Original Instructions

QH441

# Operator’s Manual

**QH441-en-140415**

SANDVIK

# QH441

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Sandvik Construction Mobile Crushers and Screens Ltd.

Tullyvannon, Ballygawley, Co.Tyrone, Northern Ireland, BT70 2HW

Tel. +44 (0) 28 8556 7799, Fax +44 (0) 28 8556 7007

W: www.sandvikmobiles.com

E: info.mobilecs@sandvik.com

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# 1 Safety

## 1.1 Safety principles

**SANDVIK put safety first.**

This is to ensure maximum safety measures are taken, *ALWAYS* read this section carefully *BEFORE* carrying out any work on the equipment or making any adjustments.

***Note: This equipment is manufactured in accordance with the Machinery Directive 2006/42/EC of 01.01.2010. The customer should make sure that this equipment is in conformance with local and national legislation if used outside of the EU.***

This section includes explanations of safety symbols, signs, signals and labels used on the product and information for use.

### 1.1.1 Signal words

The following signal words and symbols are used to identify safety messages throughout these instructions:

**DANGER**

**The signal word DANGER indicates a hazardous situation which, if not avoided, will result in serious injury or death.**

**WARNING**

**The signal word WARNING indicates a hazardous situation which, if not avoided, could result in serious injury or death.**

***NOTICE***

**The signal word NOTICE indicates a situation which, if not avoided, could result in damage to property or environment.**

**When you see ANY of the signal words in this manual, be alert; your safety is involved. Carefully read and understand the message that follows, and inform other users.**

### 1.1.2 General hazard symbol



**This general HAZARD or other hazard symbol identifies important safety messages in this manual.**

When you see ANY of the hazard symbols in this manual, be alert; your safety is involved. Carefully read and understand the message that follows, and inform other users.


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### 1.1.3 Essentials

| DANGER | |
|---|---|
|   | **INHALATION, BREATHING HAZARD!**<br>**Breathing or inhaling silica dust particles will cause death or serious injury.**<br>**Ensure suitable breathing equipment is used throughout any procedures carried out. ALL necessary precautions MUST be taken to reduce the risk of breathing dust or particles.** |

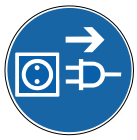


**Read this manual and familiarize yourself with any associated documentation. If in ANY doubt ask. Do not take ANY personal risk.**

**Only trained competent persons should be allowed to install, set, operate, maintain, and decomposing this equipment. Make sure that a copy of this manual is available for any persons installing, using, maintaining or repairing this equipment.**



**Training should be provided to make sure that safe working practices are followed. Initial commissioning and starting must only be undertaken by a authorised person who has read and fully understands the information provided in the manual pack. ALWAYS follow the procedures outlined in the operating and maintenance instructions.**



**To avoid the risk of electric shock, ALWAYS isolate this equipment from the supply source before removing any guards or covers or performing any maintenance or adjustment to the equipment.**

***Note: The equipment manufacturer declines all responsibility for injury or damage if the instructions and precautions in this manual are not followed.***

### 1.1.4 Safety hazards pertaining to the equipment



**The following safety symbols may be posted on the equipment and contained in the manuals. You MUST observe all safety symbols, labels, and instructions at ALL times.**

- Make sure safety instructions and safety labels attached to the equipment are always complete and legible.
- Keep safety instructions and safety labels clean and visible at all times.
- Replace any illegible or missing safety instructions and safety labels before operating the equipment.
- Ensure replacement parts include safety instructions and labels.

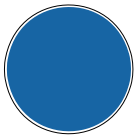
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### 1.1.5 Colour coded safety signs

Signs located on the machine and used throughout this manual are colour coded relating to the information they convey, as follows:



**PROHIBITED - YOU CAN NOT DO.**



**MANDATORY - YOU MUST DO.**



**HAZARD - YOU MUST BE AWARE OF.**

### 1.1.6 Symbols for prohibited actions

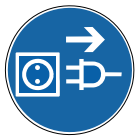
**Prohibited actions used throughout this manual are indicated by a red circle with a red diagonal line across the circle. The action which is prohibited will always be in black as follows:**

| | | | |
|---|---|---|---|
|  **No climbing** |  **No smoking** |  **Do not touch** |  **No open flames** |
|  **Do not weld** |  **Do not remove safety guard** |  **Limited or restricted access** |  **Do not use hand to test for hydraulic leaks** |


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### 1.1.7 Symbols for mandatory actions

Mandatory actions used throughout this manual are indicated by white symbols on a blue background as follows:

| | | | | |
|---|---|---|---|---|
|  **Wear safety gloves** |  **Wear eye protection** |  **Wear safety helmet** |  **Wear safety harness** |  **Wear ear protection** |
|  **Wear safety boots** |  **Wear close fitting overalls** |  **Wear respirator** |  **Wear high visibility vest** |  **Disconnect power source from supply** |
|  **Switch off and lockout equipment** |  **Read the manual** |  **Safe distance from hazard** |  **Use card for hydraulic leak testing** | |

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### 1.1.8 Symbols for hazards

Hazard symbols used throughout this manual are indicated by a yellow triangle with black symbols and black frames as follows:

| | | | | |
|---|---|---|---|---|
|  **Crushing hazard - hands** |  **Crushing hazard - feet** |  **Chemical burn hazard** |  **Electrical hazard** |  **Noise hazard** |
|  **Entanglement hazard** |  **Entanglement hazard** |  **Falling hazard** |  **Falling load hazard** |  **Ignition hazard** |
|  **Flying material hazard** |  **Lifting hazard** |  **Skin injection hazard** |  **Silica or other dust hazard** |  **Tripping hazard** |
|  **Magnet hazard** |  **Falling material hazard** |  **Crushing hazard** |  **Hanging load hazard** |  **Tipping hazard** |
|  **General hazard** |  **Explosion hazard** |  **High pressure hazard** |  **Hot surface hazard** |  **Poison hazard** |
|  **Tipping hazard** |  **Tipping hazard** |  **Hot Coolant under pressure** |  **Electrocution hazard** | |


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## 1.2 Features for operator safety

***Note: Safety features associated with this equipment have been assessed in accordance with ISO21873-2.***



**Emergency stop buttons have been installed to prevent death or serious injury. Ensure Emergency stop buttons are visible and not obstructed in any way. Ensure all personnel are trained in the operation and location of emergency stops.**



**DO NOT use this equipment if any safety guards or devices have been removed or not installed properly. Safety guards have been installed to prevent death or serious injury. All safety guards must be fitted and secured in their correct positions.**

**Operating this equipment with any safety guards or devices which have been removed or installed improperly could result in death or serious injury.**



**Steps, handrails, tread plates, and fixed guards are provided where persons are required to climb on the machine. For maintenance access ONLY.**



**If for any reason other areas of the machine need to be accessed, DO a full recorded risk assessment and take the appropriate safety measures.**

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## 1.3 Environmental safety

To avoid unnecessary engine emissions, you MUST regularly service the machine as specified in the machine maintenance sections contained in this manual.

### 1.3.1 Hazardous materials



**FIRE IGNITION HAZARD!**

**Diesel spillage MUST be cleaned up immediately due to fire hazard. Follow local and national regulations.**



**ONLY use fluids and lubrication products recommended in the maintenance schedule or OEM manuals.**



**Read and understand the instructions and information in the *Hazardous substances* section.**

**⚠ WARNING**





**POISON AND CONTAMINATION HAZARD!**

**Drinking from storage containers that have held equipment fluids or other harmful substances could cause serious injury or death. DO NOT store fuels, fluids and other materials used in the operation of this machine in food or beverage containers.**

**Fuels, fluids and other materials used in the operation of this machine may contain chemicals which could cause serious injury or death and or environmental damage if disposed of in an irresponsible manner.**

**MAKE SURE that correct procedures are formulated to safely handle hazardous materials in strict accordance with the manufacturer's instructions and all applicable regulations by correctly identifying, labelling, storing, using and disposing of the materials.**

**ALWAYS dispose of fuels, fluids or other materials used in the operation of this machine in accordance with local and national legal regulations.**

**DO NOT pour waste onto the ground, down a drain or into any water source.**

**Observe local heath and safety data information and OEM data information detailed in the *Information and Data Sheets* section of this manual when working with components or substance that may contain chemicals.**

**Use leak proof containers when draining fluids.**


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### 1.3.2 Battery disposal

All batteries must be disposed of via a local re-cycling scheme.



**Batteries must not be disposed of in normal waste which may go to landfill.**

### 1.3.3 Machine disposal

This equipment MUST ONLY be disposed of at a specialist machine breaker.

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## 1.4 Personal protective equipment (PPE)

### Entanglement hazard

**DANGER**

**PERSONNEL HAZARD!**

**DO NOT wear, loose clothing or jewellery of ANY kind.**

**Long hair MUST BE tied back.**

**ALWAYS wear (CE approved) minimum Personal Protective Equipment (PPE).**

### Minimum required personal protective equipment

The following (CE approved P.P.E.) MUST BE WORN by everyone, as a minimum requirement when working on or around the machinery, within 10m (33ft): Additional PPE may be required for specific tasks, which will be detailed in the relevant section throughout the manual.

| | | | | |
|---|---|---|---|---|
|  **Safety gloves** |  **Eye protection** |  **Safety helmet** |  **Respirator** |  **Ear protection** |
|  **Safety boots** |  **Close fitting overalls** |  **High visibility vest** | | |



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## 1.5 Organisational safety measures

The following safety measures MUST be observed at all times:



**Understand the service procedure before commencing work.**

**Keep area clean and dry.**

**NEVER lubricate, clean, service, or adjust machinery while it is moving.**

**Allow machinery to cool before performing any maintenance or adjustments.**

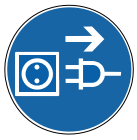


**MAKE SURE all parts are properly installed and are in good condition. Replace worn and broken parts IMMEDIATELY.**

**Remove any build up of grease, oil and debris from equipment.**

**During maintenance, use ONLY the correct tool for the job.**

**NEVER make any modifications, additions, or conversions which may affect safety.**



**Disconnect battery ground cable before making adjustments on electrical systems or welding on the equipment.**



**If clothing, tools, or any body parts become entangled in machinery, IMMEDIATELY press an emergency stop button to disengage all power. Operate controls to relieve pressure. Switch off engine and implement lockout procedures.**



**If equipment exhibits any unusual movement or sound, stop equipment, lock out IMMEDIATELY, and report the malfunction to your supervisor.**

### 1.5.1 Fire risk control measures

Carry out a site specific risk assessment to identify any fire hazards present and the actions required to remove/reduce the risk.

Follow local and national regulations regarding fire safety training as identified in the risk assessment.

Fire extinguishing equipment must be available and easily accessible to the machine operator as identified in the risk assessment.

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## 1.6 Personnel qualifications, requirements and responsibilities

**⚠ WARNING**



**PERSONNEL HAZARD**

**Lack of knowledge or understanding could cause serious injury, death or damage to the machine.**

**ONLY trained, competent, reliable and authorized personnel should operate or maintain this machine.**



**If necessary seek clarification from your supervisor and or a Sandvik representative, before attempting ANY operations or maintenance. Failure to do so may also invalidate the manufacturers warranties.**

**Statutory minimum working age limits must be observed.**



**Work on electrical system and its equipment MUST ONLY be carried out by a skilled electrician or by personnel under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations. You MUST fully understand the electrical system, refer to the electrical and hydraulic section.**



**Work on the hydraulic system MUST ONLY be carried out by persons with training and authorisation to maintain the hydraulic equipment. You MUST fully understand the hydraulic system, refer to the electrical and hydraulic section.**


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## 1.7 Safety advice regarding specific operational phases

### 1.7.1 Standard Operation



**Take the necessary steps to ensure the equipment is ONLY used when it is in a safe and reliable state.**



**Operate the equipment ONLY for its designed purpose, and only if all guarding, protective, and safety devices, emergency shut-off equipment, sound proofing elements and exhausts, are in place and fully functional.**



**ENSURE local barriers are erected to stop unauthorised entry to the equipment or work area.**



**Attach a hazard sign(s) to the equipment in appropriate positions to alert all persons of potential hazards.**

**BEFORE starting the engine ensure it is safe to do so.**

### 1.7.2 Blockage or malfunction



**In the event of material blockage, any malfunction or operational difficulty, stop equipment and lockout immediately. Rectify problem immediately, refer to the operation section. Contact your dealer for advice and assistance if required.**

### 1.7.3 Unguarded areas



**Limit access to the equipment and its surroundings by erecting barrier guards, minimum distance 1.5m (5ft) away, to reduce the risk of other mechanical hazards, falling loads and ejected materials.**



**Switch off and lockout equipment before removing any safety devices or guarding. Make sure all safety devices and guards are installed correctly before lock out is removed.**

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**DANGER**



**ENTANGLEMENT HAZARD**

**Working in close proximity to running machinery could cause serious injury or death.**

**DO NOT work close to machinery unless it is completely stopped.**

**DO NOT wear, loose clothing or jewellery of ANY kind.**

**Long hair MUST BE tied back.**

**ALWAYS wear (CE approved) minimum Personal Protective Equipment (PPE).**

### 1.7.4 Fire risk control measures

Carry out a site specific risk assessment to identify any fire hazards present and the actions required to remove/reduce the risk.

Follow local and national regulations regarding fire safety training as identified in the risk assessment.

Fire extinguishing equipment must be available and easily accessible to the machine operator as identified in the risk assessment.


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## 1.8 Special work, including maintenance, parts disposal and hazardous materials



**Observe adjustment, maintenance and service intervals detailed throughout this manual, unless:**

- - Failure of warning lights, horns, gauges, display screens or indicators calls for immediate action.
- - Adverse conditions require more frequent servicing.

**USE ONLY Original Equipment Manufacturer's (OEM) recommended replacement parts and equipment.**

**Make sure only properly trained personnel undertake these tasks.**

### 1.8.1 Securing equipment before performing maintenance

When undertaking maintenance and repair work, equipment must first be made safe.





**PERSONNEL HAZARD**

**Switch off engine and remove ignition key.**

**Switch off at isolation point, refer to the commissioning and shut down section.**

**Implement tag and lockout procedures, refer to the commissioning and shut down section.**

**Attach hazard sign(s) to equipment in appropriate positions to alert all personnel of potential hazards.**

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### 1.8.2 Maintenance site conditions



**Prior to starting any maintenance work, ENSURE equipment is positioned on stable and level ground and has been secured against inadvertent movement and buckling.**

### 1.8.3 Replacement & removal of components



**ALWAYS observe handling instructions detailed throughout this manual, OEM manuals, or spare parts suppliers' instructions.**

**Do a full risk assessment and take all necessary safety measures.**



**NEVER allow untrained staff to attempt to remove or replace any part of the equipment.**



**The removal of large or heavy components without adequate lifting equipment is PROHIBITED, this could cause serious injury or death.**



**To avoid the risk of accidents, individual parts and large assemblies being moved for replacement purposes should be carefully attached to lifting equipment and secured. ONLY use suitable lifting equipment supplied or approved by OEM.**



**NEVER work or stand under suspended loads.**



**KEEP AWAY from the feeder hopper and product conveyor discharge, where there is risk of serious injury or death from contact with ejected debris.**

### 1.8.4 Climbing and falling



**LIMIT ACCESS to the equipment and its surroundings by erecting barrier guards to reduce the risk of residual mechanical hazards, falling lifted loads, and ejected materials.**



**Falling from and/or onto this equipment could result in serious injury or death.**



**When reaching any points 2m (6ft) or more above ground level, ALWAYS use CE certified safety harness.**



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**NEVER climb on the equipment while it is in operation or use equipment parts as a climbing aid.**



**ALWAYS keep the area around the equipment clear of debris and trip hazards.**

**Keep all handles, steps, handrails, platforms, landing areas, and ladders free from dirt, oil, snow and ice.**

**Beware of moving haulage and loading equipment in the vicinity of the equipment.**



**When carrying out overhead assembly work, ALWAYS use specially designed or otherwise safety-oriented ladders and maintenance platforms.**

**ONLY use Maintenance Platforms provided on the equipment. ALWAYS perform work from an approved, safe and secure platform.**

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### 1.8.5 Safety considerations during maintenance



**It is essential that you take the following steps to MAKE SURE you and others are safe. DO full risk assessments and take all necessary safety measures.**



**During maintenance, RESTRICT ACCESS to essential staff only. Where appropriate, erect barrier guards and post warnings.**



**The fastening of loads and instructing or guiding of crane operators should be entrusted to qualified persons only.**

**NEVER work or stand under suspended loads.**

**The observer providing instructions must be within sight or sound of the operator and positioned to have an all around view of the operation.**



**ALWAYS make sure any safety device such as locking wedges, securing chains, bars, or struts are utilized as indicated in throughout this manual.**

**Make sure that any part of the equipment raised for any reason is prevented from falling by securing it in a safe reliable manner.**

**Never work alone.**

### 1.8.6 Safety considerations during cleaning



**This machine MUST be isolated prior to cleaning.**

**After cleaning, examine all fuel, lubricant, and hydraulic fluid lines for leaks, loose connections, chafe marks and damage. Any defects found MUST be repaired immediately.**



**DO NOT direct power washers near to or into control boxes and electrical devices.**

### 1.8.7 Removal of safety devices, guards and decals



**Prior to operation, all safety devices, control devices, decals and guards, temporarily removed for set-up, maintenance or repair purposes MUST be refitted and checked immediately upon completion of the maintenance or repair work.**



**To avoid serious personal injury or death, NEVER operate the equipment with safety devices, decal or guards removed or unsecured.**

**ALWAYS report any defects regarding guards, safety devices, decals or control devices.**



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### 1.8.8 Surrounding structures



**This equipment MUST ONLY be operated in a position away from buildings, permanent structures or high ground to eliminate the risk of persons falling onto the equipment or its surrounds.**

**All temporary maintenance platforms erected around the equipment MUST be removed prior to operation.**

### 1.8.9 Safety when refuelling

**⚠ WARNING**



**FIRE HAZARD**

**Smoking is PROHIBITED when refuelling or handling diesel fuel. Smoking and or using other naked flames in the vicinity of flammable materials and or fuels, could cause serious injury or death.**

**NEVER remove the filler cap or refuel with the engine running.**

**NEVER add gasoline or any other fuels mixed to diesel due to increased fire or explosion risks and damage to the engine.**

**DO NOT carry out maintenance on the fuel system near naked lights or sources of sparks, such as welding equipment.**

**IMMEDIATELY clean up spilt fuel and dispose of correctly to minimize any environmental impact. To avoid spillage use drip trays.**

**ONLY refuel with diesel from approved storage and supply equipment.**

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## 1.9 Specific hazards

### 1.9.1 Electrical energy

**External considerations and hazards**

When working with the machine, maintain a safe distance from overhead electric lines. Be aware that electricity can jump across gaps. If unsure, seek advise from a competent person or source. If overhead cables are in the vicinity, a risk assessment MUST be completed prior to operating the machine. Make sure you follow all local and national regulations.

**DANGER**




**ELECTROCUTION HAZARD!**

**Contact with overhead electric lines will cause serious injury or death.**

**If your machine comes into contact with a live wire, you MUST:**

**- Vacate the area.**

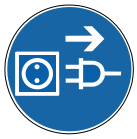
**- Warn others against approaching and touching the machine.**

**- Report the incident and have the live wire shut off.**

**Machine - Electrical**



**Work on electrical system and its equipment MUST ONLY be carried out by a skilled electrician or by personnel under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.**



**Before starting any maintenance or repair work, the power supply to the equipment MUST be isolated. Check the de-energized parts to ensure they do not have any power. In addition to insulating any adjacent parts or elements, ground or short circuit them to avoid the risk of electrical shock.**

**The electrical equipment is to be inspected and checked at regular intervals. Defects such as loose connections, scorched or otherwise damaged cables MUST be repaired, or replaced immediately. A trained competent person must do this.**



**Use ONLY original fuses with the specified current rating. Switch off the equipment IMMEDIATELY if trouble occurs in the electrical system.**

**This equipment is wired on a negative earth. ALWAYS observe correct polarity.**


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### 1.9.2 Automotive batteries



**Automotive batteries contains sulphuric acid, an electrolyte which can cause severe burns and produce explosive gases when being charged.**



**Recharge batteries in a well ventilated area.**

**Do not short circuit batteries as this could cause a large spark and explosion.**



**Smoking is PROHIBITED when maintaining automotive batteries.**

**AVOID contact with the skin, eyes or clothing.**



**ALWAYS wear appropriate PPE, Refer to *1.4 Personal protective equipment (PPE)*.**



**ALWAYS Isolate and disconnect the battery leads before carrying out any maintenance to the electrical system.**

**When disconnecting the batteries, disconnect the negative first and when connecting make sure the negative is connected last.**



**Batteries must not be disposed of in normal waste which may go to landfill.**

**All batteries must be disposed of via a local re-cycling scheme.**

### 1.9.3 Gas, dust, steam, smoke and noise

| DANGER | |
|---|---|
| <br> | **INHALATION, BREATHING HAZARD!**<br>**Breathing or inhaling silica dust particles will cause death or serious injury. ALWAYS work with a respirator approved by the respirator manufacturer for the job you are doing.**<br>**Ensure suitable breathing equipment is used throughout any procedures carried out. ALL necessary precautions MUST be taken to reduce the risk of breathing dust or particles.**<br>**Dust found on the equipment or produced during work on the equipment MUST NOT be removed with compressed air.**<br>**Dust waste MUST ONLY be handled by authorized personnel. When disposing of dust waste, the material must be dampened, placed in a sealed container and marked to ensure proper disposal.** |

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**ALWAYS operate internal combustion engines outside or in a well ventilated area.**

**If, during maintenance, the equipment must be operated in an enclosed area, MAKE SURE there is sufficient ventilation or provide forced ventilation.**

**Observe ALL local and national safety regulations. Contact your local authority for additional information.**


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### 1.9.4 Welding or Naked Flames

**⚠ WARNING**



**FIRE HAZARD**

**Welding or using other naked flames in the vicinity of the equipment creates the risk of an explosion or fire, which could result in serious injury or death from fire or explosion.**

**AVOID all naked flames in the vicinity of this equipment.**

**Welding, flame cutting and grinding work on the equipment MUST ONLY be carried out if this has been expressly authorized.**

**Before carrying out welding, flame cutting and grinding operations, clean equipment and its surroundings from dust and debris and other flammable substances and ensure the premises are adequately ventilated.**

**Before welding, the battery MUST be isolated and disconnected.**

**On machines and engines with electronic controls they must have these controls isolated and disconnected before welding. Disconnect at the plugs and sockets at machine control panel, engine control unit and input/output module. Refer also to the engine manufacturer's manual.**

### 1.9.5 Hydraulic equipment

**⚠ DANGER**



**SKIN PENETRATION HAZARD**

**Hydraulic fluid under pressure can penetrate the skin, which will result in serious injury or death.**

**If fluid is injected under the skin, it must be surgically removed or gangrene will result. GET MEDICAL HELP IMMEDIATELY.**

**ALWAYS use a piece of cardboard to check for leaks. DO NOT USE YOUR HAND.**

**Work on hydraulic equipment must be carried out by persons with training and authorisation to maintain the hydraulic equipment. Do a full risk assessment and take all necessary safety measures.**

**⚠ WARNING**



**FIRE HAZARD**

**Splashed or spilled oil creates the risk of a fire, which could result in serious injury or death.**

**Check all lines, hoses and screwed connections regularly for leaks or other damage.**

**Repair damaged lines, hoses, or screwed connections IMMEDIATELY.**

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| ⚠ WARNING | |
|---|---|
|  | **STORED ENERGY HAZARD**<br>**Latent stored pressure energy may be contained in hydraulic systems when they are off.**<br>**ALWAYS relieve pressure from the hydraulic system before carrying out any kind of maintenance or adjustment.** |



**BEFORE carrying out any repair work, depressurize all system sections and pressure hoses (hydraulic and compressed air system) requiring removal, in accordance with the specific instructions for the unit concerned.**

**ONLY fit replacement components of a type recommended by the manufacturer.**



**Hydraulic and compressed air lines MUST be laid and fitted properly. Make sure no connections are interchanged. The fittings, lengths and quality of the hoses MUST comply with the technical requirements.**

**ALWAYS practice extreme cleanliness when servicing hydraulic components. Make sure all measures are taken to avoid spillage and leaks.**

### 1.9.6 Hazardous substances

For more information, refer to ***1.3 Environmental safety*** and the ***Hazardous substances*** section.


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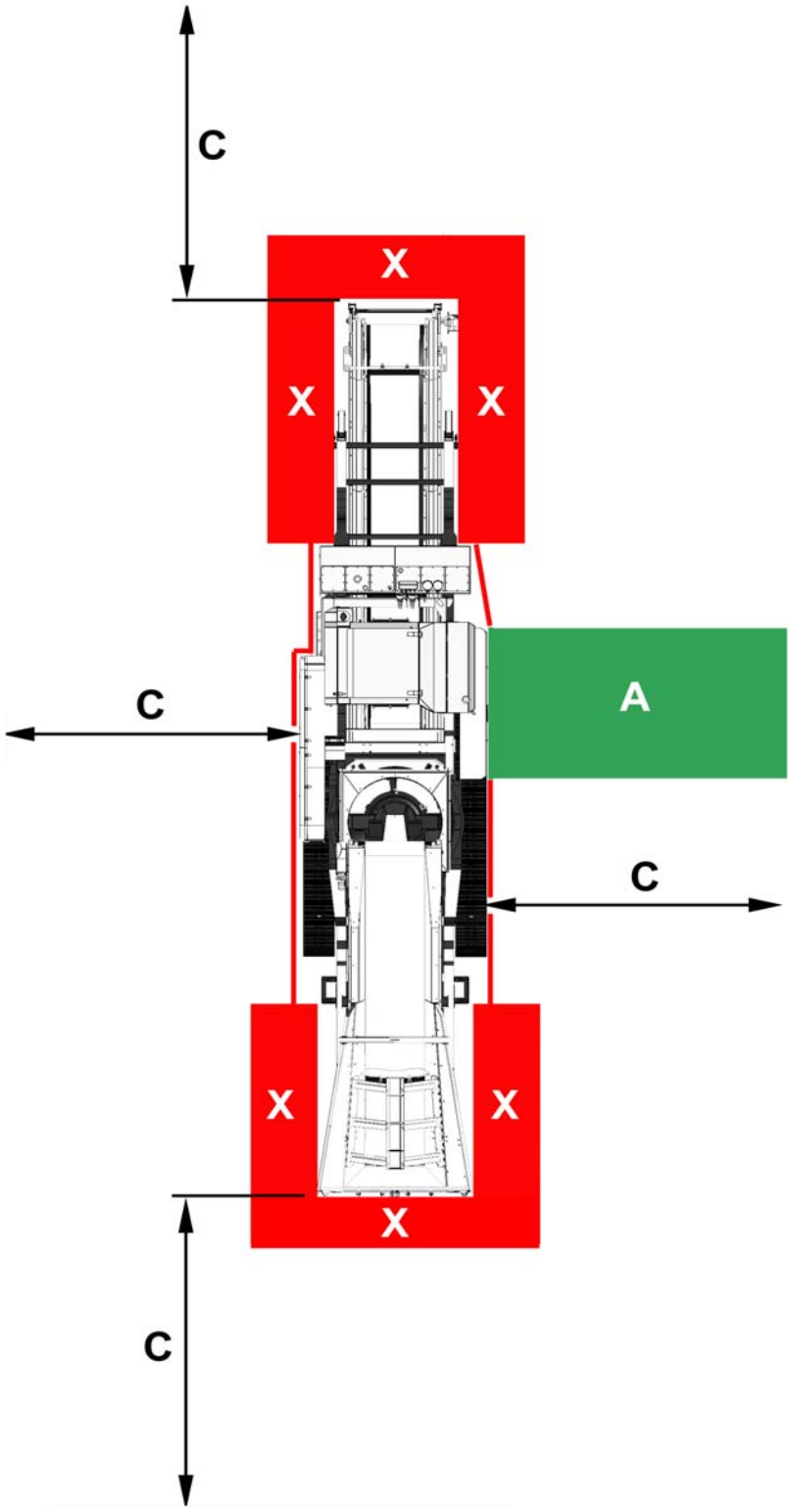
## 1.10 Vibration levels

There are no circumstances where an operator needs to be on or holding the machine during the crushing operation or moving the machine.

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## 1.11 Hazard exclusion zones




A = Access area to the machine controls, only when not loading material.

C = 20m (66ft) clearance to limit access to equipment and surroundings. Erect barriers around the perimeter of the machine. NO persons allowed within this exclusion zone unless operating machine.

X = 5m (17ft) hazard area at machine loading and material outlet areas. DO NOT ENTER when machine is operating.

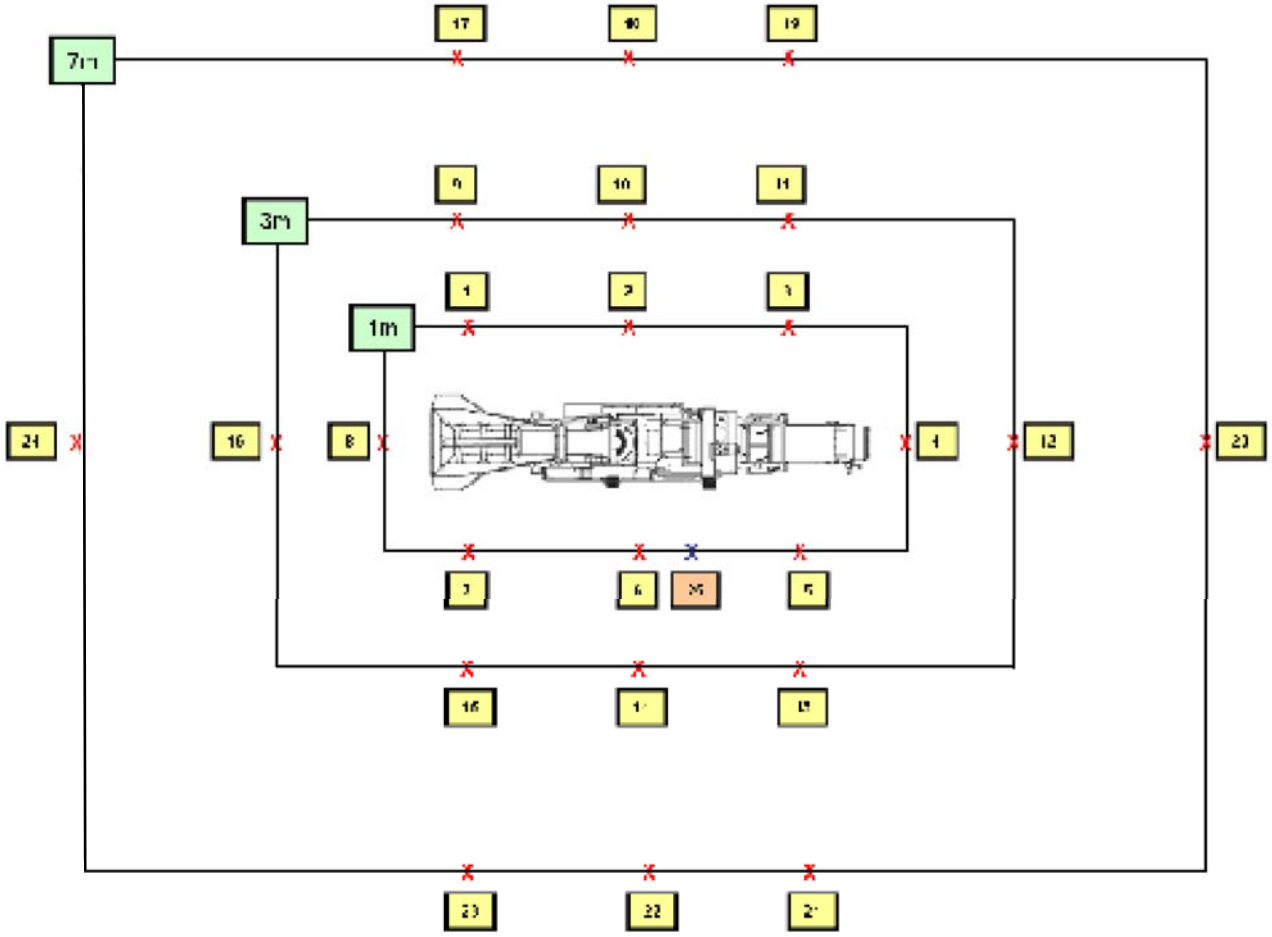
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## 1.12 Measured noise levels



**NOISE HAZARD**

**Ear protection MUST be worn if you are within 10m (33ft) of the machine when the engine and other parts of the machine are running.**




The indicated measured noise levels are at 1m (3.5ft), 3m (9.8ft) and 7m (23ft) using a Casella CEL-244 [Type 2] meter with an empty machine all systems running situated in an open area with minimum reflective surfaces and structures.

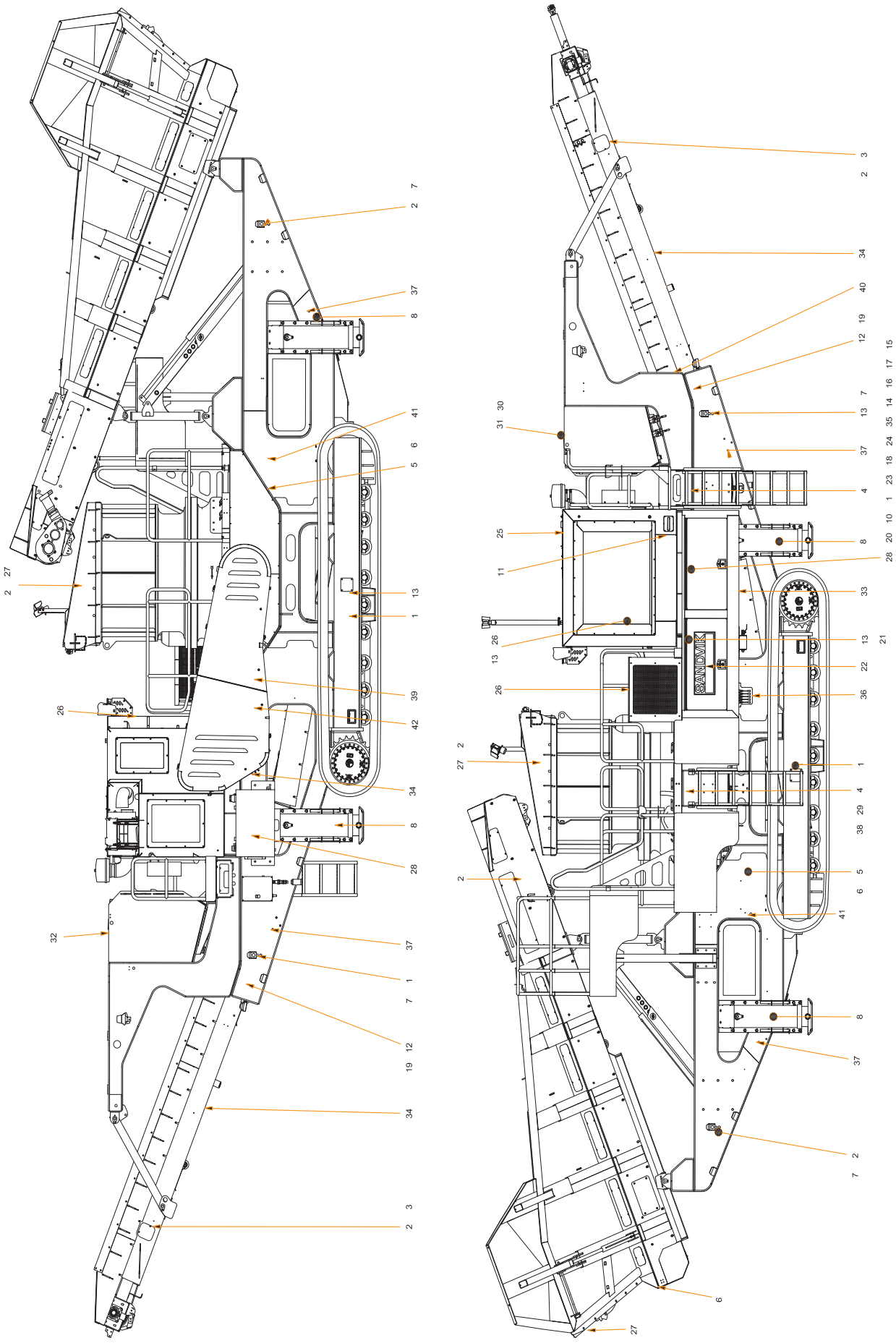
Note that product processing and local conditions will have an affect on the noise levels experienced.


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| Ref | Background Average Noise Level (Laeq) [dB] | Machine Running Average Noise Level (Laeq) [dB] |
|---|---|---|
| 1 | 51.5 | 84.4 |
| 2 | 46.5 | 90.2 |
| 3 | 47.6 | 90.2 |
| 4 | 51.4 | 79.3 |
| 5 | 54.5 | 89.3 |
| 6 | 56.5 | 90.3 |
| 7 | 50.3 | 83.2 |
| 8 | 55.6 | 76.3 |
| 9 | 52.2 | 84.4 |
| 10 | 46.9 | 88.1 |
| 11 | 42.6 | 87.3 |
| 12 | 43.6 | 77.6 |
| 13 | 47.2 | 88.4 |
| 14 | 48.1 | 88.2 |
| 15 | 50.3 | 83.6 |
| 16 | 59 | 73.5 |
| 17 | 60.1 | 82.4 |
| 18 | 56.8 | 84 |
| 19 | 53.8 | 83.2 |
| 20 | 58 | 74.7 |
| 21 | 55.7 | 84.9 |
| 22 | 59.8 | 85.4 |
| 23 | 57.4 | 82.2 |
| 24 | 58.1 | 76.5 |
| 25 | 55.5 | 95.7 |

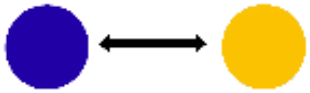
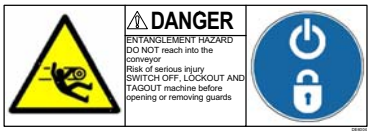
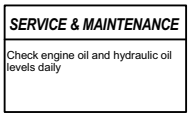
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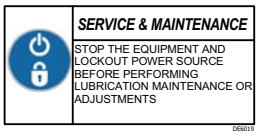
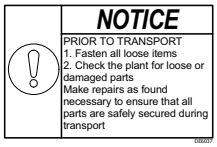
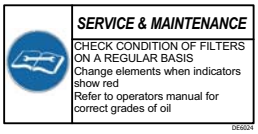
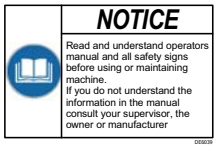
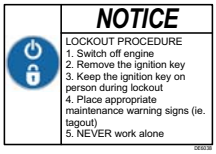
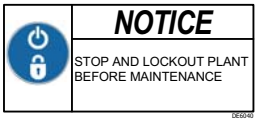
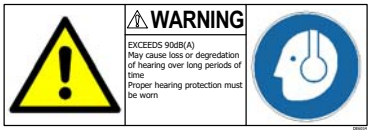
## 1.13 Safety decals - Locations



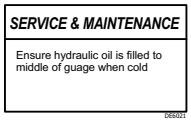
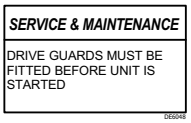
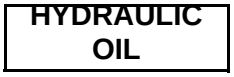


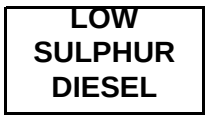
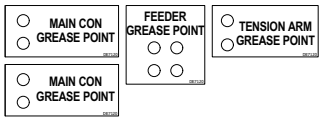
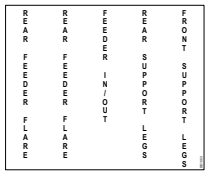
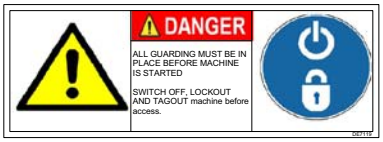

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| Item | Part No. | Image |
|---|---|---|
| 1 | DE1007 |  |
| 2 | DE6000 |  |
| 3 | DE6004 |  |
| 4 | DE6015 |  |
| 5 | DE6006<br>DE5024 |  |
| 6 | DE6007 |  |
| 7 | DE0027 |  |
| 8 | DE6011 |  |
| 9 | DE6020 |  |

| Item | Part No. | Image |
|---|---|---|
| 10 | DE6019 |  |
| 11 | DE6013 |  |
| 12 | DE6036 |  |
| 13 | DE6005 |  |
| 14 | DE6037 |  |
| 15 | DE6024 |  |
| 16 | DE6039 |  |
| 17 | DE6038 |  |
| 18 | DE6040 |  |
| 19 | DE6014 |  |

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| Item | Part No. | Image |
|---|---|---|
| 20 | DE6018 |  |
| 21 | DE1043 |  |
| 23 | DE6021 |  |
| 24 | DE6048 |  |
| 25 | DE6050 |  |
| 26 | DE6041 |  |
| 27 | DE6049 |  |
| 29 | 885-0267-00 |  |
| 30 | DE0053 |  |
| 31 | DE1075 |  |

| Item | Part No. | Image |
|---|---|---|
| 32 | DE1076 |  |
| 33 | DE1074 |  |
| 34 | DE7120 |  |
| 35 | DE0062 |  |
| 36 | DE1053 |  |
| 37 | DE0061 |  |
| 38 | DE5007 |  |
| 40 | DE5009 |  |
| 41 | DE7119 |  |
| 42 | DE6003 |  |



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# 2 Transportation & technical data

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## 2.1 Special considerations for transport

**⚠ WARNING**



**TRANSPORT HAZARD**

**Transport the machine utilizing a vehicle capable of hauling at least the listed gross weight of the machine, refer to the identification plate on the machine. Failure may result in damage to the machine, haulage vehicle, and may result in serious personal injury or death.**

**ALWAYS observe local and national regulations concerning the transportation of heavy equipment. Ensure all appropriate permits, licenses and endorsements are obtained and maintained before transporting.**

### 2.1.1 Machine preparation for transport

**⚠ WARNING**



**PERSONNEL HAZARD**

**Lack of knowledge or understanding could cause serious injury, death or damage to the machine.**

**DO NOT prepare machine for transportation until you have READ and FULLY understood this manual. If necessary seek clarification from your supervisor and or a Sandvik representative, before continuing. Failure to do so may also invalidate the manufacturers warranties.**

**⚠ WARNING**



**PERSONNEL HAZARD**

**Working on or in close proximity to the machine whilst it is on and or operating could cause serious injury or death.**

**Stop machine, isolate, remove ignition key and tag out, before continuing. Refer to *4.9 Lockout and tag procedure*.**

**Make sure all guards are in place and secure.**

Visually check machine to ensure there is no component damage. Ensure all personnel are away from the machine, drives, tracks and auxiliary equipment.

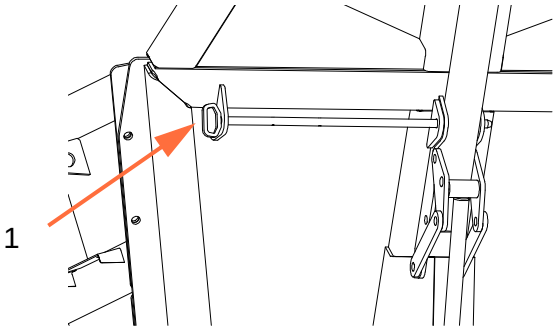
Ensure cone crusher, feeder and conveyor belts are free of material, remove if necessary.


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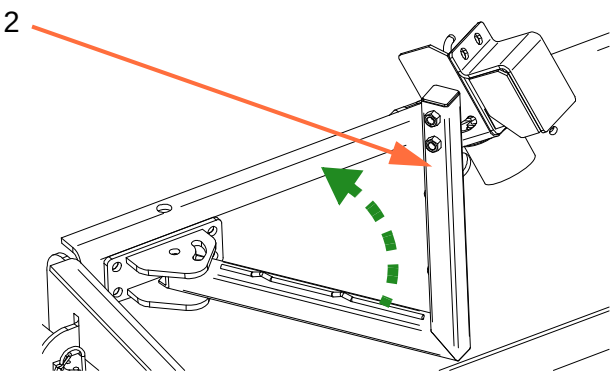
Ensure engine pre-start checks are carried out in accordance with engine manufacturer's instruction manual and the daily machine checks are made, refer to ***6.3.2 Daily maintenance schedule***.

| ⚠ WARNING | |
|---|---|
|   | **FALLING HAZARD**<br>**Falling from heights could cause serious injury or death.**<br>**Some of the steps in this procedure requires working at height, ensure the following applies when working off the ground:**<br>**Maintenance platforms are in place.**<br>**All hand rails are fixed in position.**<br>**All ladders are lowered and fixed in position.**<br>**A safety harness is worn.**<br>**Make sure all guards are in place and secure.** |

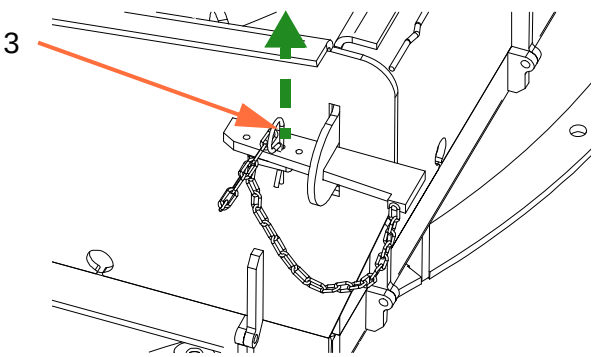
1. Remove retaining clips and bars from each hopper side and store them.




2. Lower the level sensor and camera into the transport position.




3. Release retaining clips and remove bolts from the wedges.

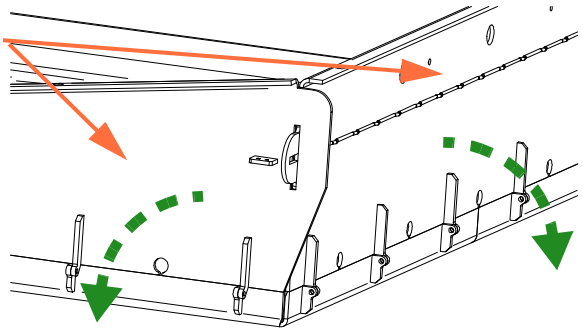



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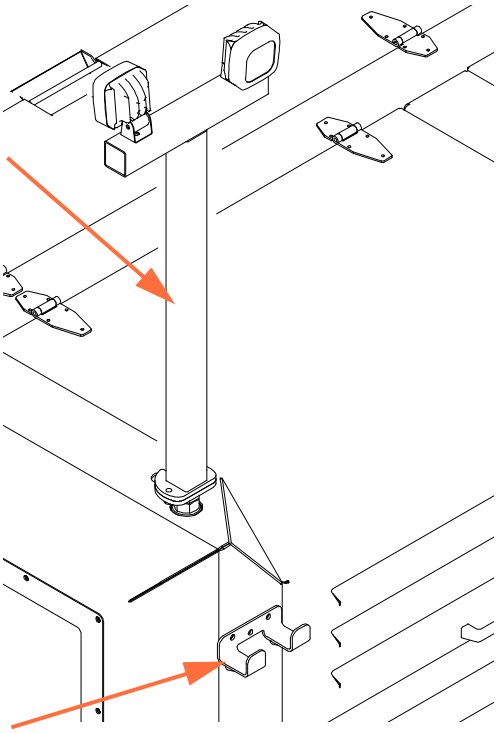
4. Remove wedge on one side and lower the side of the feed box. Remove the other wedge and carefully lower the side and end.

***Note: Take care when releasing the wedges and lowering the heavy feed box sides and end.***

4



5



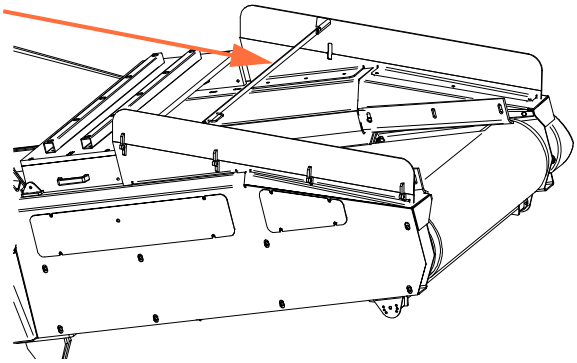
5. If the lighting mast option is fitted, disconnect the plug and remove the mast.
6. Locate the mast in the transport bracket

6


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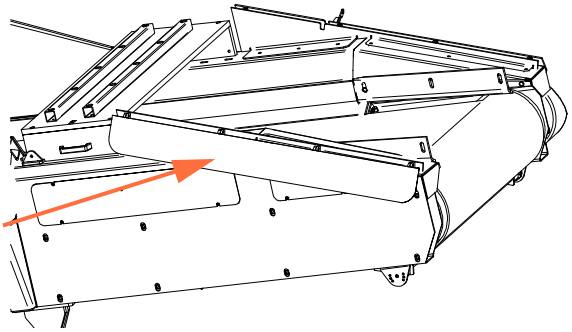
7. Remove the nuts, bolts and bracing bar from the feed conveyor sides. Store the bar and fixings in a safe place for re-use.

7



8. Lower the feed conveyor sides into the transport position.

8



9. Start the engine >

9 Refer to: ***4.3 Engine starting procedure***.

10. At display P0000, press button 4 to select machine set up mode and enable the auxiliary hydraulic system.

10

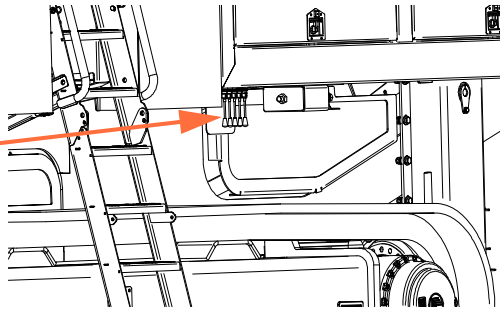


11. If the legs are in the lowered position, raise the legs fully >

11 Refer to:***4.7 Legs set-up procedure***.

12. Lower each hopper side using the individual left and right 'rear feeder flare' control levers.

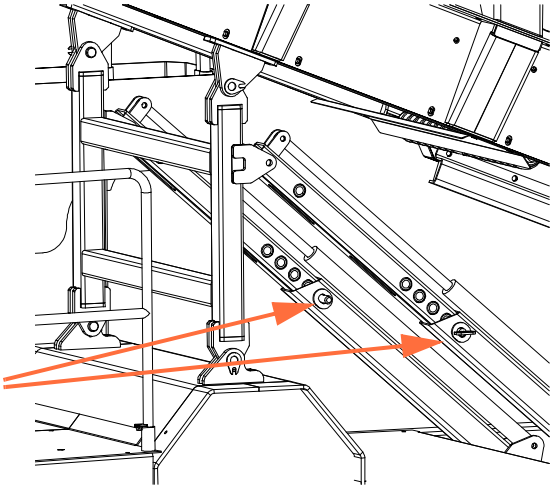
12



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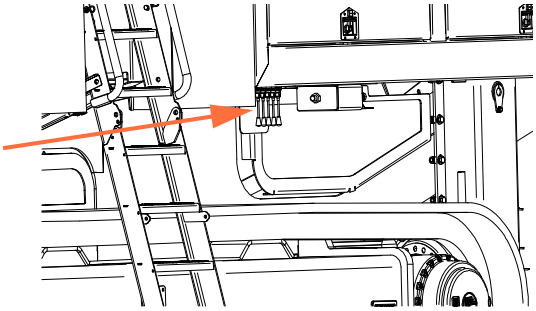
13. Remove the retaining clips and pins from the conveyor telescopic supports.

13



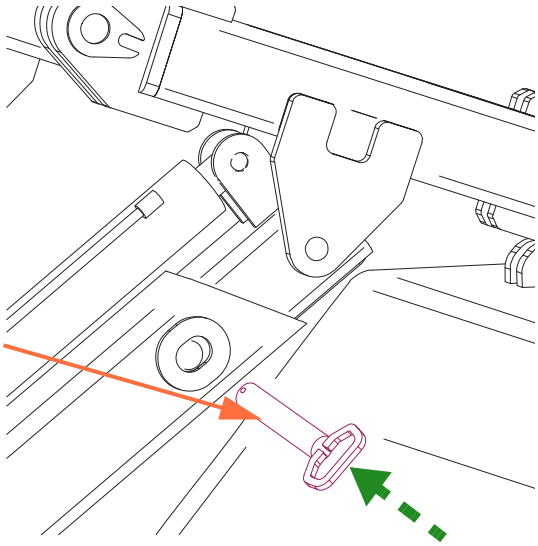
14. Lower the feed conveyor into transport position using the ‘feeder in/out’ control lever.

14



15. Fit pins and retaining clips that secure feed conveyor telescopic support in the transport position.

15



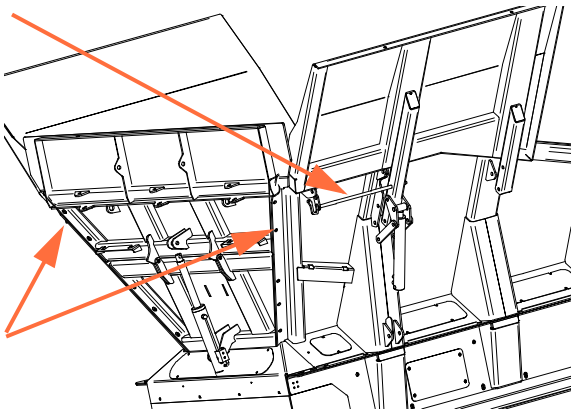

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***Note: If the optional hopper extensions are fitted, they require lowering into the transport position:***

16. Remove the clip and long bar at each side of the hopper.

17. Remove the nuts and bolts at each side of the rear hopper extension.

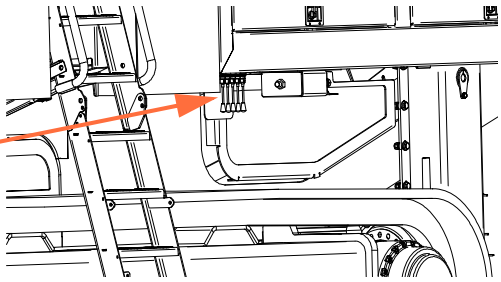
16



17

18. Lower each hopper side and rear extension using the individual left, right and rear feeder flare control levers.

18



19. Press button 4 to exit setup mode.

19

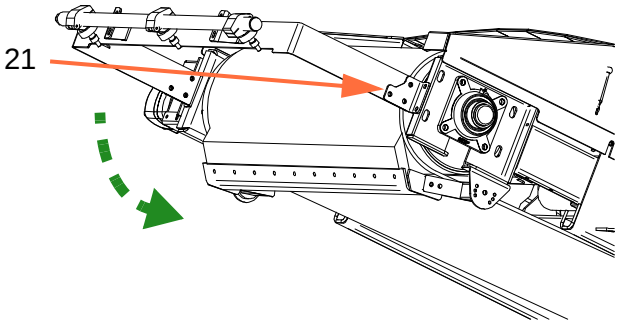


20. Stop engine, lockout and tag out >

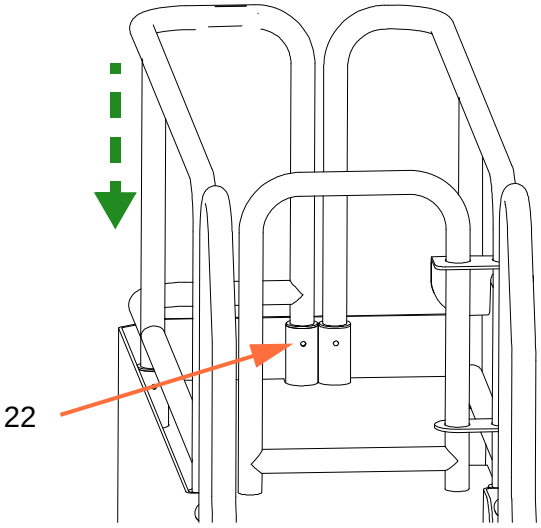
20 Refer to: ***4.9 Lockout and tag procedure***.

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21. Remove 2 bolts from each side and pivot the dust suppression water sprays down into the transport position. Leave secured with one bolt at each side and ensure bolts are placed in a safe position for transportation, such as the toolbox.

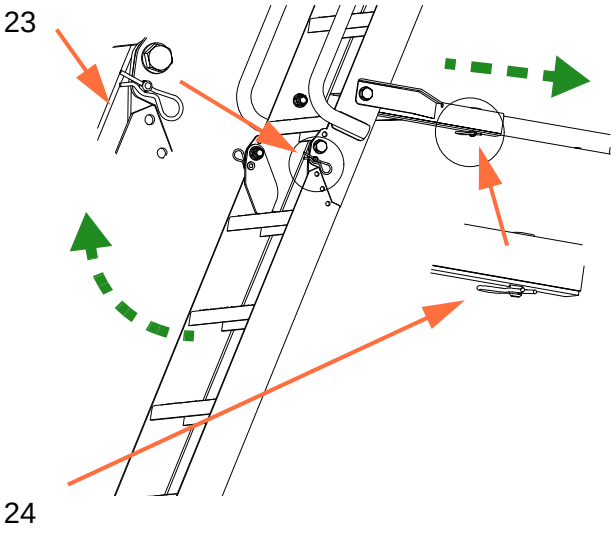



22. Remove the pins and lower the handrails of the upper maintenance platform down into the transport position. Place pins in a safe place for transportation, such as the toolbox.




23. Remove retaining clips and pins then pivot the lower part of the ladders up. Secure ladder in the raised position with the pins and clips.

24. Remove retaining clip and pin then push the ladders inward into the transport position. Secure with the pins and clips.





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### 2.1.2 Tracking machine on or off transport vehicle

| DANGER | |
|---|---|
|  | **CRUSHING HAZARD**<br>**Personnel on the machine or in exclusion zones when machine is operational, are at risk of serious injury or death.**<br>**DO NOT UNDER ANY CIRCUMSTANCES operate machine when ANY personnel or objects are on the machine or personnel are in the exclusion zones, 10m (33ft).**<br>**Carry out a thorough site inspection prior to commencing ANY machine moving operations.** |

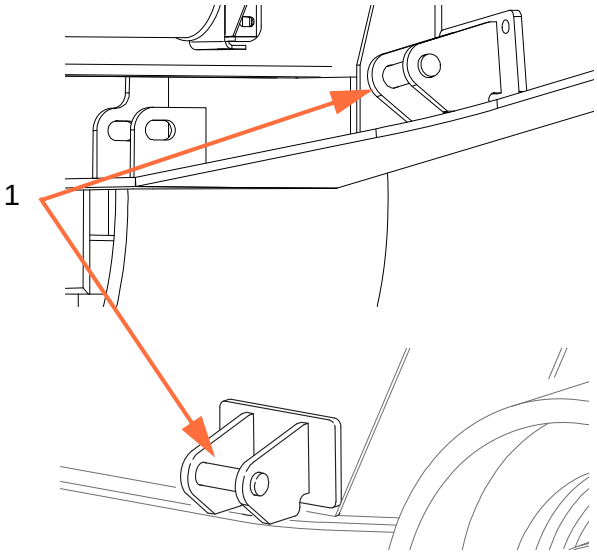
Follow start up and tracking procedure, refer to ***4.5 Moving the machine using the tracks***. The machine can be driven on or off the transport vehicle at the pre-set tracking speed.

### 2.1.3 Securing

Before moving the machine off transport vehicle ensure all temporary sealing and transport straps and chains are removed.

After tracking machine onto the transport vehicle ensure all temporary sealing, transport straps and chains are installed.

1. Lashing down the machine is the responsibility of the driver of the transport vehicle. DO NOT secure machine by the tracks, use the lashing brackets fitted inside the chassis.




2. Lower all four jacking legs sufficiently just to support the weight of the machine and spread the load >

2 Refer to ***4.7 Legs set-up procedure***.

**Note: Always check the travelling height before starting the journey.**

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## 2.2 Application & limitations

This machine has been designed and constructed to reduce minerals such as stone to a predetermined size. It must not be used for any other purpose without first contacting the Sandvik technical department. DO NOT operate until the manual and all instructions supplied with the machine are read and fully understood.

### 2.2.1 Common applications

This list is by no means exhaustive. Please contact Sandvik Construction for further information on any materials not indicated below.

- Granite.
- Slate.
- Bricks.
- Limestone.


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## 2.3 Technical specification

### 2.3.1 Feed hopper

| | |
|---|---|
| Nominal capacity | 6,3m³ (8.25yd³) |
| Capacity with extensions | 10m³ (13yd³) |
| Rear loading height | 3490mm (11ft - 6in) |
| Loading with rear door lowered | 3090mm (10ft - 2in) |
| Rear loading width | 2630mm (8ft - 8in) |
| Rear loading with extensions | 3822mm (12ft - 6in) |
| Material | 10mm (3/8in) thick hopper and Hardox liners |
| Metal detector | Up and over metal detector |

### 2.3.2 Feed Conveyor Belt

| | |
|---|---|
| Head drum diameter | Ø371mm (Ø14.5in) |
| Hydraulic drive | 80cm³ (4.9in³) piston motor |
| Gearbox | Ratio 31:1, 8000Nm (5900 lbf-ft) |
| Tail drum diameter | Ø265mm (Ø10.5in) |
| Width | 1200mm (47in) |
| Length (endless) | 13 150mm (43.2ft) |
| Speed | 36.3m/min (119ft/min) 31.1rpm |
| Specification (EP630) | 4ply: 6mm (1/4in) top cover, 2mm (0.08in) bottom cover |

### 2.3.3 Main Conveyor

| | |
|---|---|
| Head drum diameter | Ø371mm (Ø14.5in) |
| Hydraulic drive | 630cm³ (38.5 in³) motor |
| Tail drum diameter | Ø265mm (Ø10.5in) |
| Width | 1200mm (47in) |
| Length (endless) | 21 600mm (70.1ft) |
| Specification (EP630) | 4ply 6mm (1/4in) top cover, 2mm (0.08in) bottom cover |
| Discharge height | 3734mm (12ft - 4in) |

### 2.3.4 Lubrication Tank

| | |
|---|---|
| Capacity | 250 litres (66 US gall) |
| Flow meter | Fixed displacement flow meter |
| Oil cooler | Hydraulically driven oil cooler |

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### 2.3.5 Power Pack

| | |
|---|---|
| Engine | Refer to section ***8 Engine*** |
| Diesel tank size | 900 litres (238 USgall) |
| Hydraulic tank size | 900 litres (238 USgall) |
| Crusher drive | PT Tech 355mm (14in) wet clutch c/w twin pto |
| Drive belts | Spc6300 (10xsingle) |

### 2.3.6 Electrical system

Electrical control system 24V DC negative earth.

### 2.3.7 Tracks

| | |
|---|---|
| Length (centres) | 3715mm (12.2ft) |
| Overall length | 4528mm (14.1ft) |
| Track shoe width | 500mm (19.5ft) |
| Tracking speed | 0.36m/s (1.18ft/s) |
| hydraulic motor | 90cm³ (5.5in³) bent axis |
| Gearbox ratio | 124:1 |

### 2.3.8 Dimensions

For transport dimensions, refer to ***2.3.10 Machine Transportation Dimensions***.

For working dimensions, refer to section 3 Product overview.

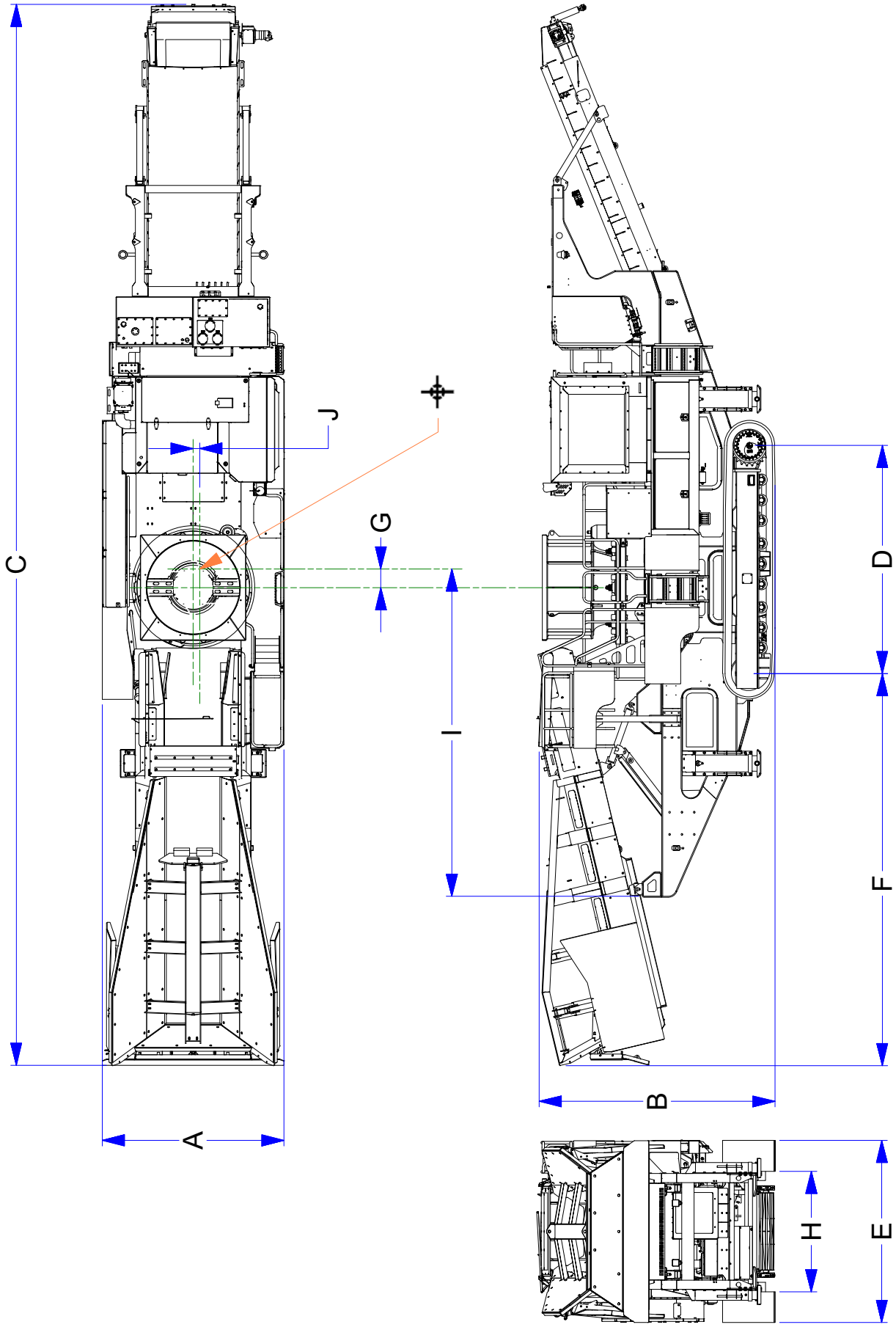
### 2.3.9 Weight

The weight of.the machine varies with each option fitted, refer to specification plate on machine for more information.

| **Description** | **Weight kg (lb)** |
|---|---|
| Hopper Extensions | 352 (776) |
| Main Conveyor Head Drum Guard | 146 (322) |
| Light Mast | 13.3 (29.3) |
| Diesel Pump | 16 (35.3) |
| Water Pump | 22 (48.5) |
| Stockpile Sensor | 5 (11) |
| Under Guard Assembly | 192 (423) |
| Auto lubrication system | 70 (154) |


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### 2.3.10 Machine Transportation Dimensions




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| | | |
|---|---|---|
| **A** | 2950mm | 9ft - 8in |
| **B** | 3800mm | 12ft - 6in |
| **C** | 17216mm | 56ft - 6in |
| **D** | 3715mm | 12ft - 2in |
| **E** | 2954mm | 9ft - 8in |
| **F** | 6360mm | 20ft - 10in |
| ***G** | *300mm | *12in |
| **H** | 1954mm | 6ft - 5in |
| ***I** | *5310mm* | *17ft - 5in |
| ***J** | *106mm* | *4in |

* ⌖ = Centre of gravity


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# 3 Product overview

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## 3.1 Features

### 3.1.1 Standard

This is a tracked, self contained cone crusher with an on-board diesel engine and features the following:

- ‘I’ beam chassis construction for maximum durability.
- Heavy duty, hydraulically positioned feed conveyor with Hardox liners.
- Up and over metal detector, providing cone protection from tramp material.
- Variable speed feed conveyor.
- Four legs to aid stability and maintenance.
- 13 litre diesel engine with direct drive ensuring maximum power delivery and fuel efficiency.
- Machine is designed for ease of mobility, rapid set up time and transportation.
- CH440 Sandvik cone installed with a choice of 6 concave types and a CSS range of 8mm to 48mm (0.3 to 1.9in) allowing a feed size up to 215mm (8.5in).
- 8 available bush settings giving an eccentric throw range from 16mm to 44mm (0.6 to 1.7in).
- Capable of up to 388 tonne/h (427 US ton/h).

### 3.1.2 Machine Models, Variations And Options

The machine can be supplied with a variety of options which are available.

Some instructions and components mentioned in this manual may not be applicable as the option has not been fitted.

### 3.1.3 Optional items

Some options and weights

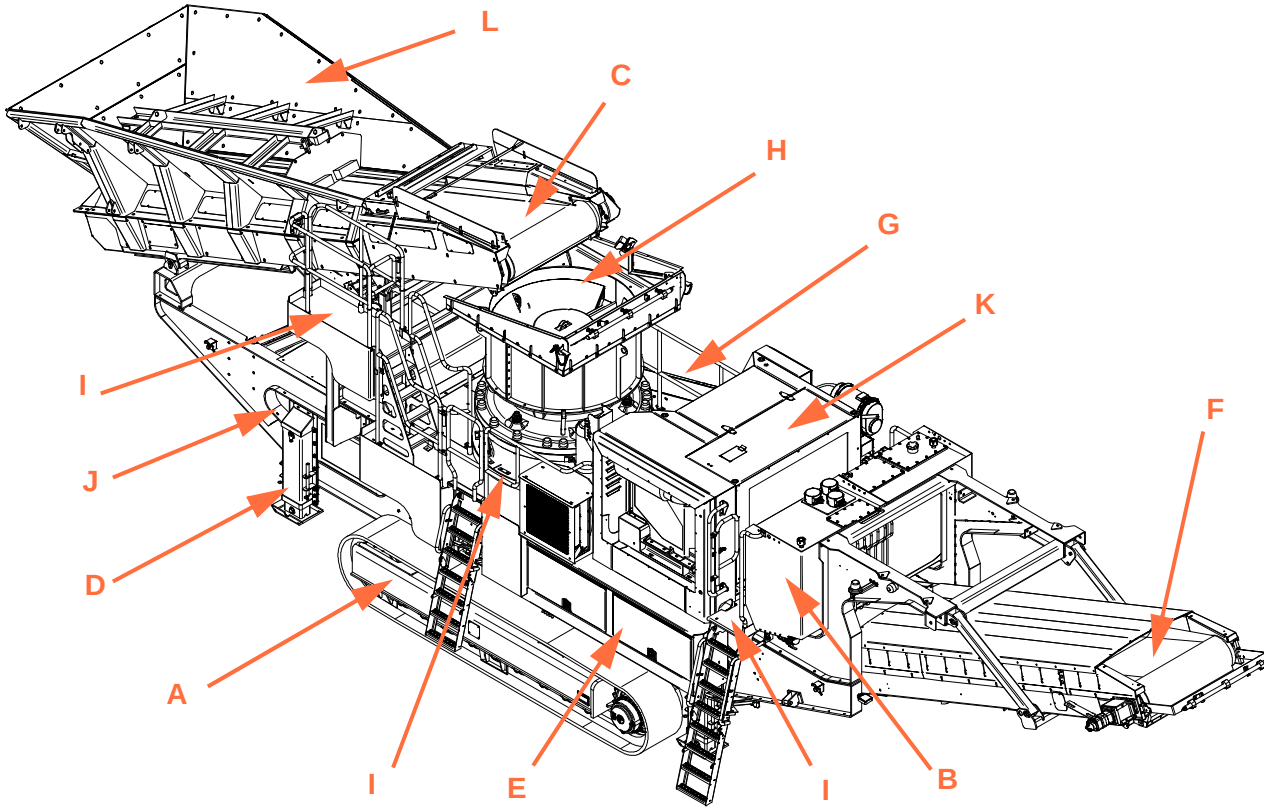
- Tropical high ambient package.
- Arctic low ambient package down to -20°C (-4°F).
- Arctic low ambient package down to -30°C (-22°F).

| Option description | Weight |
|---|---|
| Hopper Extensions | 597kg (1316 lb) |
| Main Conveyor Head Drum Guard | 146kg (322 lb) |
| Light Mast | 13.3kg (29 lb) |
| Diesel Pump | 16kg (35 lb) |
| Water Pump | 22kg (49 lb) |
| Stockpile Sensor | 5kg (11 lb) |
| Auto lubrication Assembly | 70kg (154 lb) |
| Under Guard Assembly | 192kg (423 lb) |


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## 3.2 Main Components - Overview

A. Chassis with tracks
B. Hydraulic tank
C. Feeder conveyor
D. Legs
E. Control cabinets
F. Main output conveyor
G. Drive guard and belt tension system
H. Cone crusher and feed box
I. Maintenance walkway
J. Cone lubrication tank
K. Power pack
L. Hopper

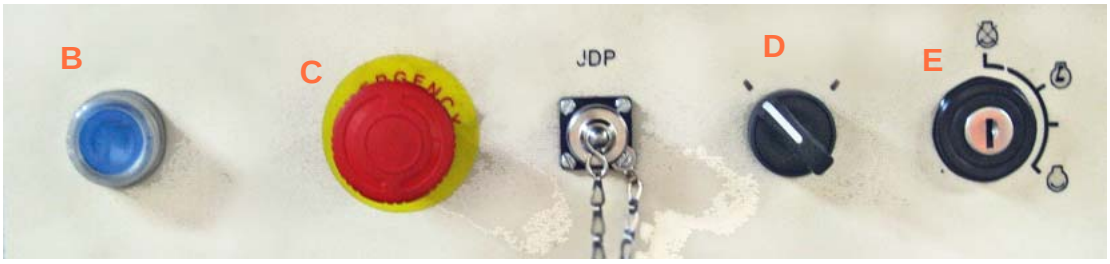



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## 3.3 Main control devices

### 3.3.1 Electrical controls




A. Display screen and soft keys.

B. Reset emergency stops prior to engine start.

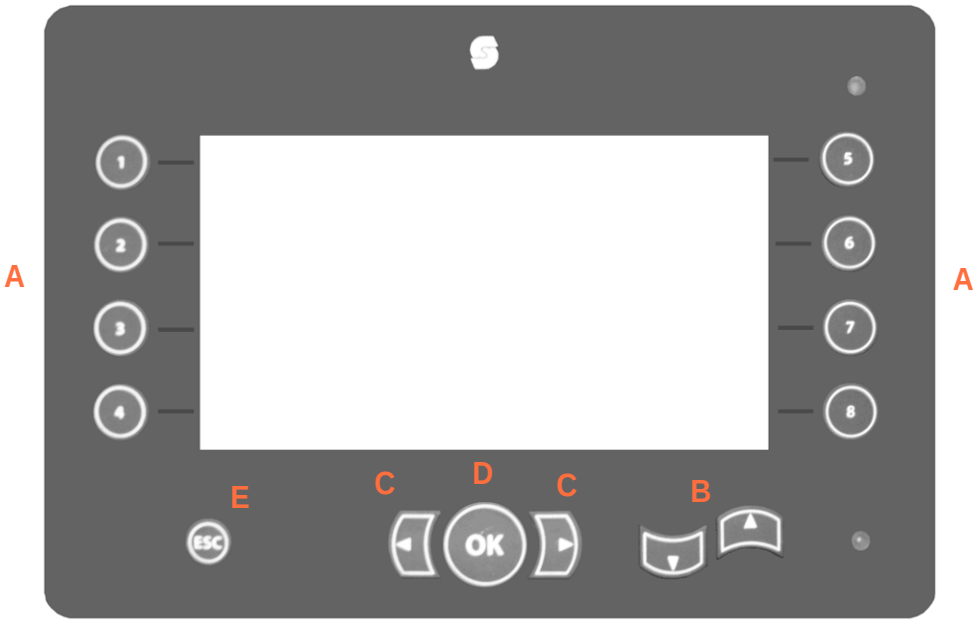
C. Emergency stop.

D. Lights.

E. Engine ignition.


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### 3.3.2 Display screen and soft keys




Navigation through menus is achieved using relevant 'soft keys' as follows:

A. Numbered keys (1 to 8) to select and deselect options displayed as an icon on screen next to relevant numbered key.

B. When up and down arrows displayed to adjust settings of current selected item.

C. When left or right page number arrows are displayed to navigate to other screen pages.

D. OK - For diagnostic use and accepting changes to configuration.

E. ESC - Return to previous menu, option or home page, press repeatedly to page back.

### 3.3.3 Icon highlighting

Icons are highlighted as follows:

- Grey when inactive.
- Green when active.
- Flashing amber prior to starting and when shutting down.



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### 3.3.4 Stopping machine in an emergency

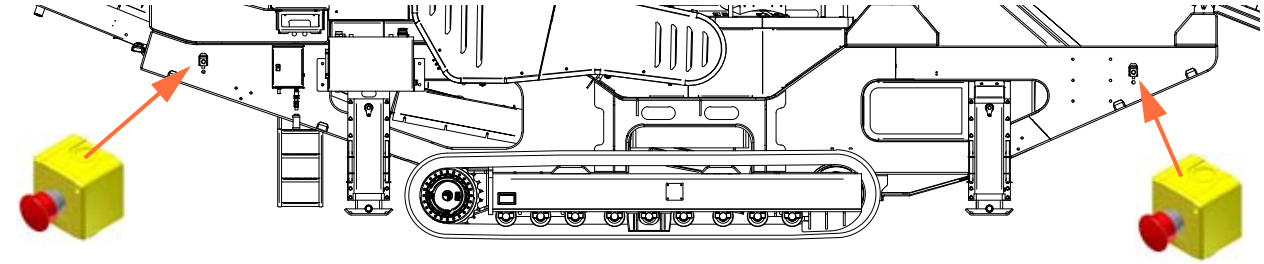
**The machine can be stopped in an emergency by pressing ANY emergency stop button located on electrical control panel, along each side of the machine or on the wired umbilical control.**

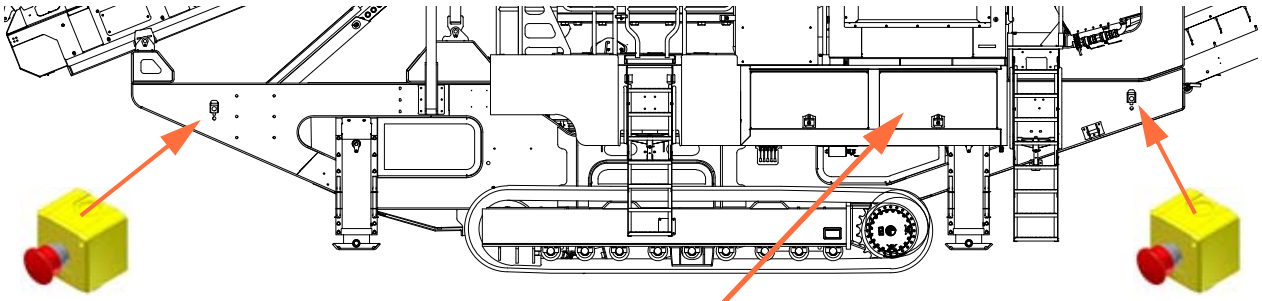
**WARNING! PERSONNEL HAZARD**

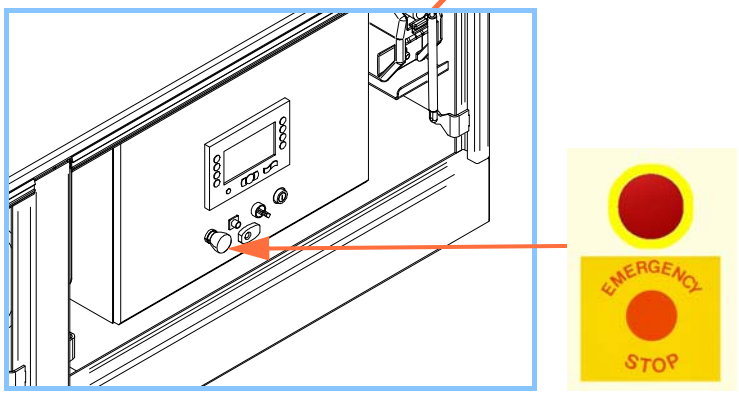
**Ensure all persons in the area of the machine are fully trained in how to use the emergency stops and their locations.**

### 3.3.5 Emergency stop locations

On machine chassis and control panel



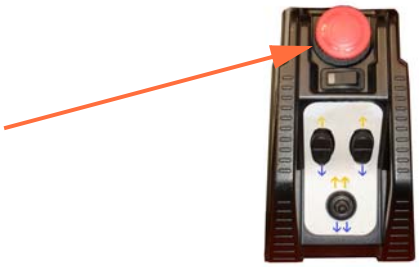




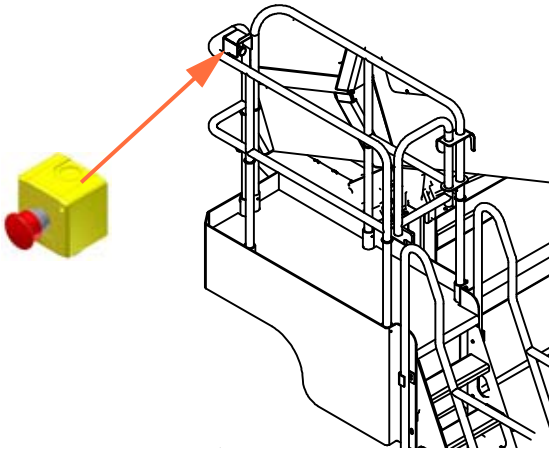


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On wired umbilical track control



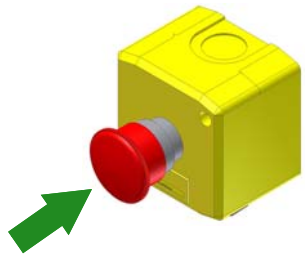
On maintenance platform



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### 3.3.6 Operation of an emergency stop

1. Push emergency stop button to stop machine.

1 

2. Turn the ignition key and isolation switch to '0' the OFF position as soon as possible.

2 

3. Lockout and tag if required >

3 Refer to ***4.9 Lockout and tag procedure***

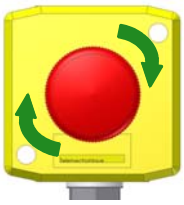
### 3.3.7 To reset an emergency stop



**WARNING! PERSONNEL HAZARD**

**Ensure the reason for the use of the emergency stop has been cleared or rectified before the emergency stop is reset.**

Turn emergency stop clockwise and release.




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### 3.3.8 Set language, date and time

1. At the initial screen, press and hold ESC until the settings information display is shown.

1 


2. To select the language, press button 3 until the required language is displayed. Repeat to cycle through the languages available.

2 


3. To adjust the date and time, press and hold button 8 until the hour time on the left changes to red. The data being changed is displayed in red.

3 


4. To adjust the hour time, press up or down arrows as required.

4  

5. Press right arrow to move to next setting minutes, then seconds, day, month, year and adjust as required using the up or down arrows.

5 

6. Use the left arrow to move back if required.

6 

7. To store the data, when the time and date have been set, finally press the right arrow until no red numbers are displayed and the seconds time runs.

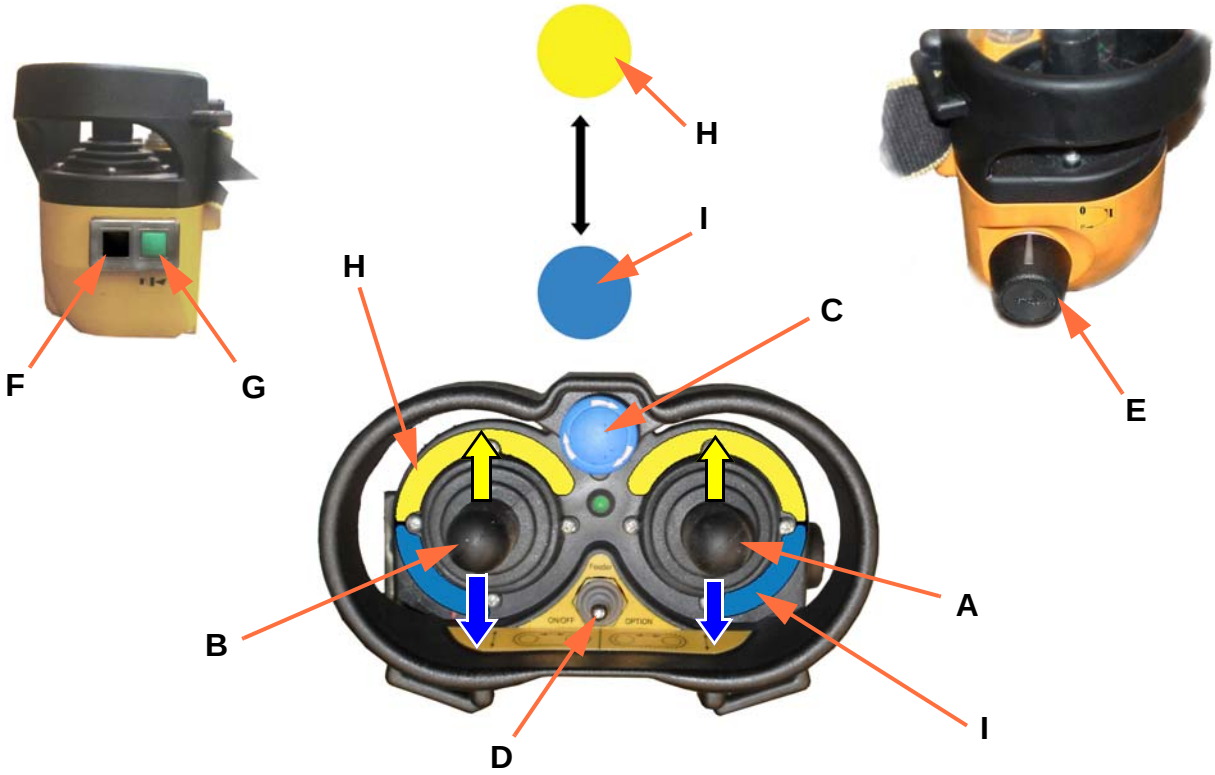
7 

8. Press ESC to return to previous display.

8 


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### 3.3.9 Radio remote control




A. Track mode: Lever forward or back to control a single track.

B. Lever forward or back to control a single track.

C. Stop engine button, when radio control is operational.

D. Mode option selection toggle switch:
Track control.
Feeder option - Feeder on/off.
Auxiliary control.

E. Radio remote control switch, turn ON/OFF (1/0).

F. Set auxiliary function in crushing mode (black button).

G. Synchronise radio control to machine (green button).

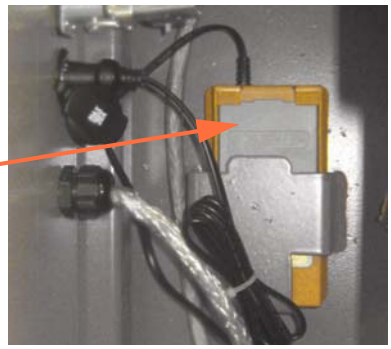
H. Yellow forward direction marker, main conveyor at front.

I. Blue direction marker, feed hopper at rear.


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### 3.3.10 Remote control battery recharging

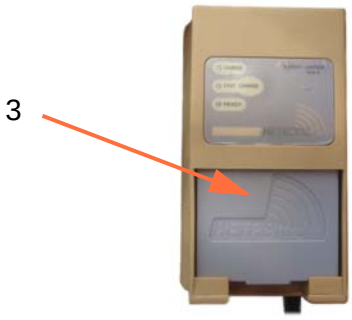
1. Open the control box cabinet door and remove the charging unit from the holder.




2. Remove the battery from the radio remote control.




3. Fit the battery into the charge unit.

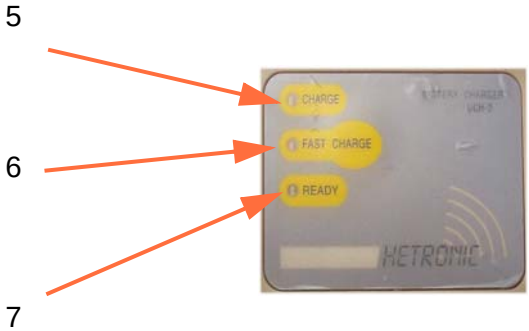



4. Connect charge unit plug into socket.

***Note: Place charge unit into holder whilst it is charging.***

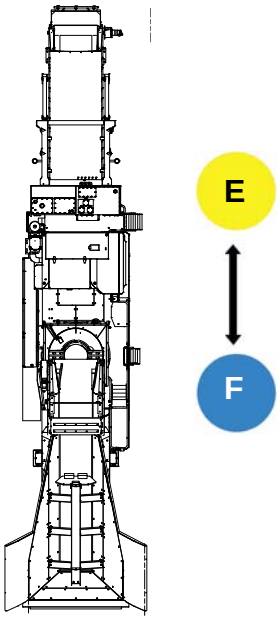


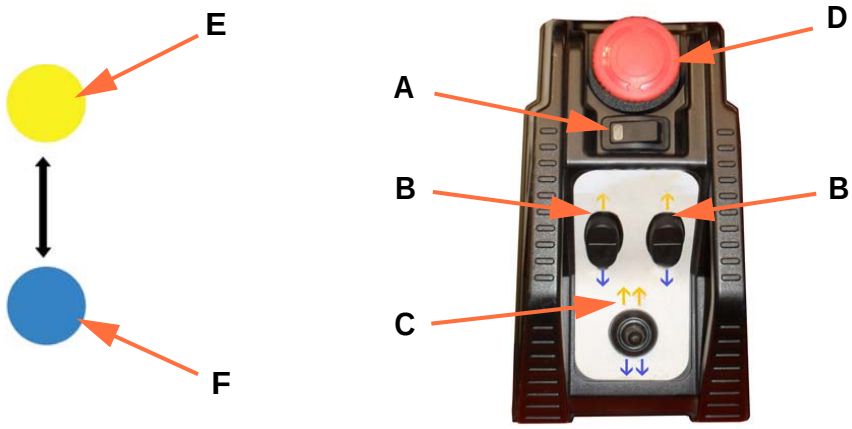

5. To charge the battery, press 'CHARGE'.
6. For quick recharge of the battery, press 'FAST CHARGE'
7. When battery charge cycle is complete, 'READY' illuminates green.




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### 3.3.11 Wired umbilical track control




A. Umbilical track controls ON/OFF switch.

B. Individual track controls.

C. Double track control for moving in straight line.

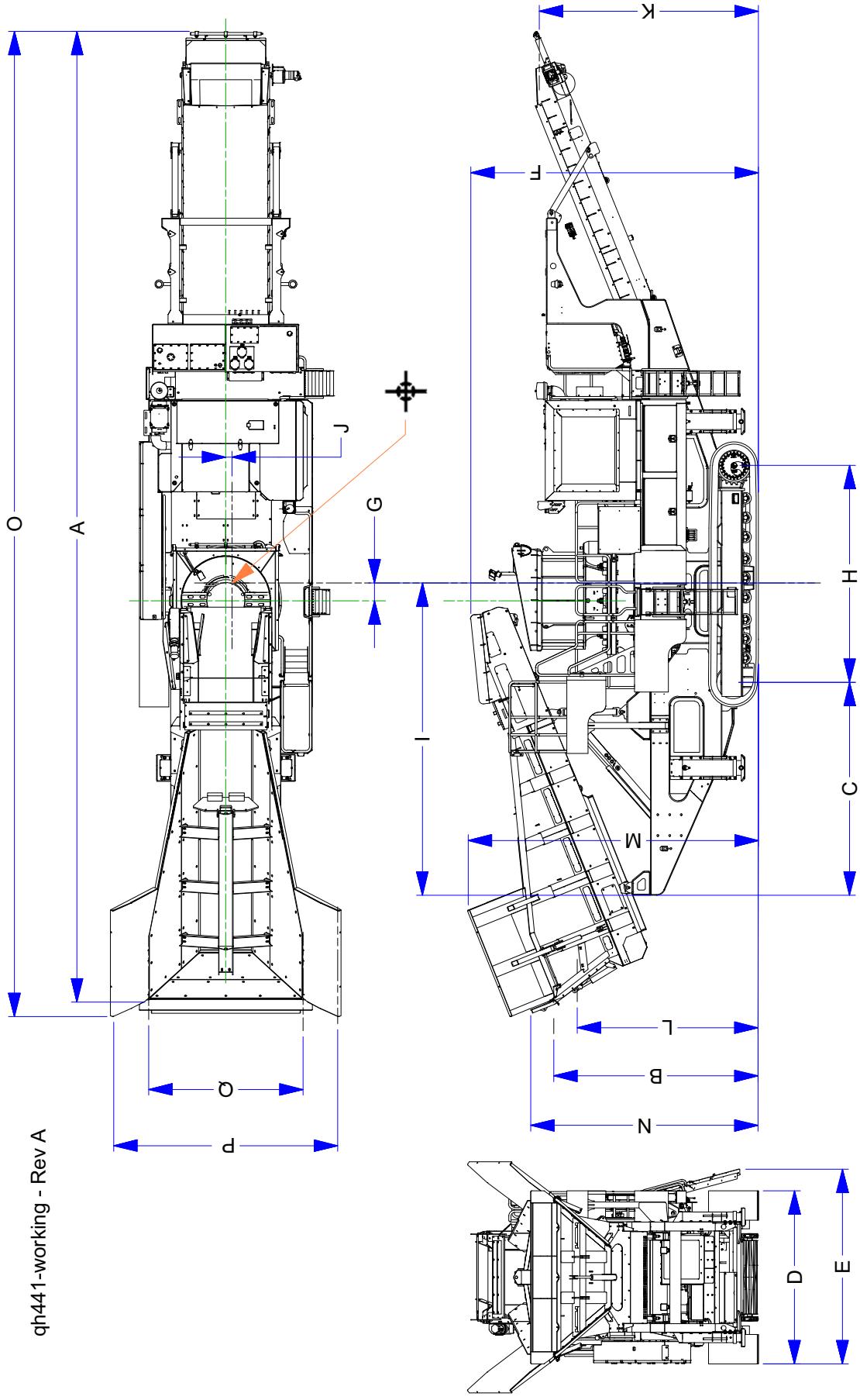
D. Emergency stop button.

E. Yellow forward direction marker, main conveyor at front.

F. Blue direction marker, feed hopper at rear.


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## 3.4 Machine Working Dimensions




Copyright © Sandvik Construction

| | | |
|---|---|---|
| **A** | 16561mm | 54ft - 4in |
| **B** | 3490mm | 11ft - 5in |
| **C** | 3631mm | 11ft - 11n |
| **D** | 2954mm | 9ft - 9in |
| **E** | 3319mm | 10ft - 11in |
| **F** | 4907mm | 16ft - 1in |
| **G *** | *328mm | 1ft - 1in |
| **H** | 3715mm | 12ft - 2in |
| **I *** | *5326mm | 17ft - 6in |
| **J *** | *106mm | 4in |
| **K** | 3739mm | 12ft - 3in |
| **L** | 3090mm<br>Door lowered | 10ft - 2in |
| **M** | 4953mm | 16ft - 3in |
| **N** | 3884mm<br>Rear extension | 12ft - 9in |
| **O** | 16807mm<br>Hopper extension | 55ft - 2in |
| **P** | 3822mm<br>Hopper extension | 12ft - 7in |
| **Q** | 2630mm | 8ft - 8in |

* =  Centre of gravity


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# 4 Commissioning and shut down

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## 4.1 General Safety

The following safety instructions apply throughout this section, additional and or variations in safety measures that are specific to their relevant sub sections will be detailed in the body of the text.

| ⚠ WARNING | |
|---|---|
|  | **PERSONNEL HAZARD**<br><br>**Lack of knowledge or understanding could cause serious injury, death or damage to the machine.**<br><br>**DO NOT START COMMISSIONING until you have READ and FULLY understood this manual. If necessary seek clarification from your supervisor and or a Sandvik representative, before attempting ANY operations or maintenance. Failure to do so may also invalidate the manufacturers warranties.** |

| ⚠ WARNING | |
|---|---|
|  | **PERSONNEL HAZARD**<br><br>**Not using the minimum Personal Protective Equipment (PPE) could cause serious injury or death, refer to *1.4 Personal protective equipment (PPE)*.**<br><br>**Make sure that the minimum Personal Protective Equipment (PPE) is used when working on or within 20m (66ft) of the machine, refer to Hazard exclusion zones in safety section 1.** |


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## 4.2 Pre-Commissioning

### 4.2.1 Pre-Start Instructions

**⚠ WARNING**



**PERSONNEL HAZARD**

**Working on or in close proximity to the machine whilst it is on and or operating could cause serious injury or death.**

**Stop machine, isolate, remove ignition key and tag out, before carrying out these pre-start checks. Refer to *4.9 Lockout and tag procedure***

**⚠ WARNING**



**FALLING HAZARD**

**Falling from heights could cause serious injury or death.**

**Some of the steps in this procedure require working at height, if this is the case, ensure the following:**

**- Maintenance platforms are in place.**

**- All hand rails are fixed in position.**

**- All ladders are lowered and fixed in position.**

**- A safety harness is worn.**

***NOTICE***

**RISK OF PROPERTY DAMAGE.**

**It is recommended that set up of this machine be carried out by a representative of Sandvik Mobile Screening and Crushing Ltd. or by a qualified representative of the dealer.**

***NOTICE***

**RISK OF PROPERTY DAMAGE.**

**The following instructions assume transportation of this machine using a low loader type vehicle, delivered in close proximity to the site. If a machine is to be transported in any other way, contact the manufacturer for additional instructions.**

1. Ensure this manual is read and understood.
2. Do not attempt to start this machine until you are aware of all aspects of its operation.
3. Remove any temporary sealing and transport straps.
4. Visually inspect machine for the following:
   - There are no signs of impact damage.

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- All safety guards / safety devices are in place and secure.
- All machine components are in place and secure.
- There are no signs of ANY fluid or oil leaks including hydraulic hoses.

5. Check machine is in good mechanical condition and there is no component damage or loss.
6. Ensure all bolts and fixings are tight and all guards are in place with all safety devices operating correctly.
7. Ensure crusher chamber, feeder and conveyor belts are free of material.
8. Carry out a full daily maintenance routine, Refer to ***6.3.2 Daily maintenance schedule***.
9. Remove all tools and equipment from the operational area.
10. Ensure all personnel are away from the machine, drives, tracks and auxiliary equipment.
11. Ensure pre-start checks outlined in the engine instruction manual are completed.
12. Ensure skirting rubbers and scrapers are in good condition and will work properly.
13. Remove any lockout tags from the machine if safe to do so, refer to ***4.9 Lockout and tag procedure***.


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## 4.3 Engine starting procedure

### 4.3.1 Before starting engine

Make sure all emergency stops are re-set, providing it is safe to do so, refer to ***3.3.7 To reset an emergency stop***.

**DANGER**



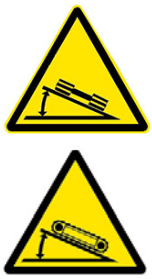
**PERSONNEL HAZARD**

**Persons on machine or in exclusion zones when starting machine, may cause serious injury or death.**

**DO NOT UNDER ANY CIRCUMSTANCES start the machine when ANY persons are standing on the machine or in the exclusion zones.**

**Ensure machine is NOT tagged out. DO NOT start machine if it is tagged out. Refer to Hazard exclusion zones in safety section 1.**

**WARNING**



**TIPPING HAZARD**

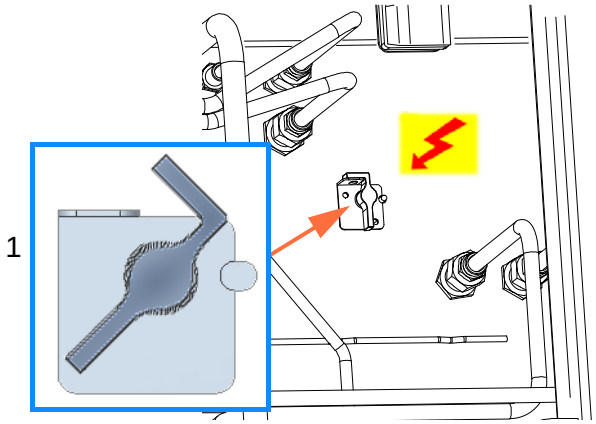
**Operating machine on unsuitable ground could cause serious injury or death.**

**Machine MUST NEVER be tracked on gradients more than: 10° left to right or 20° front to back. Both tracks MUST BE in contact with firm level ground, suitable for carrying the machine weight.**

### 4.3.2 Engine start

***Note: Ensure all scheduled maintenance checks are carried out, Refer to 6.2 Reference information.***

1. Open the left hand cabinet door and turn battery isolation switch to the ON position.




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2. Open the right hand cabinet door and turn ignition key clockwise to the first ‘RUN’ position.

2



3. Press the emergency stop reset blue button. Lights will flash for several seconds and alarm will start.

3



4. Turn ignition key fully clockwise to the ‘START’ position and hold until engine starts. The pre-start alarm will sound prior to the engine starting.

4



5. Release key slowly, which will return to ‘RUN’ position, when the engine starts. Engine will run at idling speed. The initial screen will be displayed.

5



6. If the key is released before the engine starts, turn the key to the Off position and repeat the starting sequence.

6



***NOTICE***

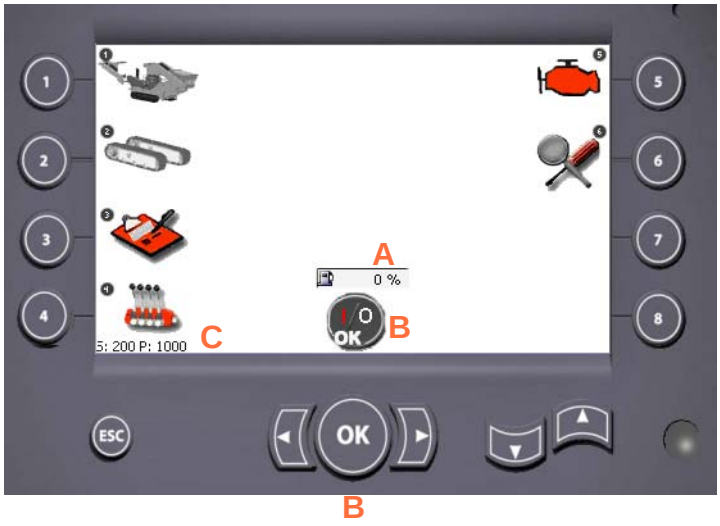
**RISK OF PROPERTY DAMAGE**

**Engine speed is preset at the factory and must not be tampered with.**

**When machine is switched off wait a minimum of 60 seconds before the start sequence is run again - An error code may show if started before the 60 second time has elapsed.**


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## 4.4 Initial screen display




1. Use the machine for crushing, refer to ***5.2 Machine crushing modes***.
2. Move the machine on the tracks, refer to ***4.5 Moving the machine using the tracks***.
3. View the fault log, press button 3.
4. Alter the machine configuration for crushing, refer to ***4.6 Preparing the crusher for operation*** or for transport, refer to ***2.1 Special considerations for transport***.
5. View engine information, press button 5.
6. Machine settings - Access code required, refer to ***6.6 Maintenance display screens***.

A. Fuel level shown as a % of maximum.

B. Machine diagnostics OK button, refer to ***6.7 Diagnostic display screens***.

C. Screen page reference.

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## 4.5 Moving the machine using the tracks

### 4.5.1 Before moving the machine

***Note: A minimum of two persons are required to carry out the following procedures, one to carry out the operations (operator) and one to warn of any potential hazards or dangers (observer).***

- Ensure loading / unloading site is clear of non-essential personnel. Erect barriers around the area and post warning signs where site conditions warrant this and perform necessary risk assessments.
- Loading/ unloading must only be carried out on firm flat ground.
- For the weight of the machine, refer to the specification plate fixed to the machine.
- When moving the machine, the operator must be in a position to have an all round view of the operation.
- Operator must be fully trained in the use of this equipment.
- An observer must warn of any potential hazards or dangers.
- For safety reasons, it is essential to check all around machine prior to and during moving, for obstacles or personnel which may be endangered by moving the machine.

**DANGER**



**MOVING MACHINE HAZARD**

**No persons should be on the machine or in the exclusion zone whilst the machine is being moved as this may cause injury or death.**

**DO NOT UNDER ANY CIRCUMSTANCES move the machine when ANY persons are standing on the machine or in the exclusion zones.**

***NOTICE***

**RISK OF PROPERTY DAMAGE**

**Raise the legs clear of the ground before machine is tracked, refer to *4.7 Legs set-up procedure*. If the legs are not raised, damage may occur to the machine and surrounding area.**

**WARNING**



**RADIO INTERFERENCE HAZARD**

**There is a small possibility the radio frequency on the remote controllers may operate other machinery. Please use the wire connected umbilical controller if this is a problem.**


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### 4.5.2 Moving the machine

**⚠ WARNING**





**TIPPING HAZARD**

**Operating machine on unsuitable ground could cause serious injury or death.**

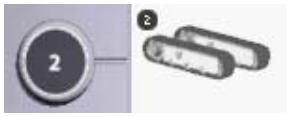
**Machine MUST NEVER be tracked on gradients more than: 10° left to right or 20° front to back. Both tracks MUST BE in contact with firm level ground which is suitable for carrying the machine weight.**

***Before the tracks operate, there is a short delay to allow the product conveyor tail to automatically raise clear of the ground***

1. Start the engine. >

1 Refer to ***4.3 Engine starting procedure***.

2. Select track operation mode button 2, on initial display screen.

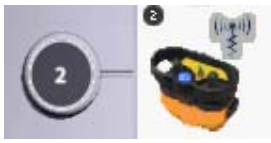
2 

3. Select track control option either the umbilical, button 1, or the radio remote, button 2, on track display screen.

Selected icon is highlighted green.

If the icon is grey the function is unavailable.

3 



4. For the umbilical track control option. >

4 Refer to ***4.5.5 Moving using wired umbilical control***.

5. For the radio remote track control option. >

5 Refer to ***4.5.4 Moving using the radio remote control***.

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### 4.5.3 Coloured direction indicators

The direction of travel is shown by the yellow and blue direction markers on the machine and on the control.



### 4.5.4 Moving using the radio remote control

For more information, also refer to ***3.3.9 Radio remote control***.

***Note: In areas where radio interference is a particular problem use the umbilical wired control.***

***NOTICE***

**RISK OF PROPERTY DAMAGE.**

**The tail section of the product conveyor will raise to clear the ground but visually check it is clear before moving the machine.**

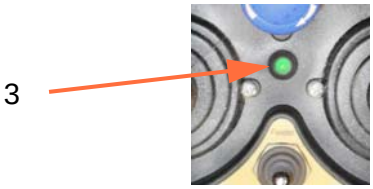
1. Check that the engine stop button is released by turning it clockwise




2. Switch the radio remote control to 1 (on).




3. Wait until the green light flashes consistently.



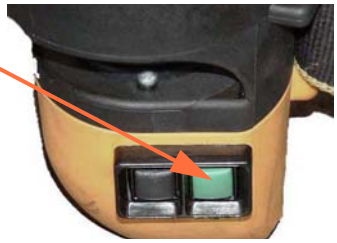


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4. Synchronise the radio control to the machine, press green button.

***Note: Siren will sound and beacon will flash and it takes approximately 7 seconds for the radio system to become operational.***

4



5. Moving the machine using the tracks is now possible using the two levers together to move in a straight line or individually to turn.

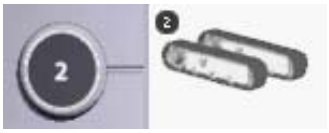
The direction of travel is shown by the yellow and blue direction markers on the machine and on the control.

5



6. Turn off track operation, press button 2.

6




7. To switch off the radio remote control turn knob to 0 (off)

7



8. To return to previous screen, press escape.

8




The Radio control must be fully recharged at regular intervals. Use the correct instructions for the controller refer to ***3.3.10 Remote control battery recharging***.

### 4.5.5 Moving using wired umbilical control

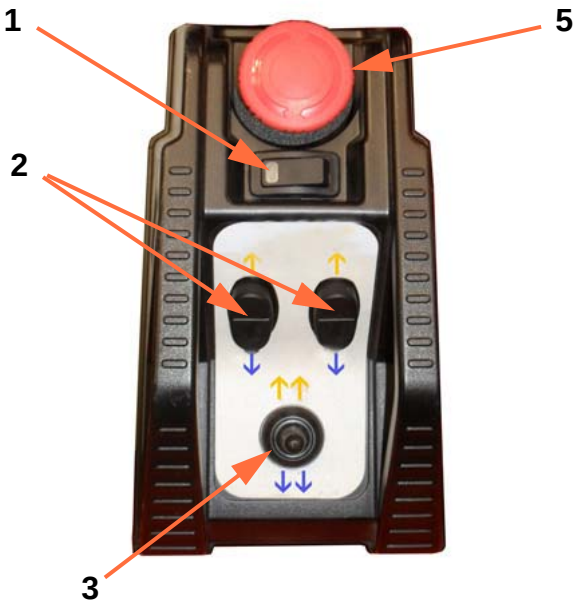
For more information, also refer to ***3.3.11 Wired umbilical track control***.

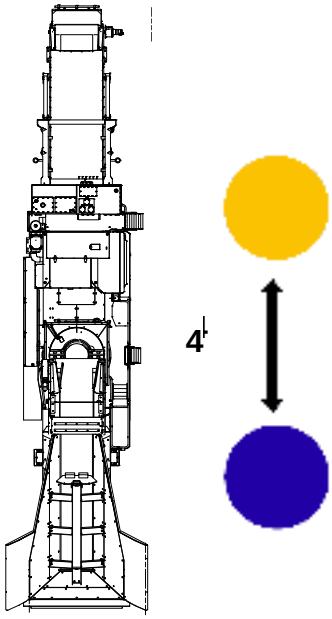
***NOTICE***

**RISK OF PROPERTY DAMAGE.**

**The tail section of the product conveyor will raise to clear the ground but visually check it is clear before moving the machine.**

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1. Switch the control ON.
2. Use the switches with a single arrow to control individual tracks.
3. Use the double arrow switch to control both tracks at the same speed to travel straight.
4. The direction of travel is shown by the yellow and blue direction markers on the machine and on the control.
5. In the event of an emergency press the emergency stop
6. Turn off track operation, press button 2.
7. To return to previous screen, press escape.

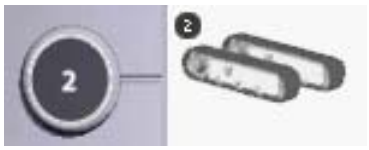
1 Umbilical control ON/OFF switch.

2 Individual track controls.

3 Double track control for moving in straight line.

4 Yellow and blue direction markers.

5 Emergency stop button.

6 


7 



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## 4.6 Preparing the crusher for operation

***Note: Ensure Sandvik service personnel are available at the initial set up the machine.***

**⚠ WARNING**



**FALLING HAZARD**

**Falling from heights could cause serious injury or death.**

**Some parts of this procedure require working at height, therefore ensure maintenance platforms are in place, all hand rails are fixed in raised working position, all ladders are lowered and fixed in position and a safety harness is worn.**

**⚠ WARNING**

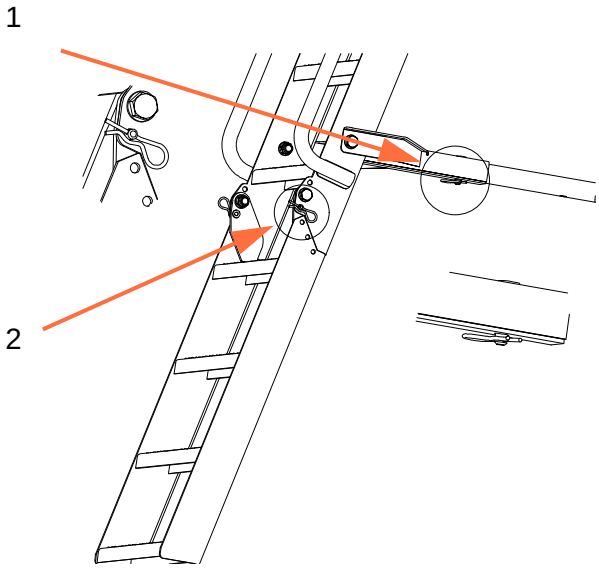


**PERSONNEL HAZARD**

**Working on or in close proximity to the machine whilst it is on and or operating could cause serious injury or death.**

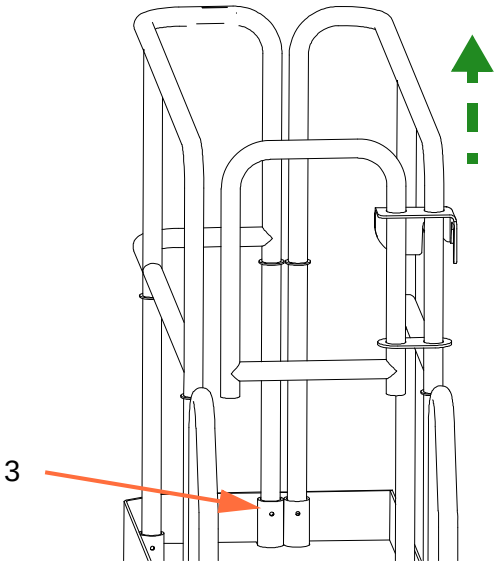
**Stop machine, isolate, remove ignition key and tag out as required, before preparing crusher for operation. Refer to *4.9 Lockout and tag procedure*.**

1. Remove the clips and pins and pull the ladders out into the working positions then secure with the pins and clips.
2. Remove the clips and pins then pivot the lower part of the ladder down. Secure in the working position with the pins and clips.



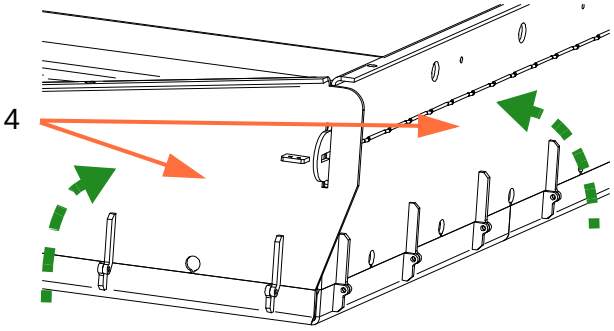

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3. On the upper maintenance platform, lift the handrails to the raised working position and secure with pins, transported loose in tool box.

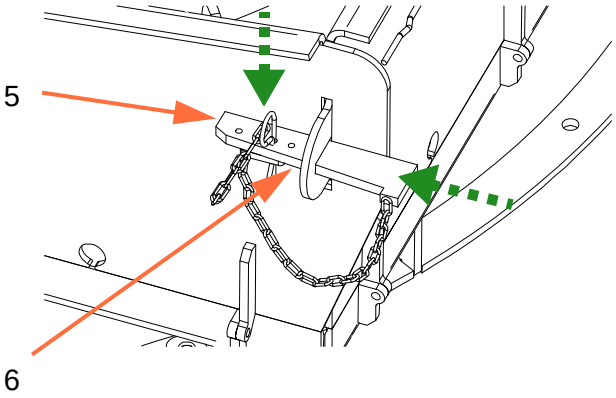



4. Raise the end and one side of the feed box.

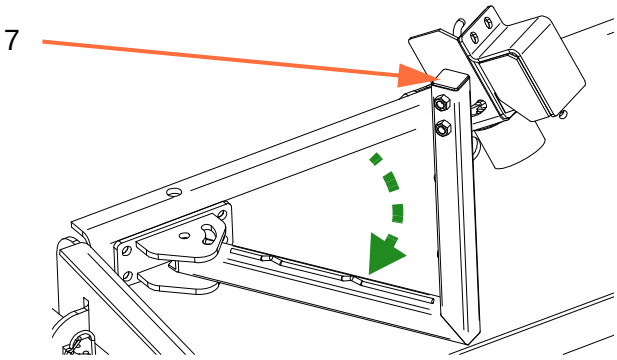
***Note: Take care when raising the heavy end and sides of the feed box.***




5. Secure one side and the end of the feed box with the wedge.
6. Fit retaining clip and install a bolt and nut into the wedge. Fit bolt into the hole nearest to the feed box end.
   Raise and secure the other feed box side in the same method.




7. Pivot the level sensor into the working position and secure.

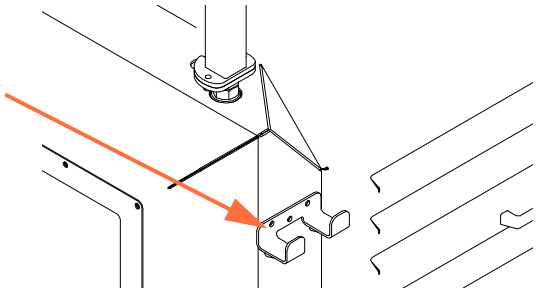




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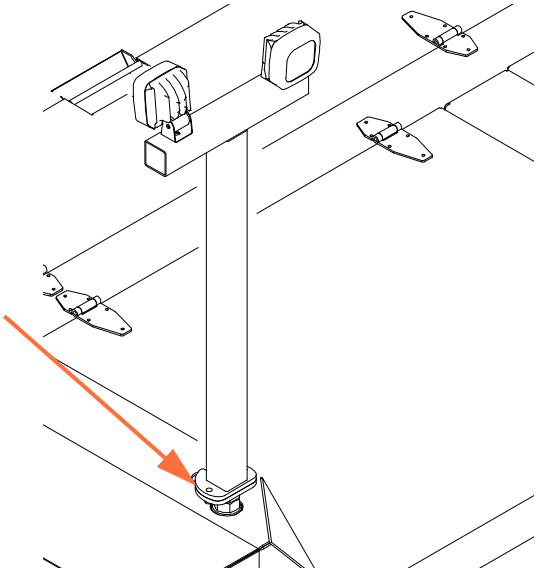
8. If the optional lighting mast is fitted, remove it from the transport bracket.

8



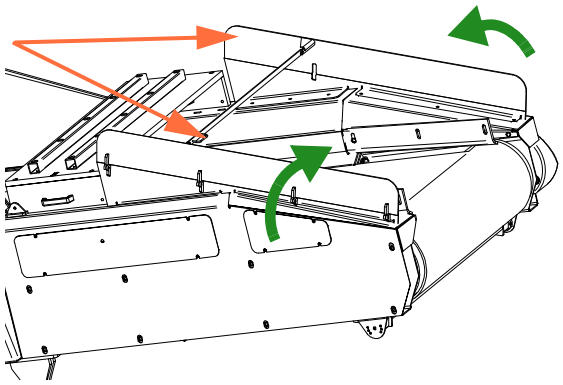
9. Install mast into the working position, secure it in the working position and connect the plug into the socket.

9



10. Raise the feed conveyor side plates, install the bracing bar across them and secure with bolts and nuts.

10





**FALLING HAZARD**

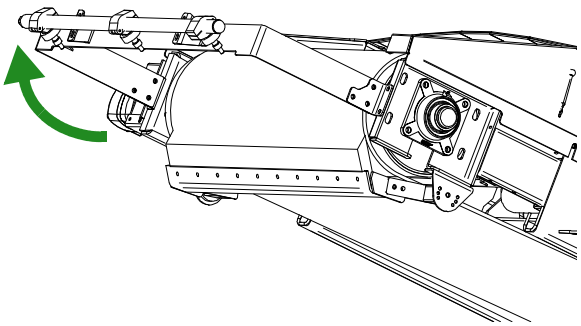
**When working at height use a maintenance platform, with handrails and ladders fixed in place. Ensure a safety harness is used.**

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11. Position the dust suppression water spray bracket in the working position and secure with 3 bolts each side.

***Note: The tube and spray nozzles may be rotated down to direct spray on to the material if required.***

11



12. Remove tag if safe to do so >

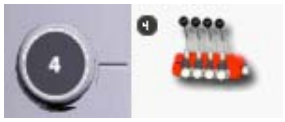
12 Refer to: ***4.9 Lockout and tag procedure***.

13. Start the engine if safe to do so >

13 Refer to: ***4.3 Engine starting procedure***.

14. Press button 4 to select machine set up mode on the initial display to enable the auxilliary hydraulic system.

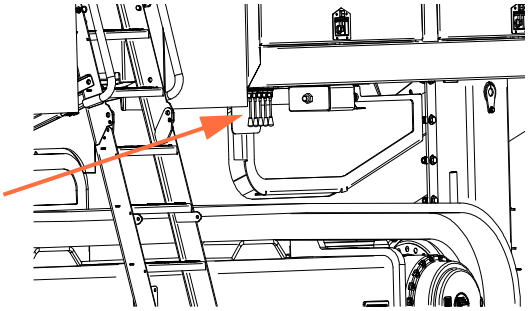
14




***Note: If the optional hopper extensions are fitted, raise them into the working position:***

15. Raise each hopper side and rear extension using the individual left, right and rear feeder flare control levers.

15

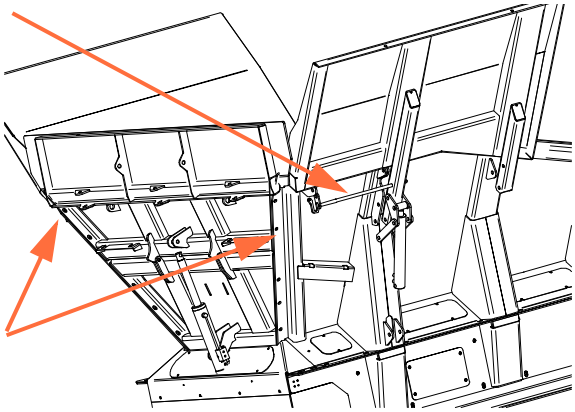


16

16. Secure each hopper side extension with the long bar and secure with the clip.

17. Secure the rear hopper extension with the bolts and nuts at each side.

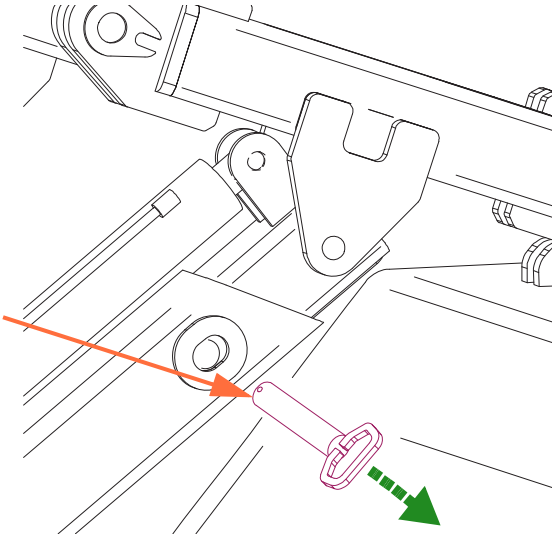
17




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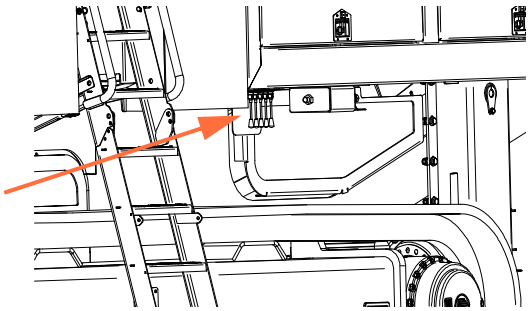
18. Remove 'R' clips and pins that secure feed conveyor in the transport position.

18



19. Raise the feed conveyor into working position using the 'feeder in/out' control lever.

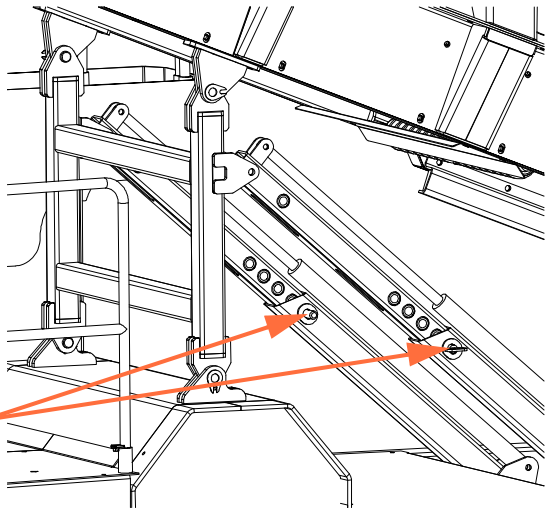
19



20. Fit pins and clips to secure feed conveyor in one of the working positions desired.

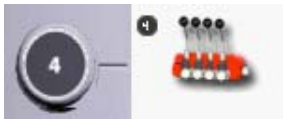
***Note: Two pins must be fitted and secured with clips. Do not rely on the hydraulic cylinders to support the conveyor.***

20



21. When finished, press button 4 again to de-select machine set up mode.

21




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## 4.7 Legs set-up procedure

### 4.7.1 Lowering the legs

**⚠ WARNING**



**CRUSHING HAZARD**

**Personnel near or on machine whilst lowering the legs, may cause serious injury or death.**

**DO NOT UNDER ANY CIRCUMSTANCES operate the legs when ANY personnel or objects are on or near the machine.**

**A MINIMUM of two persons are required for the following procedure, one to carry out the procedure and one to view for potential hazards.**

**Carry out a thorough site inspection prior to commencing ANY work operations.**

If the engine is off, start the engine, refer to ***4.3 Engine starting procedure***.

***Note: Front leg shown, rear leg similar.***

1. Press button 4 to select machine set up mode and enable the auxilliary hydraulic system. An alarm will sound.

1

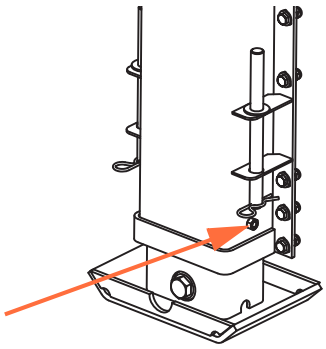


2. .Slacken the transport clamping bolt.

***Note: Machine MUST be on a level surface before operating leg levers.***

***Note: The legs are used only to stabilise the machine in addition to the tracks when crushing.***

2

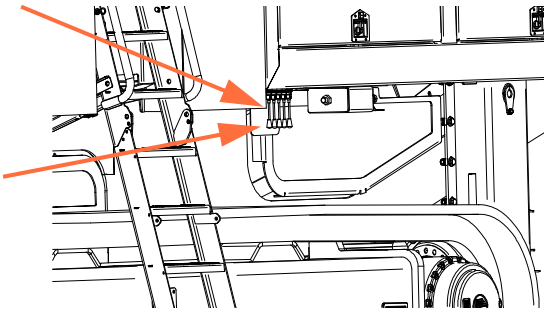


3. Operate the lever to lower the rear legs to stabilise the machine. The rear of the machine is indicated by the blue direction marker.
4. Operate the lever to lower the front legs. The the front of the machine is indicated by the yellow direction marker.

***Note: Operate the legs uniformly.***

3

4

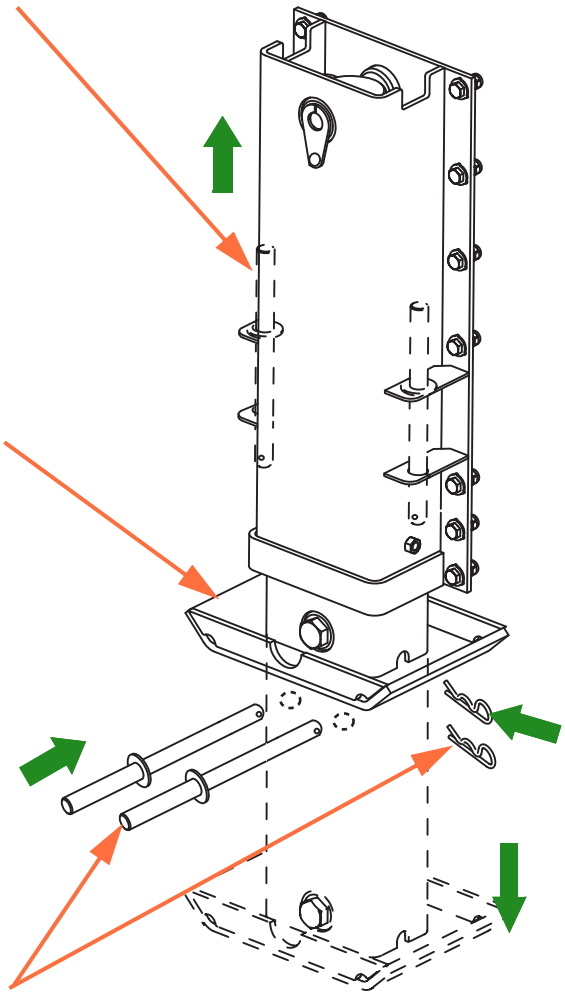



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5. If the legs are to be used to assist with machine maintenance, remove the 'R' clips and retention pins from their storage holders.
6. Lower the inner legs as required, using the levers as above, until the suitable holes are visible.
7. Install retention pins into holes in the lowered leg and secure the bars with the 'R' clips.

***Note: DO NOT operate machine whilst ONLY supported by the legs.***

5

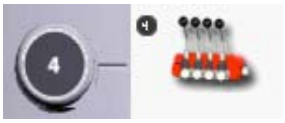


6

7

8. When finished, press button 4 again to de-select machine set up mode.

8




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### 4.7.2 Raising the legs

**⚠ WARNING**





**CRUSHING HAZARD**

**Personnel near or on machine whilst raising the legs, may cause serious injury or death.**

**DO NOT UNDER ANY CIRCUMSTANCES operate the legs when ANY personnel or objects are on or near the machine.**

**A MINIMUM of two persons are required for the following procedure, one to carry out the procedure and one to view for potential hazards.**

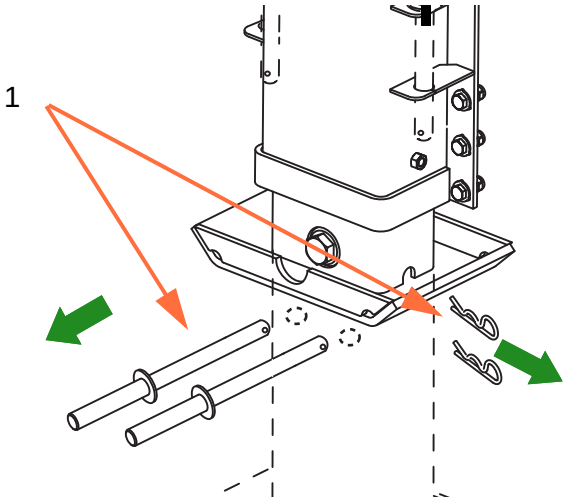
**Carry out a thorough site inspection prior to commencing ANY work operations.**

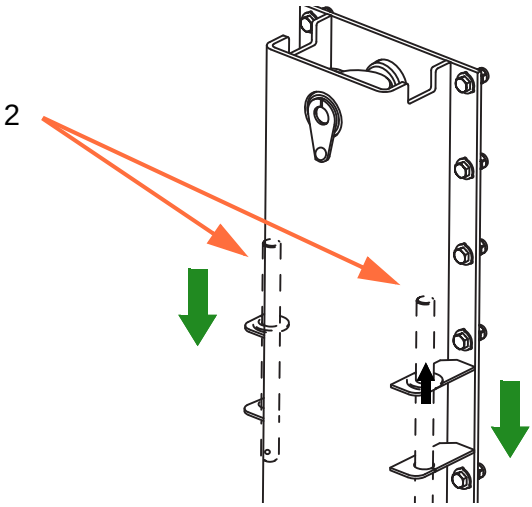
***Note: Front leg shown, rear leg similar.***

If the legs have been used to assist with machine maintenance with the retention pins fitted, proceed as follows.

1. Remove clips then remove the retention pins from holes in the lowered leg.

***Note: The legs may require lowering slightly, as described above, to enable the retention pins to be released.***




2. Place retention pins into their storage holders and fit the clips.


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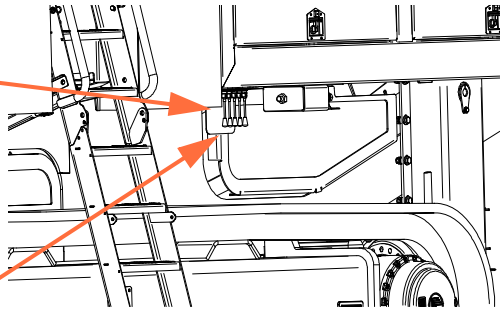
Ensure machine is on and in set up mode, refer to ***4.3 Engine starting procedure*** and ***4.6 Preparing the crusher for operation***.

3. Operate the lever to raise the rear legs. The rear of the machine is indicated by the blue direction marker.

4. Operate the lever to raise the front legs. The the front of the machine is indicated by the yellow direction marker.

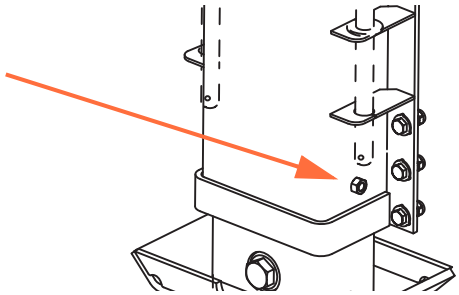
***Note: Operate the legs uniformly.***

3



4

5



5. Tighten the transport clamping bolt.

6



6. When finished, press button 4 again to de-select machine set up mode.

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## 4.8 Shut down the machine

### 4.8.1 Automatic mode shut down

If the machine is operating in automatic mode, proceed as follows:.

1. Stop loading material into the feeder >
1 Wait until there is no more material on or in the machine.
2. Wait for all material to be fully discharged from >
2 Feed conveyor, crusher chamber and all other conveyor belts.
3. Return to initial screen by pressing left button as required until the automatic operation display P4000 is shown.
3 
4. To stop the automatic operation and shut down the machine, press button 1. The stop icon will be highlighted. The alarm will sound prior to the automatic shut down.
4 


The machine components will stop in the following sequence:

1. Feed conveyor.
2. Main output conveyor.
3. Engine speed reduced.
4. Crusher.
5. Lubrication system.

There is a time delay sequence before each component stops.

### 4.8.2 Manual mode shut down

If the machine is operating in manual mode, proceed as follows:

***NOTICE***

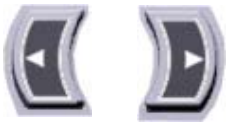
**RISK OF PROPERTY DAMAGE.**

**When shutting down the machine in manual mode, it is ESSENTIAL that the following steps are followed in the order shown, to prevent damage to the machine. The controls will only allow the correct sequence to be followed and there is a delay between sequence steps.**

1. Stop loading material into the feeder >
1 Wait until there is no more material on or in the machine.
2. Wait for all material to be fully discharged from >
2 Feed conveyor, crusher chamber and all other conveyor belts.


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3. Return to manual operation screen page 3 using the left or right arrow buttons as required until the manual mode display P9001 is shown.

3 

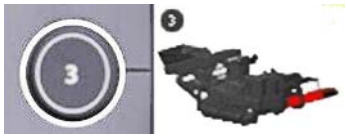
4. Stop the feed conveyor, press button 5.

4 

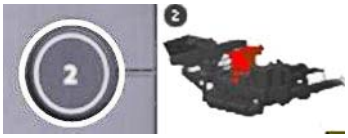

5. Return to screen P9000 page 2, press left arrow button until the manual mode display P9000 is shown.

5 

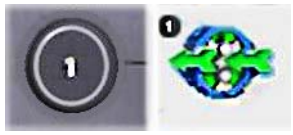
6. Stop the main conveyor, press button 3.

6 


7. Stop the crusher, press button 2. The engine will reduce in speed then crusher will stop.

7 


8. Stop the lubrication system, press button 1.

8 


9. Press ESC as required to return to initial display screen.

9 


10. Stop engine by turning ignition key to 'OFF' position.

10 

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## 4.9 Lockout and tag procedure

### 4.9.1 How to fit a single tag

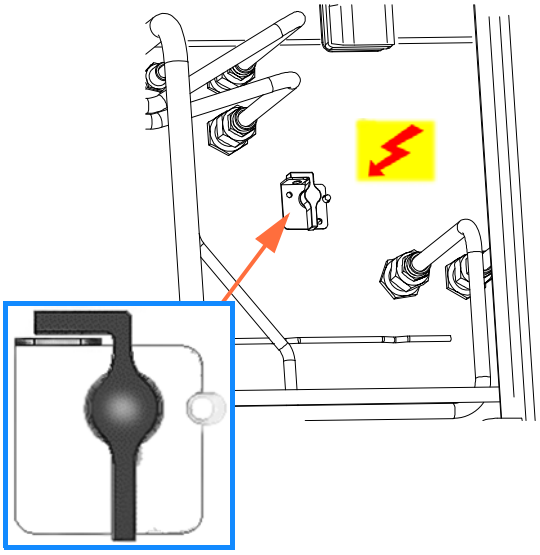
1. Ensure ignition key is in the 'OFF' position. Remove the ignition key and keep it with you.

1



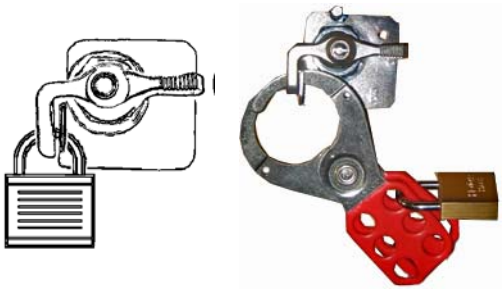
2. Turn battery isolation switch to the OFF position.

2



3. Attach your lock or tag across isolation switch holes to show you are working on the machine.

3



***Note: The lock or tag must have a 7.9mm (5/16in) diameter shackle so the isolation switch cannot be turned on.***

***Note: Use a gang tag if more than one person is at work on the machine, refer to 4.9.3 How to fit a gang tag.***

### 4.9.2 To remove a single tag

1. Ensure ALL maintenance and work has been completed and no persons are on or near the machine.
2. Fit and secure all guards. Check all guards are operational.
3. Unlock and remove your single lock or tag from isolation switch.
4. Replace the ignition key.
5. If a gang tag for multiple locks or tags has been used, refer to ***4.9.4 To remove a gang tag***.


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### 4.9.3 How to fit a gang tag

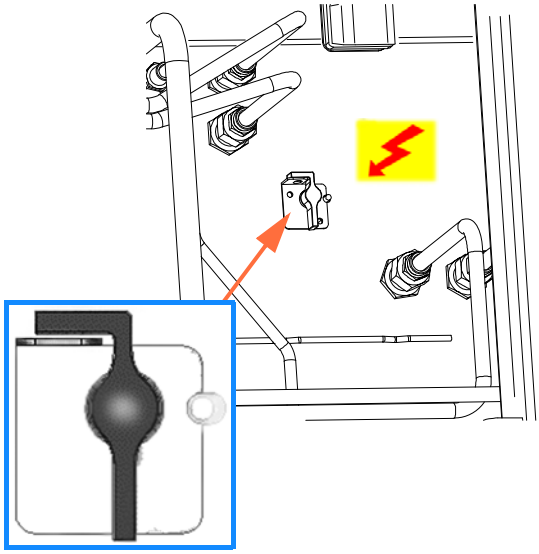
1. Ensure ignition key is in the 'OFF' position. Remove key and keep secure until all personnel working on the machine have finished and are clear from it.

1



2. Make sure the battery isolation switch is in the OFF position.

2



3. Attach the gang tag as shown.
4. Each person attaches their lock to the gang tag BEFORE they start work and keeps their key with them at all times.

***Note: The lock or tag must have a 7.9mm (5/16in) diameter shackle so the isolation switch cannot be turned on.***

3



4

### 4.9.4 To remove a gang tag

1. Once each person finishes their work they remove ONLY their own lock from the gang tag.
2. When the last person has finished their work and the last lock is removed, the gang tag may also be removed.
3. Replace the ignition key, if all personnel have finished and are clear of the machine.

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# 5 Operations

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## 5.1 Operations - minimum safety requirements

The following safety instructions apply throughout the operations section, additional and or variations in safety measures that are specific to the relevant operations procedure will be detailed in the body of the text.

**DANGER**





**INHALATION, BREATHING HAZARD**

**Operating this machine generates dust. Breathing or inhaling silica dust particles will cause death or serious injury.**

**Ensure suitable breathing equipment is used throughout ANY operational activities. ALL necessary precautions MUST be taken to reduce the risk of breathing dust or particles.**

**ALWAYS wear at least the minimum (CE approved) Personal Protective Equipment (PPE), Refer to *1.4 Personal protective equipment (PPE).***

**WARNING**









**PERSONNEL HAZARD**

**Working on or in close proximity to the machine whilst it is on and or operating could cause serious injury or death.**

**DO NOT stand on machine whilst it is in operation.**

**Limit access to equipment and surroundings throughout operational activities, refer to Hazard exclusion zones in the safety section 1.**

**Always make sure that all safety guards are installed and in correct working order before operating this machine.Failure to do so could cause serious injury or death.**

**DO NOT start any operational activity until you have read and fully understand this manual, including the safety section.**

**If there is a operation procedure that is not fully understood contact Sandvik before commencing with the operation.**

For general information and the operating principles of the cone crusher, refer also to the Sandvik cone crusher manual. The instructions supplied with the cone crusher are intended for a crusher installed and operated in a static position with different controls but are included for information and reference.


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## 5.2 Machine crushing modes

1. Follow at least the minimum safety requirements during all operational activities >
2. Check that the machine is fully set up for operation >
3. Do any outstanding scheduled maintenance checks and work. >
4. Start the engine and the initial mode selection display will be shown >
5. Select plant crushing operation mode menu, press button 1.

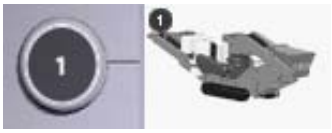
The following crushing screen will be shown.

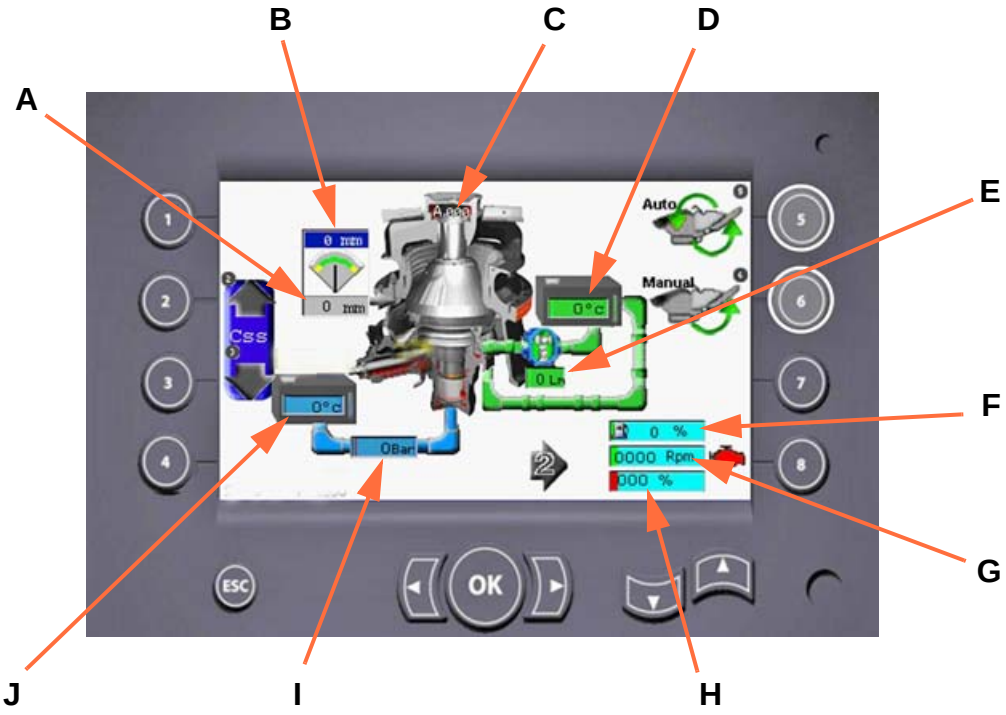
1 Refer to ***5.1 Operations - minimum safety requirements***.

2 Refer to ***4.6 Preparing the crusher for operation***.

3 Refer to ***6 Routine maintenance***.

4 Refer to ***4.3 Engine starting procedure***.

5 




A. Desired gap setting CSS.
B. Current gap setting CSS.
C. Cone 'A' value.
D. Lubrication oil temperature.
E. Lubrication oil flow rate.
F. Fuel tank level gauge as a percentage value.
G. Engine speed.
H. Engine load as a percentage value.
I. Hydraulic fluid 'Hydroset' pressure.
J. Machine hydraulic fluid temperature.

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***NOTICE***

**COLD START**

**When starting machine in temperatures of 0°C (32°F) or below, run all systems at idle speed to allow the hydraulic fluid to reach working temperature. The crusher will not start until the lubrication oil has reached 15°C (59°F).**

**DO NOT feed material into machine during this time.**

**DO NOT change the engine speed while any systems are running.**

**DO NOT operate systems contrary to these instructions.**


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## 5.3 Methods of operation

The crusher start up has an automatic mode which should normally be used.

The manual crusher start up mode may be used if desired but components of the machine must be started and stopped in the correct sequence. The machine controls will only allow the correct sequence by highlighting the next step when available.

**DO not start the machine if it is full of material.**

**Clear any material away before starting.**

Select the automatic or manual method of operation as follows:

1. For automatic operation press button 5, then refer to ***5.4 Automatic mode***.

1




2. For manual operation press button 6, then refer to ***5.5 Manual mode***.

2




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## 5.4 Automatic mode

Each sequence of the operation will be highlighted as it starts. A warning is activated prior to each function starting in the following sequence:

- Cone lubrication system starts and oil is pre-heated if required.
- Crusher starts, when cone lubrication system is functioning correctly.
- The ‘Hydroset’ system adjusts the crusher to the set gap.
- Main output conveyor starts and the speed increases to the pre-set speed.
- The automatic operation screen will be displayed:
- The machine icon highlight will flash as the components start up and will change to a green highlight when ready to start operation.

### 5.4.1 Feeder start and stop

When the crusher is at operating speed, the feeder icon will flash, press start button 5.

A warning is activated prior to starting.

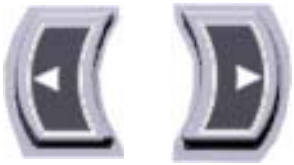
Press button 5 again to stop the feeder.




### 5.4.2 Automatic operation - additional control screens

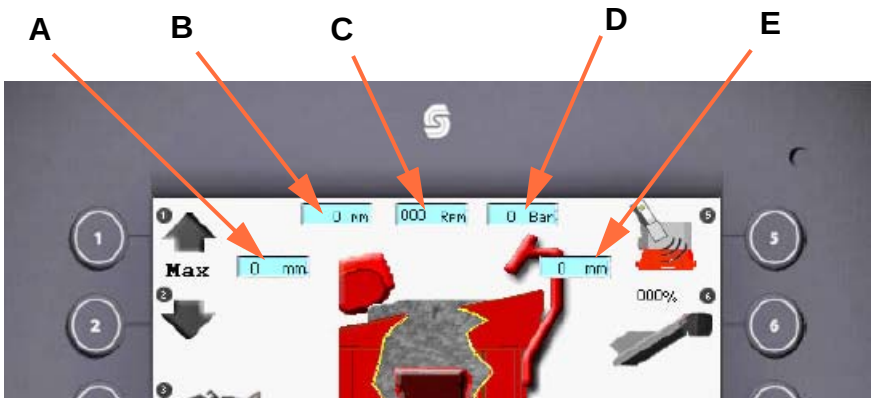
Press right arrow to view next screen.

Press left arrow to return to previous screen.




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### 5.4.3 Automatic mode screen 2




A. Feed material level set point.

B. Close side setting CSS.

C. Crusher speed.

D. 'Hydroset' pressure.

E. Current material level in feeder box.

### 5.4.4 To stop the crusher in automatic mode

To stop the crusher normally when automatic mode is being used, refer to ***4.8.1 Automatic mode shut down***.

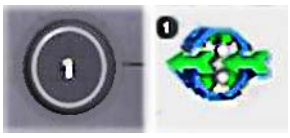
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## 5.5 Manual mode

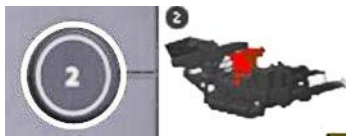
Each operation will not be enabled until the parameters of the previous operation are satisfactory.

In the manual mode, machine components can only be started in the following sequence:

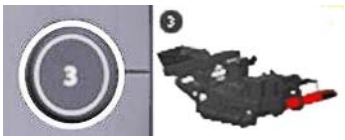
1. Start the lubrication system, press button 1.

1 


2. Start the crusher when possible, press button 2. The crusher icon will flash when the lubrication system is operating correctly.

2 


3. Start the output conveyor when possible, press button 3. The conveyor icon will flash when the crusher is operating at the set speed.

3 


4. Adjust the engine speed and crusher speed if required, press up arrow button to increase speed or the down arrow to decrease the speed.
Engine speed and load are displayed.

4 


5. When the output conveyor is operating, go to next screen page, press right arrow button.

5 

### 5.5.1 Feeder start and stop

When the crusher is at operating speed, the feeder icon will flash to indicate it can be started, press button 5. A warning is activated prior to starting.

Press button 5 again to stop the feeder.




### 5.5.2 To stop the crusher in manual mode

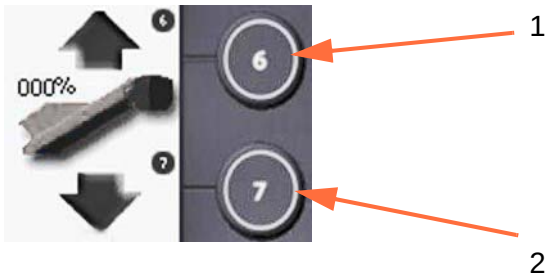
To stop the crusher normally when manual mode is being used >

Refer to ***4.8.2 Manual mode shut down***.


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### 5.5.3 Feed conveyor manual speed adjustment

1. To increase the feed rate speed, press button 6.
2. To decrease the speed, press button 7. Speed is shown as a percentage of the maximum.

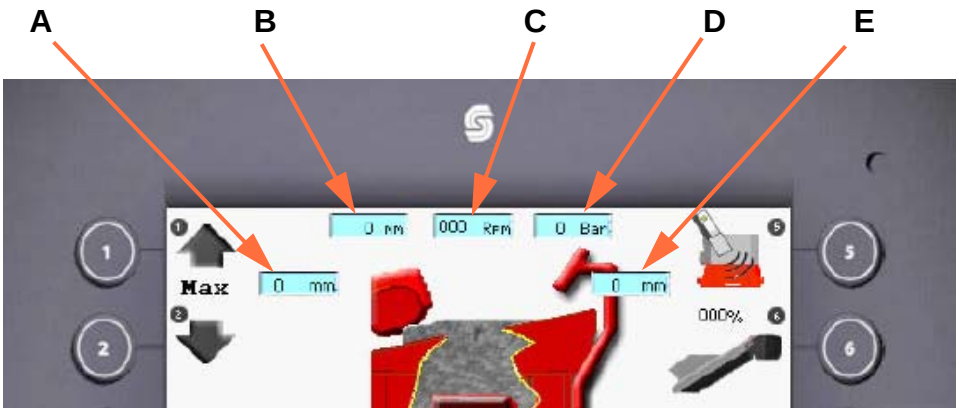



### 5.5.4 Feed conveyor automatic speed control

To set up the feed box level sensor to control the feed conveyor, press right arrow button to go to the next screen page.



The crusher feed box level sensor adjustment display will show.




A. Feed material level set point.
B. Close side setting CSS.
C. Crusher speed.
D. 'Hydroset' pressure.
E. Current material level in feeder box.

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## ⚠ WARNING



**FLYING OR FALLING MATERIAL HAZARD**

**Make sure the level sensor is correctly set.**

**If it is not correctly set, feed material may be ejected or fall from the feed chute box.**

1. To enable the level sensor to control the feeder, press button 5 and the icon will be highlighted.

1




2. To adjust the maximum level of material in the feeder box, press button 1 to raise the upper level allowed.

2




3. To lower the maximum level of material, press button 2.

3




4. The maximum level distance is displayed.

4





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## 5.6 Daily calibration of crusher wear parts

To monitor the wear rate of the crusher components, provide correct close side setting gap dimension for product output, the crusher should be calibrated daily before the start of crushing.

1. From a crusher operation screen, press right arrow button repeatedly until the last screen page is displayed.

1



2. To calibrate the wear parts of the crusher, press button 5.

2



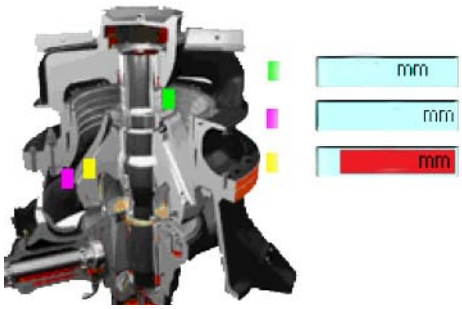

3. Refer to the messages on screen to follow the progress of the daily calibration and wear monitoring.

3



4. The current amount of wear on the cone crusher wear parts will be shown.

4




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## 5.7 Close side setting gap [CSS]

The size of the output material is adjusted by changing the CSS gap, this can be carried out from a screen page where the CSS adjustment icon is displayed. A blue icon is displayed when the crusher is in manual mode and a grey icon when in automatic mode.

This adjustment can be done whilst the crusher is running.

When changing the CSS make sure the feeder is running as the display screen does not function correctly when the feeder is stopped and may display false values.

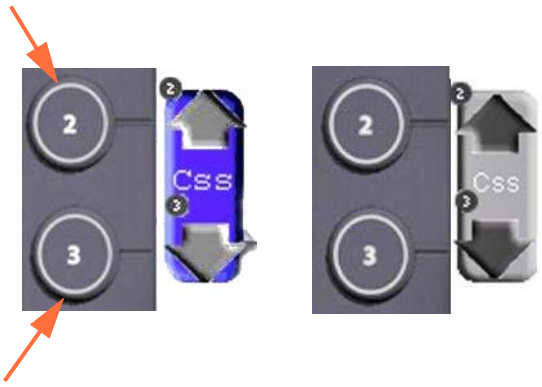
Do not feed material into the crusher whilst adjusting the crusher gap.

The gap setting is adjusted by raising or lowering the inner cone, 1mm (0.04in) with each press of the button.

***Note: A blue background indicates the system is in manual mode and a grey background, automatic mode.***

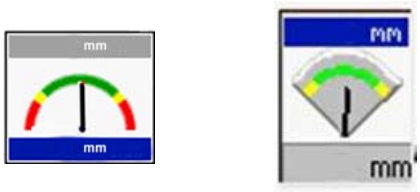
1. To raise the inner cone and decrease the gap and material output size, press button 2.
2. To lower the inner cone and increase the gap and material output size, press button 3.
3. The current gap setting is shown in the lower blue area. The desired new gap setting is displayed in the grey area. The green indicator shows the progress as the adjustment takes place, pointing upward vertical when set.

1




2

3





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## 5.8 Feeding material into machine

### 5.8.1 Before starting

Follow at least the minimum safety requirements during all operational activities, refer to ***5.1 Operations - minimum safety requirements***.

Ensure machine is set for operation, refer to ***4.6 Preparing the crusher for operation***.

Ensure any outstanding scheduled maintenance checks and operation are completed, refer to ***6 Routine maintenance***.

### 5.8.2 Loading hopper with material

Ensure cone crusher, output conveyor and feed conveyors are started, refer to ***5.3 Methods of operation***.

Ensure the following applies when loading material into the hopper:

- Material should preferably be fed from a screened stockpile or primary jaw crusher, into the feed conveyor hopper.
- Place material carefully into the hopper from a height no greater than 300mm (12in) above the hopper.
- Make sure the feed conveyor is evenly loaded in the rear loading area to maximise production.
- DO NOT over fill hopper.
- Avoid start / stop operations of the feed conveyor.
- Supply material into hopper steadily and constantly to give maximum output and minimum wear.
- DO NOT load any material that is larger than 80% of the cone crusher inlet opening.
- When the crushing chamber is empty, avoid feeding solitary round rocks.
- Never feed combustible process material into the crusher.

### 5.8.3 Cone crusher

If any material finds its way into the cone crusher that is larger than 80% of the cone crusher inlet STOP machine immediately, refer to ***5.4.4 To stop the crusher in automatic mode*** or ***5.5.2 To stop the crusher in manual mode***.

Lockout and tag the machine, refer to ***4.9 Lockout and tag procedure***, before removing the large material with appropriate lifting equipment.

***NOTICE***

**RISK OF EQUIPMENT DAMAGE**

**NEVER use excavators, under any circumstances, to force material into the feeder as the machine will be damaged. Any damage occurred from this action will invalidate any Sandvik manufacturers's warranty.**

The feed box above the crushing chamber should have material evenly distributed around it.

The crushing chamber should always be full of material and choke fed when crushing.

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## 5.9 Feed conveyor metal detector

A metal detector is positioned over the feed conveyor to warn of metal from entering the cone crusher.

Any metal or uncrushable material will cause damage to the crusher, therefore great care should be taken to prevent any such material being present in the mineral supplied to the feed conveyor.

1. If metal is detected on the feed conveyor the conveyor will stop, an alarm will occur and a red detect light will illuminate on the metal detector control box, situated under the maintenance platform.

1



2. A warning error message will also be shown on the control display >

2 Wait until all the material in the crusher has been passed to the output conveyor.

3. Stop the machine >

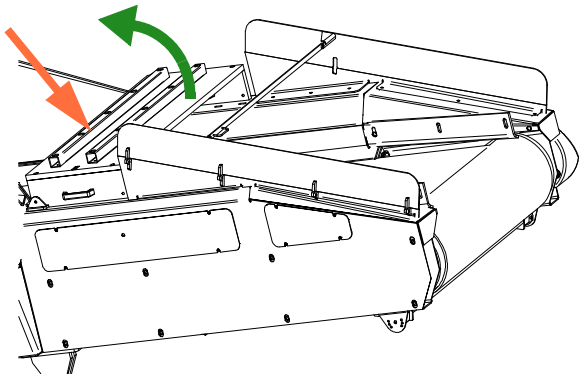
3 Refer to ***4.8 Shut down the machine***.

4. Lockout machine >

4 Refer to ***4.9 Lockout and tag procedure***.

5. From the maintenance platform, locate and clear the metal from the feed conveyor. To locate metal under the detector it can be raised.

5



6. When the metal has been removed from the feed conveyor, press the red reset button on the metal detector control box.

6



7. Start the engine >

7 Refer to ***4.3 Engine starting procedure***.

8. Start the machine to begin crushing >

8 Refer to ***5.2 Machine crushing modes***.

9. If it is safe to do so, start the feed conveyor, press button 5.

9






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## 5.10 Blocked crusher

**DANGER**



**RISK OF CRUSHING**

**Never stand inside the crusher when a blockage is being removed. You might be pulled forcefully and suddenly downwards together with the material in the crushing chamber and be crushed.**

**WARNING**



**FLYING FRAGMENTS**

**Never use wedges etc, to clear blockages in the feed opening. Stones and fragments can be thrown out at high speed from the crushing chamber.**

**WARNING**



**EXPLOSIVES**

**Never remove a blockage from the crusher by explosive blasting. Blasting may cause personal injury and seriously damage bearings or other parts. Sandvik takes no responsibility for injury to personnel or damage to the equipment when blasting is used.**

In some cases it is possible to clear the blockage by increasing the CSS (closed side setting) temporarily.

**WARNING Follow the maintenance safety instructions in *6.1 Maintenance - minimum safety requirements*, before attempting to clear a blockage.**

If the crusher is blocked with material:

- Make sure the feeder is OFF and has stopped.
- Make sure the crusher is OFF and has stopped.
- Make sure the main conveyor is OFF and has no material on it.
- Start machine again only when the material is removed and it is safe to do so.

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Original Instructions

QH441-en-140415

# QH441

# Maintenance Manual

SANDVIK

# QH441

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Sandvik Construction Mobile Crushers and Screens Ltd.

Tullyvannon, Ballygawley, Co.Tyrone, Northern Ireland, BT70 2HW

Tel. +44 (0) 28 8556 7799, Fax +44 (0) 28 8556 7007

W: www.sandvikmobiles.com

E: info.mobilecs@sandvik.com

# 6 Routine maintenance

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## 6.1 Maintenance - minimum safety requirements

The following safety instructions apply throughout the maintenance section, additional and or variations in safety measures that are specific to the relevant maintenance procedure will be detailed in the body of the text.

Maintenance is essential for safety and to ensure the best possible performance from your machine by reducing the chances of breakdowns.

For maintenance schedules and procedures relating to Original Equipment Manufacturers, refer also to section 10 - Information and Data Sheets.

**⚠ WARNING**





**PERSONNEL HAZARD**

**Working on or in close proximity to the machine whilst it is on and or operating could cause serious injury or death.**

**DO NOT stand on machine whilst it is in operation.**

**Stop machine, isolate, remove ignition key and tag out, before carrying out any maintenance procedures. Refer to 4.8 - Shut down the machine.**

**Ensure at least the minimum Personal Protective Equipment (PPE) is worn during maintenance and repair, Refer to 1.4 - Personal protective equipment (PPE)**

**⚠ WARNING**





**FALLING HAZARD**

**Some maintenance requires working from height. Falling from heights could cause serious injury or death.**

**When working at height, ensure the following:**

**- Maintenance platforms are in place.**

**- All hand rails are fixed in position.**

**- All ladders are lowered and fixed in position.**

**- A safety harness is worn.**

**⚠ WARNING**



**HOT SURFACE HAZARD**

**The engine could still be hot after operation and cause severe burns if touched.**

**Make sure that the engine is cool before maintenance is started.**



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## ⚠ WARNING



**HYDRAULIC FLUID INJECTION HAZARD**

**High pressure hydraulic system. Fluid could penetrate the skin and cause serious injury or death.**

**DO NOT use your hand to test for leaks.**

**ALWAYS use a piece of cardboard or similar.**

## *NOTICE*

**RISK OF EQUIPMENT DAMAGE.**

**Do all maintenance procedures as a minimum requirement.**

**Machines that operate in severe site or environmental conditions may require more frequent maintenance routines.**

**Only use lubricants, fluids, filters and parts recommended by the Original Equipment Manufacturer (OEM) or accelerated wear or damage could result. NEVER use grease containing Molybdenum.**

**Incorrect filling procedures can cause contamination and can damage the equipment. Make sure that the fluid is filled correctly.**



**DO NOT start any maintenance until you have read and fully understand this manual, in particular section 1 - Safety**

**If there is a maintenance procedure that is not fully understood contact Sandvik before commencing with the maintenance.**

**Any adjustments must ONLY be carried out by trained personnel.**



**Any adjustments to the hydraulic system must ONLY be carried out by trained Sandvik service engineers.**

**Make sure that oils and fluids are cleaned and disposed of correctly in a way that meets the local and national environmental regulations.**

**Batteries must not be disposed of in normal waste which may go into land fill.**

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## 6.2 Reference information

For information, maintenance schedules and procedures relating to components fitted on the machine but from other Original Equipment Manufacturers, refer to 10 - Information and Data Sheets.

For information relating to recommended lubricant and fluids used in the machine, refer to 6.5 - Lubricants and fluids.

For information on schematic hydraulic and electrical diagrams, refer to section 9 and supplied diagrams.


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## 6.3 Maintenance Schedules

### 6.3.1 First 50 to 80 Hours maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this procedure is done at the first 50-80 hours running of the machine (minimum requirement).

1. Replace the hydraulic fluid filter elements. Refer to 6.4.1 - Location of compartments for maintenance and 6.4.11 - Hydraulic return filters for filter locations.
2. Replace the cone crusher lubrication tank In-line filter element.
3. Do the cone crusher checks and maintenance, refer to 'running-in' section in, 10.1.5 - Sandvik cone crusher manuals.
4. Check the crusher drive belt tension and inspect the belts, refer to 6.4.19 - Crusher belt drive tension system - Inspect/adjust.

### 6.3.2 Daily maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this schedule is carried out before the machine is started each day (minimum requirement). Some service information may also show on the display screen when the machine is on.

1. Do the daily engine maintenance, such as coolant level, service indicators and drain any water from the primary fuel filter. Refer to the separate engine operation and maintenance manual.
2. Do the daily cone crusher maintenance. Refer to 10.1.5 - Sandvik cone crusher manuals.
3. Do the daily power take-off (clutch) maintenance. Refer to 10.1.2 - Hydraulic power take-off (clutch) - PT Tech (HPTO14).
4. Clean any dirt from around the tank air vents and engine air filters.
5. Check air cleaner rubber seals - Inspect and clean as necessary.
6. Check air pre-cleaner - Inspect and clean as necessary.
7. Diesel tank - Check top up level. Refer to 6.4.5 - Fuel tank - check top up.
8. Track gearbox - Check there are no oil leaks.
9. Hydraulic tank - Check top up level. Refer to 6.4.6 - Hydraulic tank - check top up.
10. Clutch lubrication tank - Check the condition of the air vent and top up oil if required. Refer to 6.4.8 - Clutch lubrication tank - check top up.
11. Crusher lubrication oil - Check top up, refer to 6.4.7 - Crusher lubrication tank - check top up.
12. Emergency stops - Make sure all operate & reset. Refer to 3.3.6 - Operation of an emergency stop.
13. Crusher chamber - Ensure it is free of any obstructions.
14. Crusher lubrication system - Inspect hoses for signs of damage or leaks.

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15. Walk around the machine and do a visual inspection.
16. Safety guards - Make sure they are all present and secure.
17. Hydraulic, water and diesel hoses - Check for signs of damage or leaks.
18. Driven equipment - Inspect for damage or wear, including any optional equipment.
19. Check the crusher drive belt tension and inspect the belts, refer to 6.4.19 - Crusher belt drive tension system - Inspect/adjust.
20. Check the grease level in the Automatic lubrication system (if fitted) replenish if necessary refer to 6.5.1 - Machine Lubricants and fluids used in manufacture.
21. Check the Automatic lubrication system (if fitted) is operating, press the test button refer to 10.1.6 - Optional auto grease lubrication.

### 6.3.3 Weekly maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that these this schedule is carried out on a weekly basis [minimum requirement].

**Preliminaries:**

1. Do the daily maintenance schedule. Refer to 6.3.2 - Daily maintenance schedule.
2. Do the weekly engine maintenance, such as checking drive belts, hoses and clamps. Refer to the separate engine manufacturer's maintenance manual.
3. Do the weekly cone crusher maintenance. Refer to 10.1.5 - Sandvik cone crusher manuals.

**Schedule continued:**

4. Cone crusher chamber - Inspect. Refer to 6.4.18 - Crushing chamber - inspect.
5. Conveyor belts, drums, rollers and other moving parts - Inspect for damage or wear.
6. Belt drive tension system - Inspect. Refer to 6.4.19 - Crusher belt drive tension system - Inspect/adjust.
7. Feeder conveyor and cone rock box - Remove any obstructions.
8. All panels - Ensure they are in place and secure.
9. Oil cooler and engine radiator - Clear any build up of dust or dirt.
10. Bearings - Grease. Refer to 6.4.22 - Bearings - grease.
11. Feeder conveyor belt sealing rubbers - Check/adjust.
12. Belt scraper - Adjust. Refer to 6.4.23 - Belt scraper - adjust.
13. Track gearbox - Check oil level. Refer to 6.4.3 - Track gearbox oil - check top up.
14. Track machine 50m (164ft) in both directions to prevent chain seizure. Refer to 4.5 - Moving the machine using the tracks.
15. Track - Check & adjust if required. Refer to 6.4.24 - Tracks - inspect.


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### 6.3.4 Monthly maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this schedule is carried out every month [minimum requirement].

Do the monthly cone crusher maintenance, refer to 10.1.5 - Sandvik cone crusher manuals.

### 6.3.5 250 Hours maintenance - C13 Tier 3a engine only

**Not applicable to Tier 3b engine**

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

1. Do the engine maintenance, refer to 10.1.4 - Engine manual (supplied separately).
2. For the Caterpillar C13 tier 3a engine only, do the 250 hours maintenance schedule, refer to 8.2.1 - 250 Hours engine maintenance schedule - C13 Tier 3a only.

### 6.3.6 500 Hours maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 500 hours (minimum requirement).

**Preliminaries:**

1. Do the weekly maintenance schedule. Refer to 6.3.3 - Weekly maintenance schedule.
2. For the Caterpillar C13 tier 3a engine only, do the 250 hours maintenance schedule, refer to 8.2.1 - 250 Hours engine maintenance schedule - C13 Tier 3a only.

**Schedule continued:**

3. Do the engine 500 hours maintenance schedule. Refer to 8.2.2 - 500 Hours engine maintenance schedule and the engine manufacturer's maintenance manual.
4. Do the 500 hours power take-off (clutch) maintenance:
   - Drain and replace clutch oil, replace clutch oil filter, replace clutch air breather.
   - Refer also to 10.1.2 - Hydraulic power take-off (clutch) - PT Tech (HPTO14).
5. Replace engine air filters, primary and secondary,.refer to 6.4.9 - Air cleaner - servicing.
6. Replace the hydraulic fluid filter elements, refer to 6.4.1 - Location of compartments for maintenance and 6.4.11 - Hydraulic return filters for filter locations.
7. Replace the hydraulic tank air vent element, refer to 6.4.18 - Crushing chamber - inspect.
8. Replace cone crusher lubrication in-line oil filter, refer 6.4.15 - Cone lubrication in-line filter.
9. Replace cone crusher lubrication air filter and top hat, refer to 10.1.5 - Sandvik cone crusher manuals.
10. Main conveyor, wear liners - Inspect.
11. Drain off any water and sediment from the fuel tank, refer to 6.4.2 - Fluid drain points and top up, refer to 6.4.5 - Fuel tank - check top up.

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12. Drain off any water and sediment from the hydraulic tank, refer to 6.4.2 - Fluid drain points and top up, refer to 6.4.6 - Hydraulic tank - check top up.

**NOTICE**

**ENVIRONMENTAL HAZARD**

**Dispose of all waste correctly, refer to 1.3 - Environmental safety.**

### 6.3.7 1000 Hours maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 1000 hours (minimum requirements).

**Preliminaries:**

1. Do the 500 hours maintenance schedule. Refer to 6.3.6 - 500 Hours maintenance schedule.
2. Do the 500 hours engine maintenance schedule, refer to 8.2.2 - 500 Hours engine maintenance schedule.

**Schedule continued:**

3. Do the 1000 hours cone crusher maintenance. Refer to 10.1.5 - Sandvik cone crusher manuals.
4. Do the 1000 hours cone crusher lubrication tank filter maintenance, refer to 6.4.16 - Strainer and filters inside cone lubrication tank.
5. Do the 1000 hours power take-off (clutch) maintenance. Refer to OEM maintenance manual. Refer to 10.1.2 - Hydraulic power take-off (clutch) - PT Tech (HPTO14).
6. Track gearbox oil - Replace. Refer to 6.4.4 - Track gearbox oil - replace.

### 6.3.8 2000 Hours or 1 year maintenance schedule

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 2000 hours or annually (minimum requirement).

**Preliminaries:**

1. Do the 500 hours maintenance schedule. Refer to ***6.3.6 - 500 Hours maintenance schedule***.
2. Do the engine 2000 hours maintenance schedule, refer to 8.2.4 - 2000 Hours or 1 year engine maintenance schedule.

**Schedule continued:**

3. Change the hydraulic fluid, refer to 6.5 - Lubricants and fluids.
4. Do the cone crusher 2000 hours maintenance. Refer to 10.1.5 - Sandvik cone crusher manuals.


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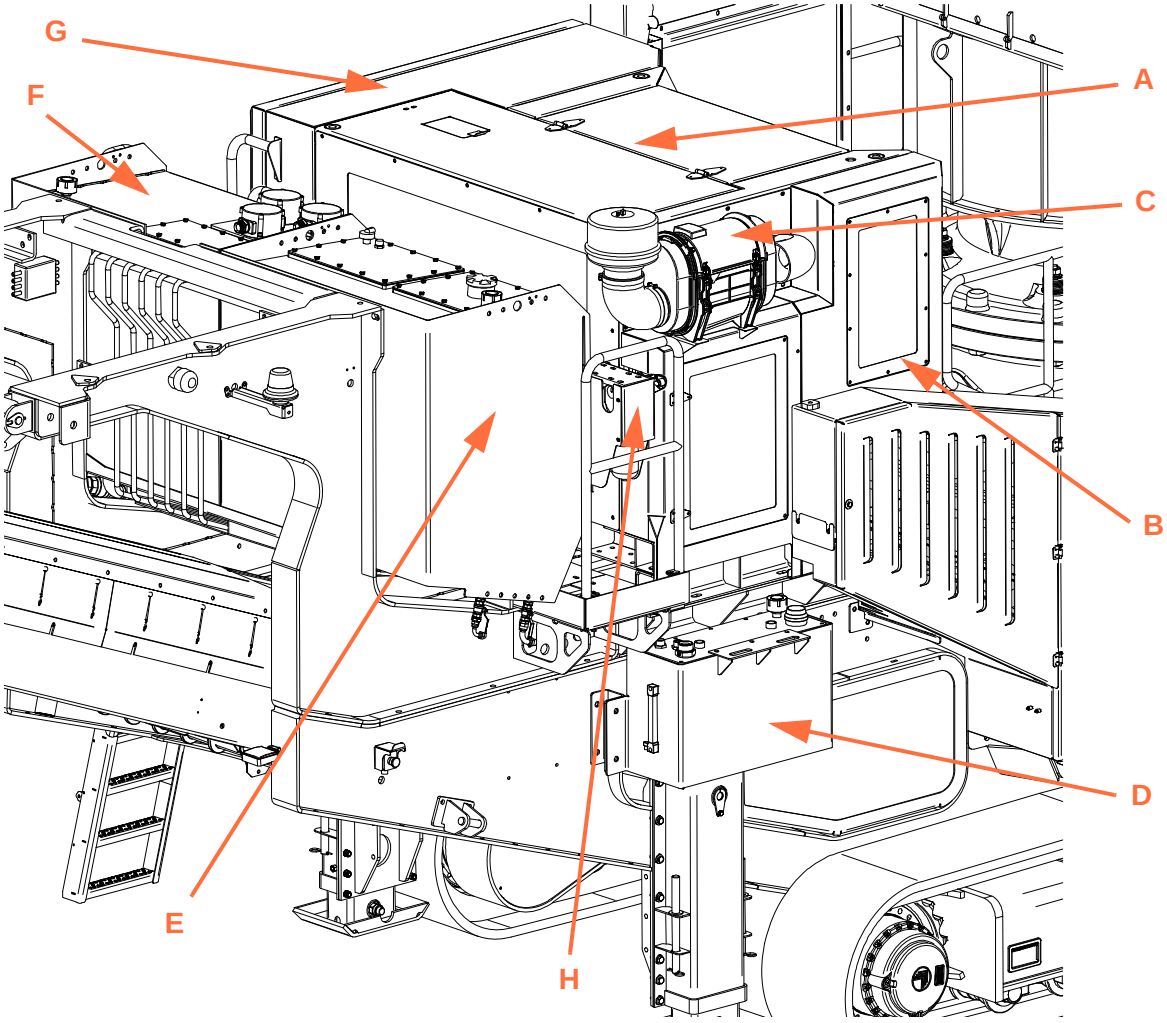
## 6.4 Maintenance procedures

**⚠ WARNING**

**PERSONNEL HAZARD**

**Follow the instructions of section 6.1 - Maintenance - minimum safety requirements, before any maintenance procedure is started.**

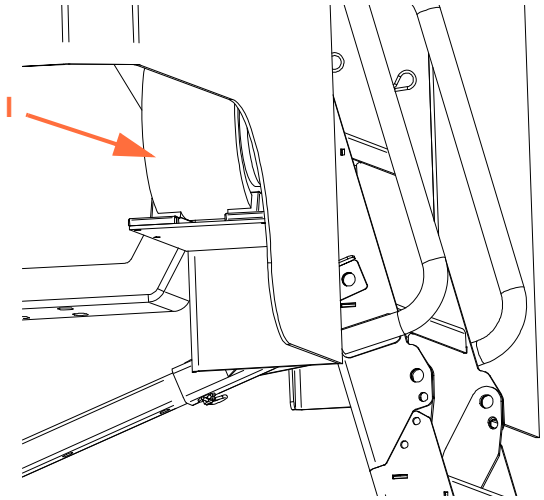
### 6.4.1 Location of compartments for maintenance



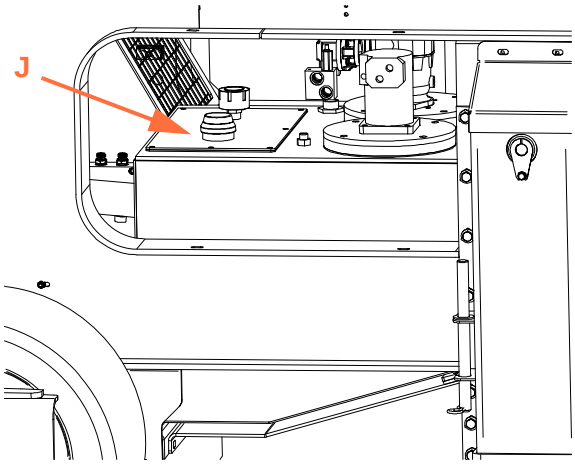

A. Engine compartment
B. Power take-off (clutch)
C. Engine air cleaner
D. Clutch lubrication tank
E. Fuel tank
F. Hydraulic tank
G. Radiator compartment
H. Power pack pressure filter compartment

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I. Air pump filter, under maintenance platform



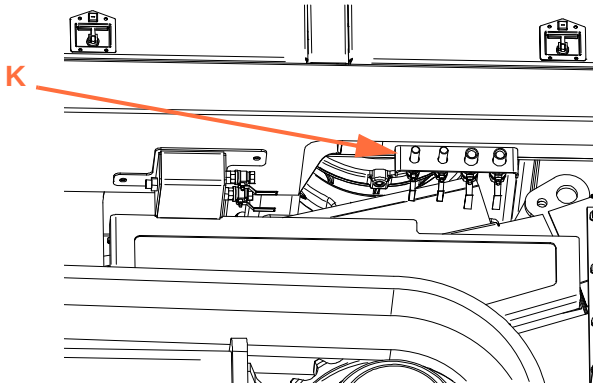

J. Cone lubrication tank under feed hopper, shown with chassis cover plate removed.




### 6.4.2 Fluid drain points

K. Drain valves under cabinets:

- Engine coolant system drain
- Engine oil sump drain
- Hydraulic fluid drain
- Diesel fuel tank drain





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### 6.4.3 Track gearbox oil - check top up

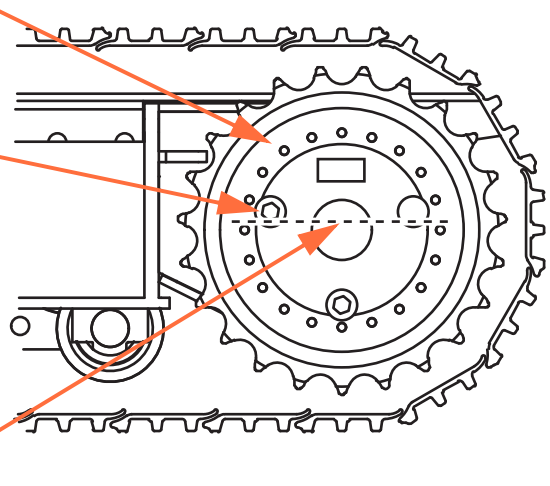
**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

1. Start The Engine and prepare the machine for moving >

1 Refer to 4.5 - Moving the machine using the tracks.

2. Move the machine until the gearbox is in the correct position shown.

2



3

3. Clean the area around the filler/level plug then remove the plug.

4. Top up if required to correct oil level, the bottom of the threaded hole. Allow any surplus to drain before installing and tightening plug.

4

Repeat for track gearbox on the other side.

5. For lubrication information. >

5 Refer to section 6.5 - Lubricants and fluids.

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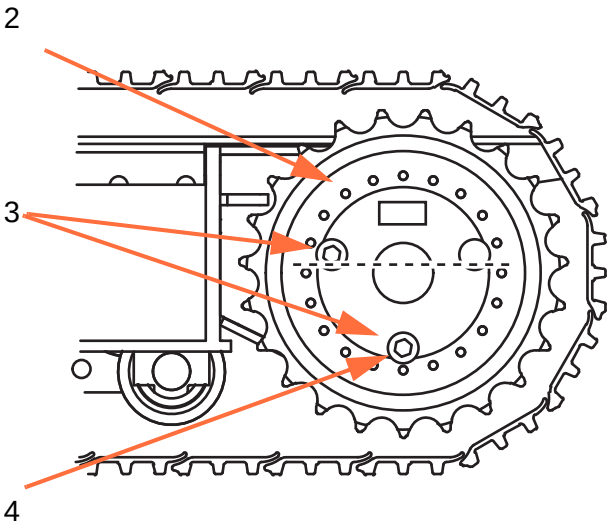
### 6.4.4 Track gearbox oil - replace

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

1. Start The Engine and prepare the machine for moving >

1 Refer to 4.5 - Moving the machine using the tracks.

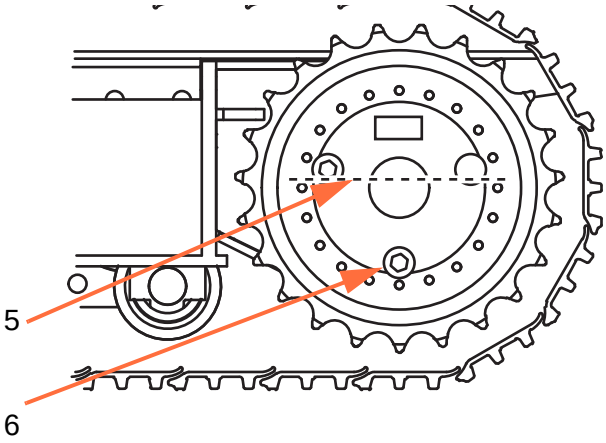
2. Move the machine until the gearbox is in the correct position shown.
3. Clean the area around the plugs, then using a suitable container to catch the oil, remove the plugs.
4. Allow oil to thoroughly drain then re-install the drain plug




5. Fill gearbox to correct oil level, the bottom of the threaded hole.
6. Allow any surplus to drain before installing and tightening filler plug.

***Note: Check plug seal before installing a plug.***

Repeat for track gearbox on the other side.




7. For lubrication information. >

7 Refer to section 6.5 - Lubricants and fluids.


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### 6.4.5 Fuel tank - check top up

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

| ⚠ WARNING | |
|---|---|
|  | **FLAMMABLE LIQUID HAZARD**<br>**Diesel fuel is flammable therefore is easily ignited and fires or explosions can result.**<br>**Smoking, open flames, sparks and welding is strictly prohibited while refuelling.**<br>**ALWAYS wear at least the minimum (CE approved) Personal Protective Equipment (PPE), refer to *1.4 - Personal protective equipment (PPE).***|

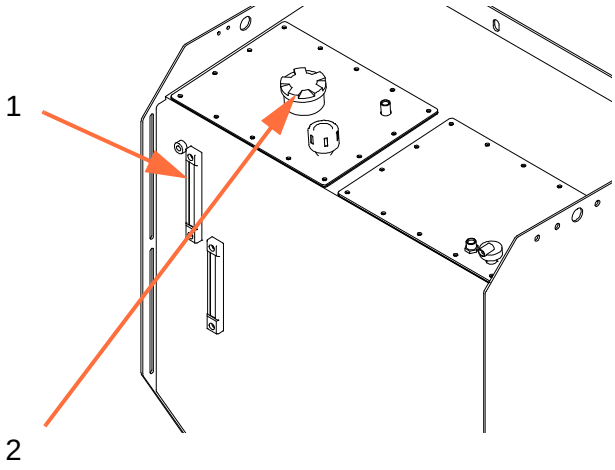
***NOTICE***

**RISK OF EQUIPMENT DAMAGE**

**Incorrect filling procedures can cause contamination and can damage the equipment. Make sure that the fuel is filled correctly.**

1. Check level in Diesel fuel tank with the gauges. A low level will show on the display screen.
2. If fuel is required, remove filler cap and top up as necessary.

   ***Note: Clean around filler cap before opening, to prevent fuel contamination.***




3. . For the recommended fuel > 3 Refer to section 6.5 - Lubricants and fluids.

### 6.4.6 Hydraulic tank - check top up

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule**

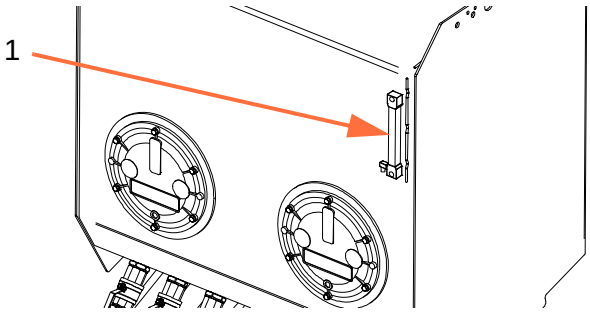
***NOTICE***

**RISK OF EQUIPMENT DAMAGE**

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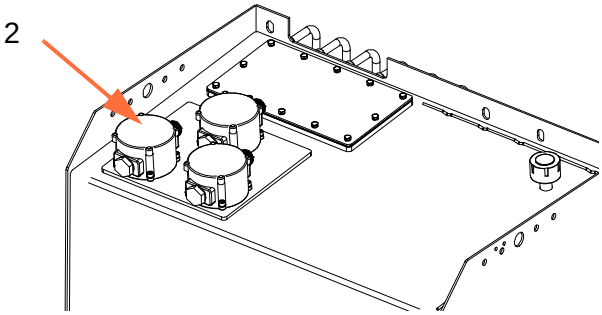
**Incorrect filling procedures can cause contamination and can damage the equipment. Make sure that the fluid is filled correctly**

1. Check level in hydraulic tank with the gauge. A low level will show on the display screen.




2. If more hydraulic fluid is required, remove a filter and top up as necessary.

***Note: Clean around filters before opening, to prevent contamination.***




3. For hydraulic fluid information > 3 Refer to section 6.5 - Lubricants and fluids.

### 6.4.7 Crusher lubrication tank - check top up

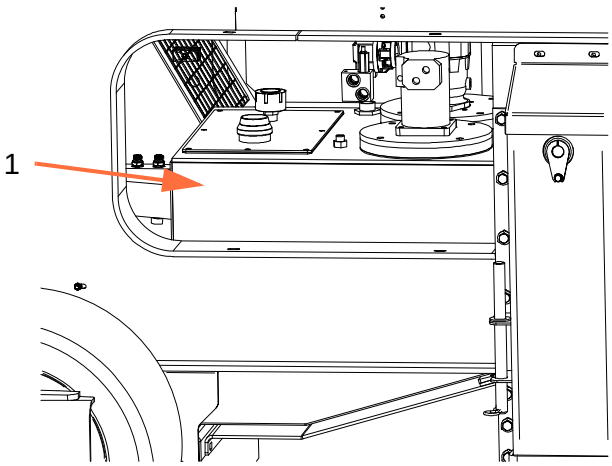
**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***NOTICE***

**RISK OF EQUIPMENT DAMAGE**

**Incorrect filling procedures can cause contamination and can damage the equipment. Make sure that the oil is filled correctly**

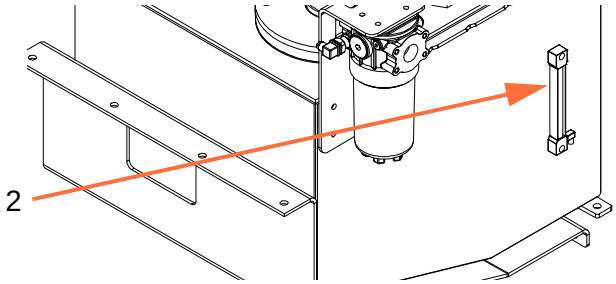
1. Remove cover to access the cone crusher lubrication tank.





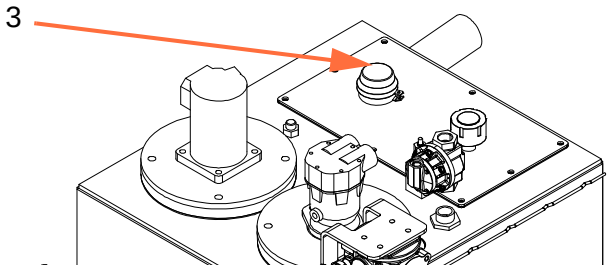
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2. Check level in crusher lubrication tank with the gauge. A low level will show on the display screen.




3. If more oil is required, remove filler cap and top up as necessary.

***Note: Clean around filler before opening, to prevent contamination.***




4. For crusher lubrication oil information > 4 Refer to section 6.5 - Lubricants and fluids.

### 6.4.8 Clutch lubrication tank - check top up

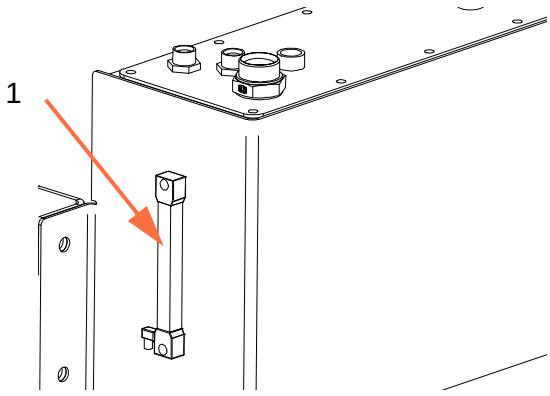
**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***NOTICE***

**RISK OF EQUIPMENT DAMAGE**

**Incorrect filling procedures can cause contamination and can damage the equipment. Make sure that the oil is filled correctly**

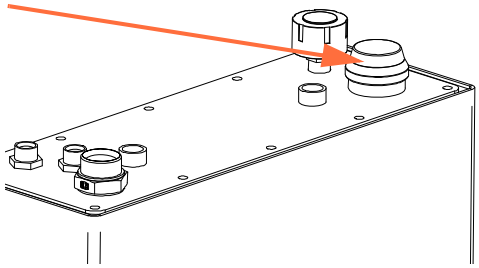
1. Check level in clutch bearing lubrication tank with the gauge. A low level will show on the display screen.




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2. If more oil is required, remove filler cap and top up as necessary.
3. Clean around filler before opening, to prevent contamination

2



4. For clutch bearing lubrication oil information >

3 Refer to section 6.5 - Lubricants and fluids.

### 6.4.9 Air cleaner - servicing

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

A fault message will display on control screen if there is an air filter blockage.

***Note: When the engine is operated in environments that are dusty or dirty, the air cleaner elements may require more frequent servicing than that stated in the maintenance schedules***

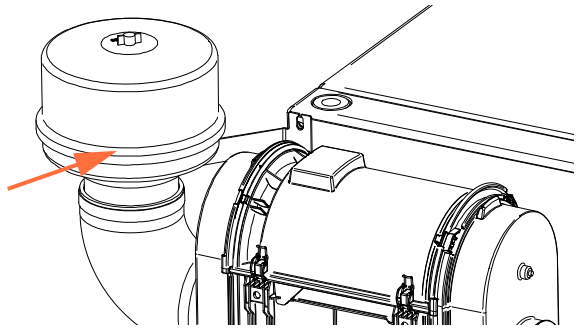
| ⚠ WARNING | |
|---|---|
|  | **INHALATION, DUST HAZARD**<br>**Breathing or inhaling dust particles could cause serious injury or death.**<br>**Make sure all necessary precautions are taken to reduce the risk of breathing in dust particles.** |

1. Locate the air cleaner >

1 Refer to 6.4.1 - Location of compartments for maintenance.

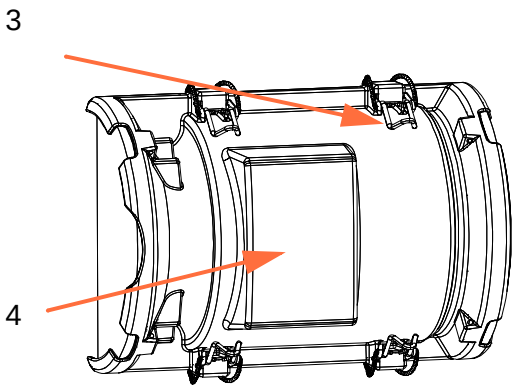
2. Clean the area around the filter and remove the air pre-cleaner assembly.

2

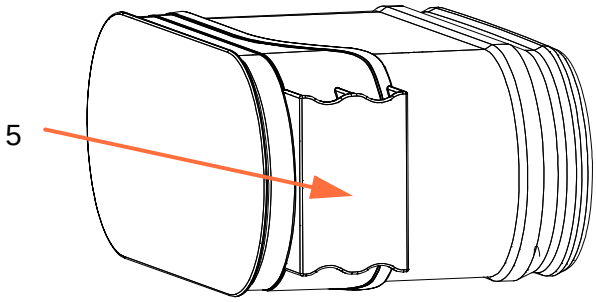



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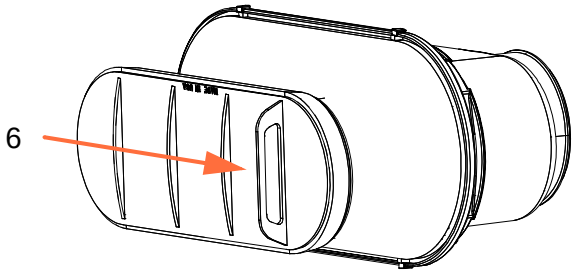
3. Open the clips.
4. Remove the cover.



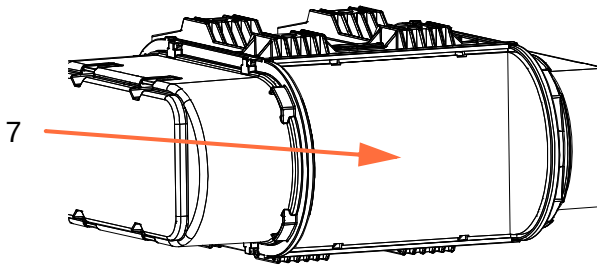

5. Remove the primary air cleaner.




6. Only remove and replace the secondary air cleaner after five services.



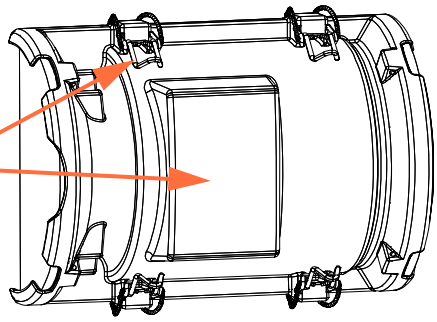

7. Clean the inside with a dry cloth. Install the filters.




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8. Install the cover and close the clips.

8



9. For engine air filters >

9 Refer to the applicable power pack parts manual for servicing kits.

10. If an air filter blockage fault message is shown on the control screen, refer to the JMG blue fault code manual.

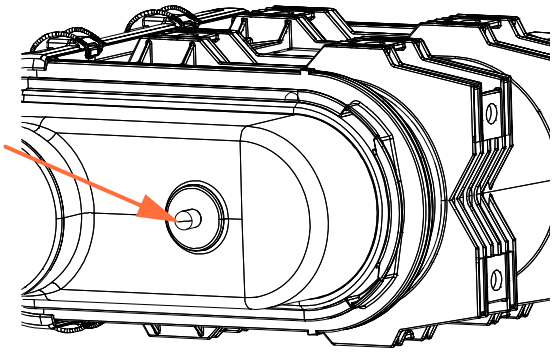
10



11. After rectifying the blockage, It will be necessary to press the reset button.

Refer also to engine manufacturer's manual.

11

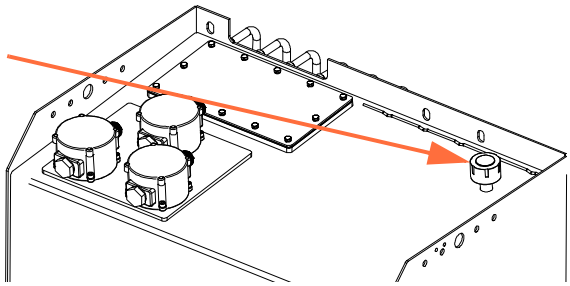


### 6.4.10 Hydraulic tank air vent filter element

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

1. At the top of the hydraulic tank, clean the area around the air vent.

1




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QH441-en-140415

2. Remove the cap of the air vent, renew the air vent filter element and install the air vent cap >

***Note: Only remove the cap to change the filter, not the complete vent housing.***

2 Refer to 6.3.6 - 500 Hours maintenance schedule.

### 6.4.11 Hydraulic return filters

**DANGER**





**SKIN PENETRATION HAZARD**

**Hydraulic fluid under pressure can penetrate the skin, which will result in serious injury or death.**

**If fluid is injected under the skin, it must be surgically removed or gangrene will result. GET MEDICAL HELP IMMEDIATELY.**

**ALWAYS use a piece of cardboard to check for leaks. DO NOT USE YOUR HAND.**

**Make sure all hydraulic pressure has been released and the system has cooled before working on the hydraulic system.**

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***NOTICE***

**RISK OF CONTAMINATION**

**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

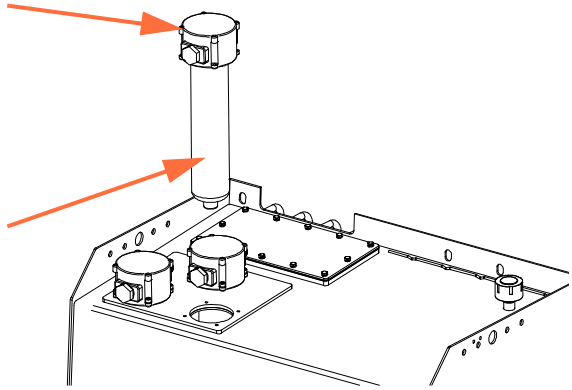
1. Clean the top of the hydraulic tank. Disconnect return pipe and remove return filter housing.

***Note: Filter housings and pipes will contain fluid which will require collecting and disposing of in a suitable container.***

2. Remove and dispose of the three filter elements.

3. Install new filter elements >

1



2

3 Refer to section 12, Power pack parts manual for servicing kits.

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### 6.4.12 Hydraulic strainers, filters and fluid renewal

| DANGER | |
|---|---|
|  | **SKIN PENETRATION HAZARD**<br>**Hydraulic fluid under pressure can penetrate the skin, which will result in serious injury or death.**<br>**If fluid is injected under the skin, it must be surgically removed or gangrene will result. GET MEDICAL HELP IMMEDIATELY.**<br>**ALWAYS use a piece of cardboard to check for leaks. DO NOT USE YOUR HAND.**<br>**Make sure all hydraulic pressure has been released and the system has cooled before working on the hydraulic system.** |

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***NOTICE***

**RISK OF CONTAMINATION**

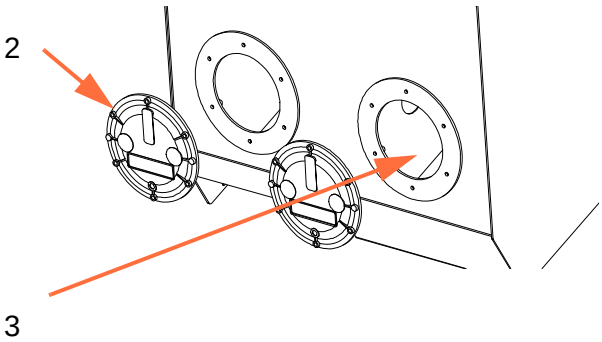
**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

1. Drain the hydraulic fluid from the tank into suitable capacity containers >

1 Refer to 6.4.2 - Fluid drain points to drain and 6.5 - Lubricants and fluids for tank capacity.

2. Clean the outside of the tank and surrounding area to prevent contamination then remove the tank access covers.
3. Clean the tank of any sediment.

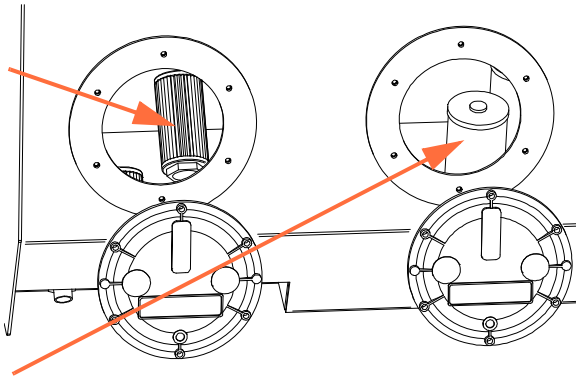




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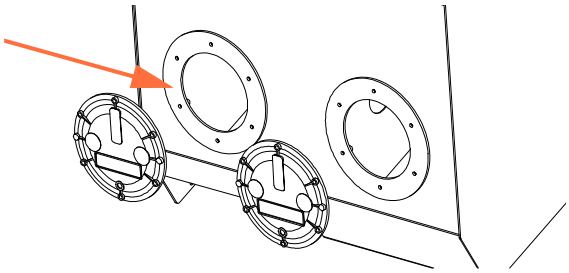
4. Remove and dispose of the three hydraulic strainers.
5. Remove and dispose of the two hydraulic filters.

***Note: It is essential that all hydraulic systems are clean and not contaminated.***




6. Renew all hydraulic strainers and filter elements ->

6 Refer to section12, Power pack parts manual for servicing kits.




7. Fit the tank access covers. Make sure sealing surfaces on the covers and tank are clean. Renew if necessary.

8. Refill the tank to the correct level. For recommended fluid and quantity >

8 Refer to 6.5 - Lubricants and fluids

### 6.4.13 Hydraulic pressure filters

**DANGER**



**SKIN PENETRATION HAZARD**

**Hydraulic fluid under pressure can penetrate the skin, which will result in serious injury or death.**

**If fluid is injected under the skin, it must be surgically removed or gangrene will result. GET MEDICAL HELP IMMEDIATELY.**

**ALWAYS use a piece of cardboard to check for leaks. DO NOT USE YOUR HAND.**

**Make sure all hydraulic pressure has been released and the system has cooled before working on the hydraulic system.**

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule**

***NOTICE***

**RISK OF CONTAMINATION**

**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

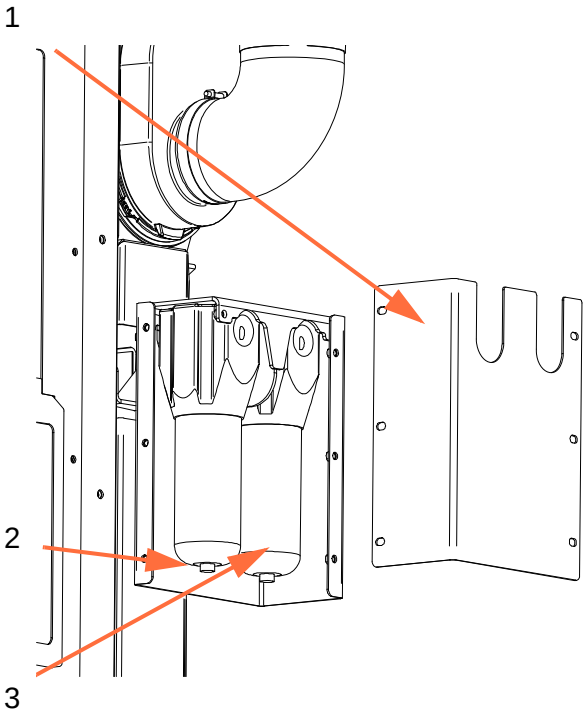
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**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

1. Remove the filter cover.
2. Clean around the filter housing and remove the housing.

   ***Note: Filter housings will contain fluid which will require collecting and disposing of in a suitable container.***

3. Remove and dispose of the filter elements inside housings, (not illustrated).




4. Install new filter elements >

4 Refer to section 12, Power pack parts manual for servicing kits.

### 6.4.14 Clutch lubrication oil and filter

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule**

***NOTICE***

**RISK OF CONTAMINATION**

**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

1. Drain the oil from the tank into suitable capacity containers >

1 Drain positioned in base of tank.

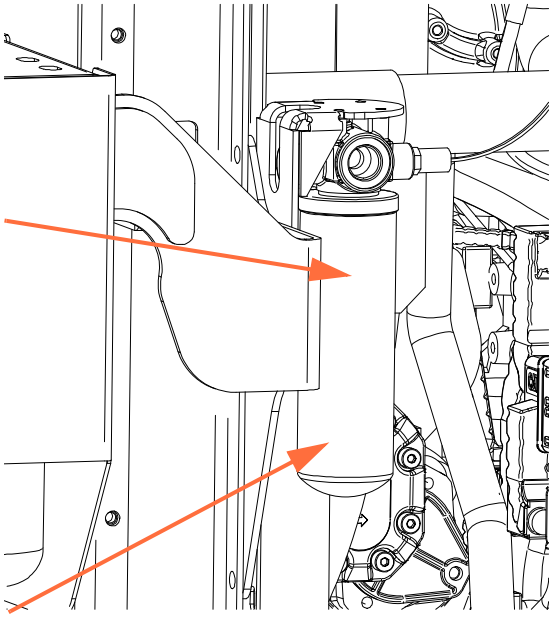

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2. Clean around the filter housing and remove the filter, located in the power pack near the clutch power take off.

   ***Note: Filter will contain oil which will require collecting and disposing of in a suitable container.***

3. Remove and dispose of the filter element, (not illustrated).

4. Install new filter element >




4 Refer to section 12, Power pack parts manual for servicing kits.

### 6.4.15 Cone lubrication in-line filter

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule**

***NOTICE***

**RISK OF CONTAMINATION**

**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

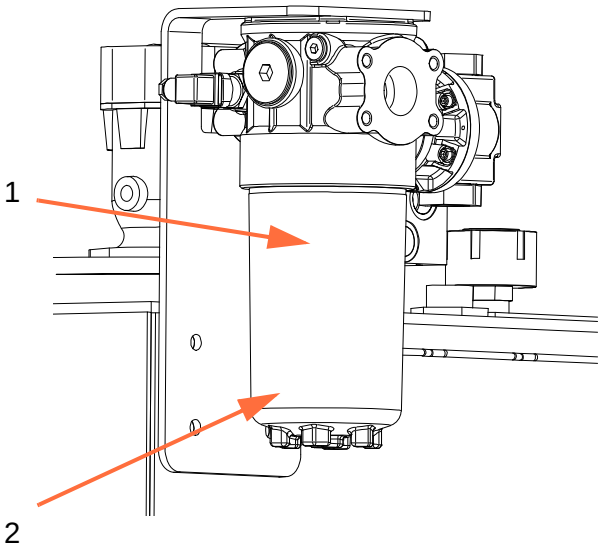
**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

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1. Clean around the filter housing and remove the filter, located next to the cone lubrication tank.

   ***Note: Filter will contain oil which will require collecting and disposing of in a suitable container.***

2. Remove and dispose of the filter element, (not illustrated).




3. Install new filter elements >

3 Refer to engine power pack parts manual for servicing kits.

### 6.4.16 Strainer and filters inside cone lubrication tank

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***NOTICE***

**RISK OF CONTAMINATION**

**Clean up any spills after performing these operations, with a spill kit that conforms to your local and national regulations.**

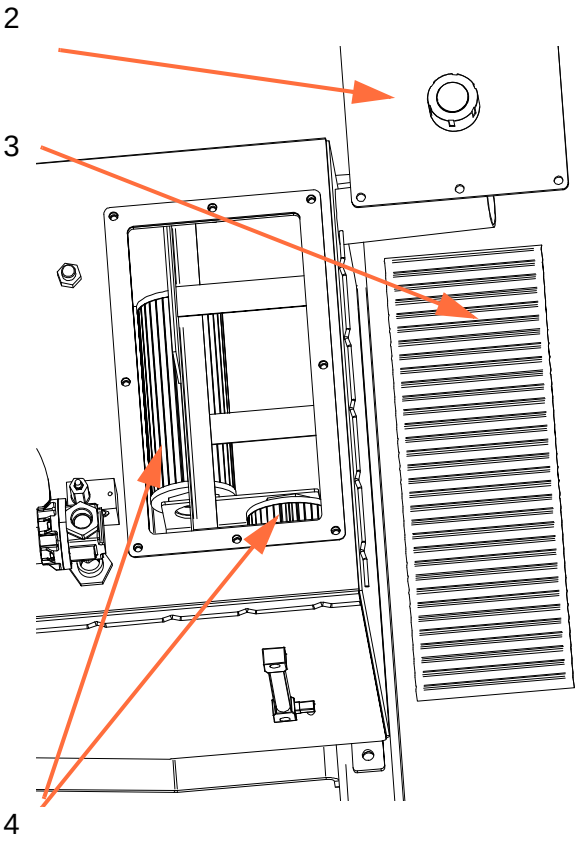
**Make sure that filters are disposed of correctly in a way that meets the local and national environmental regulations.**

1. The strainer and filters inside the cone lubrication tank should be cleaned or renewed as required, when the tank is drained and cleaned >

Drain positioned in base of tank.

1 Refer also to section 10.1.5 - Sandvik cone crusher manuals for recommended service information.


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2. Remove the cover plate.
3. Remove the strainer, clean or renew as required.
4. Remove and dispose of the filter elements.
5. Install new filter elements >

5 Refer to section 11 and 12 parts manuals for servicing kits and filter parts.

### 6.4.17 Air fan filter

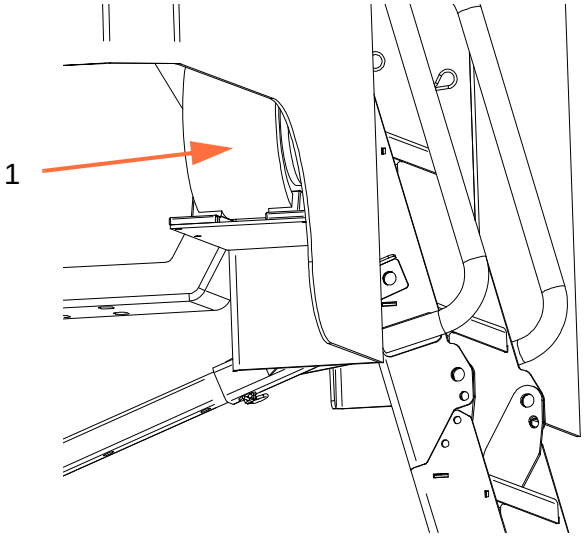
**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***Note: When the engine is operated in environments that are dusty or dirty, the air cleaner elements may require more frequent servicing than that stated in the maintenance schedules***

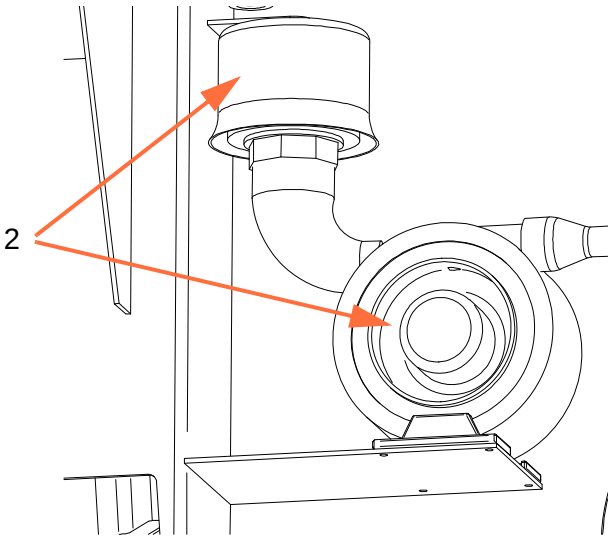
| ⚠ WARNING | |
|---|---|
|  | **INHALATION, DUST HAZARD**<br>**Breathing or inhaling dust particles could cause serious injury or death.**<br>**Make sure all necessary precautions are taken to reduce the risk of breathing in dust particles.** |

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1. Locate the air fan for the cone crusher, under the side of the maintenance platform.




2. Clean the area around the filters then remove and dispose of the filter elements.




3. Install new filters >

3 Refer to engine power pack parts manual for servicing kits.

### 6.4.18 Crushing chamber - inspect

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

***Note: Inspection of the crushing chamber must be carried out regularly and records kept of the results. This gives the operator an indication of uneven and or oval wear over time.***

Inspect crushing chamber upper groove area in four opposing points, for excessive wear and or damage.

For further information refer to section 10.1.5 - Sandvik cone crusher manuals**.**


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### 6.4.19 Crusher belt drive tension system - Inspect/adjust

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance**

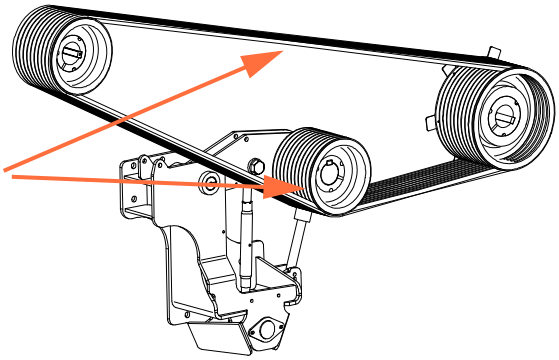
1. Open the drive guards doors and latch them open.

1 .



2. Visually Inspect for the following:
   - Condition of the v-belts.
   - Any slack on the belts.
   - V-belt tracking off the pulleys alignment

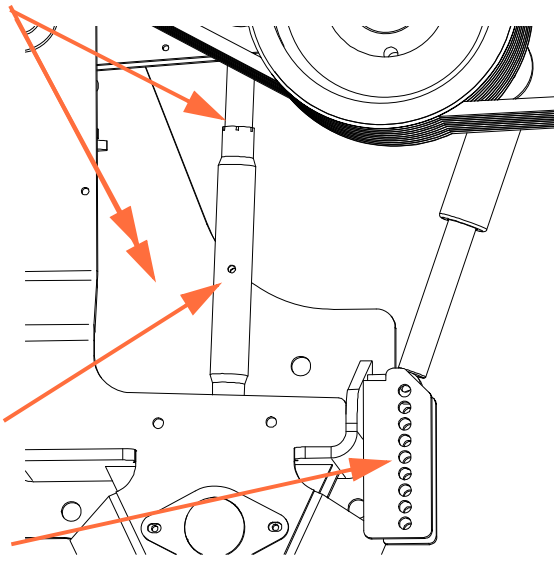
2



3. Adjust, replace or renew drive belts as necessary. If required, take up any slack in the v-belt >

3 Refer to diagram and recommended belt tensions below.

4



4. Loosen the upper and lower lock nuts of the turnbuckle.
5. Decrease the length of the turnbuckle to adjust belt tension, then lock in position by tightening the lock nuts.
6. As the belts wear and require tightening the damper position will need to be repositioned in a lower mounting hole.

5

6

When drive belts are installed the crusher should be rotated briefly running in manual mode. This is to make sure that they are settled properly into the pulley grooves.

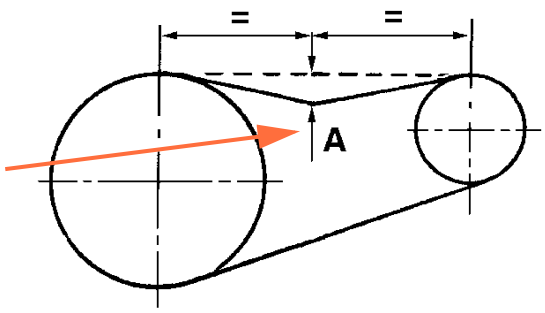
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**NOTICE**

**Tensioning drive belts too tight can cause excessive movement within the tension arm assembly, leading to premature failure of components.**

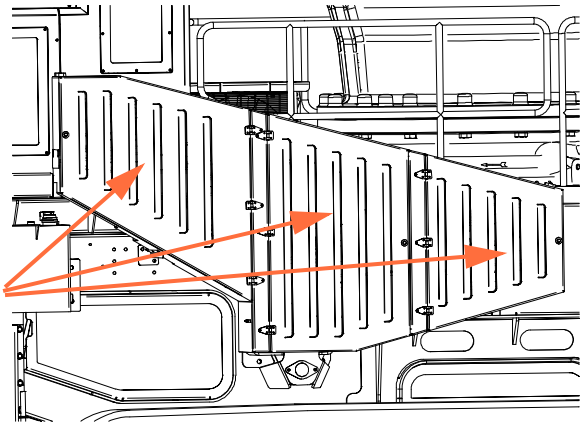
7. Recommended tension of Red Power 3 belts, applied at the mid point on the upper part of the belt.
   - Load at 'A' =125N or 12.75kgf (28lbf).
   - New belts deflection at 'A' = 61mm (2.4in).
   - Used belts deflection at 'A' = 73.5mm (2.9in).

7




8. Close and secure all the drive guards before starting the machine.

8



### 6.4.20 Replacing the crusher drive belts

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance.**

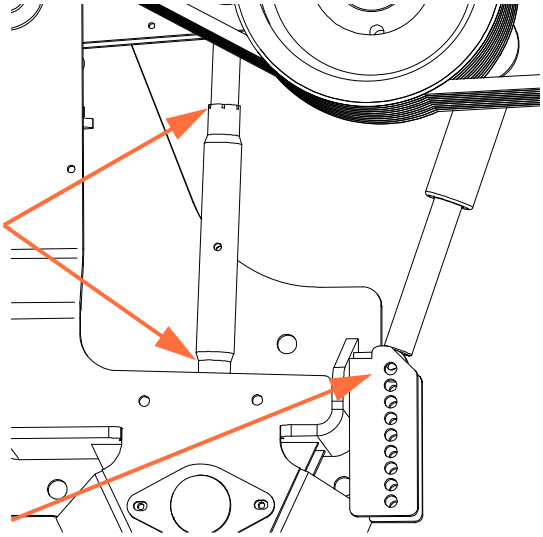
1. Open the drive guards and latch open.

1 .



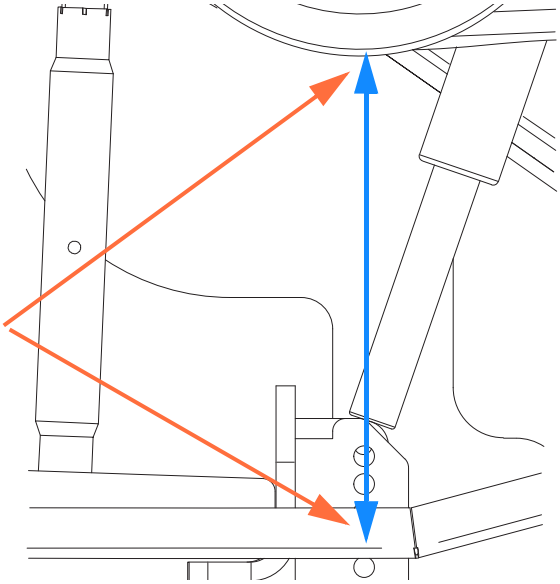

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2. Loosen the upper and lower lock nuts of the turnbuckle.
3. Remove the lower damper mounting bolt.




4. Increase the length of the turnbuckle, raising the idler approximately 660mm (26in) from the bottom of the drive guard.

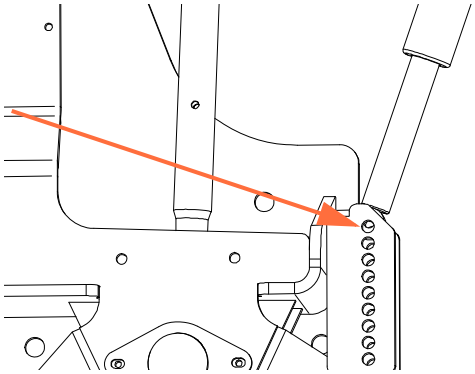
The belts can now be replaced as a complete matched set.




5. Tension the new belts >

5 Refer to 6.4.19 - Crusher belt drive tension system - Inspect/adjust.

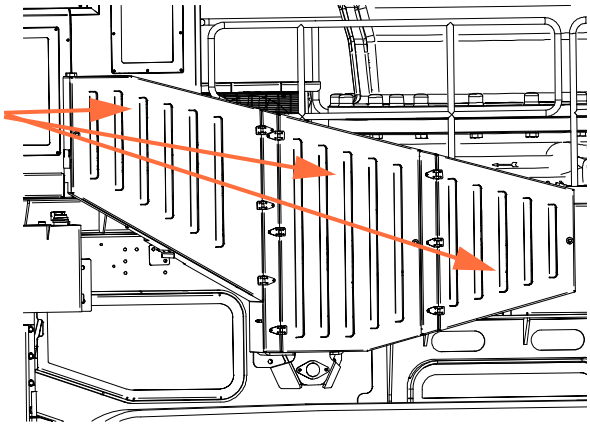
6. Install the damper in the upper mounting hole.




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7. Close and secure all the drive guards before starting the machine.

7



### 6.4.21 Replacing the turnbuckle polyurethane bushes

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance.**

The drive belts have been removed for greater clarity this operation can be carried out with them in place.

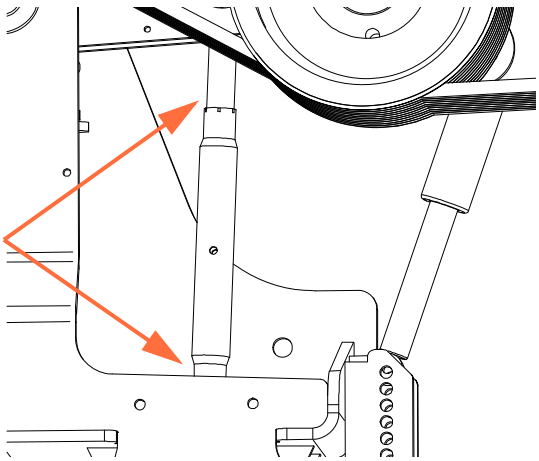
1. Open the drive guards and latch open.

1 .



2. Loosen the upper and lower lock nuts of the turnbuckle.

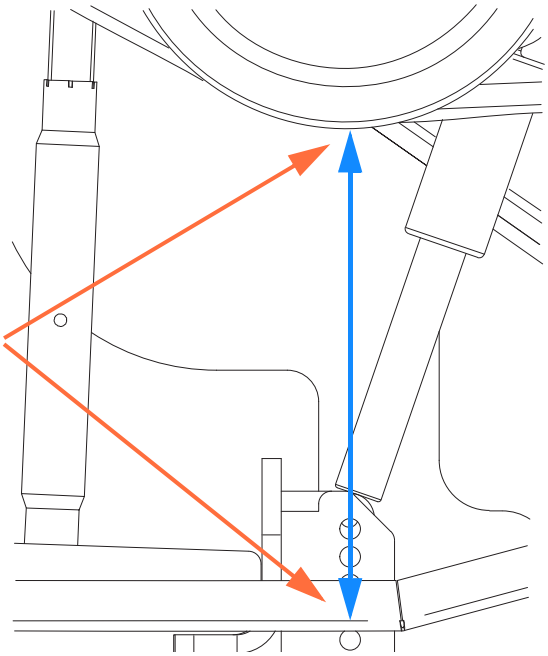
2




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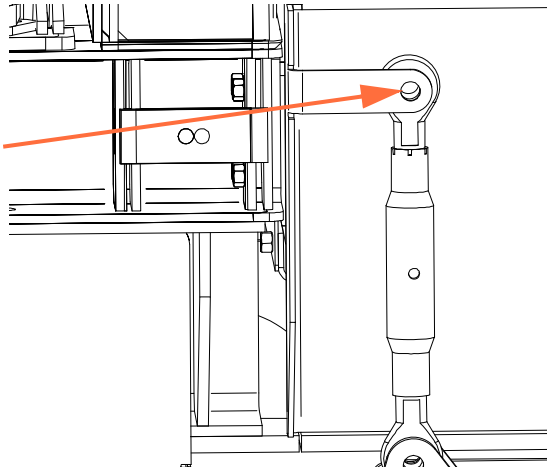
3. Increase the length of the turnbuckle, raising the idler pulley to approximately 660mm (26in) from the bottom of the drive guard.

3



4. Remove the nut and bolt to release the top of the adjustable tie bar from its stowed position.

4

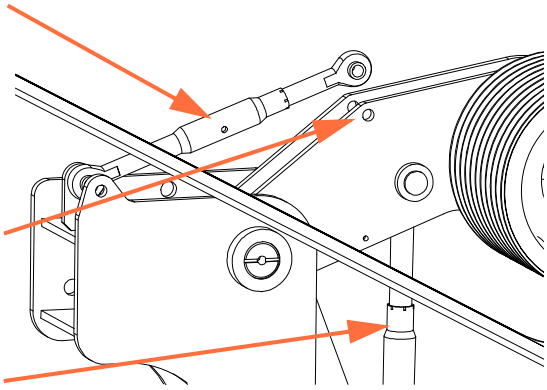


5

6

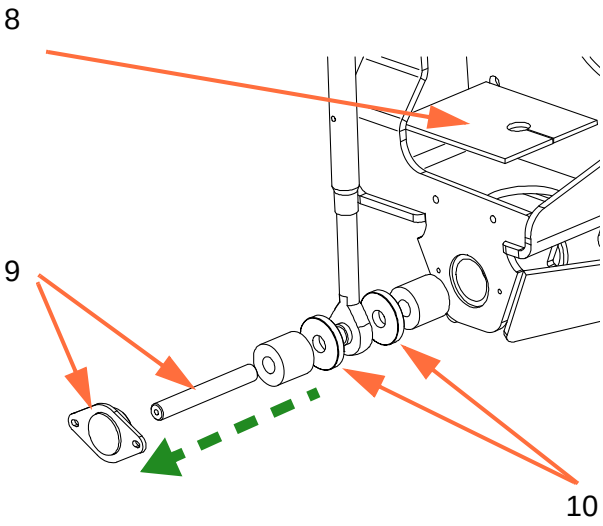
7

5. Extend the tie bar to locate in the tension arm.
6. Adjust the tie bar and secure in the tension arm using bolt and nut.
7. Release the turnbuckle transferring the weight to the tie bar.

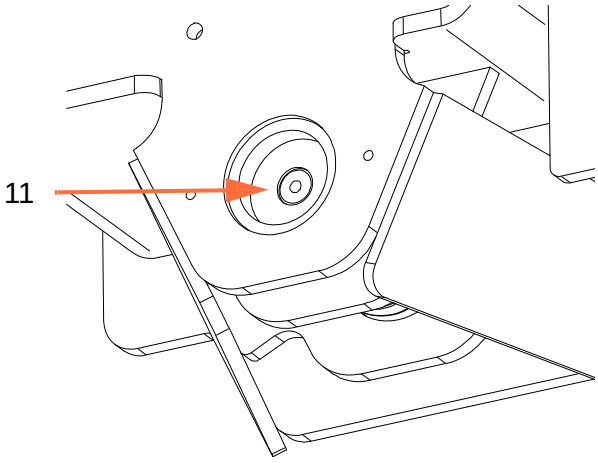


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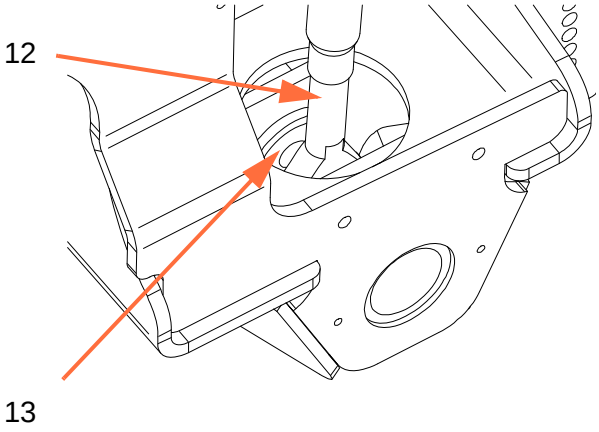
8. Remove the rubber cover mat.
9. Remove the cover plate and the centre pin. The pin has an internal thread, use an M12 bolt to assist with removal.
10. Two metal spacers both sides of the turnbuckle eye will be released and drop down.




11. Remove the outer polyurethane bush.




12. Decrease the length of the turn buckle to clear the housing.
13. Remove the inner bush.

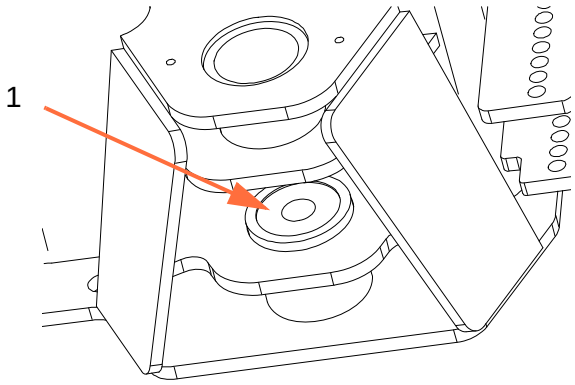




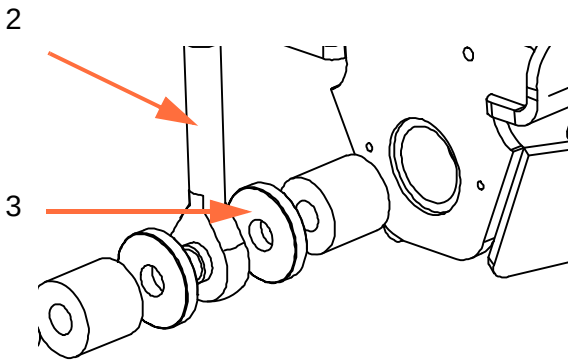
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**To fit the new polyurethane bushes**

1. Fit the new inner bush into the housing.



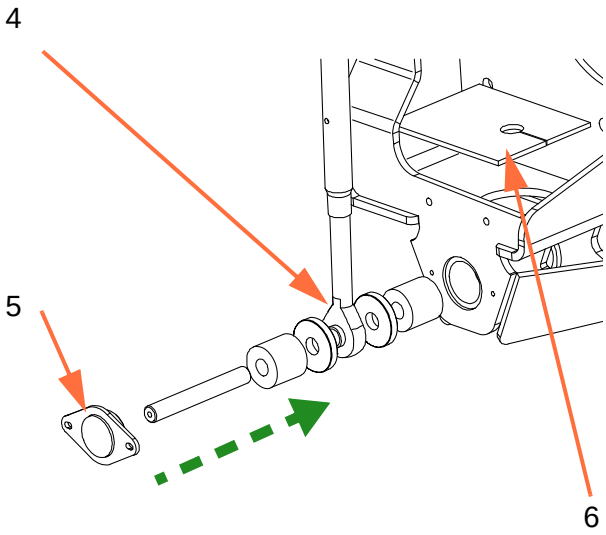

2. Increase the length of the turnbuckle to align with the hole in the bush.
3. Make sure the rear spacer is in place.




4. Feed the pin through the outer bush, outer spacer and turnbuckle eye then inner spacer and previously fitted bush.

***Note: Make sure the thread in the pin is facing out for future removal.***

5. Fit the cover plate.
6. Replace the rubber cover mat around the turnbuckle.




7. Tension the drive belts > Refer to 6.4.19 - Crusher belt drive tension system - Inspect/adjust.
8. Before starting the machine > Close the drive guards and secure.

**NOTICE**

**It is recommended that both bushes are replaced at the same time.**

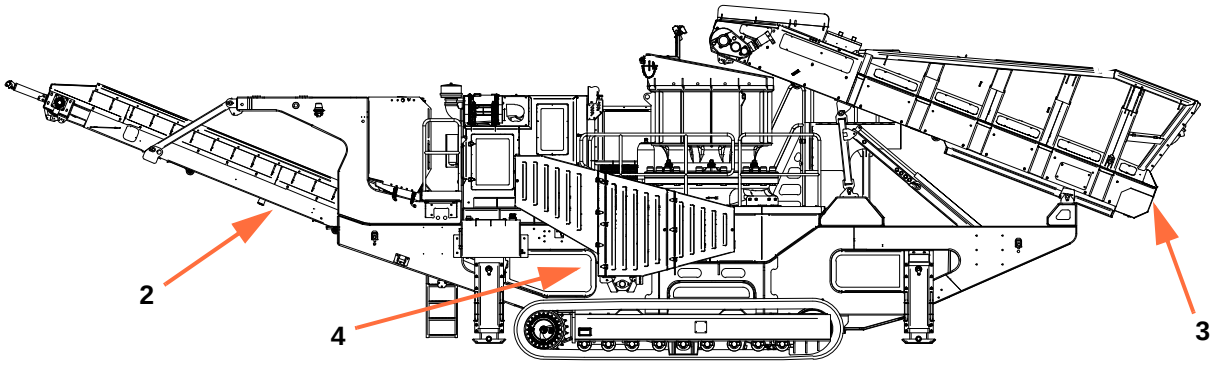
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### 6.4.22 Bearings - grease

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

**NOTICE**

**Only apply grease where indicated, and in the correct quantity Failure to do so will invalidate any warranty.**

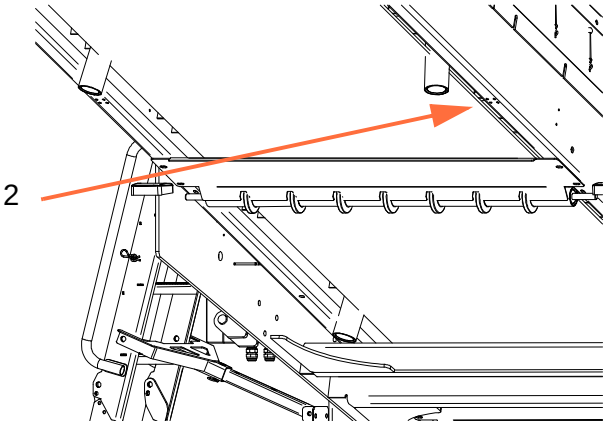



1. Inject the correct amount of grease into each grease point. >

1 Refer to 6.5 - Lubricants and fluids for recommended grease type.

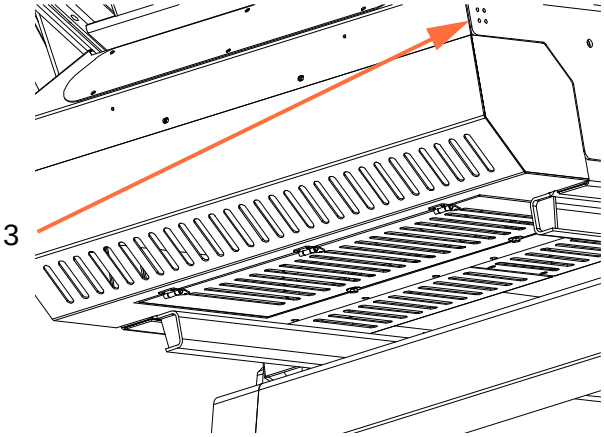
2. Main conveyor grease points x 4.

Add 2.5 grams per grease point daily.



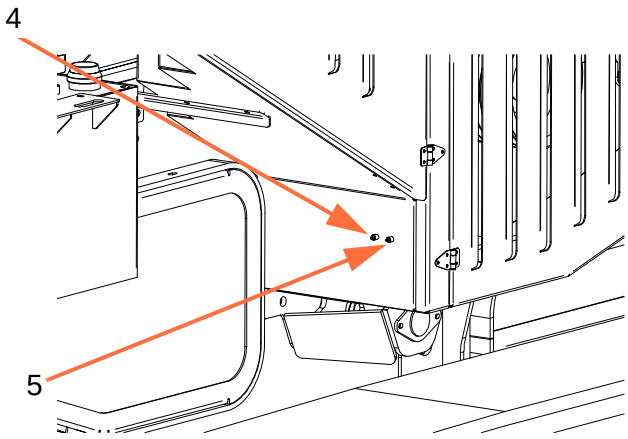

3. Feed conveyor x 4.

Add 2.5 grams per grease point daily.





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4. Drive belt pivot x1

1 gram inner grease point daily.

5. Torque arm x1

Add 12 grams outer grease point daily.

If an autolube system is fitted the grease reservoir level must be checked daily and the level replenished refer to 6.5.3 - Engine lubricants and fluids.

Certain faults on the autolube system will be displayed on the main display screen. The autolube system can be tested using the button on the side of the unit refer to 10.1.6 - Optional auto grease lubrication..

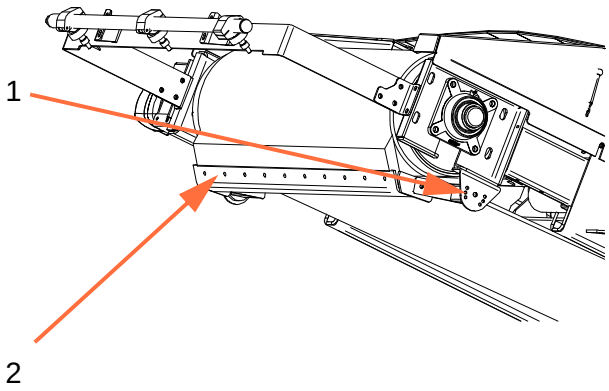
### 6.4.23 Belt scraper - adjust

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**



**FALLING HAZARD**

**When working at height use a maintenance platform, with handrails and ladders fixed in place. Ensure a safety harness is used.**




1. At the top of the main conveyor, remove the bolts on both sides of the belt scraper.
2. Pivot the belt scraper bar into the required position and install the bolts.

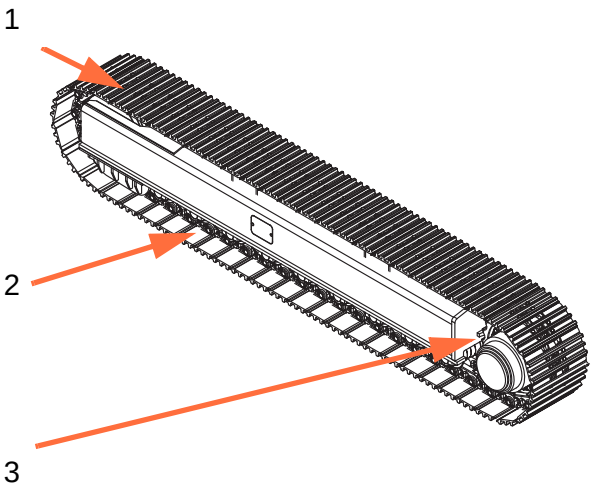
Copyright © Sandvik Construction

### 6.4.24 Tracks - inspect

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

Carry out a visual inspection of the track and tracking components on both sides of the machine for any signs damage or wear, pay particular attention to the following:

1. Complete track pad assembly - Check and tighten the chassis pad bolts if necessary.
2. Rollers - Tighten if necessary.
3. Sprockets - Check sprocket bolts and tighten if necessary.




4. Idler and tension system. >
5. Track gearbox - Check oil and for any signs of leakage. >

4 Refer to 6.4.25 - Track tension - check.

5 Refer to 6.4.3 - Track gearbox oil - check top up.

***Note: In order to inspect all of the tracks it will be necessary to inspect the visible upper section then move the machine to inspect the remainder. Refer to 4.5 - Moving the machine using the tracks.***

### 6.4.25 Track tension - check

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

1. Move the machine 10m (33ft) straight, forwards and backwards on level ground to allow the tracks to adopt their natural degree of tension >

1 Refer to 4.5.2 - Moving the machine

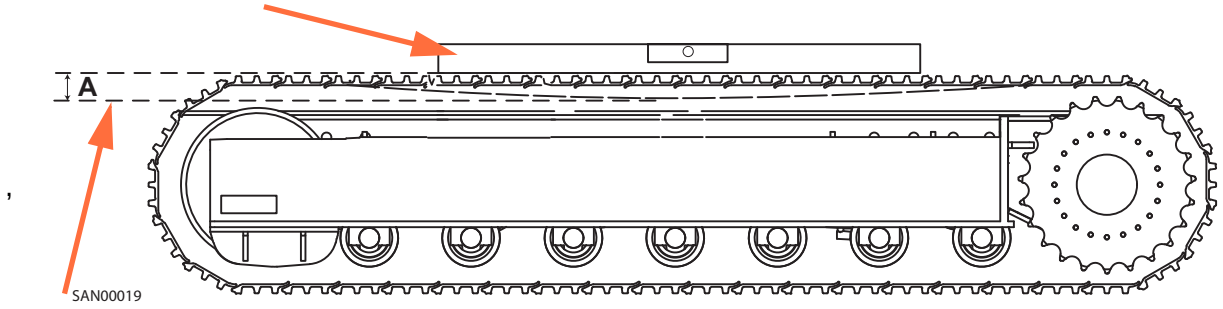
***Note: Do not slew the machine.***

2. Stop and tag-out the machine >

2 Refer to 4.8 - Shut down the machine and 4.9 - Lockout and tag procedure

3. Measure the slack in the track >

3 Use a straight edge.




4. The dimension ‘A’, should not exceed 30mm (1.2in) >

4 Adjust the track tension if necessary.


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| | |
|---|---|
| 5. To adjust the track tension > | 5 Refer to either, 6.4.26 - Track tension - increase, or 6.4.27 - Track tension - reduce. |
| 6. Move the machine a short distance forward and backward on level ground to allow tracks to adopt their natural tension > | 6 Refer to 4.5 - Moving the machine using the tracks. |
| 7. Stop the machine > | 7 Refer to 4.8 - Shut down the machine. |
| 8. Lockout and tag the machine > | 8 Refer to 4.9 - Lockout and tag procedure. |
| 9. Measure slack dimension 'A' again > | 9 Adjust as necessary. |

### 6.4.26 Track tension - increase

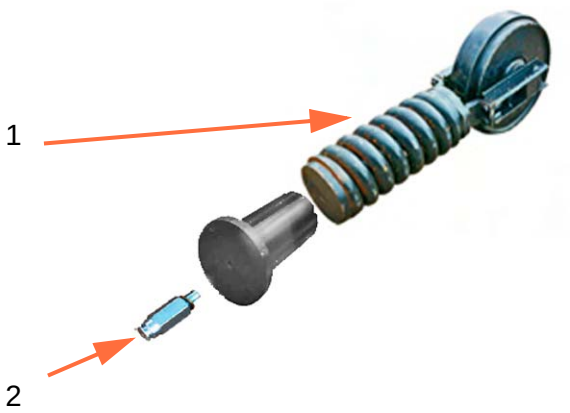
**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule**

**NOTICE**

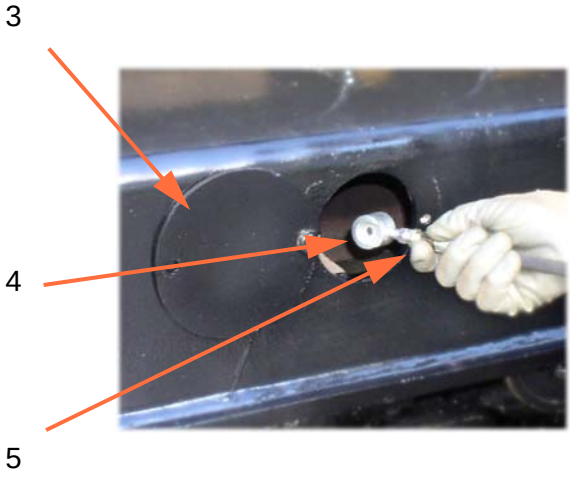
**DO NOT over tension the track as this places excessive loads on the gearbox and idler bearings, which will lead to accelerated wear and premature failures.**

Track adjustment operates through a tensioning system:

1. When the tensioning cylinder is filled with grease it pushes the spring tension unit and idler forward.
2. Grease is filled through the track adjuster grease nipple valve.




3. Remove inspection cover on side of track frame.
4. Ensure grease nipple is secure and attach grease gun connector to the grease nipple.
5. Pump grease into tensioning system until track droop is correct.




| | |
|---|---|
| 6. Recheck track tension > | 6 Refer to 6.4.25 - Track tension - check. |

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7. Add or release grease as required and repeat check >

7 Refer to 6.4.26 - Track tension - increase or 6.4.27 - Track tension - reduce, as applicable.

8. Clean off any excess grease, and install inspection cover >

8 See above.

### 6.4.27 Track tension - reduce

**⚠ WARNING**

**PERSONNEL HAZARD**

**Grease under high pressure, could penetrate the skin causing serious injury or death.**

**NEVER unscrew a grease nipple by more than half a turn, when track is under tension.**

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

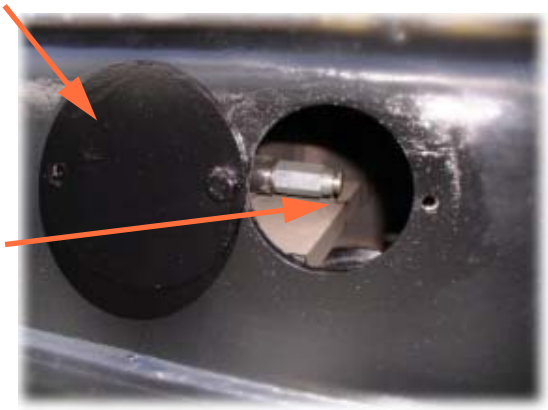
1. Remove inspection cover on side of track frame.

2. Slacken grease nipple half a turn, anti-clockwise.

***Note: If track fails to loosen, apply a little pressure to the idler end of the tension system.***

Grease will escape slowly from track tensioning cylinder / grease nipple and track tension will reduce. Tighten grease nipple to set tension.

1



2

3. Recheck track tension >

3 Refer to 6.4.25 - Track tension - check

4. Add or release grease as required and repeat check >

4 Refer to 6.4.26 - Track tension - increase or 6.4.27 - Track tension - reduce, as applicable.

5. Clean off any excess grease, and install inspection cover >

5 See above.

### 6.4.28 Crusher liners - replace

**WARNING! Follow the maintenance safety instructions in 6.1 - Maintenance - minimum safety requirements, before starting this maintenance schedule.**

To replace the crusher liners, refer to 10.1.5 - Sandvik cone crusher manuals.



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### 6.4.29 New crusher liners - Reset datum

When the crusher liners have been replaced the datum position between the mantle and the concave ring requires to be reset so that the wear rate can be monitored. This datum is also required to ensure that the correct gap, Closed Side Setting (CSS), dimension can be provided by the system.

1. Push button 1 on the main screen P0000 to select plant crushing operation mode.

1



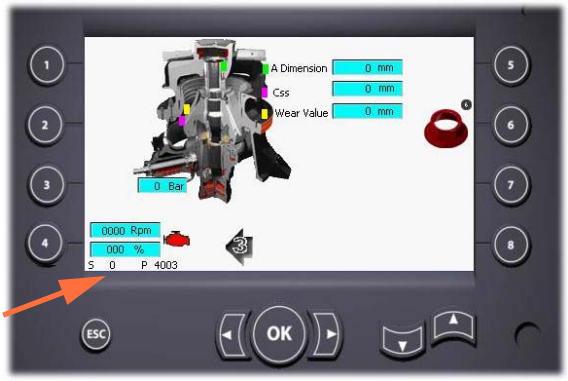

2. Press the right arrow button to scroll through four screens until P4003 screen is reached.

2




3. Cone information and calibration screen P4003

3



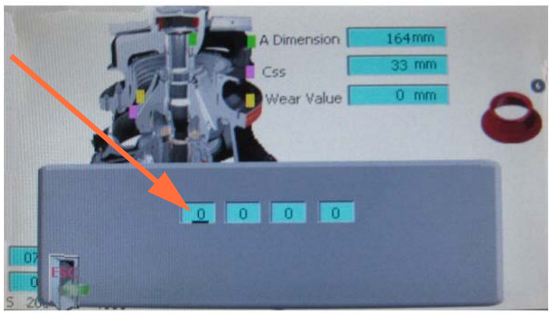

4. Push button 6 to reset crusher liners datum.

4




5. A security page appears. To activate the reset datum operation, use the numbered buttons at the side of the display to enter the same 4 digit security code obtained to access the maintenance screens. Refer to section 6.6.1 - Access to maintenance display screens.

5




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## 6.5 Lubricants and fluids

**NOTICE**

**RISK OF EQUIPMENT DAMAGE.**

**Only use lubricants, fluids, filters and parts recommended by the Original Equipment Manufacturer (OEM) otherwise accelerated wear or damage could result.**

**Never use grease containing Molybdenum. This may cause damage to the machine components and will invalidate the warranty.**



**ENVIRONMENTAL HAZARD**

**Make sure that oils and fluids are cleaned and disposed of correctly in a way that meets the local and national environmental regulations.**

### 6.5.1 Machine Lubricants and fluids used in manufacture

| Reference | Maximum volume | Temperature | Manufacturer - Equivalent Specifications | Sandvik Part No |
|---|---|---|---|---|
| Cone lubrication oil | 250 litres (66 US gal) | -30 to 10°C (-22 to 50°F) | Shell Omala S2 GX100 | 10-82-0100 |
| | | 0 to 30°C (32 to 86°F) | Shell Omala S2 GX150 | 10-82-0150 |
| | | 20 to 50°C (68 to 122°F) | Shell Omala S2 GX220 | 10-82-0220 |
| Clutch fluid | 80 litres (21 US gal) | - | Refer to PT Tech information | - |
| Hydraulic system | 900 litres (238 US gal) | -10 to +50°C (14 to 122°F) | Shell Tellus S2 V46 | CN6074 |
| | | -25 to +25°C (-13 to 77°F) | Shell Tellus S2 V32 | 825.0156-00 |
| | | -35 to +15°C (-31 to 59°F) | Shell Tellus S4 VX 32 | CN5700 |
| Feeder gearbox | 6.8 litres (1.8 US gal) | - | Shell Omala S2 GX220 | 10-82-220 |
| General grease lubrication points and track tension | - | - | Shell Gadus S3 V220C 2 | CN6073 |
| Track gearbox | 5 litres (1.3 US gal) per track | -25 to 90°C (-13 to 194°F) | Shell Spirax S2 G 80W-90 | CN6100 |
| | | | Alternative: Exol Athena EP90 gear oil | - |
| Cone spider bearing grease | 6-8kgs | | Shell Gadus S3 V 460_2 | CN8065 |
| Torque arm grease | 12grams | -20 to +150°C (-4 to 300°F) | SKF LGHB2 | CN6110 |


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### 6.5.2 Clutch fluid renewal

Refer to clutch manufacturer’s manual for their recommendations, 10.1.2 - Hydraulic power take-off (clutch) - PT Tech (HPTO14).

### 6.5.3 Engine lubricants and fluids

For engine lubrication and fluids, refer to 8.3 - Engine lubrication and fluids.

### 6.5.4 Hazardous fluids

A list of hazardous substances associated with this equipment can be found in 10.2 - Hazardous substances.

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## 6.6 Maintenance display screens

**WARNING! Follow the maintenance safety instructions at the start of section 6, before starting this maintenance procedure.**

The following maintenance displays describe the special mode for testing only, which allows each function of the machine to be operated independently of other functions. The functions can only be accessed after a security code is entered.

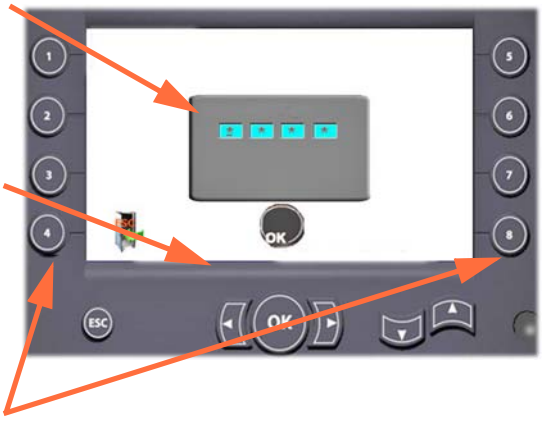
### 6.6.1 Access to maintenance display screens

1. Press button 6 on the main machine control screen to access the maintenance display screen.

1




2




2. A security page appears. To gain access to the maintenance screens, a 4 digit security code supplied by Sandvik is to be entered.
3. To obtain the 4 digit security code, contact Sandvik quoting the reference number on screen.
4. Enter the 4 digit security code, using the numbered buttons at the sides of the display screen.

3

4

5. Press the OK button.

5




When the correct code is entered, access is granted. If the incorrect code is entered, access is denied for 60 seconds before another attempt can be made.

Once the maintenance screen is activated by the security code, the warning siren and flashing beacon operates and there is a 10 second delay before any function can be operated.

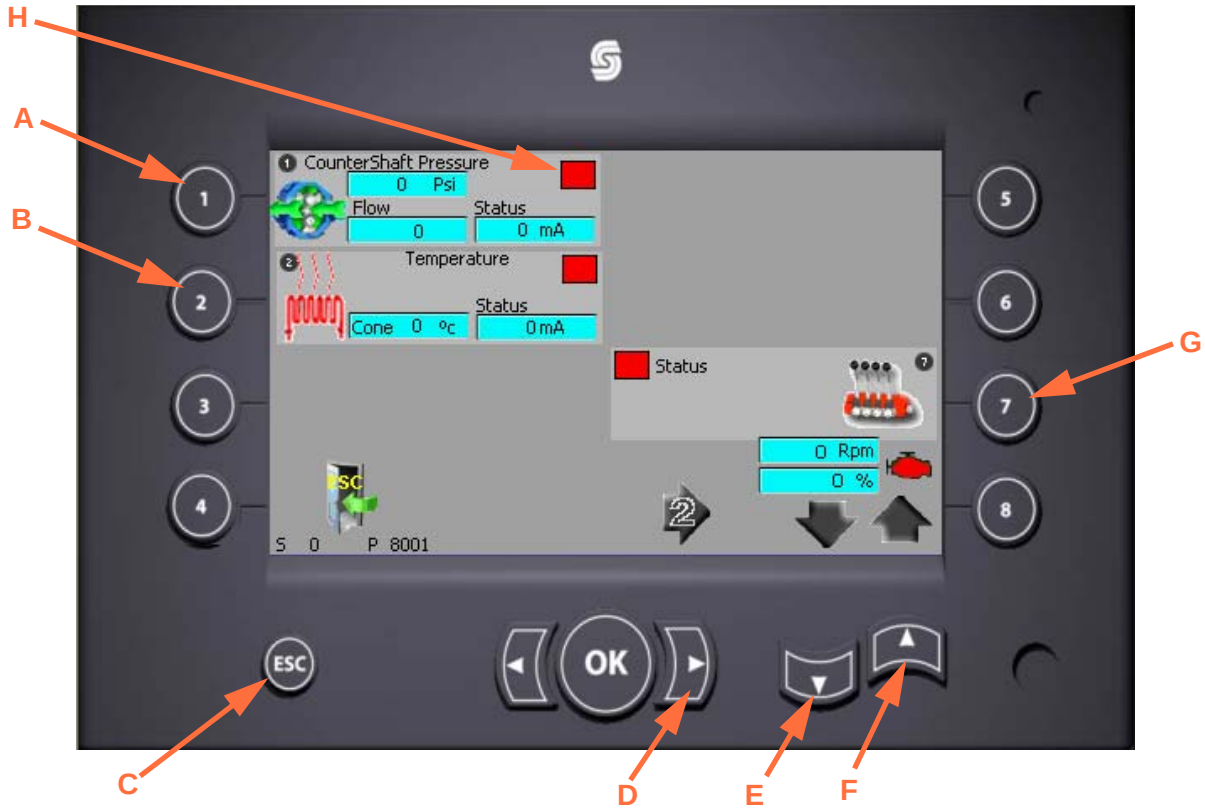

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### 6.6.2 To exit maintenance display screens

1. Scroll to page 1 of the maintenance display screens. 1 

2. Press ESC button. 2 


### 6.6.3 Maintenance display screen 1

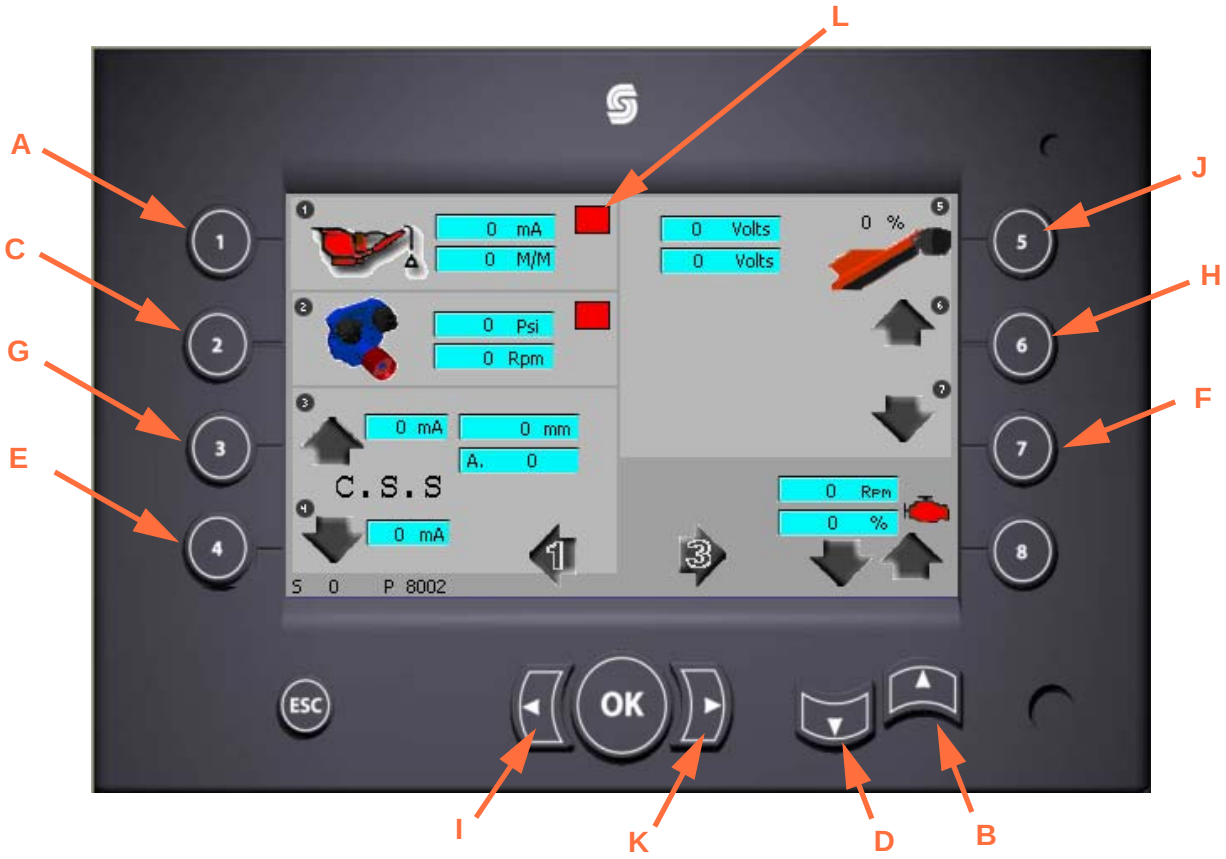



A. Lubrication pump on/off
B. Lubrication oil heater on/off
C. Esc - return to main screen
D. Scroll forward to next screen
E. Engine speed decrease
F. Engine speed increase
G. Auxiliary functions
H. Individual function status on/off (green/red)

***Note: The function status indicator (H) will be lit red if the function is inactive (off) or green if the function is active (on).***

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### 6.6.4 Maintenance display screen 2




A. Main output conveyor on/off
B. Engine speed increase
C. Enable clutch
D. Engine speed decrease
E. Open, Hydroset lower (increase CSS)
F. Feed conveyor speed decrease
G. Close, Hydroset raise (reduce CSS)
H. Feed conveyor speed increase
I. Scroll back to previous screen
J. Feed conveyor on/off
K. Scroll forward to next screen
L. Individual function status on/off (green/red)

***Note: The function status indicator (L) will be lit red if the function is inactive (off) or green if the function is active (on).***


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### 6.6.5 Maintenance display screen 3.




A. Beacon on/off

B. Siren on/off

C. Lubrication oil cooler on/off

D. Scroll back to previous screen

E. Parameter list

F. Air blower control on/off

G. Main hydraulic oil cooler on/off

H. Individual function status on/off (green/red)

I. Scroll forward to next screen

***Note: The function status indicator (H) will be lit red if the function is inactive (off) or green if the function is active (on).***

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### 6.6.6 Maintenance display screen 4.




A. Reset stored faults
B. Reset default parameters
C. Reset service
D. Scroll back to previous screen
E. Fan speed activate
F. Fan speed increase
G. Fan speed decrease
H. Individual function status on/off (green/red)

***Note: The function status indicator (H) will be lit red if the function is inactive (off) or green if the function is active (on).***


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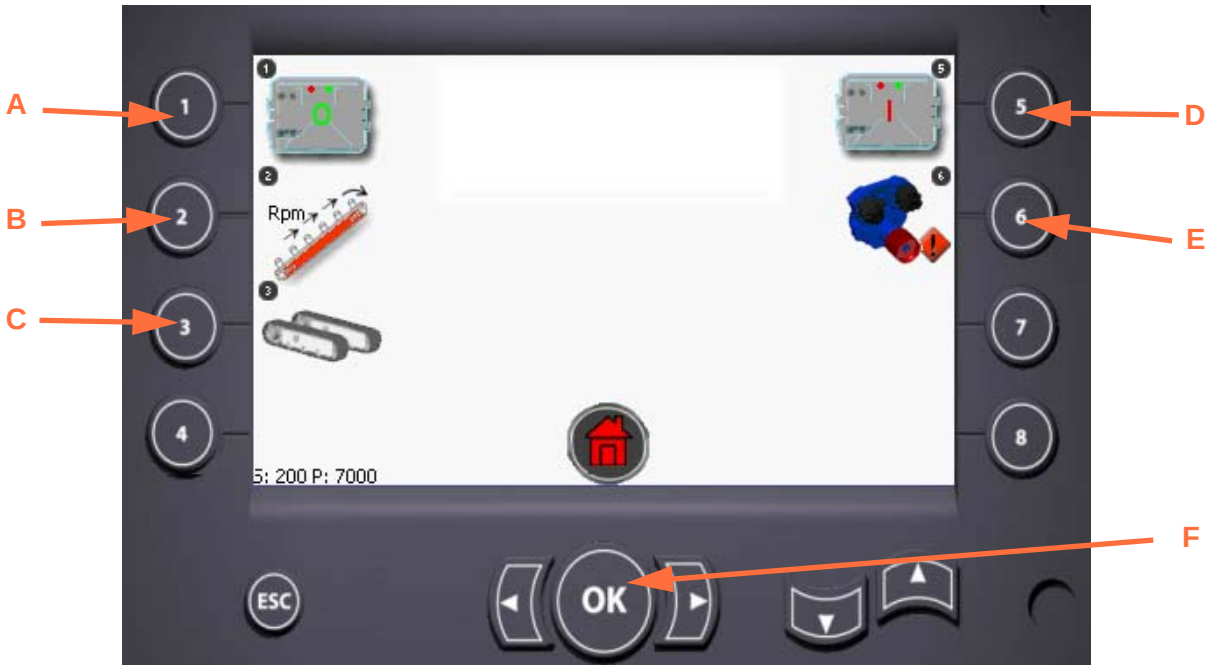
## 6.7 Diagnostic display screens

### 6.7.1 Access to diagnostic display screens

At the initial display press and hold the OK button for several seconds until the main diagnostic screen is displayed.




### 6.7.2 Diagnostic main display screen:




A. Outputs from control
B. Speed of Crusher, engine and main conveyor
C. Tracks
D. Inputs to control
E. Clutch
F. OK (home)

Press the numbered button for the required diagnostic information, some over several screen pages.

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### 6.7.3 To exit diagnostic display screens

Press OK (Home) button to return to machine main control screen.




### 6.7.4 Outputs diagnostic display screens

1. Press button 1 to select the first controls output information screen.

1

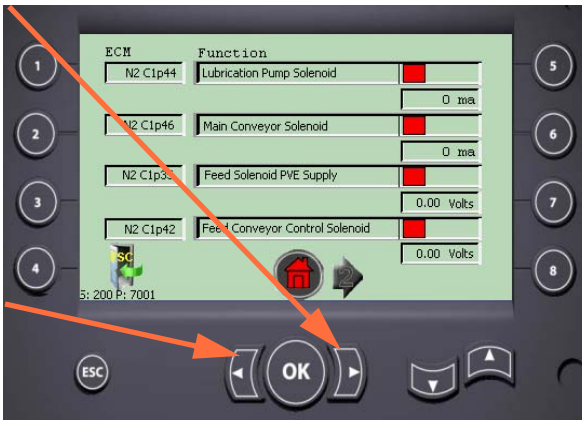


2

There are several screens detailing output diagnostic information.

2. To navigate through each screen press the right arrow button for the next screen.
3. Press left arrow for the previous screen.

3




4. Press the ESC button to return to the diagnostic main screen.

4





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### 6.7.5 Speeds diagnostic display screen

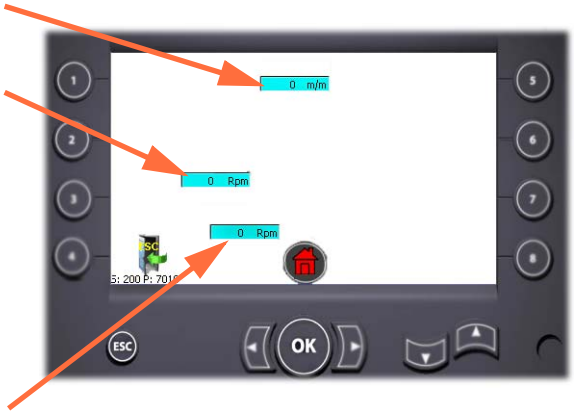
1. Press button 2 to select the speed information screen.

1




2

3




4

2. Main conveyor speed (m/min.).
3. Clutch speed (RPM).
4. Crusher speed (RPM).

5. Press the ESC button to return to the diagnostic main screen.

5




### 6.7.6 Tracks diagnostic display screen

1. Press button 3 to select track control information screen.

1




2




2. Diagnostic information shown on the tracks and track control units.

3. Press the ESC button to return to the diagnostic main screen.

3

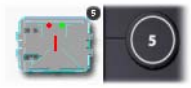



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### 6.7.7 Inputs diagnostic display screens

1. Press button 5 to select the first controls input information screen.

1

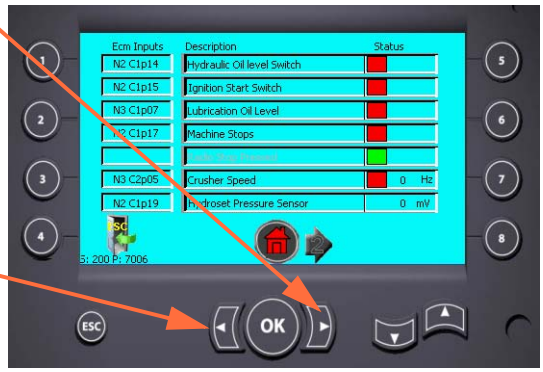


2

There are several screens detailing input diagnostic information.

2. To navigate through each screen press the right arrow button for the next screen.
3. Press left arrow for the previous screen.

3




4. Press the ESC button to return to the diagnostic main screen.

4




### 6.7.8 Clutch diagnostic display screen

1. For further information on the clutch ->

1 Refer also to 10.1.2 - Hydraulic power take-off (clutch) - PT Tech (HPTO14)

2. Press button 6 to select power take-off clutch information screen.

2



3. Press the ESC button to return to the diagnostic main screen.

3




4. Press the ESC button to return to the diagnostic main screen.

4





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# 7 Trouble shooting

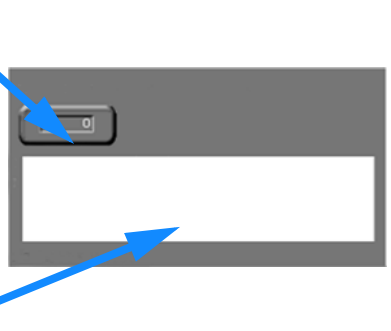
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## 7.1 Common problems

The section that follows lists some of the common problems that can occur with the machine. If any of these occur, carry out the checks listed:

### 7.1.1 Machine fault codes

When the system detects a fault, fault is reported on the display screen.




1. Each fault is identified by a fault number.
2. A fault description is also shown.

3 There are three categories of faults:
- Red faults - stop the machine
- Blue faults - stop the feeder
- Engine faults.

4 Refer to document ‘JMG display fault codes’ in ***10.1.3 JMG display fault codes***.


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# 8 Engine

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## 8.1 Engine information

### 8.1.1 Engine manual

The engine manufacturer supplies a manual which should referred to for further information on the engine fitted to the machine.

### 8.1.2 Alternative Caterpillar engines

Alternative specifications of Caterpillar C13 engines can be fitted to the machine power pack, for Tier 3a or Tier 3b regulations.

**C13 Tier 3a**

| | |
|---|---|
| Engine | Caterpillar C13, Tier 3a |
| Engine power | 328kW (440 HP) |
| Speed | 1800 RPM |

**C13 Tier 3b**

| | |
|---|---|
| Engine | Caterpillar C13, Tier 3b |
| Engine power | 328kW (440 HP) |
| Speed | 1800 RPM |

Make sure any information regarding servicing requirements, reported faults and spare parts are correct and applicable to the engine fitted.


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## 8.2 Maintenance schedules

### 8.2.1 250 Hours engine maintenance schedule - C13 Tier 3a only

**Not applicable to C13 Tier 3b engine**

**WARNING! Follow the maintenance safety instructions in *6.1 Maintenance - minimum safety requirements*, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 250 hours (minimum requirement).

Do the weekly maintenance schedule. Refer to ***6.3.3 Weekly maintenance schedule***.

For the Caterpillar C13 tier 3a engine only, do the 250 hours engine maintenance, refer to the engine operation and maintenance manual.

- Engine oil and engine oil filter change
- Fuel filters replace (primary and secondary)
- Air cleaner filters replace (primary and secondary)
- Clean crankcase breather canister

### 8.2.2 500 Hours engine maintenance schedule

**WARNING! Follow the maintenance safety instructions in *6.1 Maintenance - minimum safety requirements*, before starting this maintenance schedule.**

1. Make sure that this schedule is carried out every 500 hours (minimum requirement).
2. On the Caterpillar C13 tier 3a engine do the 250 hours maintenance schedule, refer to ***8.2.1 250 Hours engine maintenance schedule - C13 Tier 3a only***.
3. Do the engine 500 hours maintenance schedule. Refer also to engine manufacturer's maintenance manual.
4. On the Caterpillar C13 tier 3b engine, replace the primary, secondary and in-line fuel filters, as listed in the 3b service kit.

### 8.2.3 1000 Hours engine maintenance schedule

**WARNING! Follow the maintenance safety instructions in *6.1 Maintenance - minimum safety requirements*, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 1000 hours (minimum requirements).

1. Do the engine 500 hours maintenance schedule. Refer to ***8.2.2 500 Hours engine maintenance schedule***.

### 8.2.4 2000 Hours or 1 year engine maintenance schedule

**WARNING! Follow the maintenance safety instructions in *6.1 Maintenance - minimum safety requirements*, before starting this maintenance schedule.**

Make sure that this schedule is carried out every 2000 hours or annually (minimum requirement).

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1. Do the engine 500 hours maintenance schedule. Refer to ***8.2.2 500 Hours engine maintenance schedule***
2. Do the engine 2000 hours inspection and maintenance. Refer to engine manufacturer's operation & maintenance manual.
3. Drain and replace engine coolant.
4. On the Caterpillar C13 3b engine replace fumes disposal filter element.


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## 8.3 Engine lubrication and fluids

### 8.3.1 Lubricants and fluids used in manufacture

| Reference | Maximum volume | Temperature | Manufacturer - Equivalent Specifications | Sandvik Part No |
|---|---|---|---|---|
| Engine coolant (Pre-mixed) | 70 litres (18.5 US gal) | All | Univar Caflon HDA | CN8015 |
| Diesel fuel | 900 litres (238 US gal) | - | Ultra low sulphur diesel | CN7834 |
| Engine oil (Oil used in Tier 3b and Tier 4 engines must be compliant for use in them) | 40 litres (10.6 US gal) | -10 to +50°C (14 to 122°F) | Shell Rimula R4T L 15W-40 | CN7898 |
| | | -35 to +25°C (-31 to 77°F) | Shell Rimula R6 LME 5W-30 | CN7998 |

### 8.3.2 Engine oil renewal

Refer to engine manufacturer's manual for their recommendations, ***10.1.4 Engine manual (supplied separately)***.

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# 9 Electrical & Hydraulic Information

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## 9.1 Schematic diagrams

### 9.1.1 Electrical information

Refer to the electrical schematic diagrams pdf document.

### 9.1.2 Hydraulic information

Refer to the hydraulic schematic diagrams pdf document.


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# 10 Information and Data Sheets

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## 10.1 Original equipment manufacturer information

***Note: Please ensure you read this section carefully. It contains information supplied by original equipment manufactures of components and hazardous substances used in the machine, therefore Sandvik has reservations for misprints.***

### 10.1.1 Tracks - Strickland

### 10.1.2 Hydraulic power take-off (clutch) - PT Tech (HPTO14)

### 10.1.3 JMG display fault codes

### 10.1.4 Engine manual (supplied separately)

### 10.1.5 Sandvik cone crusher manuals

Sandvik CH440:

- Operator’s
- Maintenance
- Wear Parts
- Spare Parts.

### 10.1.6 Optional auto grease lubrication.

### 10.1.7 Electrical schematic diagrams.

### 10.1.8 Hydraulic schematic diagrams.


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## 10.2 Hazardous substances

1. Univar Caflon - engine coolant
2. Low sulphur Diesel fuel oil
3. Shell Rimula R4T L - engine lubrication oil
4. Shell Rimula R6 LME 5W30 - engine lubrication oil
5. Shell Omala S4 GX 150 - cone lubrication gear oil
6. Shell Tellus S2 - hydraulic fluid
7. Shell Tellus S4 VX - hydraulic fluid
8. Shell Gadus S3 V220 C2 - grease
9. Exol Athena EP90 - track gear oil
10. Shell Spirax S6 GXME 75W-80 - track gear oil
11. Shell Spirax S3 TLV - clutch bearing lubrication oil
12. Cat TDTO 0W-20 - clutch fluid

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