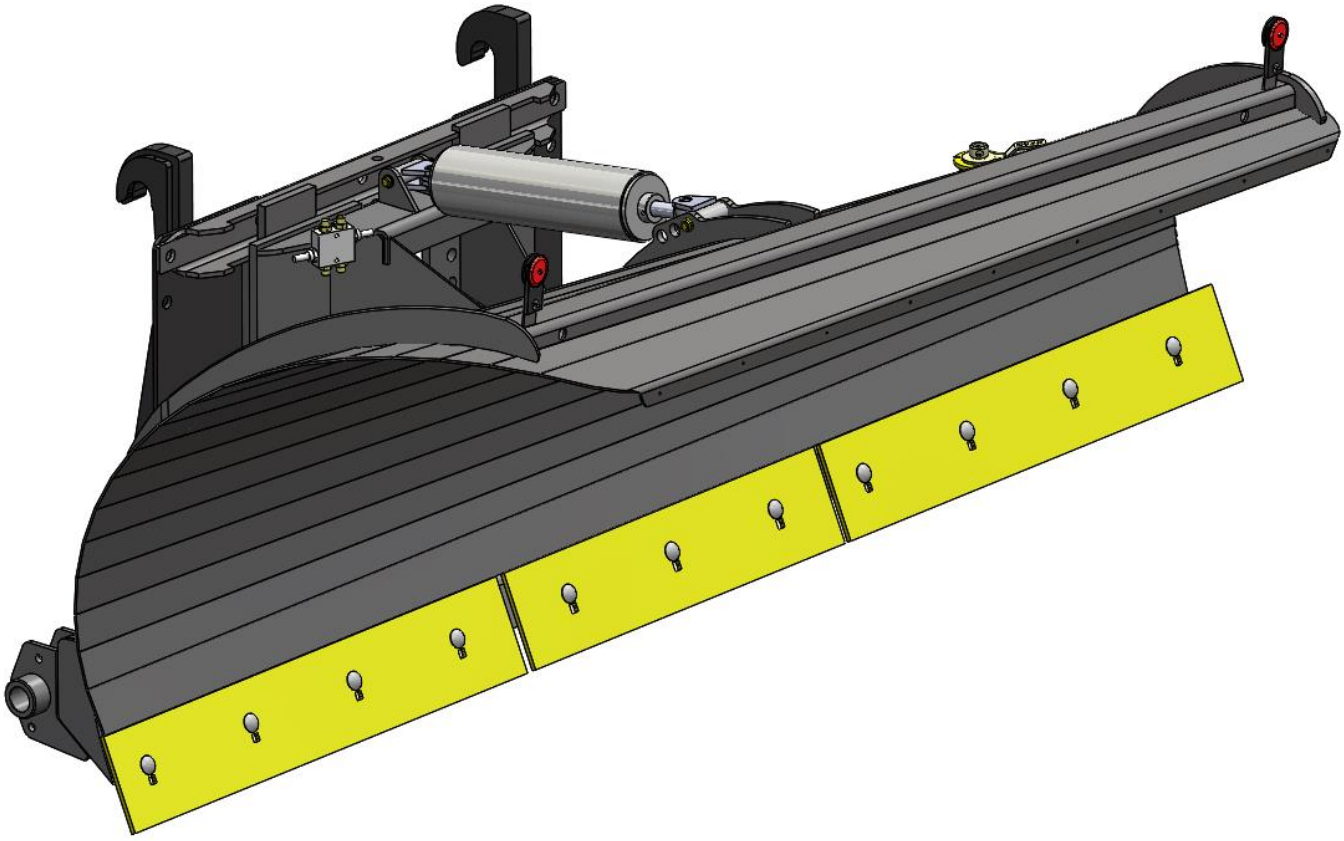
Original

Operating and maintenance manual

Diagonal plow and Butterfly plow



Lametal Oy • Kaskenviertäjäntie 2, 73100 LAPINLAHTI, FINLAND
• info@stark.fi • parts@stark.fi • www.stark.fi

General

Congratulations on the purchase of your STARK Plow!

For us, the long lifecycle and efficiency of your new equipment is a priority. To keep the plow in top working condition, read this manual carefully before using the equipment.
STARK products are engineered and manufactured in Finland, and each of them is equipped according to the needs of the customer.
Never let anyone operate or maintain the device without reading this manual carefully! Always make sure that safety precautions are observed in use and maintenance. Keep this manual for future reference and make sure to hand it over to a new owner.
The cornerstones of the product development of STARK attachments are quality, durability and economy. The products are engineered to be high-performing, safe and durable in professional use. Any feedback on our products is welcome and contributes to the further development of our products. If you have any questions about the use or maintenance of the plow, please contact us by e-mail: info@stark.fi
Visit our webpage www.stark.fi for the complete product range, including new products.
The manufacturer reserves the right for structural and technical changes without prior notice. Therefore, some pieces of information given in the manual may have changed after printing this manual.

Read before use

Make sure you know your equipment before you start using it.
Equipment may be operated only by an individual who is thoroughly familiar with its use.
All operators must be properly instructed before use and maintenance of the equipment. Use by individuals with insufficient instructions may pose serious risks to the operators themselves, to the environment and the equipment.



When coupling the attachment to the base machine, make sure:

- that all locking cotters are intact and in order
- there is no pressure in the hydraulic system
- that hydraulic hoses are intact
- there is no skin contact to hydraulic oil when connecting hydraulic hoses
- not to pull by the hydraulic hoses, but only by the hydraulic fitting



During operation, pay attention to:

- safe, appropriate travel speed
- other traffic, people and animals
- danger zones and objects that block your view
- children

NEVER use the machine if there is someone in the danger zone.
NEVER go under the attachment.

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Table of contents

General 2

Read before use 2

1. DECLARATION OF CONFORMITY 4

2. PURPOSE OF USE 5

3. SAFETY PRECAUTIONS 5

4. IDENTIFICATION INFORMATION AND SPAREPARTS 6

4.1. Identification plate 6
4.2. Maintenance services 6

5. MAIN PARTS OF THE PLOWS 7

5.1. Diagonal plow RELAX 7
5.2. Diagonal plow 8
5.3. Butterfly plow 9
5.4. Butterfly plow RELAX 10

6. ATTACHING THE PLOW 11

6.1. Attaching the plow to a base machine 11

7. OPERATING THE PLOW 12

7.1. Operating instructions 12
7.2. Adjusting blades 12
7.3. Adjusting flatblades 13
7.4. Adjusting perforated blades 14
7.5. Anti-Damage System -safety mechanism 16
7.6. Relief valve 17
7.7. Adjusting the RELAX -blade system 18
7.8. Pin Float -technology 21
7.9. Transferring the plow 23
7.10. Detaching the plow 23
7.11. Diagonal plow and Diagonal plow RELAX accessories 23
7.12. Butterfly plow and Butterfly plow RELAX accessories 23

8. MAINTAINING THE PLOW 24

8.1. General safety precautions for the use and maintenance 24
8.2. Tightening torque 24
8.3. Daily maintenance 24
8.4. Maintenance after 10 hours 24
8.5. Maintenance after every 50 hours or weekly 24
8.6. Lubrication points 25

9. HYDRAULICS 27

10. WARRANTY POLICY 30

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1. DECLARATION OF CONFORMITY

The original manufacturer's EC declaration of conformity:
Generic product name: Diagonal plow, Butterfly plow
Models: AL 3200, AL 3600, AL 4000, AL 3100 R, AL 3400 R, AL 3700 R, TA 3200, TA 3600, TA 4000, TA 3100 R, TA 3400 R, TA 3700 R

Manufacturer:
Lametal Ltd
Kaskenviertäjäntie 2 73100 LAPINLAHTI, Finland
tel. +358 17 731 565

Declares that the above-mentioned equipment meets the provisions of Directive 2006/42/EC on machinery and, where applicable, complies with the standards

- SFS-EN ISO 12100-1,
- SFS-EN ISO 12100-2
- SFS-EN 1050

The person authorized to compile technical documentation:



Lassi Mehtonen
Managing director
Kaskenviertäjäntie 2
73100 Lapinlahti, FINLAND

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2. PURPOSE OF USE

Plows are used for clearing snow from streets and small / large areas.
Using to plow or move heavier material than snow is prohibited and will terminate warranty.

3. SAFETY PRECAUTIONS

Make sure you know your equipment before you start using it. Equipment may be operated only by an individual who is thoroughly familiar with its use.



Before connecting hydraulics to the base machine, make sure that:

- there is no-one between the attachment and the base machine
- the base machine is turned off and the parking brake is on.

When coupling the attachment to the base machine, make sure that:

- all locking cotters are intact and in order
- hydraulic hoses are intact
- there is no skin contact to hydraulic oil when connecting hydraulic hoses
- you do not to pull by the hydraulic hoses, but only by the hydraulic fitting.



During operation, pay attention to:

- safe, appropriate travel speed
- other traffic, people and animals
- danger zones and objects that block your view
- children
- use of turn signal when driving

NEVER use the machine, if there is someone in the danger zone
NEVER go under the attachment



WARNING! Pressurized hydraulic hoses and components!

During maintenance, the hydraulics of the base machine MUST be turned off. The base machine MUST also be turned off and the parking brake MUST be applied. The equipment must be properly supported, if maintenance can only be performed by going under the equipment. Never go under the equipment if it is not properly supported.
Daily maintenance:

- check general condition of structures, make repairs if needed
- check the hydraulic hoses and fittings, and replace damaged parts

After every 50 hours of operation:

- lubricate points specified in later section of this manual
- check all bolts and nuts for tightness

Check all bolts, nuts and hydraulic fittings for tightness after the first day of operation!
If the equipment is not likely to be used for a longer period, clean it thoroughly after use and lubricate as instructed.

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4. IDENTIFICATION INFORMATION AND SPAREPARTS

4.1. Identification plate

Identification plate is placed on the side of the equipment. The plate includes contact information, machine type, year of manufacture, serial number and weight. (See an example of an identification plate in picture 1 below).
The first four numbers in the serial number indicate the month and year of manufacture (month first). The remaining five numbers constitute the machine tracking number, which is stored in the manufacturer's database (13971 in the example below).



Picture 1. Identification plate

Take down the machine type and the serial number of your plow:

Product and model _____Serial number_____

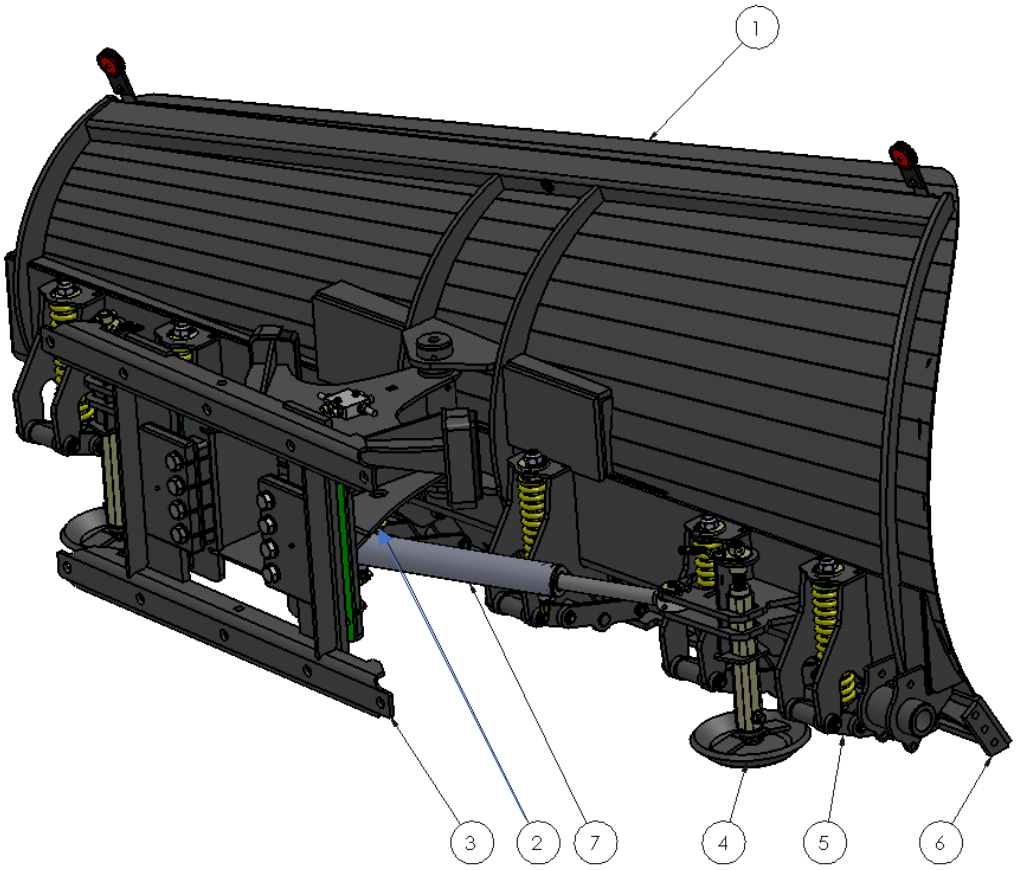
4.2. Maintenance services

When replacing parts, use original, manufacturer spare parts only. By using original spare parts, you ensure dependable operation of the plow and comply with the warranty policy. To facilitate the supply of spare parts, always inform the manufacturer/retailer of the model and serial number of the plow (marked in the identification plate) when you order spare parts.
For more information on maintenance and spare parts, please contact the STARK maintenance and spare part services or your retailer.
Contact information for STARK maintenance services:
tel. +358 (0)17 731 565, e-mail info@stark.fi

tel. +358 (0)44 758 6221, e-mail parts@stark.fi

5. MAIN PARTS OF THE PLOWS

5.1. Diagonal plow RELAX

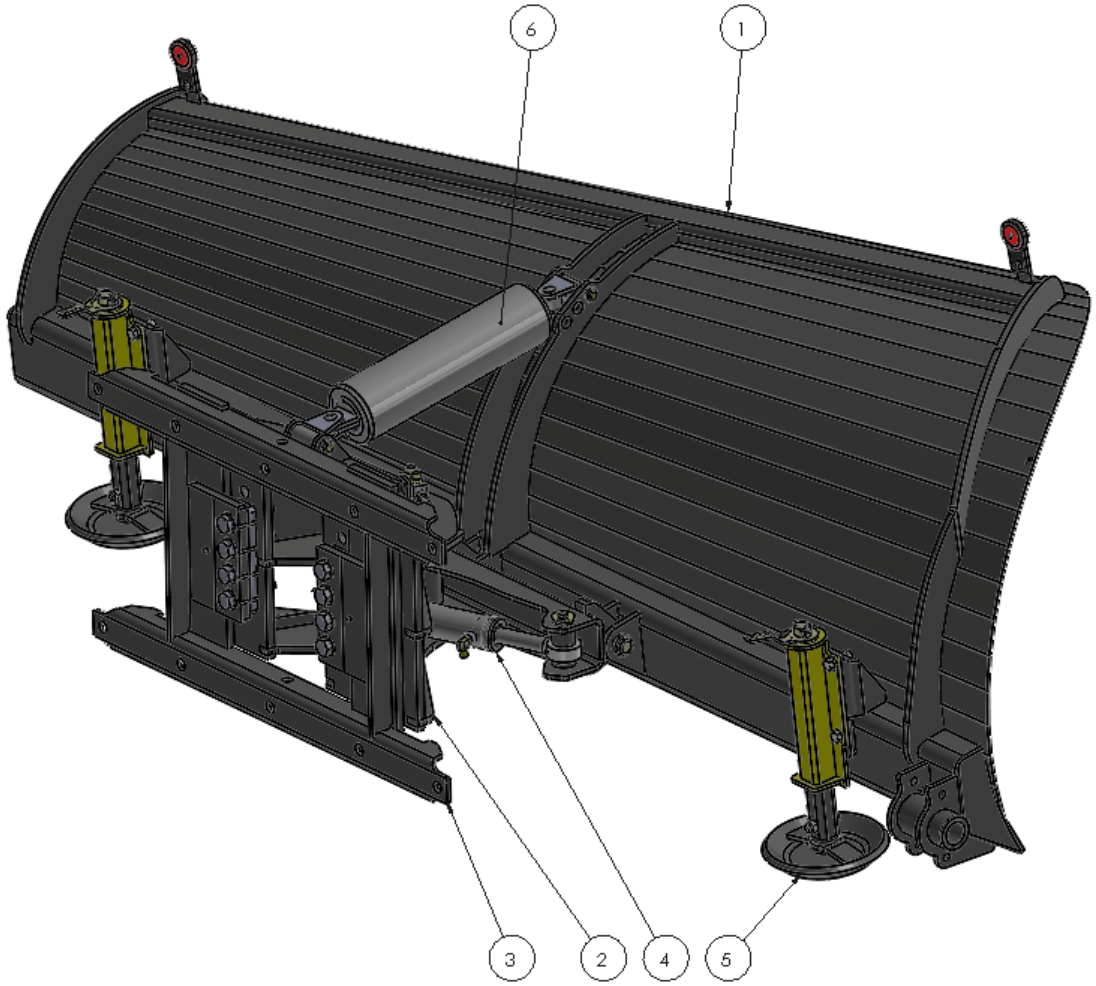


Picture 2. Main parts of the diagonal plow RELAX

1. Plow's frame
2. Steering frame
3. Floating frame
4. Support plate
5. Relax blade system
6. Blade frame
7. Hydraulic cylinder

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5.2. Diagonal plow

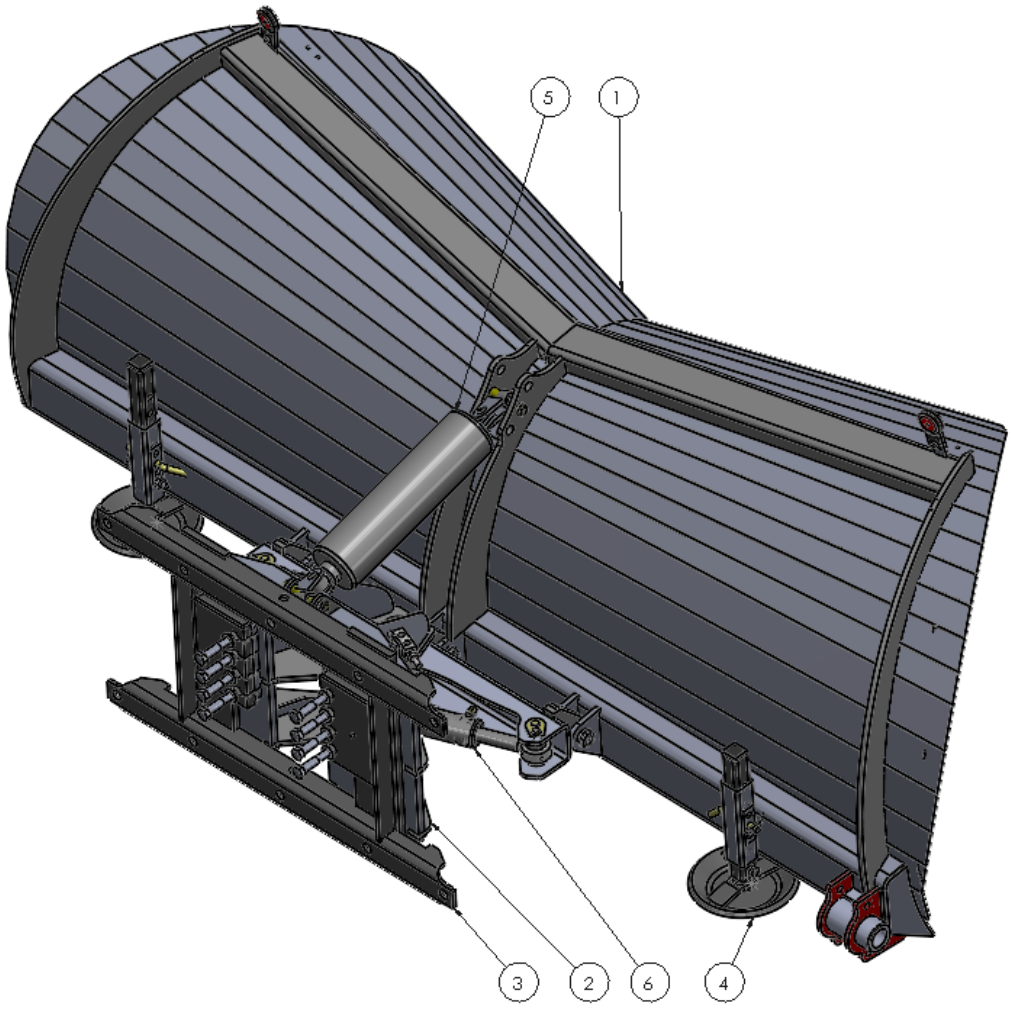


Picture 3. Main parts of the diagonal plow

1. Plow's frame
2. Steering frame
3. Floating frame
4. Hydraulic cylinder
5. Support plate
6. Anti-damage system

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5.3. Butterfly plow

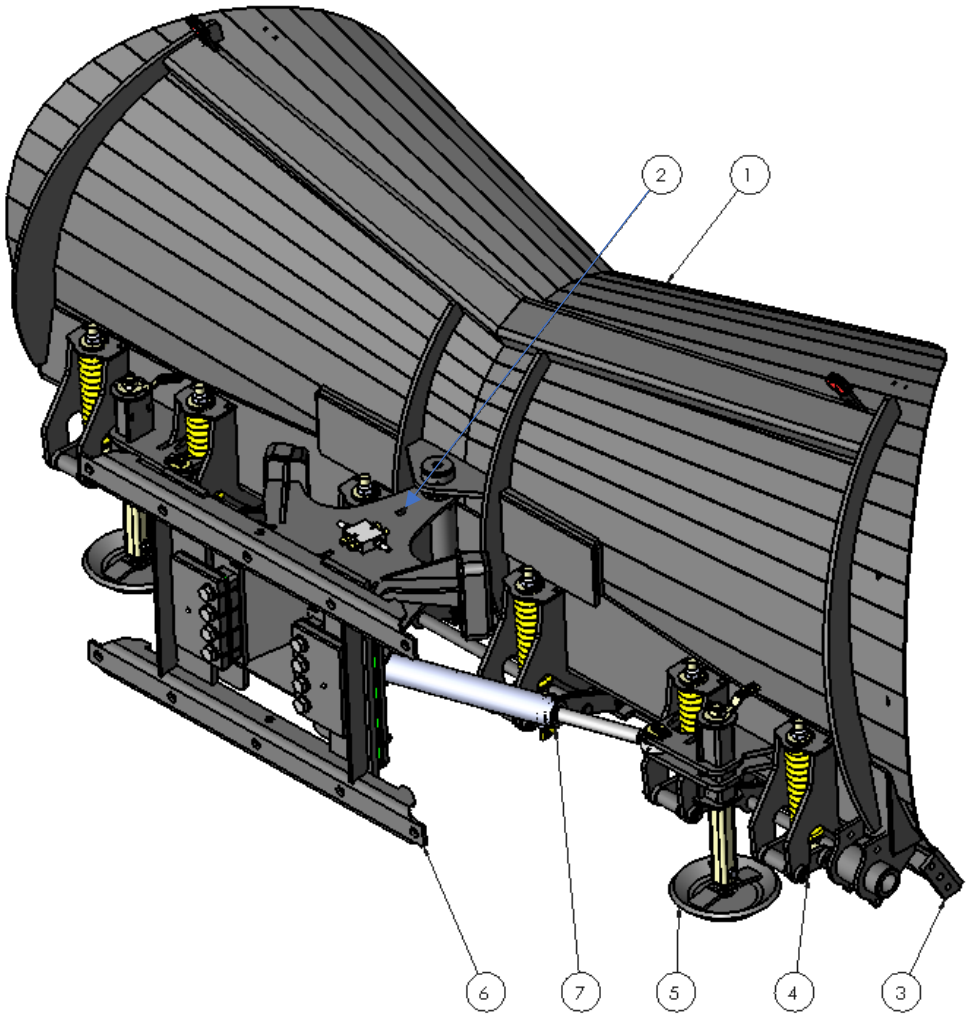


Picture 4. Main parts of the butterfly plow

1. Plow's frame
2. Steering frame
3. Floating frame
4. Support plate
5. Anti-damage system
6. Hydraulic cylinder

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5.4. Butterfly plow RELAX



Picture 5. Main parts of the Butterfly plow

1. Plow's frame
2. Steering frame
3. Blade frame
4. Relax blade system
5. Support plate
6. Floating frame
7. Hydraulic cylinder

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6. ATTACHING THE PLOW

When attaching the plow, make sure it is compatible with the base machine by following instructions below. Always check the compatibility when attaching the plow to a new base machine.

6.1. Attaching the plow to a base machine

The plow is attached to the base machine by bolted STARK FIT quick hitches. The machine is connected to a hydraulic system. Hydraulic circuit diagrams can be found in a later section in this manual. Ask your retailer for available STARK FIT quick hitches.

Before using the plow, MAKE SURE all locking cotters and pins are secured and intact.

When coupling the plow to the base machine, please pay attention to the instructions on the use of the base machine.

1. Make sure that the attachment and the base machine are compatible in terms of mechanical solutions, hydraulics and electricity.

2. Apply parking brake. The plow is attached to the coupler on the base machine (e.g. a loader). Attach the plow to the base machine, and make sure the locking cotters and pins are secured.

3. Turn off the base machine and make sure the parking brake is applied.

4. Make sure there is no pressure in the base machine hydraulic system. When connecting, always make sure the hydraulic connectors are clean and the hoses are intact

5. Check carefully the attachment's, the base machine's and the fitting's trajectory for collision. Do a test run using the base machine and the loader in extreme positions to check that the plow won't collide with base machine. Make sure that the hydraulic hoses and attachments have enough space. If needed, change the location of the hoses in the base machine.

6. Bolts, nuts and fittings on the new attachment may loosen in during the first hours of operation. **POST-TIGHTEN them after first day of operation.**

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7. OPERATING THE PLOW

Before using the plow make sure:

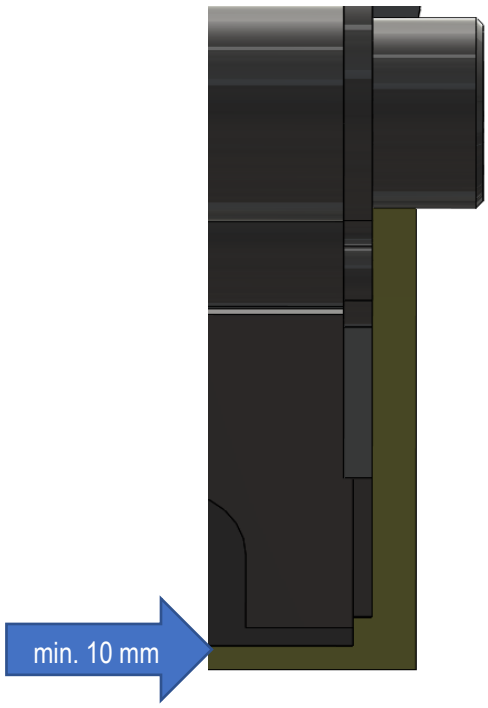
- the plow is installed correctly
- all locking pins are in place
- hydraulic hoses are connected right and properly
- hoses are intact
- there are no oil leaks
- all functions are working properly, and the support legs are adjusted to appropriate height for the terrain and conditions
- learn to operate the plow in a closed area before actually plowing

7.1. Operating instructions

1. Make sure that the attachment and the base machine are compatible in terms of mechanical solutions, hydraulics and electricity
2. The plow is attached to the coupler on the base machine (e.g. a loader). Attach the plow to the base machine, and make sure the locking cotters and pins are secured.
3. Turn off the base machine and make sure the parking brake is applied.
4. Make sure there is no pressure in the base machine hydraulic system. When connecting, always make sure the hydraulic connectors are clean and the hoses are intact.
5. Check carefully the attachment's, the base machine's and the fitting's trajectory for collision. Make sure that the hydraulic hoses and attachments have enough space. If needed, change the location of the hoses in the base machine.
6. Stay alert for any abnormal behavior and oil leaks also during driving

7.2. Adjusting blades

Edge of the blade should be 15–45 mm lower than the blade frame. Blades need to be adjusted at the latest when the blade edge is less than 10 mm lower than the blade frame (picture 6). Do not adjust the blades more than 50 mm lower than the blade frame.

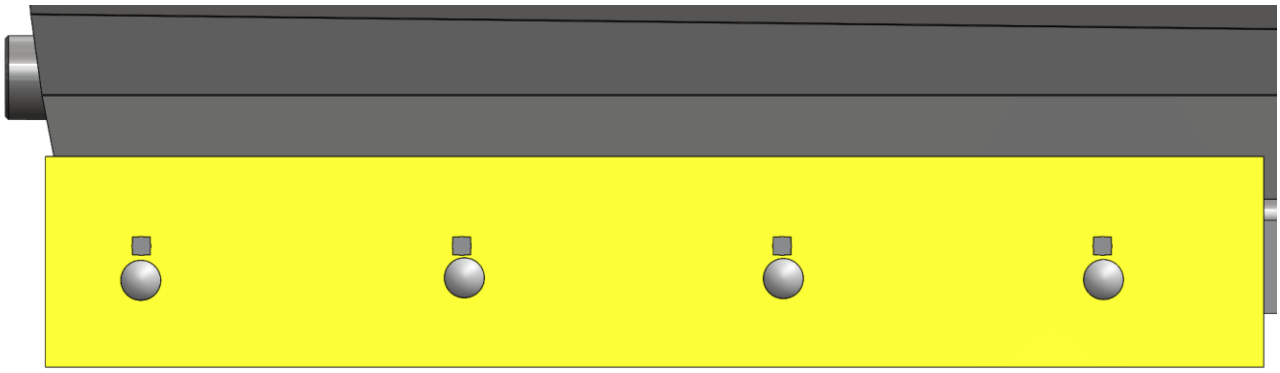


Picture 6. Minimum distance for the blade edge from the frame

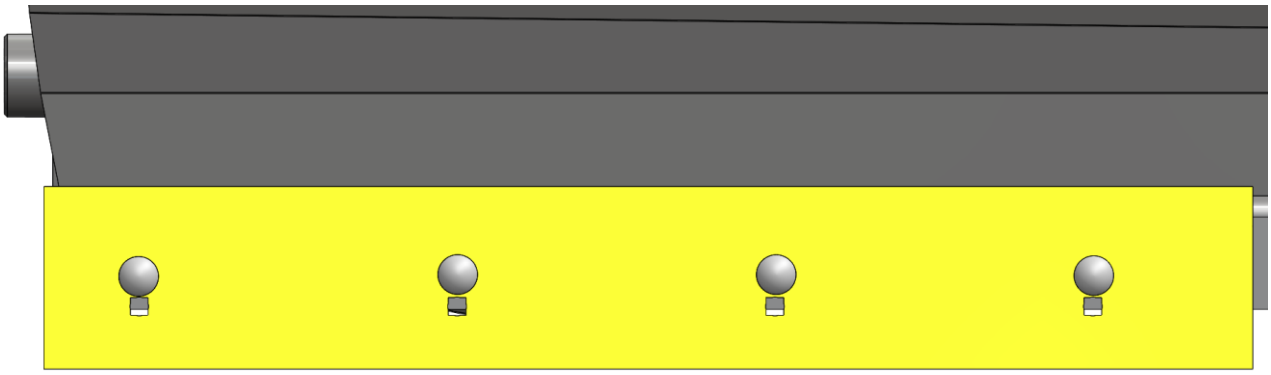
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7.3. Adjusting flatblades

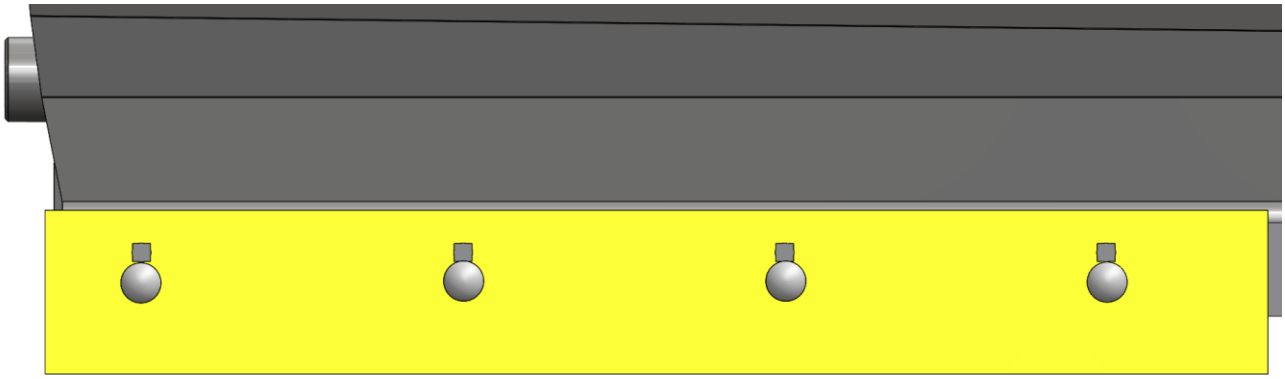
Flat blades can be adjusted three times. Each time there will be about 45 mm wear edge on the blade. First when the blade is new, it is in the position of picture 7. When the blade edge wears out it is lowered and attached from the upper holes of the blade (picture 8). Next time the blade is turned and again attached from the lower holes (picture 9). When the blade edge wears out again it is lowered by attaching it from the upper holes (picture 10). When the blade edge wears out in this position, it needs to be replaced.



Picture 7. New blade

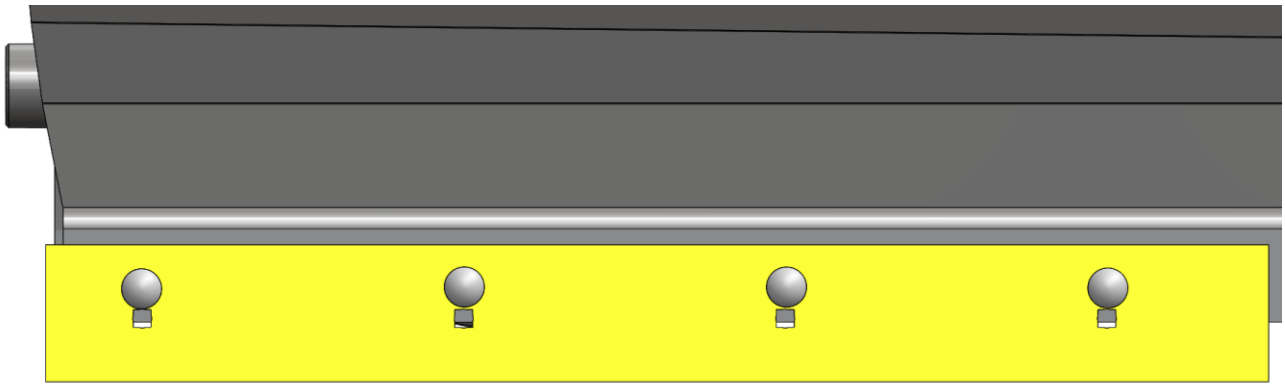


Picture 8. Lowered blade



Picture 9. Turned blade

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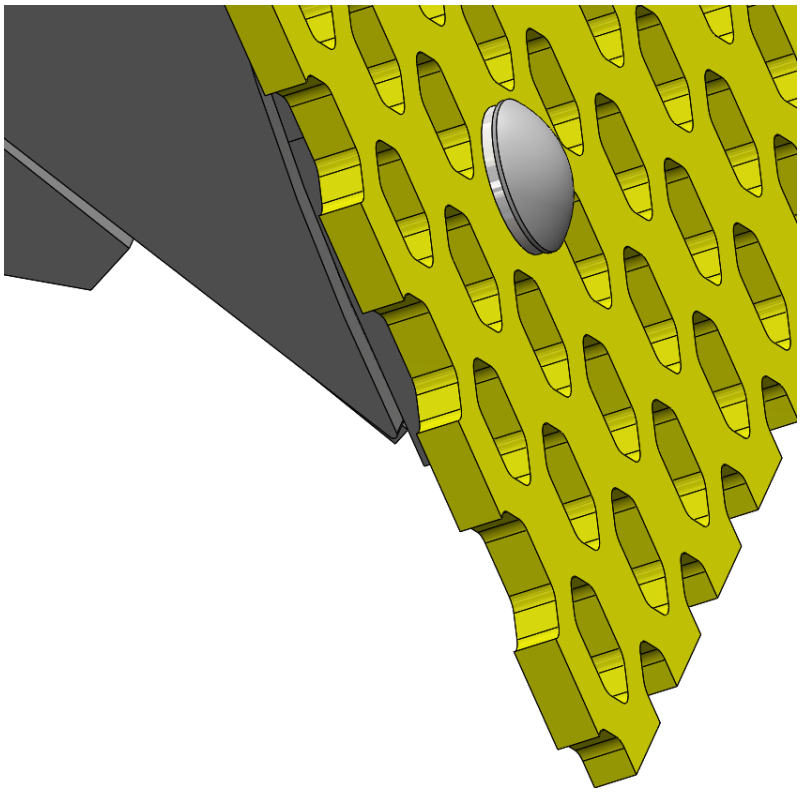


Picture 10. Turned and lowered blade

7.4. Adjusting perforated blades

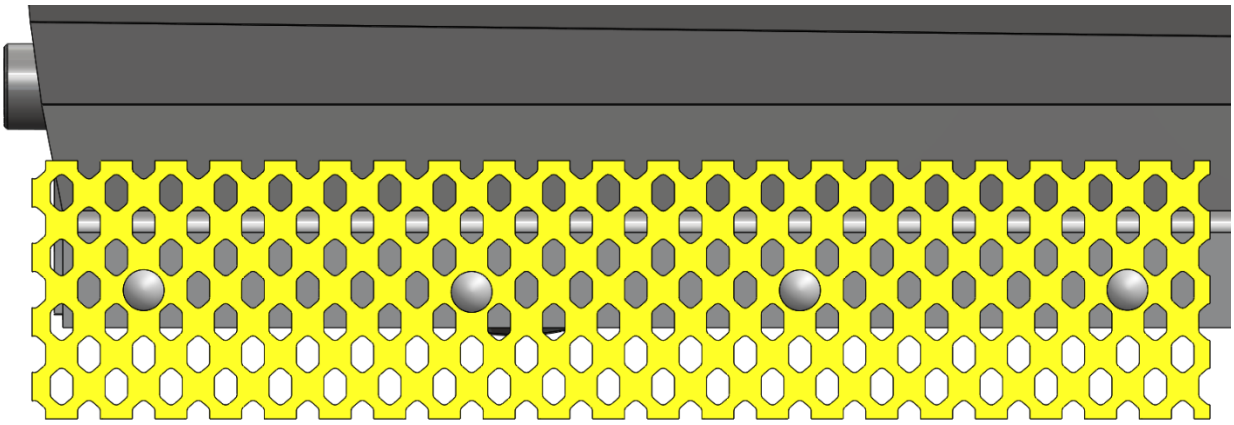
When adjusting perforated blades, the bolts can be removed by holding the bolt head with locking pliers and loosening the locking nut behind the blade. Also, when tightening, the bolt head will need to be held to enable the nut to be tightened. M20 washer is added under the bolt for getting a better grip on it (picture 11).

The bolts are removed, and the blade lowered until a hole on the blade frame can be seen again. The bolts are attached now to the holes next to the ones they were attached to before (picture 12). This enables the blade to be lowered appropriately (picture 13).

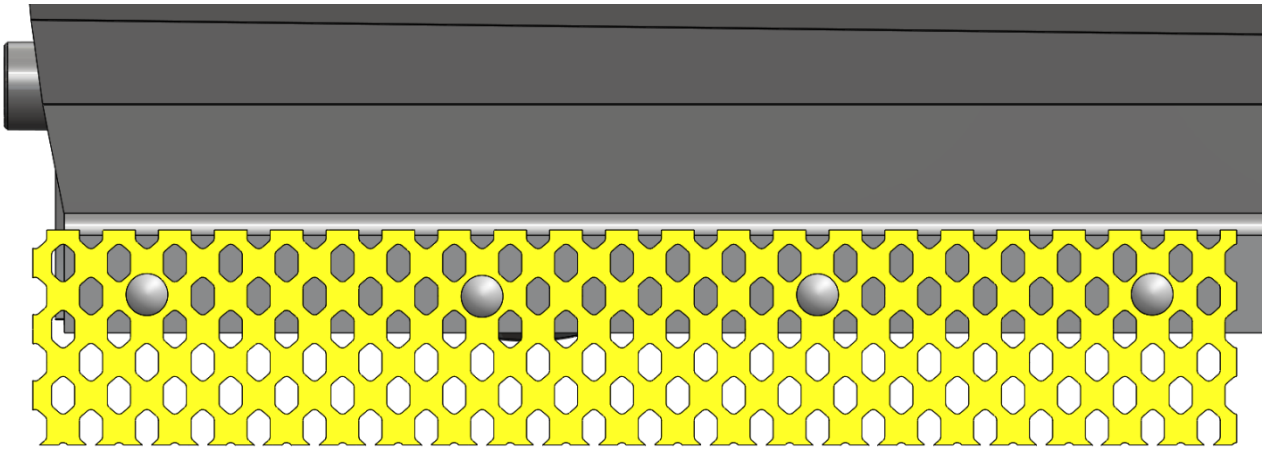


Picture 11. M20 washer under the bolt

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Picture 12. First position of the blade

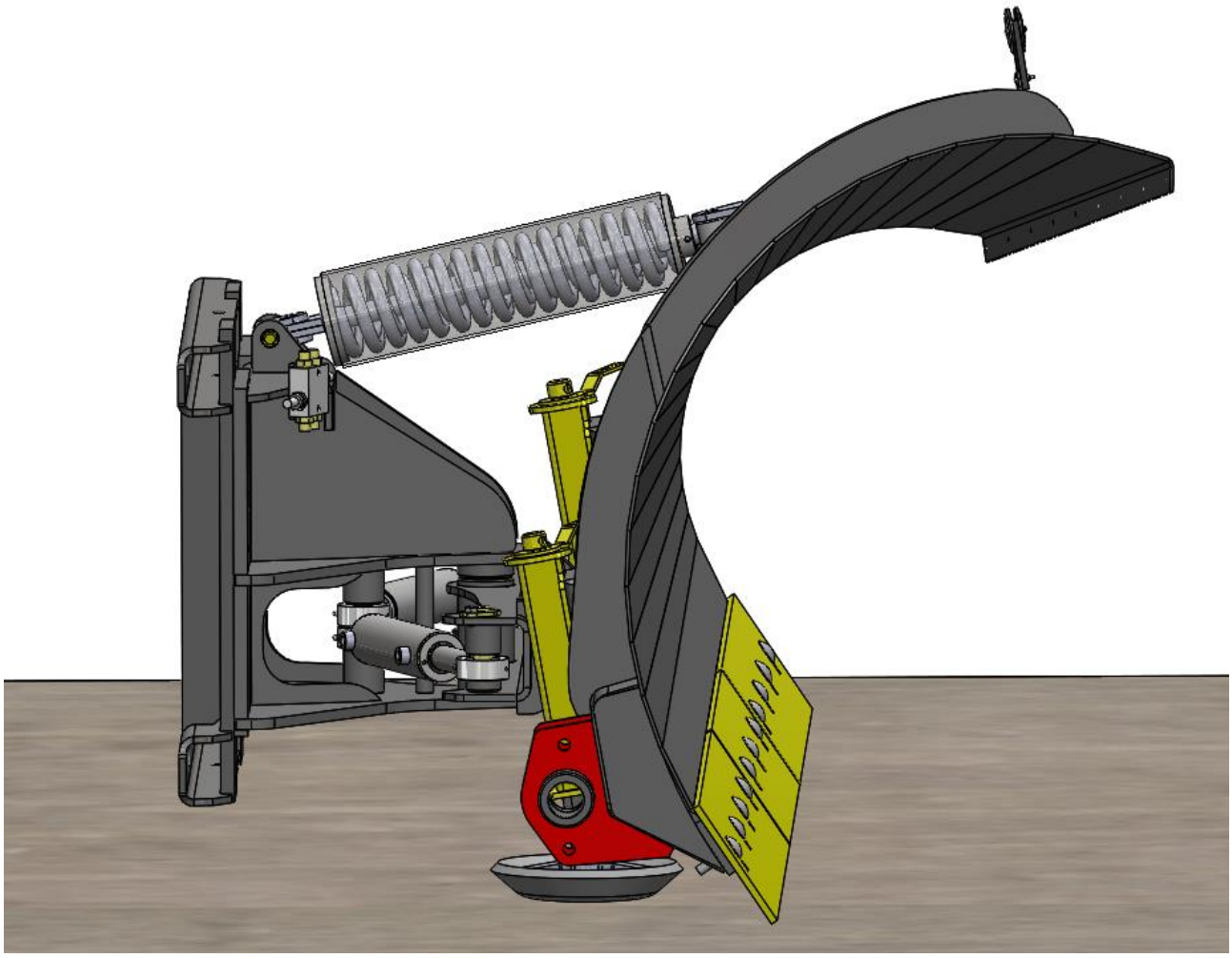


Picture 13. Blade after it has been lowered

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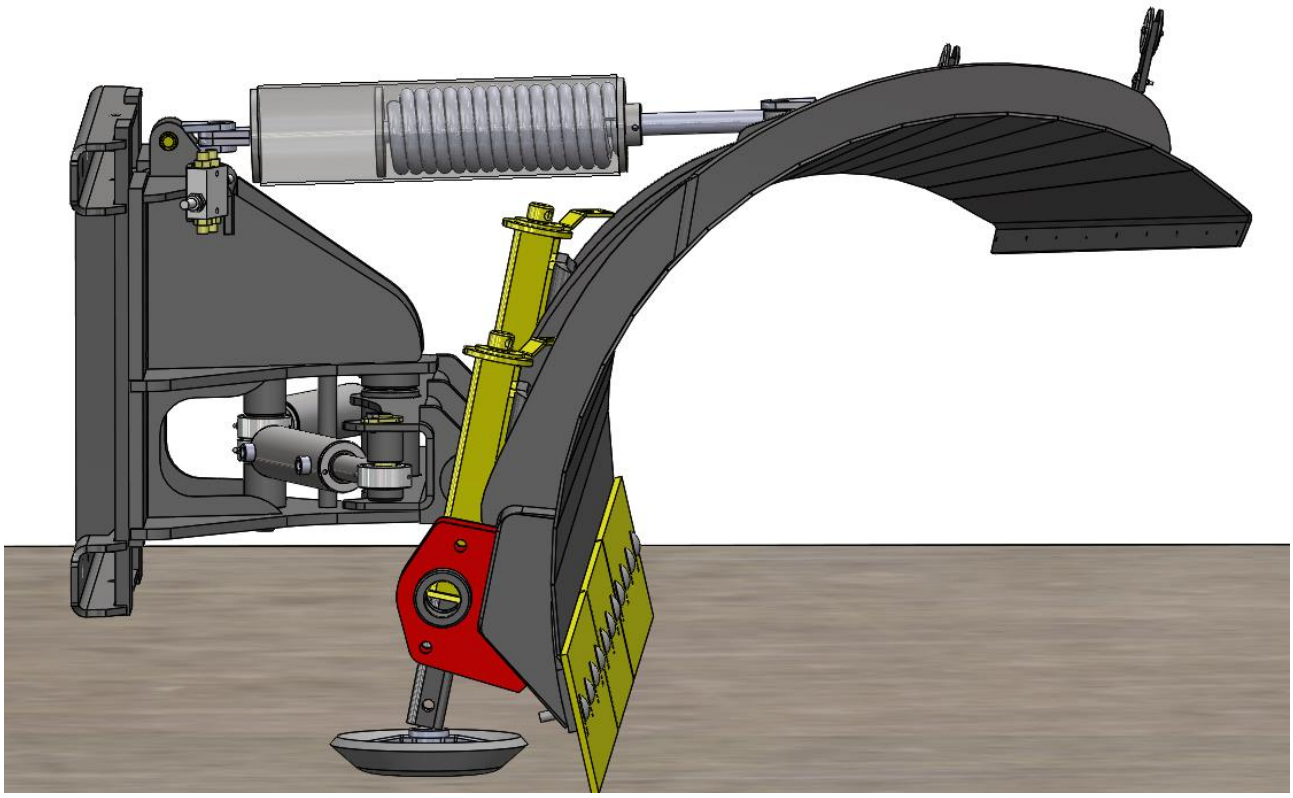
7.5. Anti-Damage System -safety mechanism

STARK Diagonal- and Butterfly plows come equipped with ADS-safety mechanism which protect the plow in case of collision. When user drives to an obstacle, safety mechanism yields which prevents the plow or its parts to be damaged (pictures 14 and 15).



Picture 14. Anti-damage system in normal position before collision

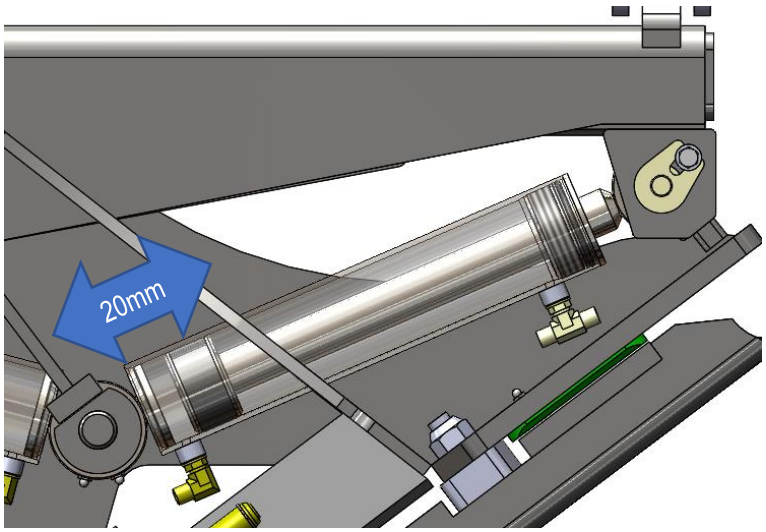
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Picture 15. Anti-damage system when the plow hits an obstacle

7.6. Relief valve

Pay attention to the functioning of the relief valve when turning the wings. If driving with the wings in extreme position, the cylinder piston is at the end of the chamber and the relief valve cannot function. When operating the plow, leave approx. 20mm of space inside the cylinder, so the relief valve will work as intended (picture 16).



Picture 16. Piston is almost at the bottom, leaving space for relief valve to function

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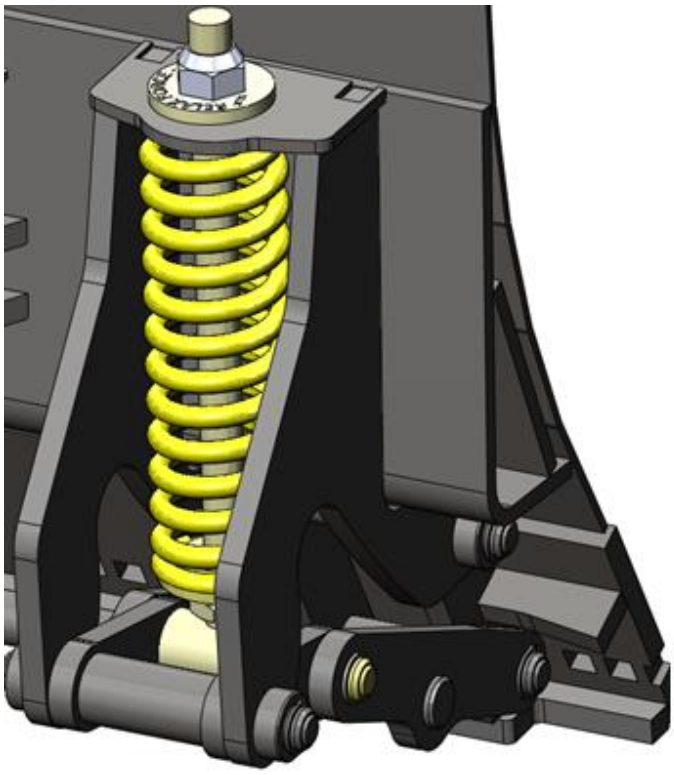
7.7. Adjusting the RELAX -blade system

RELAX -release mechanism keeps the blades locked. The plowing result is even and formation of packed snow decreases. When the blade hits an obstacle the release mechanism opens allowing the blade frame to turn backwards and the blade to go over the obstacle. The system protects the driver, the plow and the base machine from damaging.

Plows with RELAX -blade system can be pressed down to remove packed snow.

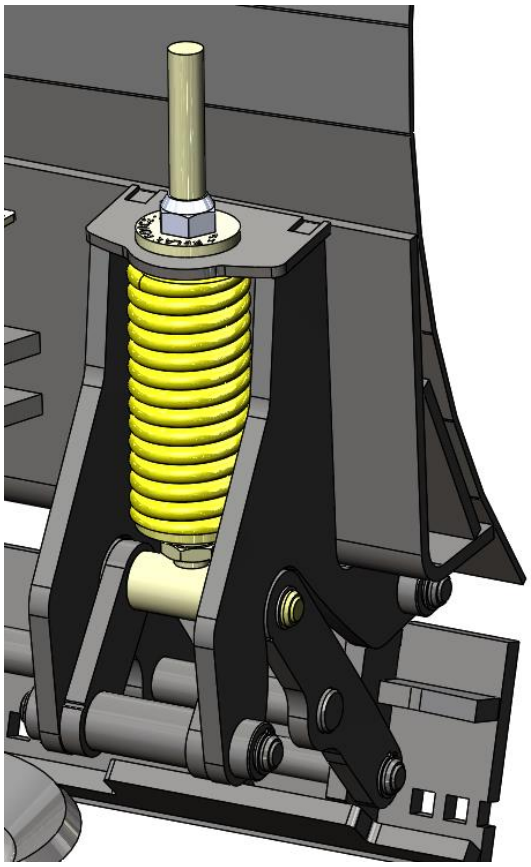
Operation of the RELAX -blade system

- Blade frame is mechanically locked in position by three joints (picture 17)
- When the blade hits an obstacle, the increased pressure releases the lock and the blade frame swivels in a quick and wide motion over the obstacle (picture 18)
- When the obstacle is passed, and pressure returns to normal the spring pushes the blade frame back into the locked position (picture 17)



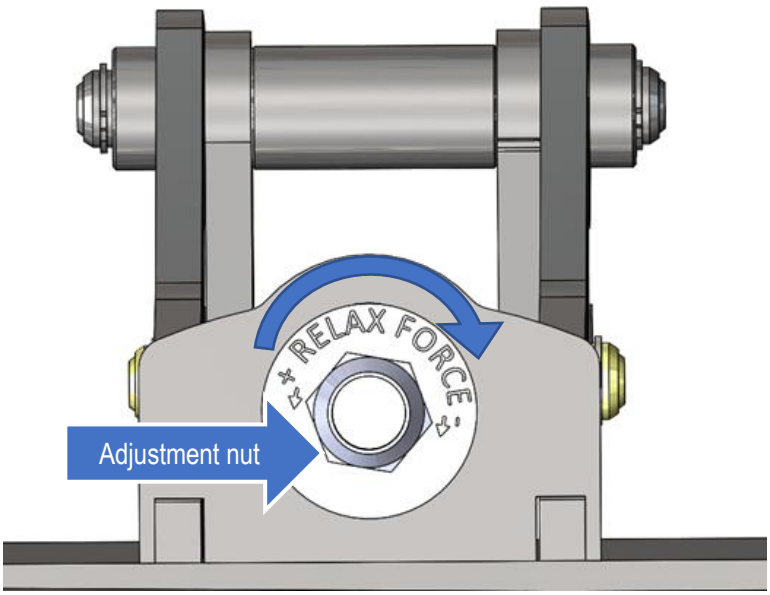
Picture 17. RELAX-mechnanism in normal position

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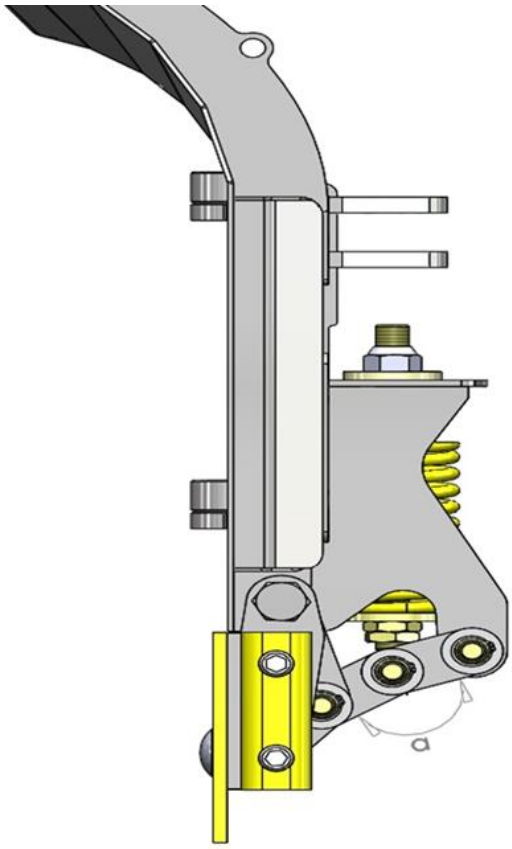
Picture 18. RELAX -mechanism during collision

The amount of pressure which releases the lock can be adjusted by changing the angle of the joints. Larger the angle, the more easily the lock releases. When the adjustment nut is tightened (picture 19) less pressure is required and when the nut is loosened more pressure is required. The angle between joints should be at least 5° to enable the release mechanism to function as designed (picture 20). Never adjust the angle totally straight!



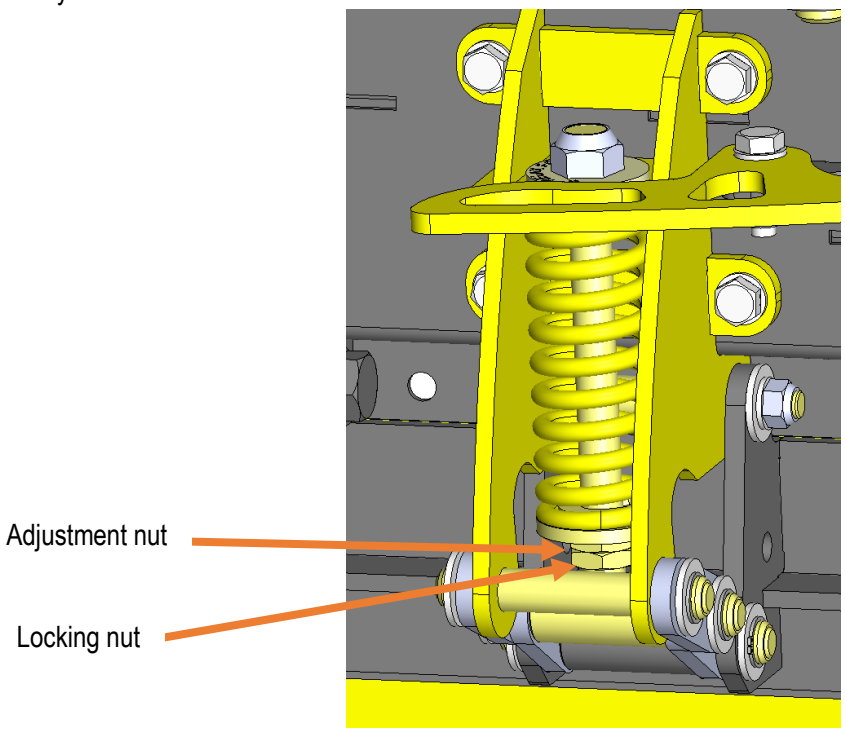
Picture 19. Adjusting the RELAX- mechanism

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Picture 20. RELAX -mechanism minimum angle is 5°

Rigidity of the spring can be adjusted by the tension nut under the spring (picture 21). Shortest permitted length for the spring is 175 mm when blade is released, then the spring is pre-strained by 25 mm. At the factory the spring is pre strained by 15 mm.

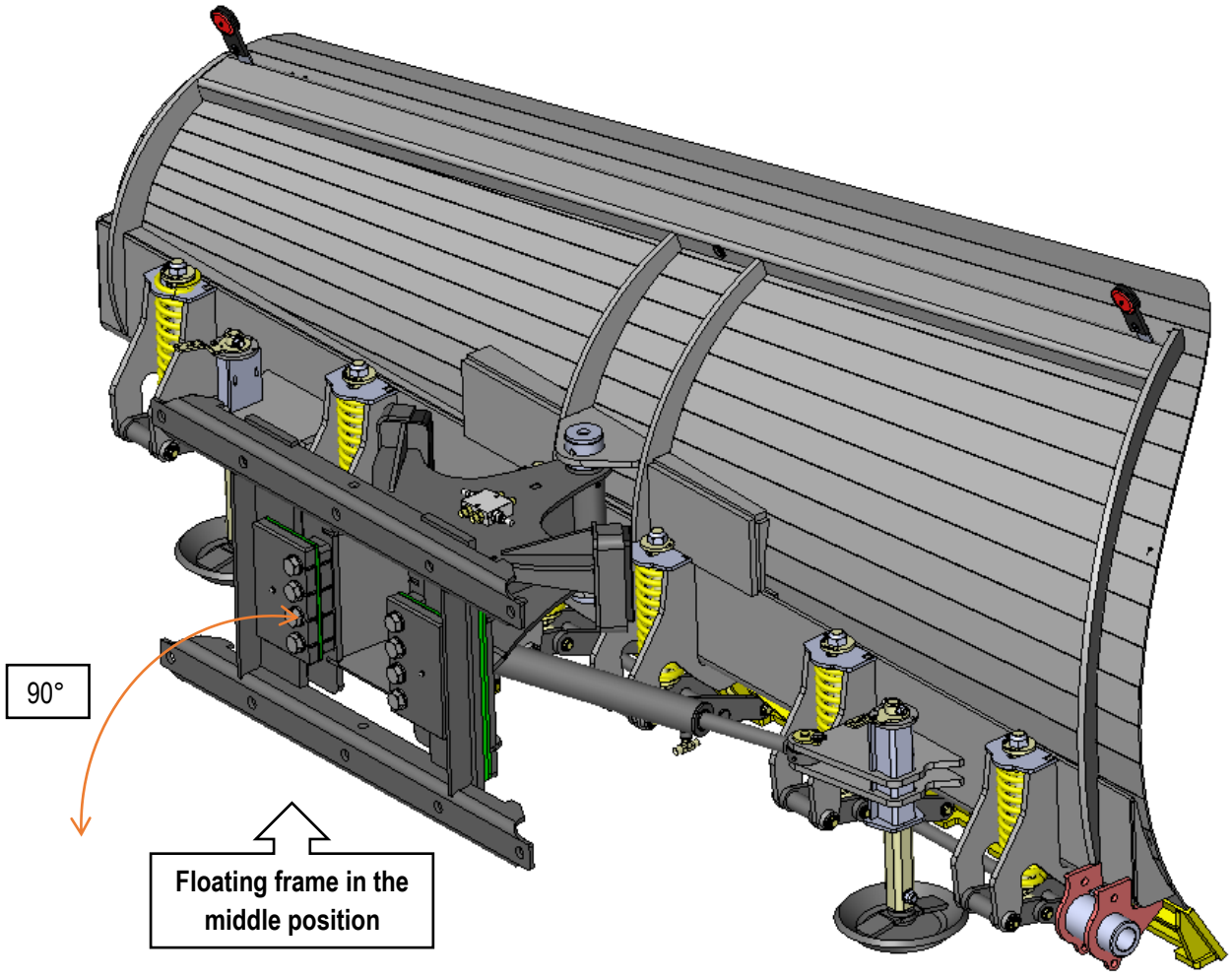


Picture 21. Adjusting the spring

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7.8. Floating Frame -technology

STARK plows have FLOATING FRAME -flotation system. FLOATING FRAME -technology enables the plow to closely follow the ground with vertical and horizontal flotation independent from the base machine. FLOATING FRAME -system is located by the fittings and this location together with the sliding plates reduce bouncing of the plow while working. When plowing keep the floating frame in the centre position and fitting in a 90-degree angle against the ground (picture 22).



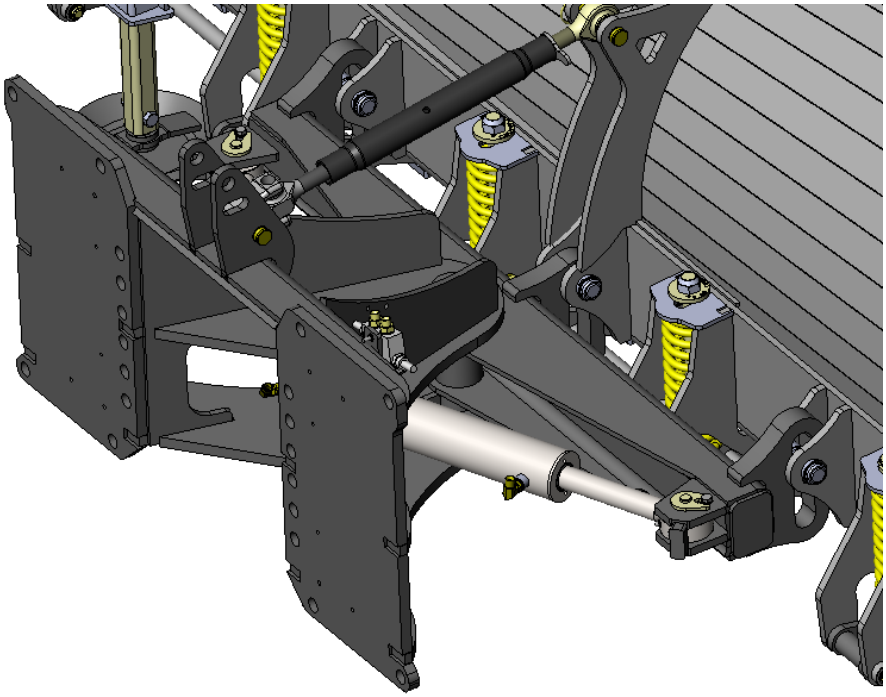
Picture 22. Optimal plowing position, floating frame is in the middle position and plow is perpendicular against the ground

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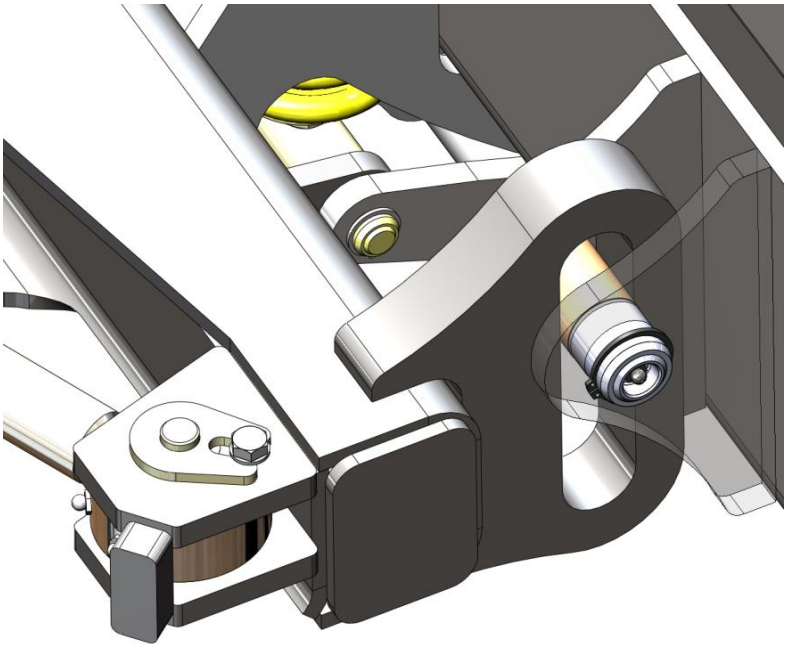
7.9. Pin Float -technology

Pin float- technology allows the plow to float freely without the implement being controlled by the base machine.

Floating is effected by means of pins, sleeves and floating slots in the implement frame (pictures 23 and 24).
The studs have greasing which improves the rotation of the hardened sleeves and significantly reduces wear.



Picture 23. Floating frame is attached to the plow's frame by Pin float -mechanism



Picture 24. Floating frame's bushing and grease nipple

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7.10. Transferring the plow

Lift the plow high enough and reduce speed if needed, especially on bumpy, uneven roads. The plow or the base machine can be damaged due to excessive speed.

7.11. Detaching the plow

- Lower the plow to an even ground on its support plates.
- Turn off the base machine, put on the parking brake and release pressure from the system.
- Take off the hydraulic hoses and protect the couplings with plugs.
- Open the mechanical locking and loosen the plow.
- If the plow is left unused for a long period of time, clean and lubricate it properly before storage.

7.12. Diagonal plow and Diagonal plow RELAX accessories

- Snow stopper
- Electric directional valve for Snow stopper (12V or 24V)
- LED- lights
- Snow rubber
- Support wheels
- Flat blade set
- Perforated blade set

7.13. Butterfly plow and Butterfly plow RELAX accessories

- Snow stopper
- Electric directional valve for Snow stopper (12V or 24V)
- LED- lights
- Snow rubber
- Support wheels
- Flat blade set
- Perforated blade set
- Throwing wings (only for TAR)

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8. MAINTAINING THE PLOW

8.1. General safety precautions for the use and maintenance

- Comply with the applicable laws and regulations and the instructions in this manual.
- Never go under the plow if it is not supported.
- Always put on the base machine's parking brake before any servicing on the plow.
- Use only tools which are in good condition.
- Watch out for pressurised hydraulic hoses and components.
- Make sure there is no pressure in the hydraulic system. Take into account the pressure accumulator.
- Do not let hydraulic fluids or lubricants to the ground.
- Wear appropriate personal protective equipment.

8.2. Tightening torque

	Nm (Strength 8.8)
M4	3,3
M5	6,5
M6	11,3
M8	27,3
M10	54
M12	93
M14	148
M16	230
M18	329
M20	464
M22	634
M24	798
M27	1176
M30	1597
M33	2161
M36	2778
M39	3597

Table 1. Tightening torque

8.3. Daily maintenance

It is important to perform a daily visual inspection of the plow for early detection of possible faults and to prevent further damage. Inspect the following items on the plow daily:

- Hydraulic hoses and components for possible leaks
- General mechanical condition

8.4. Maintenance after 10 hours

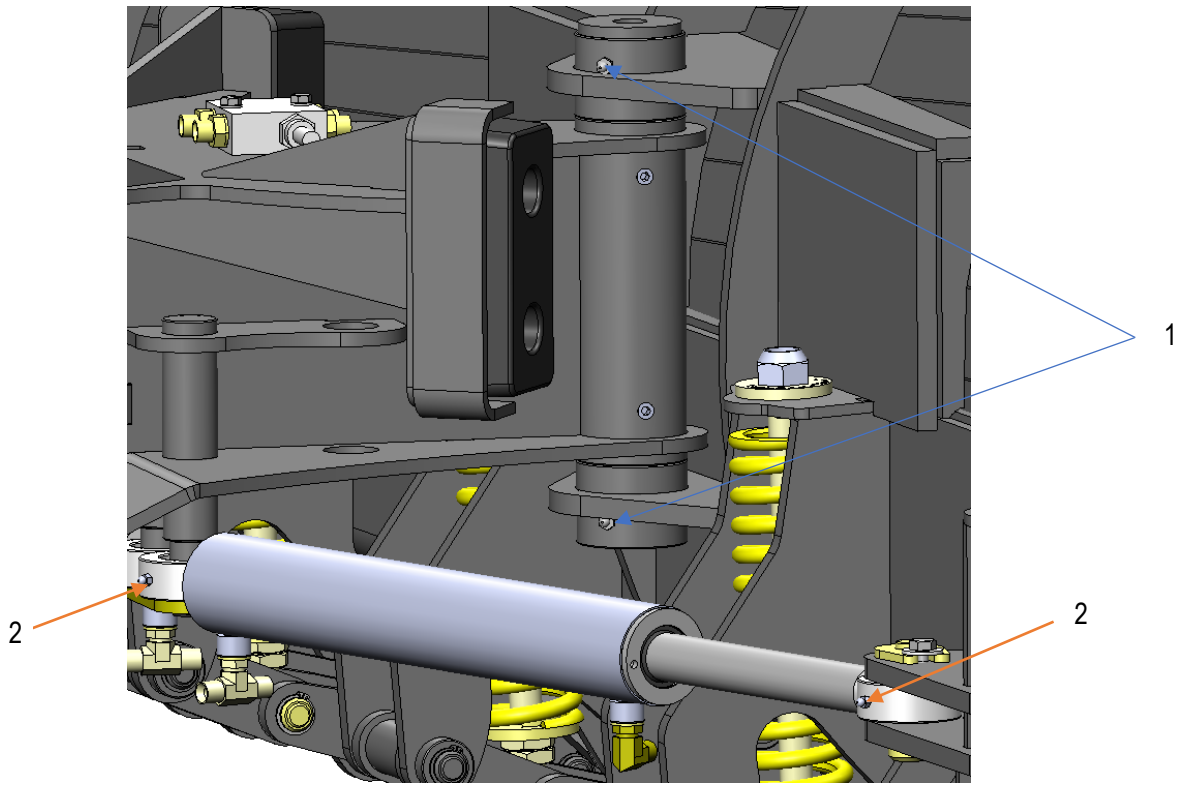
- Lubricate marked components shown in the later section
- Check the bolts for the tightness (table 1)

8.5. Maintenance after every 50 hours or weekly

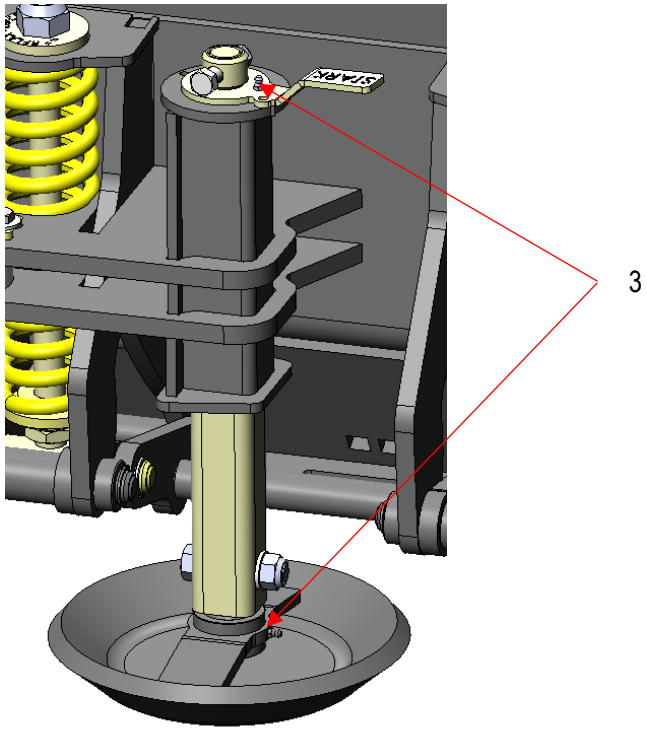
- Lubrication, recommended quality NLGI-2 grade grease or equivalent, shown in the later section
- Check the mechanical condition of the plow for distortion or breach
- Check the fastening bolts for tightness

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8.6. Lubrication points

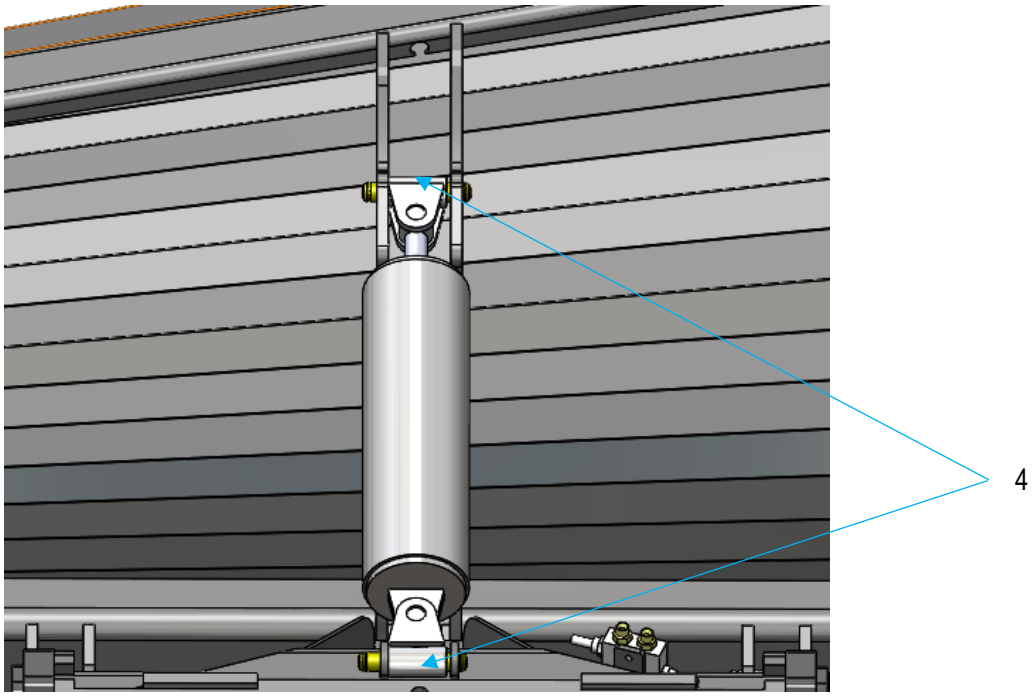


Picture 25. Grease nipples of the steering frame and hydraulic cylinders

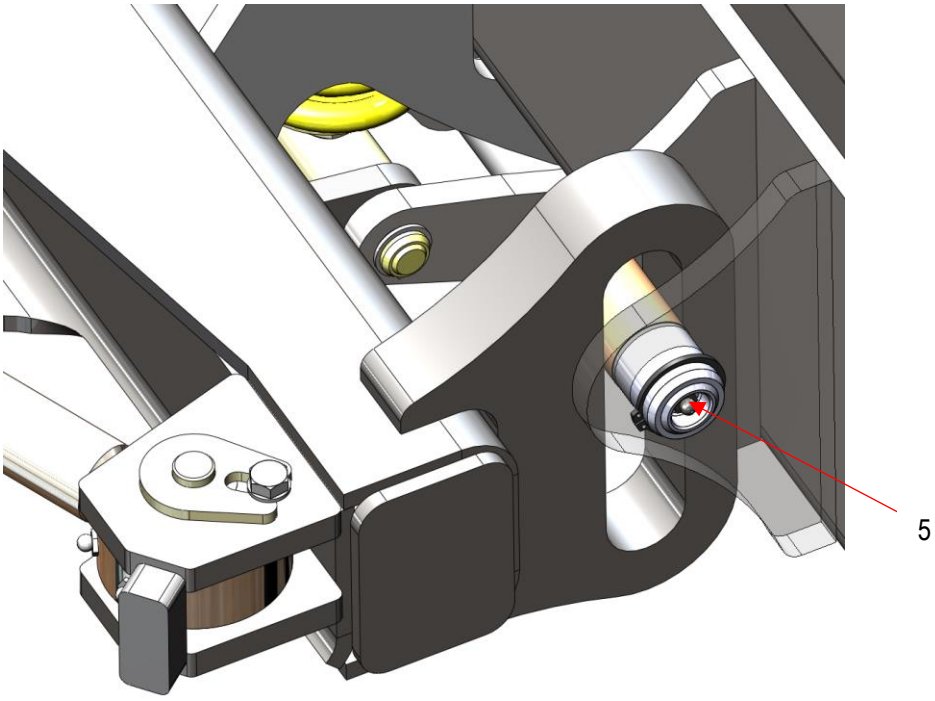


Picture 26. Grease nipples of the support plate

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Picture 27. Grease nipples of the anti-damage system



Picture 28. Grease nipples in floating frame (3 pc)

1) Grease nipples in steering frame
2) Grease nipples in hydraulic cylinder
3) Grease nipples in support plate
4) Grease nipples in anti-damage system (Only in non-RELAX versions)
5) Grease nipples in floating frame (3 pc)

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9. HYDRAULICS

Plow is attached to the base machine with 2-hose hydraulics (chart 1). The system is equipped with a complex closed hydraulic system, which has been tested and adjusted by the manufacturer. Any alterations or modifications to the hydraulic system are on the sole responsibility of the client.

Diagonal- and Butterfly plows can be equipped with snow stopper- accessory. Plow which is equipped with snow stopper can be attached to either a 4-hose (chart 2) or a 2-hose (chart 3) base machine. Electric directional valve is required for 2-hose base machine.

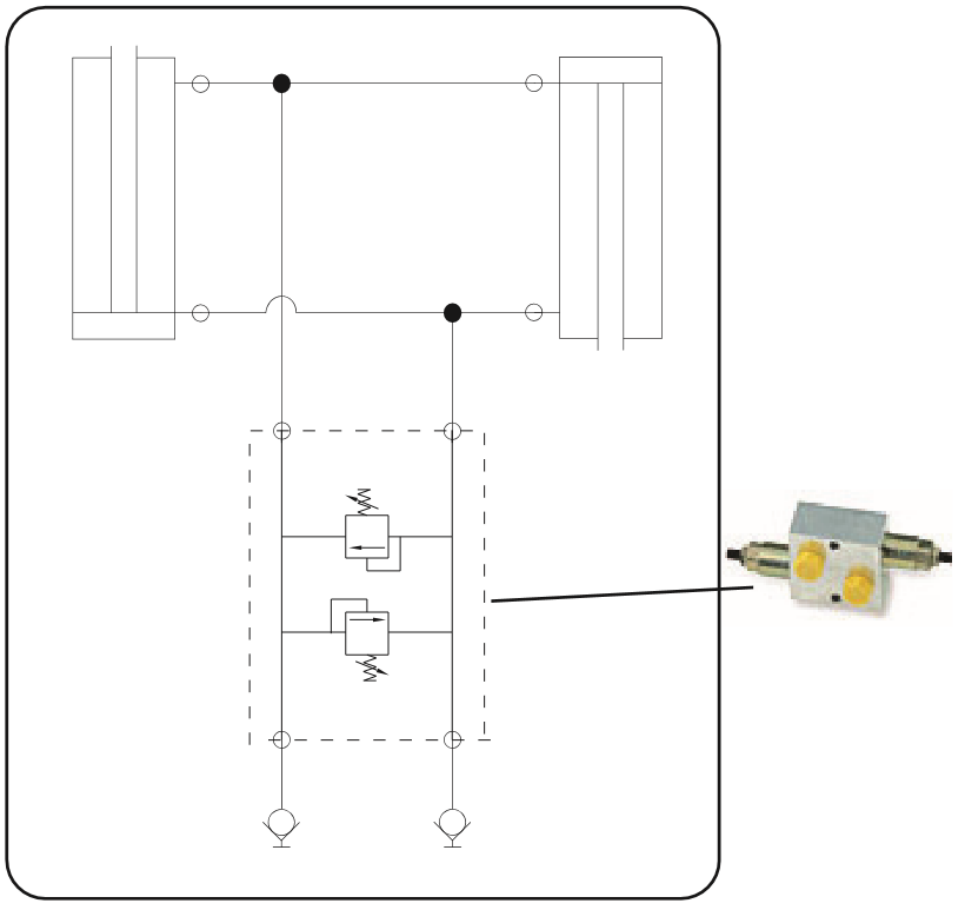


Chart 1. Chart for 2-hose hydraulics

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A – Base machine's control block 1
B – Base machine's control block 2
C – Left hydraulic cylinder
D – Right hydraulic cylinder
E – Snow stopper's hydraulic cylinder

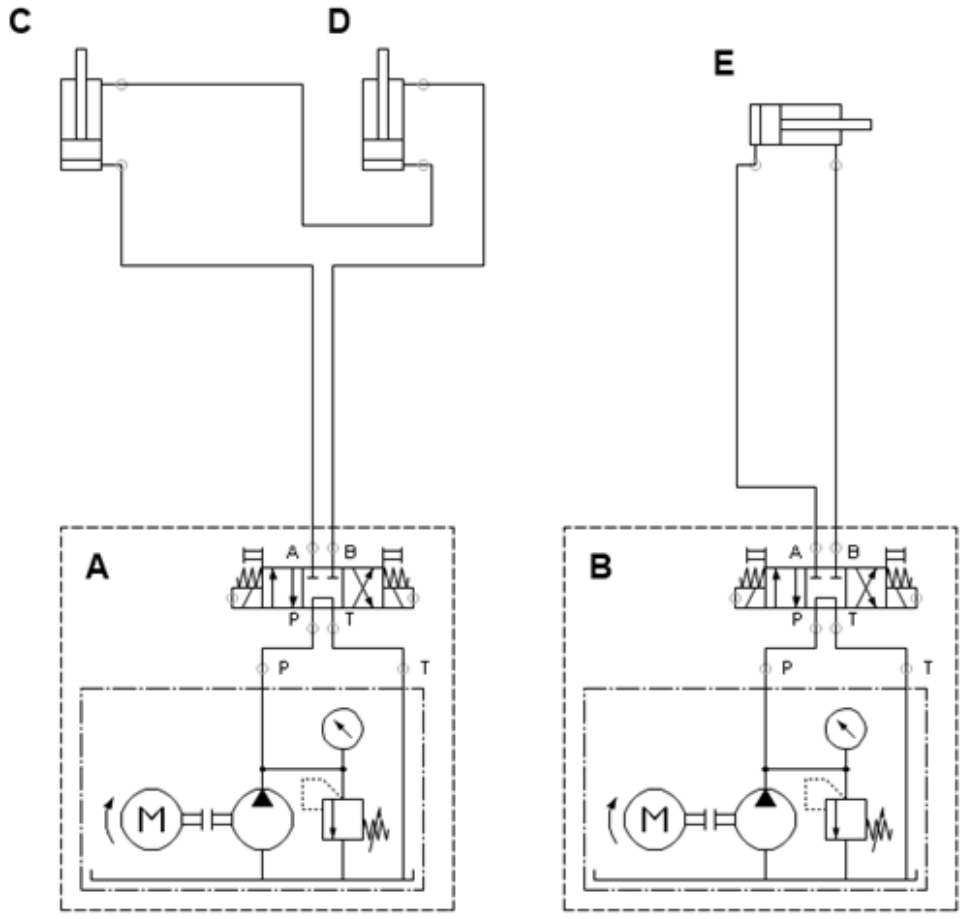


Chart 2. 4-hose base machine's hydraulic chart for snow stopper

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A – Base machine's control block 1
B – 6/2-valve
C – Left hydraulic cylinder
D – Right hydraulic cylinder
E – Snow stopper's hydraulic cylinder

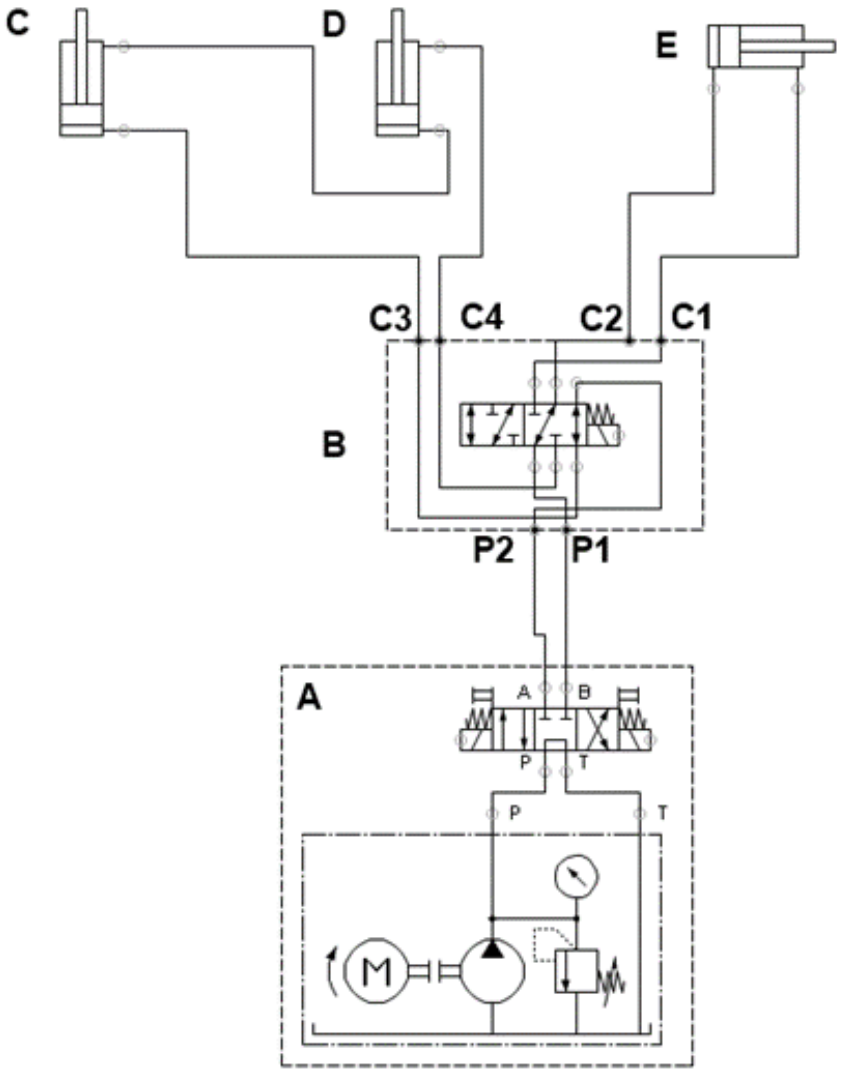


Chart 3. 2-hose base machine's hydraulic chart for snow stopper

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10. WARRANTY POLICY

1. **Warranty coverage**
   Lametal Oy, the manufacturer of STARK attachments, offers new devices a guarantee which covers material and manufacturing defects in accordance with the terms in this warranty policy. Limitations to the warranty are specified in point 7.
2. **Warranty starting date**
   The warranty starts on the agreed date of product delivery to the client, or on the date of approved instalment or on the date the equipment has been taken into operation. The equipment is taken into operation when it has been delivered to the client in accordance with the agreement and the client has acknowledged receipt of the equipment. The client is to check the equipment before use as instructed in this manual and to notify the manufacturer or the reseller of the equipment of any defects or flaws that are noticed during initial inspection. This notification is to be done in writing within eight (8) days after delivery. Hidden defects and defects that are otherwise difficult to detect must be reported immediately after detecting them, within one (1) year after receipt of the equipment at the latest.
3. **Warranty period**
   STARK warranty covers a period of one (1) year. If need be, the client and the manufacturer make separate agreements on warranty concerning repairs and spare parts used in repairs.
4. **Repairs during the warranty period**
   Repairs during the warranty period are carried out free of charge within the normal working hours by the manufacturer repair and maintenance services or by a repair service provider accredited by the manufacturer. If repairs are carried out by a repair service provider which has not been accredited by the manufacturer, the manufacturer does not compensate for costs that are not covered by the warranty, such as travel and waiting hours, daily allowances, travel expenses or costs arising from detaching and reinstalling the equipment. The manufacturer does not compensate for indirect costs caused by repairs during the warranty period, such as lost working hours. Original parts replaced during the warranty period shall remain with the manufacturer. The client must keep the damaged parts for six (6) months unless otherwise agreed, and have them delivered to the manufacturer without delay upon request.
5. **Conditions for repair under warranty**
   Manufacturer's instructions for operation, instalment and maintenance have been followed.
   The equipment was damaged when operated in conditions for which it has been engineered.
   In maintenance and repairs, only original, manufacturer parts have been used.
   The form for the notification of defects provided by the manufacturer or the retailer has been filled in according to the instructions and submitted for processing.
6. **Warranty after repair**
   Warranty holds until the end of the original warranty period. Repair under warranty does not prolong the warranty period.
7. **Limitation to the warranty**
   The warranty does not cover:
   - consequential expenses resulting from the damaged equipment
   - indirect costs, such as loss of working hours
   - damages caused to a third party
   - equipment or components that have been modified or repaired by the client themselves
   - damages caused by normal wear and tear, inappropriate maintenance operations, neglect, accident, connecting error, equipment overloading, user's inexperience or use of other than original parts

   The warranty offered by the manufacturer does not exceed the purchase price of the equipment.
8. **Warranty claim procedure**
   For a warranty claim to be processed, the form for the notification of defects provided by the manufacturer or the retailer must be filled in according to the instructions and submitted for processor. The warranty claim procedure is carried out either in Finnish or English.

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