposure to sunlight, the following are minimum requirements for extended storage beyond the initial crating and preparation from the factory. These steps are also required when the Roughnecks are placed in storage after commissioning or operating periods.

» Clean the AMP® roughly.
» All metal surfaces are coated or painted as called out on the technical drawing package. No exposed metal shall be present. For items previously, electro-zinc plated or anodized, a commercial rust inhibitor coating shall be used to prevent corrosion. Previously painted surfaces shall be free of oxidation and repainted as recommended by FORUM Handling Tools.
» Damaged, missing or frayed hydraulic connections and hoses shall be replaced in accordance with the technical drawing package. No open hydraulic connections shall be present prior to extended storage. All hydraulic ports shall be connected or properly plugged.
» The AMP® has to be lubricated and maintained as recommended by FORUM Handling Tools (see chapter „6.2 Lubrication“, on page 64).
» Commercially available rust inhibitor shall be applied to all hydraulic cylinder rods to prevent corrosion.
» Place the AMP® always on a suitable surface and secure it with tensioning cables and anti-slip mats.
» Store in dry surroundings (maximum humidity 80%).
7.2 Post Storage

It is imperative that after prolonged storage, all components have to be checked for damages due to other than normal environmental conditions, damage caused by external sources, or missing parts. The AMP® shall be properly tested according to the Commissioning Procedure (see chapter „4.1 Commissioning“, on page 47) before it is placed back in operation.

7.3 Disposal

When used properly the AMP® does not pose any hazard for users or the environment.

However, operation of the AMP® requires use of hydraulic fluids, lubricants and cleaning agents, which can pollute the environment. For this reason always ensure that such substances are disposed of properly according to international, national and local regulations.

Never dispose of hydraulic fluids, oils, lubricants, oily cleaning rags or oily water together with industrial or domestic wastes.

Observe the safety data sheets published by the manufacturers on environmental hazards and disposal of the service and operating products used.

Ensure that all service and operating products as well as replacement parts are disposed of safely and ecologically.

Please note specifically that FORUM Handling Tools is not obligated to take back used equipment.

List of Service Products Used

The Safety Data Sheets on the service products used are included in the appendix to this OMM.
Appendix

A. Sample of EC Declaration
APPENDIX

A. Sample of EC Declaration

FORUM B + V Oil Tools GmbH

EC-DECLARATION OF CONFORMITY

We, FORUM B + V Oil Tools GmbH
Hermann-Blohm-Strasse 2
20457 Hamburg / Germany

declare that the products: Hydraulic Operated Multi-Pipe Elevator AMP-350 - AMP-1500

which is the subject of this declaration, fulfills all of the relevant requirements of:
2006/42/EC Machine Directive
2014/34/EC ATEX Directive of Equipment for use in hazardous areas

Amongst others following harmonized and technical standards and specifications were used:

DIN EN ISO 13635 Petroleum and natural gas industries - Drilling and well-servicing equipment
DIN EN ISO 12100 Safety of machinery, Risk assessment and Risk Reduction
DIN EN ISO 80079-36 Non-electrical equipment for use in potentially explosive atmospheres

Description of Product:
The following named lifting accessory will be described in more detail in the accompanying Data Book and/or certificate and the associated Technical Documentation

Product / Device Type: [refer to data book]
Rated Capacity: [refer to data book]
Part Number: [refer to data book]
Serial Number: [refer to data book]
Delivery date: [refer to data book]
Order No.: [refer to data book]
Marking: CE 12G T5

The Engineering Manager of FORUM B + V Oil Tools GmbH, Hermann-Blohm-Strasse 2, 20457 Hamburg, Germany, is authorized to compile the technical files. Documents in accordance to Directive 2014/34/EU Article 12 (1) b) a) have been deposit at the notified body 18EXU - Institut fur Sicherheitstechnik GmbH, Fuchsmühlenweg 7, D-09599 Freiberg, Notified Body No. 0637, reference IE-14-6-001/200, Archive-No. 219/14. FORUM B + V Oil Tools has established a quality assurance system in accordance to ISO 9001 and API 01 approved by API Quality Registrar, Washington D.C./USA, Registration No. 2850 + 01-2769.

Hamburg, issued on [refer to data book]

Authorized Representative Name Position
Matthias Theiss Managing Director

FORUM B + V Oil Tools GmbH
Hermann-Blohm-Strasse 2, 20457 Hamburg
Phone: +49 40 37022-689; Fax: +49 40 37022-6891 E-Mail: oiltools@f-e-t.com
Internet: www.blohmvoss-oiltools.com
Registered Office: Hamburg
Booth X is a trademark of Bohn + VossShpeyer GmbH

Managing Directors: Matthias Theiss, Tillar Kipp Schmitt
Commercial Register: District Court of Hamburg, HRB 135 890
TaxNo.: 46/23202275, VAT-D-No.: DE 234 745 990
Banking: HSBC, Tönka & Rohrklaust AG
BIC: SWIFT TUDR DE DD XX
EUR-Acc.: IBAN: DE73 3003 0880 0012 8350 10
USD-Acc.: 219/14 - 001/200 - IBAN: DE50 3003 0880 4012 8350 06
11.06.2017

Fig. 91: EC Certificate of Conformity Sample
Our goal is to become the leading provider of mission critical oilfield products and related services in terms of customer satisfaction, safety and financial performance.

Our experienced management team and employees are dedicated to solving our customers’ problems. We invest in long term relationships and cooperate on product development with our clients, we consider them our partners.

**No One Gets Hurt**
The safety of our employees and customers is our first priority coupled with a healthy respect for the environment.

**Integrity**
In everything we do, in every interaction, both internally and externally, we strive to operate with the utmost integrity and mutual respect.

**Customer Focused**
Our products enhance our customer’s performance and we listen to their needs and work with them to solve their challenges.

**Good Place To Work**
We are committed to creating a workplace that fosters innovation, teamwork and pride. Every team member is integral to our success and is treated equally and fairly.