

MOUNTING INSTRUCTIONS UNDERBODY CYLINDERS



MOUNTING INSTRUCTIONS

UNDERBODY CYLINDERS (KR, UM & UL)

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1. Introduction

1.1. Scope of use

This manual is to instruct you on the correct mounting of the Hyva underbody cylinder range and associated products. It gives basic advice on safety and precautions to be taken before and during installation. The advice given in these pages is by no means complete and should not be used as an alternative to common sense.

The Hyva underbody cylinder range includes KRA, KRM, UMB, UME, ULB and ULE cylinders.

1.2. General remarks

The Hyva cylinder has been developed for lifting purposes only and application for any other purpose is prohibited. The cylinder is not to be used as a stabiliser and any kind of side load must be avoided whenever possible.

Specification sheets are available for all Hyva cylinders; these sheets contain all relevant dimensional and application information. Units are according the metric system (millimeters, metric tons etc).

For two- or three-way tipping a cradle has to be used. For a vehicle designated for rear or side tipping only we highly recommend to use a cradle for cylinders with a stroke of 1000 mm and more. This is to minimise side load and to ensure a longer seal kit life.

Before mounting any equipment on to the truck, always ensure the work is in accordance with the body-builder's guidelines as directed by the truck manufacturer.

If you have questions concerning the application, installation, operation or repair of any Hyva product - please contact your nearest Hyva Service Point or visit www.hyva.com.

Warning

Applying side load to any cylinder is dangerous.

See document OIL-0002 for recommended hydraulic oils and document ALL-0011 for info on oil viscosity.

1.3. Safety

1.3.1. Explanation of guidance

Tip

Gives the reader advice in order to simplify certain tasks or warns of potential problems.

Warning

Warning of danger to the operator or product. The operator can be seriously hurt or the equipment severely damaged if the recommended procedure is not followed.

Danger

There is a serious threat to the life of the operator.

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1.3.2. Precautions

Work safe and in a clean area and use proper lifting equipment. Ensure a pressure relief valve is installed in the hydraulic system and the pressure relief setting does not exceed the maximum cylinder pressure. Ensure there is enough free working space for mounting the cylinder. If the tipper body is raised to create working space, support the body using body props before mounting the cylinder.

Danger

Working under an unsupported tipper body is a danger to life.

If necessary tilt the vehicles cabin (see the truck manual for details). Disconnect the vehicle's battery leads before welding. While lifting a cylinder be aware that the stages can extend.

Warning

Not using the appropriate equipment when lifting parts (such as the proper sling for a cylinder) is a danger to life.

Ensure any oil spilt during installation and testing is disposed of in an environmental friendly way.

1.4. Warranty

For warranty/guarantee see General Sales terms & conditions of Hyva Group, document FO-E00000130.

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2. *Mounting instructions*

This section covers mounting of the cylinder on to the vehicle and attaching it to the body.

2.1. *General*

2.1.1. *Components*

The KR cylinders in general are delivered including the cradle with integrated knock-off and brackets.

For the UM and UL cylinder the cradle has to be ordered separately.

The cradle for the UM and UL range is standard without knock-off.

Cradles for cylinders UM 129 and larger can be delivered including an integrated knock-off and brackets.

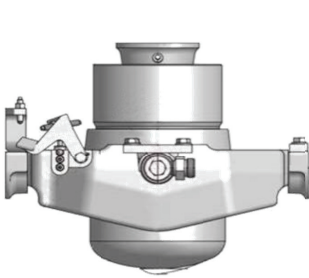


FIGURE 1 KRM CYLINDER INCL. CRADLE AND BRACKETS

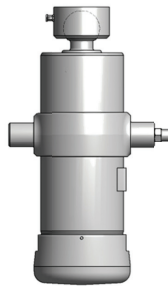


FIGURE 2 UMB CYLINDER

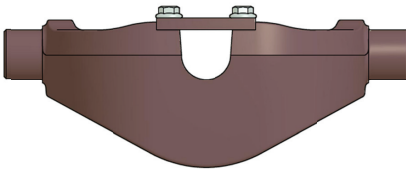


FIGURE 3 CRADLE UM RANGE

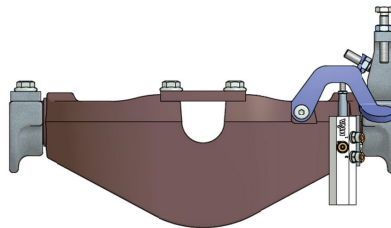


FIGURE 4 CRADLE UM INCL. KNOCK-OFF AND BRACKETS

The basic components of an underbody cylinder assembly are shown in Figure 5.

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A = cylinder
B = closing plates
C = cup
D = cradle
E = brackets

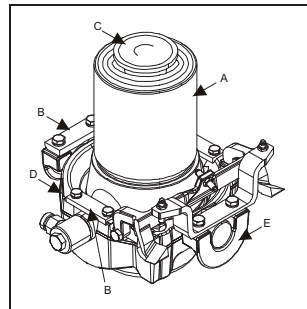


FIGURE 5 CYLINDER ASSEMBLY COMPONENTS

2.1.2. Mounting position and clearances

It is strongly advised to mount the cylinder in vertical position: this maximises the lifting force and minimizes horizontal forces on the tipping hinges. The rotation of a cylinder mounted in a cradle is limited to 30 degrees. In case no cradle is used we advise not to exceed a cylinder mounting angle of 30 degrees from the vertical. In short: the preferred angle for the cylinder is completely vertical.

The free space for fitting an underbody cylinder is limited by chassis parts such as cross members, drive shafts and axles. By increasing the number of stages in a cylinder the build in dimensions can be decreased. When mounting a cylinder it is advised to check for interference with other equipment on the vehicle. Axles move up and down during motion, a tipping cylinder rotates during the tipping cycle.

For two or three way tipping the underbody cylinder is normally mounted between 100 and 500 mm in front of the centre of gravity of the body (i.e. towards the cab). See Figure 6. For rear tipping the cylinder can be behind the centre of gravity (between the centre of gravity and the rear end of the body).

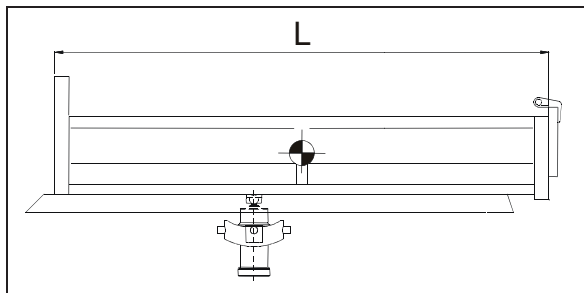


FIGURE 6 CYLINDER MOUNTING POSITION (L= BODY LENGTH)

When the cylinder is positioned between the centre of gravity and the rear end, the lifting force generated by the cylinder whilst tipping will pull the body upwards from the rear hinges. The capability of the rear hinges to withstand this effect should be checked.

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Consequences of changing the mounting position of the underbody cylinder on a tipper chassis:

1. For rear end tipping the lifting capacity decreases when the cylinder is moved to the rear
2. For rear end tipping the tipping angle increases when the cylinder is moved to the rear
3. For rear end tipping the forces on the tipper body increase when the cylinder is moved to the rear so body, sub frame and rear hinges' strength must be checked
4. For side tipping the torsion of the body changes when the cylinder is moved away from the centre of gravity

The application requirements (lifting capacity and tipping angle) of the cylinder are governed by the load capacity of the vehicle and the geometrics of the assembly (rear overhang, body-volume and -length, pivot length, etc.). The axle loading for the vehicle is governed by legal requirements in the country of use and the technical specification of the vehicle manufacturer.

The maximum thrust on the cylinder as shown on the cylinder specification sheet may not be exceeded. The maximum thrust on the cylinder is the thrust on the first stage at beginning of tipping. It is determined by the tipping weight, the body dimensions, the position and the mounting angle of the cylinder.

The specification sheets lists a range of tipping weights to emphasise the multitude of factors involved. With the Hyva Tipper Program (freely available at www.hyva.com) a tipping calculation can be made to check the tipping weight, tipping angle and the maximum thrust on the cylinder.

If you are unsure of any of these details – please contact you nearest Hyva Service Point, who will advise on the suitable fitting position for your application.

Tip

To calculate the required tipping weight in off-road applications use:

*Body volume (m³) * specific mass of payload (sand = 1.6 T/m³) + empty body weight + 15% for overload*

Caution

The cylinder should be mounted with a minimum pull out of 15 mm and a maximum pull out of 50 mm (the closed length of the cylinder on the Hyva specification sheet already includes 20 mm pull out).

Where a 'knock-off' or other end of stroke device is to be used remember to allow 150 mm cylinder stroke unused to activate the device.

In case the body is not supported on the sub frame close to the cylinder, the body will deform under load. In this case the minimum pull-out becomes an even more critical issue to ensure the body does not rest on the cylinder in closed position.

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The maximum angle that the underbody cylinder may reach in tipped position, when mounted in a cradle, is 30 degrees from the vertical. The maximum angle between cup and piston is 30 degrees. See also Figure 7.

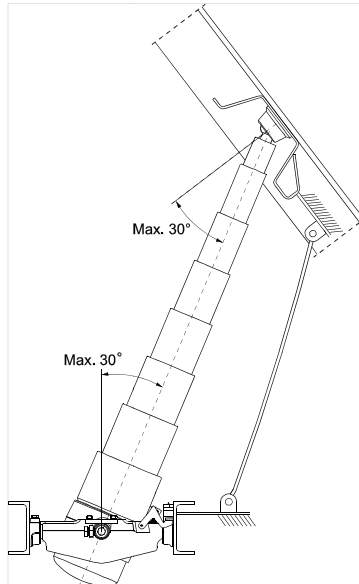


FIGURE 7 MOUNTING ANGLES UNDERBODY CYLINDER

2.1.3. Cross members

In general the underbody cylinder is fitted between two cross members which are placed between the main beams of the chassis. The distance between the cross members is determined by the components used when the cylinder is mounted.

I For the UM and UL range

The cradle with integrated knock-off is delivered with U-shaped brackets to weld (see 2.1.4). In this case cross member distance should be:

Cradle width + 2 x bracket width + 2 to 4 mm clearance (see also Figure 8)

When the cradle without knock-off is used, the distance depends on the type of brackets used. When the brackets to weld are used: cross member distance should be:

Cradle width + 2 x bracket width + 2 to 4 mm clearance

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When the cradle without knock-off and the brackets to bolt are used (see 2.1.5): cross member distance depends on how the brackets are mounted.

Total clearance between cradle and brackets must be 2-4 mm.

When the cradle is not used, it is advised to use the brackets to bolt. The cross member distance depends on how the brackets are mounted.

Total clearance between cylinder and brackets must be 2-4 mm.

See the cradle specification sheet, 015BRA06, for the cradle and bracket dimensions.

II For the KR range

The specification sheets for the KR range mention this cross member distance already as they are standard delivered incl. cradle and brackets.

III General

Take into account room for rotation of the cylinder during tipping (cylinder rotation is approximately half the tipping angle). The cross members must be strong enough to withstand the cylinder load. See Table 2 for recommended cross member profiles and dimensions. The vertical position of the cross members and brackets is determined by the relative position of the lifting plate on the body; remember the cylinder pull-out (see specification sheet).

Always use standard Hyva brackets to ensure all dimensions are correct in relation to the cradle.

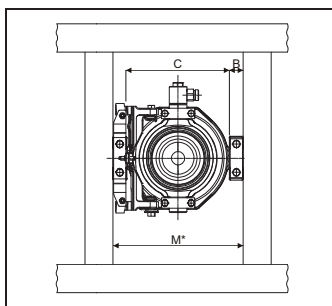


FIGURE 8 B = BRACKET WIDTH
C = CRADLE WIDTH
M* = MINIMUM CROSS MEMBER
SPACING (INC 2-4 MM PLAY)

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Caution

Be sure the cross members are strong enough to withstand the load of the cylinder and thick enough to be welded. If the wall is too thin the weld will shear out of the web (see Table 2: Recommended Cross Member Profiles and Dimensions).

Caution

Ensure the top flange of the cross member is of sufficient thickness to withstand the load of the cylinder, if it is too thin the bracket will shear the cross member. Preferred sections are cold finished U-profiles or Box-profiles (see Table 2: Recommended Cross Member Profiles and Dimensions). Hot rolled UNP can be used; however the angle of the flange webbing will distort the bolts and weaken the fixing. The angle must be compensated for, by using an angled filler plate.

2.1.4. Brackets to weld

The brackets to weld can be welded to the cross members. These brackets are obligatory for the cradle with integrated knock-off. They can optionally be used for the cradle without knock-off.

Remove the locking plates from the brackets. The locking plate for the cradle with knock off needs extra attention as it should be placed back properly after the cradle is fitted. Weld the brackets to the cross members, taking into account the K-measurement and the pull-out. Make sure the front and rear brackets are aligned in both vertical and horizontal planes. Fully weld around the brackets with weld size a5, using a welding material with a minimum yield strength of 420 MPa.

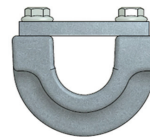


FIGURE 9 BRACKET TO WELD

2.1.5. Brackets to bolt

Brackets to bolt can be placed on top of the cross members and bolted. These brackets can be used for the cradle without knock-off. When the cylinder is mounted without the cradle, these brackets can be used also.

In general there must be a clearance of 2-4 mm between cylinder and brackets. Place the brackets on top of the cross member flange with the greaser pointing upwards. Fix the brackets using bolt sizes corresponding with the bracket hole dimensions. Use bolts of minimum quality Q8.8 with self-locking nuts and washers. For mounting torques see Table 1: Bolt and nut specifications.

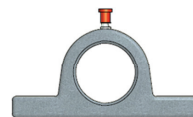


FIGURE 10 BRACKET TO BOLT

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2.2. Grease points

Make sure that all greasers and protection caps are placed and use the specified grease.

2.3. Additional clearance (rotation)

When rotation of the cylinder is likely to conflict with cross members, alternate profiles may be used to provide additional clearance during tipping (see Figure 11). Ensure the chosen profile is strong enough for the cylinder load.

2.4. Reinforcement of cross members

As the cylinder rotates during tipping, a horizontal force component acts on the front cross member in the direction of the cab. This cross member must be reinforced with additional bracing members (see

Figure 12).

2.5. Mounting cylinder into the chassis

Before mounting the cylinder into the brackets lightly grease the cylinder pins with a multipurpose grease to lubricate and protect against corrosion. Also grease the pins of the cradle when used.

Danger

If during mounting of the cylinder the tipping body is raised, it is necessary to support the body by use of a body prop.

Never reach under or work on a raised body unless it is adequately propped.

Mount the cylinder in the chassis brackets. Make sure the oil inlet is facing the correct direction for connection of the hydraulic system.

Tip: Work safe!

Use the proper lifting equipment taking the following into account.

The lifting device must be attached to the base and not to the piston (ball/eye), as the cylinder will extend when lifted.

The lifting device must be attached above the centre of gravity of the cylinder to prevent the cylinder moving unexpectedly (rotating or falling out of the device).

The brackets to weld must be closed at the top with the appropriate closing plates and bolts.

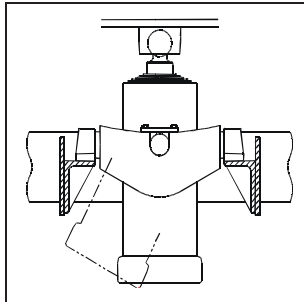


FIGURE 11 ALTERNATE CROSS MEMBER PROFILE FOR ROTATIONAL CLEARANCE

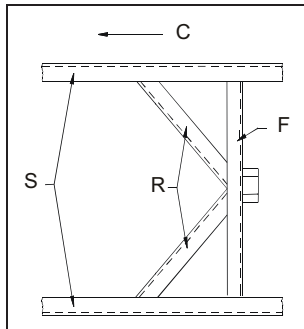


FIGURE 12 CROSS MEMBER REINFORCEMENT
C = CAB DIRECTION
S = SUB FRAME
F = FRONT CROSS MEMBER
R = REINFORCEMENT

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2.6. Attaching cylinder to the body

The bottom of the body must be reinforced to withstand the cylinder load (see Figure 13).

A typical example of this reinforcement consists of:

1. Two extra cross members between the main beams of the body (minimum distance: diameter of the cylinder base + 50 mm)
2. Two extra longitudinal beams between the above cross members at the same minimum distance
3. An additional ± 12 mm thick lifting plate between these beams

Tip

Ensure the additional cross-members do not interfere with the cylinder knock-off (cradle mounted). For extra clearance these cross-members can be made at the same width as the chassis cross members (see section 2.1.3).

Mark the exact position of the cylinder cup / top bracket on the body lifting plate to be sure the cylinder is orientated 100% vertical when the body is lowered (especially in case of cradle mounting). Remove the plug from cylinder inlet to ease extension of the cylinder (residual oil from testing of the cylinder may come out).

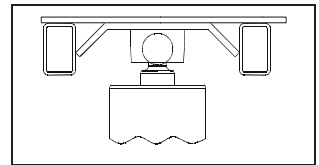


FIGURE 13 BODY REINFORCEMENT

Remove the cup from the cylinder to weld it more easily to the body lifting plate. Remove the paint from the cup-surface which you wish to weld. The cup can also stay on the piston but then the piston must be fully extended to prevent seal damage from heat input. Fully weld around the cup with weld size a5, using a welding material with a minimum yield strength of 420 MPa.

Caution

Protect the cylinder and all pneumatic, electrical and other leads/hoses from weld spatters

Warning

Disconnect the battery leads before welding.

Grease the ball/cup or eye/bracket after welding.

2.7. Painting cylinder

Hyva cylinders are painted black (RAL 9005). When painting the body, do not repaint the moving blank parts of cylinder such as trunnion pins, piston, stages, wipers, inside of cup, ball or eye.

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3. Connecting and testing the cylinder

The layout of the hydraulic system has been determined before mounting the tipping cylinder. However for checking and information here are some points which may be helpful during fitting. If in doubt ask your Hyva agent or the Sales Engineering department at Hyva.

3.1. Pump

For 3-way tippers it is important that:

1. The selection of pump size and PTO ratio do not result in a maximum piston speed in the cylinder of more than 0,25 m/s. The specification sheet of the cylinder lists the maximum allowed pump flow.
2. Taking into account the working conditions and engine speed, the pump must not be exposed beyond the maximum allowed intermittent values of pump speed and pressure

3.2. Safety cables

For side tipping operations safety cables must be used. The safety cables restrain the body in case of self-tipping of a fully laden body. This can occur especially with a body with high, bottom hinged, sideboards.

When a knock-off is used, it should be activated before the cables are pulled tight. Tippers without knock-off must have safety cables which are not pulled tight before the cylinder reaches end of stroke.

The cables may not be used to limit the stroke of the cylinder, they are only meant as safety measure.

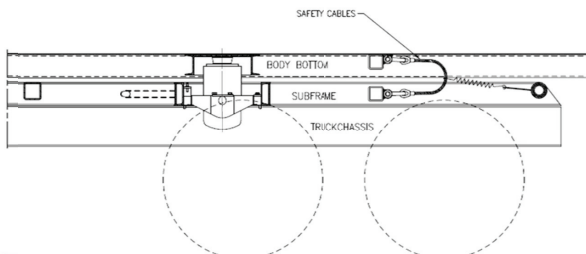


FIGURE 14 SAFETY CABLES

Be sure the cables and the connections to the body and sub frame are strong enough to resist the self-tipping force of the body. Hyva uses $\varnothing 16$ mm cables as standard. When properly installed the same cables can be used for the rear tipping operation.

3.3. Connecting the hydraulic system

Remove the plug from the oil-inlet in the cylinder pin and place the inlet adaptor. Do not fully screw it in but leave 1-2 mm to give the adaptor the possibility to rotate (swivel). Connect the adaptor to the hydraulic system. Ensure there is sufficient hose length so it does not obstruct the movement of the cylinder while tipping.

Fit grease nipples into the brackets if applicable and grease all moving parts before use with multipurpose grease for lubrication and corrosion protection.

3.4. End of stroke control ('knock-off')

For two- or three-way tippers a 3-way knock-off mechanism must always be used.

The KR range has the knock-off already integrated in the cradle.

The UM cylinders 129 and larger can also use a cradle with integrated knock-off.

For smaller types a separate knock-off can be added.

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3.4.1. Knock-off mechanisms

Following knock-off mechanisms can be used:

1. Pneumatically operated, mounted on cylinder cradle/bracket
2. Hydraulically operated, mounted on cylinder cradle/bracket
3. Pneumatically operated, mounted in the chassis with cables between the pneumatic valve and body floor
4. Hydraulically operated, mounted in the chassis with cables between the knock-off valve and body floor
5. Cable operated, connected to the tipping valve directly or with a separate knock-off valve between tipping valve and air control
6. Electrical cable operated (available for power packs)

3.4.2. Pneumatic knock-off

The pneumatically operated knock-off is connected with the tipping valve according to Figure 15.

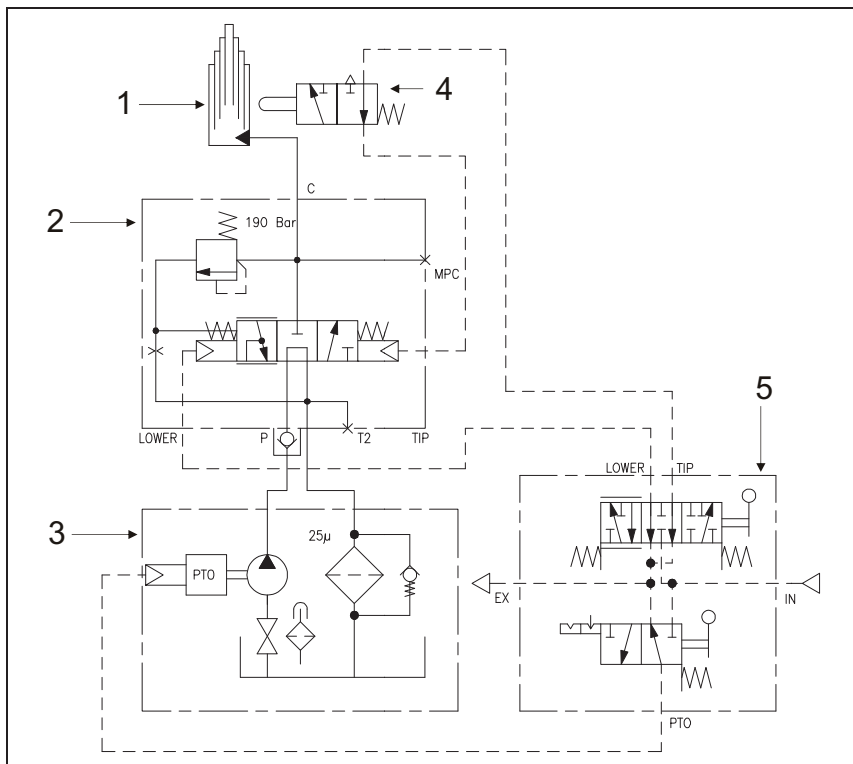


FIGURE 15 HYDRAULIC SYSTEM WITH PNEUMATIC KNOCK-OFF
 1 = CYLINDER
 2 = TIPPING VALVE
 3 = HYDRAULIC SUPPLY & RETURN
 4 = KNOCK-OFF
 5 = PNEUMATIC SYSTEM

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See figure 16 for the air connections on the pneumatic knock-off for the UM cradle.

Use 6 mm air hoses for the following connections:

1. To the air control
2. To the tipping valve
3. Exhaust: connect 20-30 cm air hose (not included) with the opening facing to the ground.

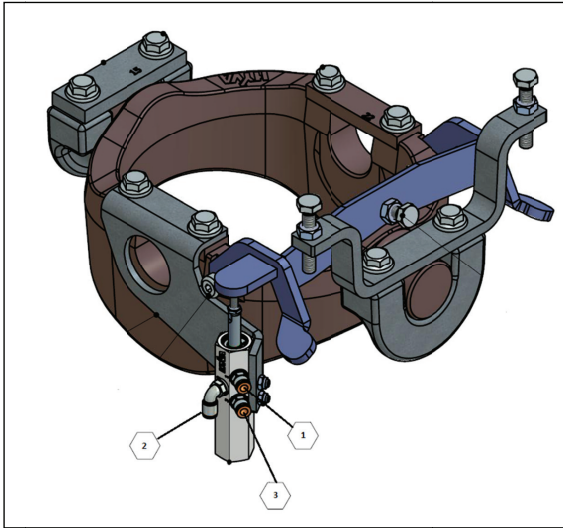


FIGURE 16 CRADLE UM INCLUDING KNOCK-OFF AND BRACKETS

See figure 17 for the air connections on the pneumatic knock-off for the KR cradle.

Use 6 mm air hoses for the following connections:

1. Exhaust: connect 30 cm air hose (included in the mounting instruction bag) with the opening facing to the ground.
2. To the tipping valve
3. To the air control

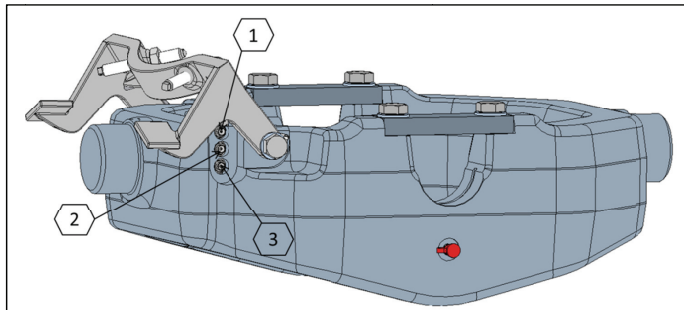


FIGURE 17 CRADLE KR INCLUDING KNOCK-OFF

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3.4.3. Hydraulic knock-off

The hydraulically operated knock-off is available in two types:

1. Single line system (normally open)
2. Double line system

In the single line system the valve must be fitted between the tipping valve and cylinder. As soon as the knock off is operated, it blocks the flow between valve and cylinder, this stops the tipping operation.

The pressure relief valve of the tipping valve will dissipate the pump flow (heat generation). For the single line system see Figure 7 (left scheme).

In the double line system the valve ideally is fitted between pump and tipping valve in a by-pass circuit. As soon as the knock-off is operated, it bypasses the pump flow to the tank.

In case the knock-off valve is fitted between the valve and the cylinder it can lead to cylinder jerking as the cylinder tends to lower beyond the position where the knock off is activated after which the pump flow pushes up the cylinder again.

If the resistance in the by-pass line is too high the tipping operation will not stop. This is usually a result of a high pump flow, either from the pump being too large or the excessive engine speed, see 17 (right scheme).

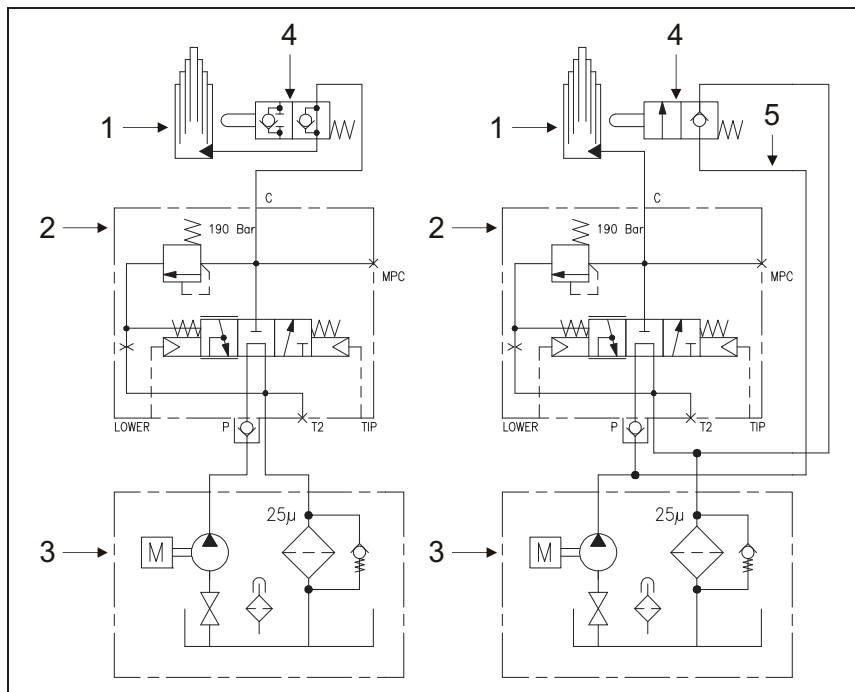


FIGURE 17 HYDRAULIC SYSTEMS WITH HYDRAULIC KNOCK-OFF
 LEFT IS SINGLE LINE SYSTEM RIGHT IS DOUBLE LINE SYSTEM
 1 = CYLINDER 4 = KNOCK-OFF
 2 = TIPPING VALVE 5 = BY-PASS RETURN LINE
 3 = HYDRAULIC SUPPLY & RETURN

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3.4.4. Knock-off Adjustment

To adjust the cradle mounted knock-off for rear tipping, follow the procedure below:

1. Tip the body to the rear end of stroke at low speed
2. Lower the body to reduce the cylinder stroke with 150 mm and support the body with a body prop
3. Set knock-off mechanism to the 'just activated' position with the adjusting screws. Make sure the counter nuts are well tightened.
4. Check the setting of knock-off mechanism by tipping the body at working speed

Caution

Immediately stop tipping operation if the pressure starts to build up because the cylinder is at end of stroke.

To adjust the cradle mounted knock-off for side tipping, follow the procedure below:

1. Tip the body to side end of stroke at low speed until the cables are under tension (immediately stop tipping operation if pressure starts to build up)
2. Lower the body to reduce the cylinder stroke with 75 mm and support the body with a body prop
3. Set knock-off mechanism to the 'just activated' position with the adjusting screws. Make sure counter nuts are well tightened.
4. Check the setting of knock-off mechanism by tipping the body at working speed
5. Adjust setting for both sides

3.5. Final checks

Test the tipping operation in all directions (rear, left, right). The first tip should be slow and all movements are to be closely observed to check:

- Cylinder movement is smooth
- Hoses do not interfere with any parts
- Cylinder extends in a straight line
- Ensure there is no contact while tipping (side and rear) between the rear end of the body and other parts of the truck (such as rear bumper, towing-hooks, tail lamps etc.)

Tip the body a few times at normal tipping speed and do the same checks. If you find the cylinder movement is stiff, loosen the bolts and realign the cylinder. Protect hoses where they move against metal parts (if they cannot be repositioned). It is not necessary to bleed air from the cylinder.

Tip

During the first few tips some seal kit grease may be appear on the stages of the cylinder, this is normal and does not mean the cylinder is leaking.

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4. Tables

Specifications and advice during fitting

4.1. Table 1: Bolt and nut specifications

Size	DIN		Quality	Torque	
	Bolt	Nut			
M12	931	985	8.8	80	Nm
M16	931	985	8.8	210	Nm

TABLE 1: BOLT AND NUT SPECIFICATIONS

4.2. Table 2: Recommended cross member profiles and dimensions

Tipping Weight (ton)	Minimum W _{xx} (cm ³)	Hot Rolled UNP (yield 235 MPa)	Cold Rolled U (yield 235 MPa)	Box Profile (yield 235 MPa)
Up to 7.5	30	-	100x50x6	100x50x5
Up to 10	40	100	120x60x6	100x60x6
Up to 15	60	120	140x65x6	120x60x6
Up to 20	80	140	-	140x60x8
Up to 25	100	160	-	140x70x8
Up to 35	140	180	-	160x80x8
35 and over	140+	200	-	180x80x8

Note: All strength calculations based on St.37-2 and cross-member length of 1m.

TABLE 2: RECOMMENDED CROSS MEMBER PROFILES AND DIMENSIONS

Notes:

Table 2 gives information relating to **truck** chassis' only.
The information given in table 2 is for guidance only, see also body builders guidelines.
Given the diversity of engineering and application requirements of trailers, manufacturers must accept the responsibility of specifying their own profiles. Hyva does not recommend profiles for trailers.

MOUNTING INSTRUCTIONS

UNDERBODY CYLINDERS (KR, UM & UL)

5. Service points

An overview of our worldwide and national service agents is given on www.hyva.com. Please contact your nearest service partner in case your Hyva equipment does not perform as you expect, even if you are at considerable distance from the agents location. Most agents maintain their own networks and can advise you or assist you with appropriate service.

Look on the Hyva website to find the up to date service points.

www.hyva.com