



MOUNTING INSTRUCTIONS

TABLE OF CONTENTS

1.	Intro	1
1.1	Cylinder types	1
1.2	General remarks.....	2
1.3	Safety	3
1.3.1	Lifting cylinders.....	3
1.4	Environmental.....	4
1.5	Signs.....	4
1.6	Contact Hyva	5
2.	Mounting Instructions.....	6
2.1	Main Components	6
2.1.1	Tipper	6
2.1.2	Cylinder.....	7
2.2	Mounting Position and clearances	8
2.3	Mounting dust cover	11
2.3.1	FC, FCE and EF cylinders.....	11
2.3.2	FE, FEE and FSE cylinders	11
2.3.3	Cylinders with dust ring.....	12
2.3.4	Double acting cylinders.....	12
2.4	Attaching the cylinder to the chassis.....	13
2.4.1	Trunnion mount [FC and FE type]	13
2.4.2	Eye trunnion mount [FEE and FCE type]	20
2.4.3	Spherical eye mount [FSE, USE and EF type]	22
2.5	Attaching the cylinder to the body.....	23
2.5.1	Trunnion mount [FC, FCE and EF type].....	23
2.5.2	Spherical eye mount [FE, FEE and FSE type].....	25
2.5.3	Spherical eye mount [USE type].....	27
2.5.4	Eye (rigid) mount.....	29
3.	Fasteners and adapters.....	31
4.	Connecting the cylinder.....	32
4.1	Connecting a single acting cylinder	32
4.2	Connecting a double acting cylinder	33
5.	Hydraulic oil and material for instalation.....	34
5.1.	Hydraulic oil.....	34
5.2	Recommended materials.....	34
5.2.1	Pins.....	34
5.2.2	Cross member profiles.....	34
6.	Final Checks.....	36

1. Intro

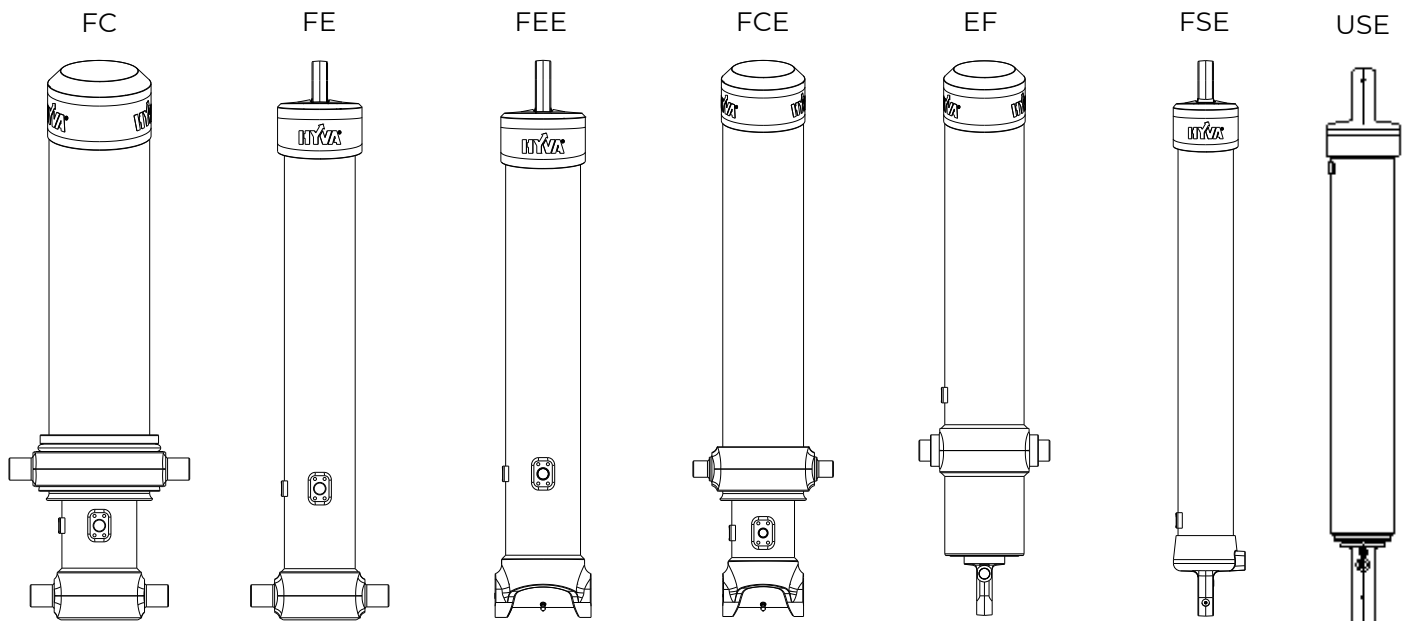
This document was created to assist with the installation of Hyva front-end cylinders and related equipment. By the end of this text we expect to have solved all the possible questions you might have on how to install the cylinder, if there is any remaining doubt, please contact Hyva and we will provide support as soon as possible.

The main topics in this manual are divided as follow:

- Introduction
- Mounting Instructions
- Mounting positions and clearances
- Attaching to the chassis
- Attaching to the body

1.1 Cylinder types

Our range of front-end cylinder is composed by six different types that vary mainly on the way of mounting on chassis and body. The below picture illustrates all the current models. Some cylinder models are also available with a double acting piston (called 1DA) or as a full double acting cylinder.



FC = cylinder with outer cover (body mounting) and trunnion (chassis mounting)

FE = cylinder with eye (body mounting) and trunnion (chassis mounting)

FEE = cylinder with double eye (body and chassis mounting)

FCE = cylinder with outer cover (body mounting) and eye (chassis mounting)

EF = inverted cylinder with trunnion (body mounting) and eye (chassis mounting)

FSE = cylinder with double spherical eyes (body and chassis mounting)

USE = inverted cylinder with double spherical eyes (body and chassis mounting)

Each cylinder has a specific specification sheet that contains all relevant dimensions and application information, make sure you have the latest update before starting to plan and install.

1.2 General remarks

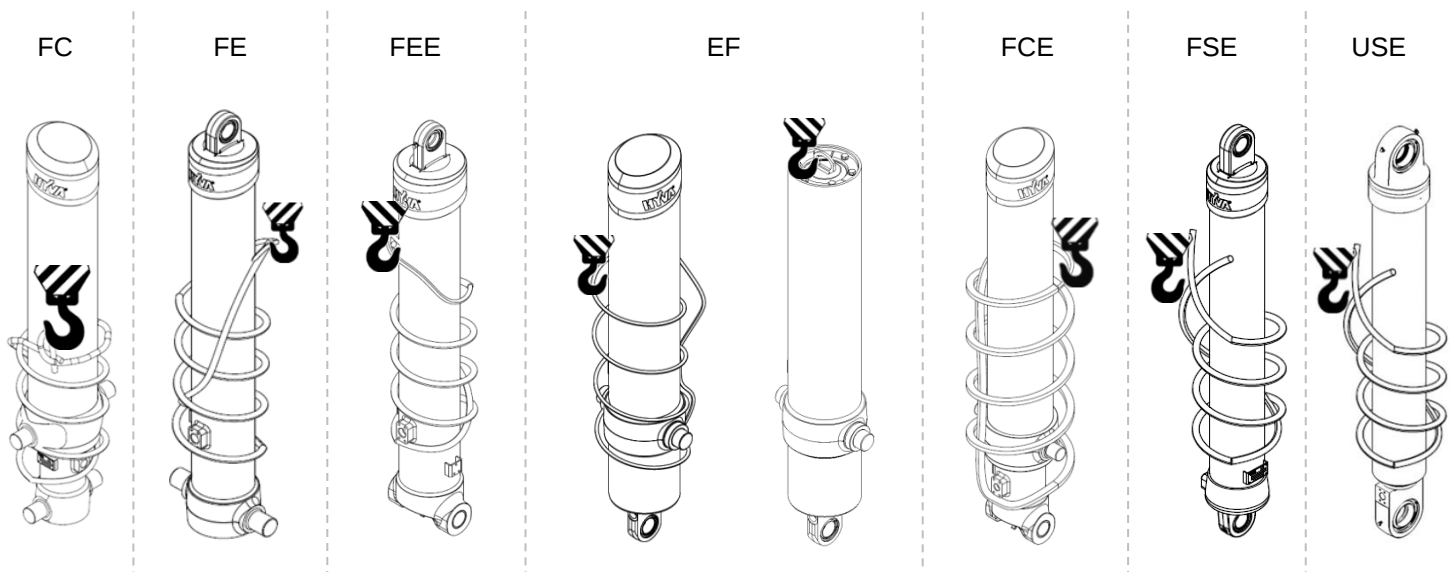
- We strongly recommend to create application studies, our engineers have the expertise to advise you on the selection of an optimal cylinder, please contact Hyva technical staff to request this kind of assistance.
- Hyva also provides a web base program to support you on this kind of analysis, for more information access <https://tipper.hyva.com/>.
- Where a tipper is to be built-up with no subframe on the chassis, we strongly advise that a Hyva cradle is used to mount the cylinder. Instructions for cradle mounting of the Hyva cylinder are also given in this manual.
- Cylinder must be mounted in the exact center line of the body. Cylinder must be mounted exactly vertical, looking to the body front.
- Hyva cylinders are painted to provide 480 hours in salt spray test as per ISO 9227 (ISO 10289 rating 9). If there is a necessity of repainting the cylinder to change color, make sure to mask all blank steel areas such as trunnion pins, inner diameter of the trunnion bush, spherical bearing, etc. Exposed tubes such as the piston and stages outer diameter must also be masked to avoid painting.
- The cylinder is designed to operate in temperatures between -40°C [-40°F] and 80°C [176°F].
- All Hyva cylinders are suitable to be used with bio-degradable oils based on synthetic esters.
- Maximum allowed pump flow vary according to certain conditions, please see specification sheet of each cylinder to get the cylinder specific information.
- If the cylinder is to be fitted above the gearbox, splitter box or any part that needs periodic service, clearance must be provided between this part and the bottom of the cylinder.
- Specification sheets are available for all Hyva cylinders; these sheets contain all relevant dimensional and application information about your cylinder. For a better understanding of our specifications sheets please check the document CYL-0041.
- This cylinder is a lifting device only. The cylinder is designed to lift bodies for the commercial vehicle industry. It is not allowed to be used in structures where people are lifted. In case of doubt please contact your nearest Hyva Service Partner.
- It should not be used as a structural member and should not be subjected to side loads. Hyva is aware that stabilizing cylinders will be subjected to some side load; however side loads should be avoided. Side loads should be taken by proper stability/rigidity of the full tipper design (suspensions, chassis, frame and body). Hyva will not backup side load damage by any warranty. Operators should be instructed to avoid tipping conditions that can result in side loads (uneven ground, uneven loaded body, side wind, not aligned truck and trailer, etc.).

1.3 Safety

- Before start working, ensure there is enough space to install the cylinder and all the tools and protection equipment are available for use and in good condition. Never perform any action that could put your or any other person's life at risk.
- When removing the oil plugs some residual pressure can be trapped in the cylinder. Great care must be taken with removing the plugs to prevent injuries. Proper safety equipment should be used.
- Some parts are considerably heavy and should not be carried by hand. Use proper lifting devices to avoid injuries and unnecessary risk.
- Work under an unsupported body can cause serious injury or even death. If there is a necessity of working with a raised body, make sure it is well supported by body props the whole time.
- To avoid damage to the truck cabin, cover the rear of the cabin with a tarpaulin. If necessary tilt the truck cabin according to the truck manual.
- Make sure to work according to all local rules and regulations.
- Also important for safety is to know how to operate and make maintenance on the vehicle, Hyva has a specific document dedicated to provide information on this topic. Please check the file TIP-0009 - Operating and Maintenance Instructions for Tippers "Alpha".

1.3.1 Lifting cylinders

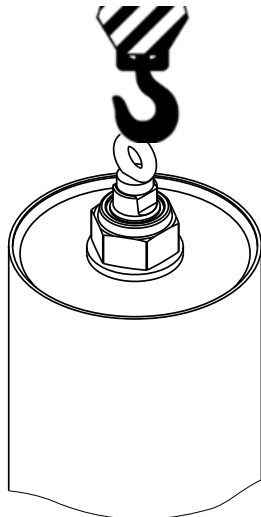
During the installation process will be necessary to lift the cylinder. Cylinders are heavy, should be handled with care and using proper devices. Keep the oil plug tight on the oil inlet during the lifting of the cylinder, this will help preventing cylinder from opening. The picture below illustrates how to lift each cylinder type.



MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

When lifting an FC or FCE remember to put the rope around cover **and** base. It is as well possible to mount a M16 (this is only possible with non DA cylinders) lifting eye on the piston head on FC or FCE cylinders and make sure the cylinder cannot extend during lifting.

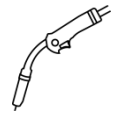
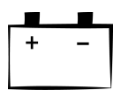
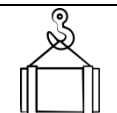


1.4 Environmental

Be sure to work according to all environmental regulations. Ensure any oil spilled during installation and testing is disposed in an environmental friendly way. Protection caps must be discarded in an environmental way, ensure you give it the correct destination.

1.5 Signs

In this document, a few signs will be used to highlight points that require extra attention.

	Grease	This sign indicates need for greasing. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.
	Torque	This sign indicates that a specific torque value must be applied, please see TABLE 1 at page 29 for the torque values.
	Drill	This sign indicates that drilling will be necessary at some point during a specific step.
	Weld	This sign indicates that parts must be welded. Weld size will be indicated on each case. Welding wire must be at least 350 MPa.
	Battery	Caution! Disconnect vehicle battery before welding
	Lift	This sign indicates that the operation requires a proper lifting device; do not execute it by hand.

1.6 Contact Hyva

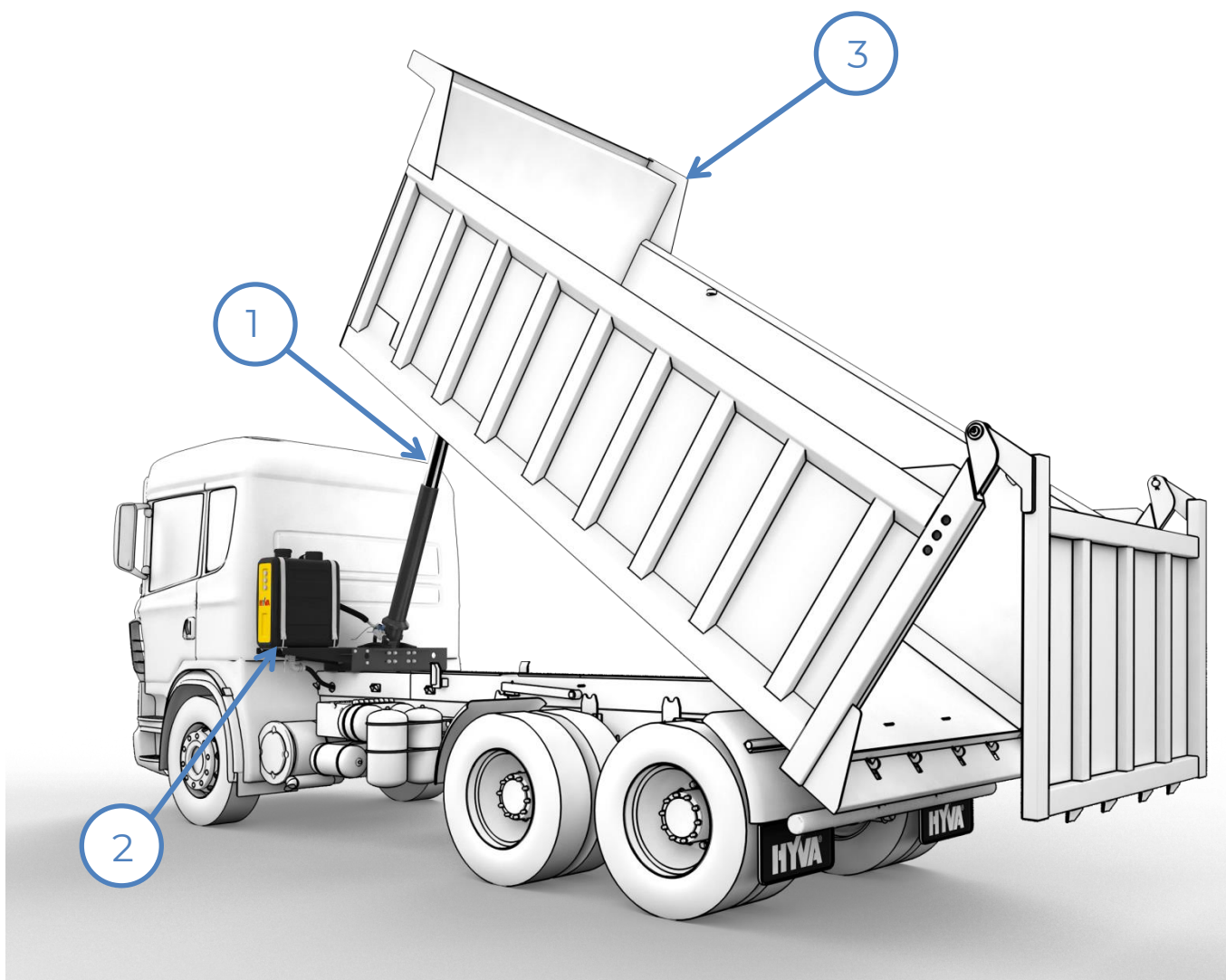
In case you have any questions concerning the application, installation, warranty, operation or repair of any Hyva product: Please contact your nearest Hyva Service Partner and check the Hyva website (both for documentation as for service partner coordinates).

www.hyva.com

2. MOUNTING INSTRUCTIONS

2.1 Main Components

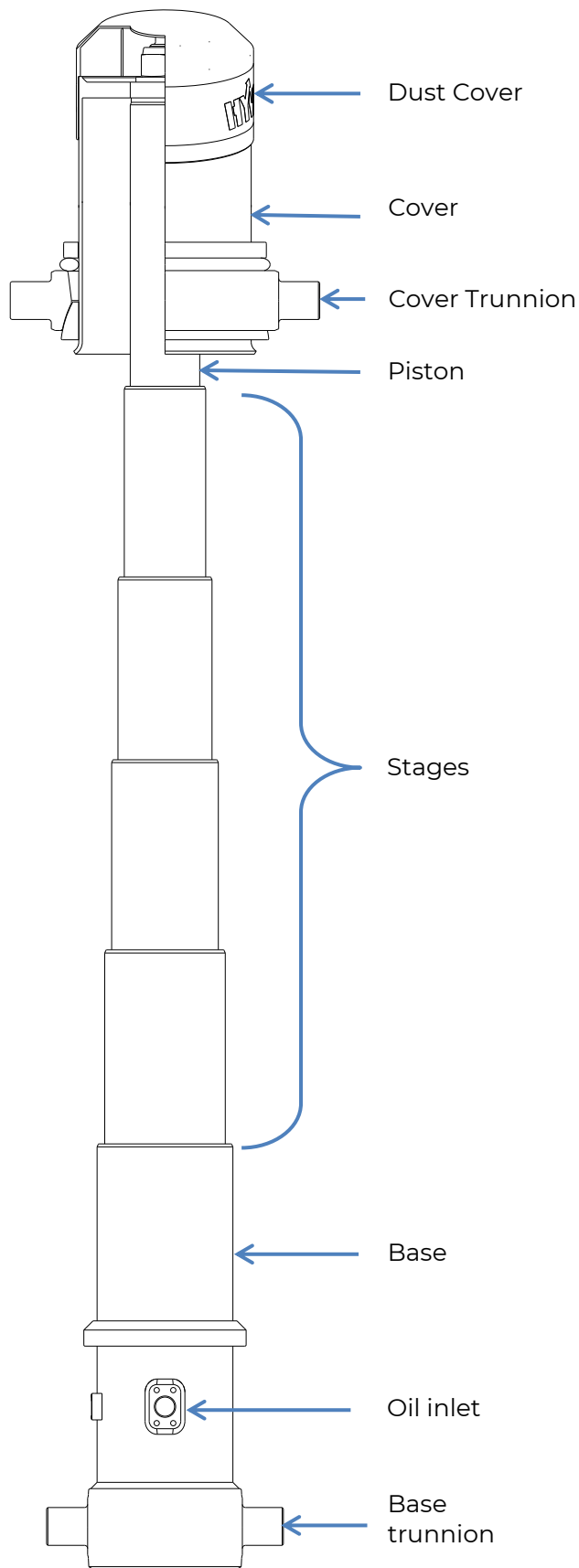
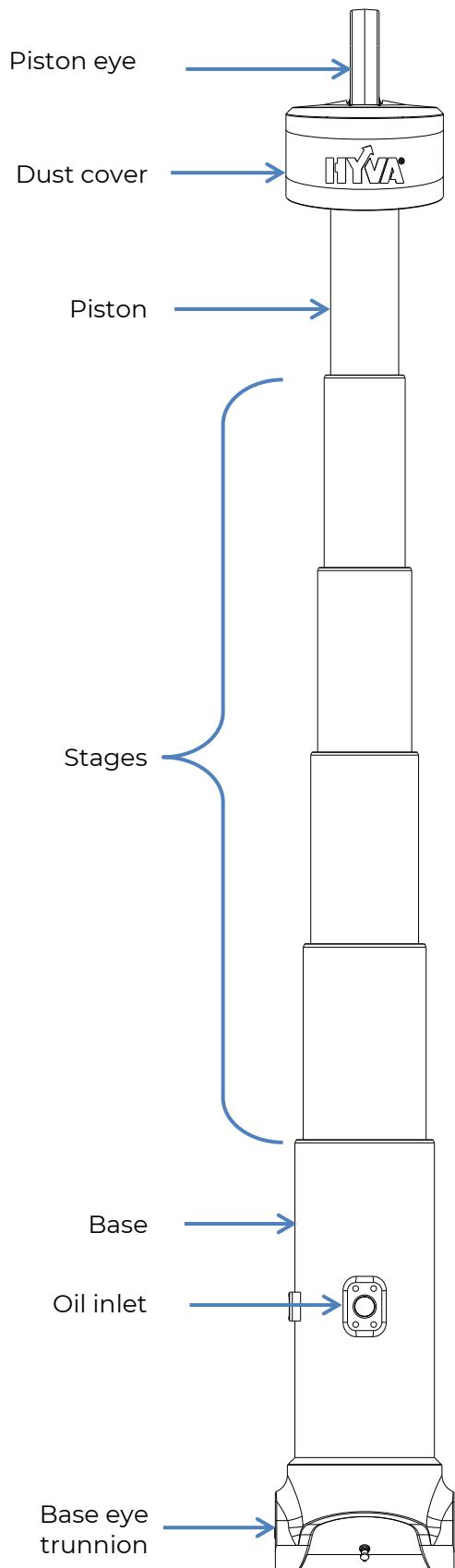
2.1.1 Tipper



- 1 - Cylinder
- 2 - Wet kit
- 3 - Tipper body

2.1.2 Cylinder

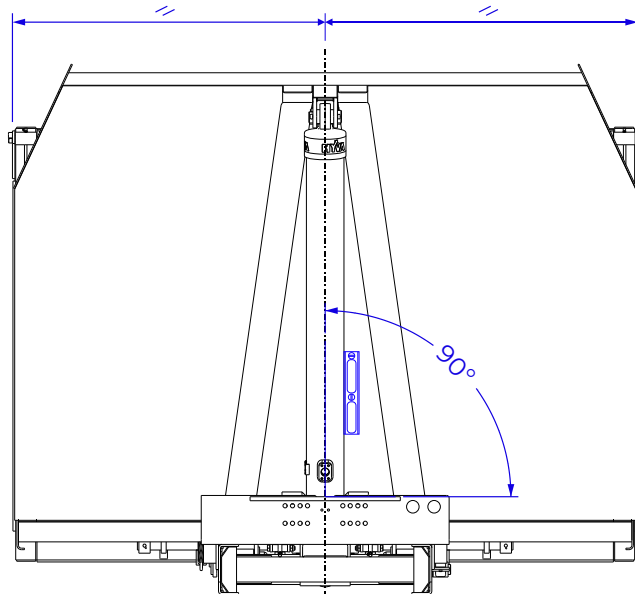
Note: Below picture is a rough overview



2.2 Mounting Position and clearances

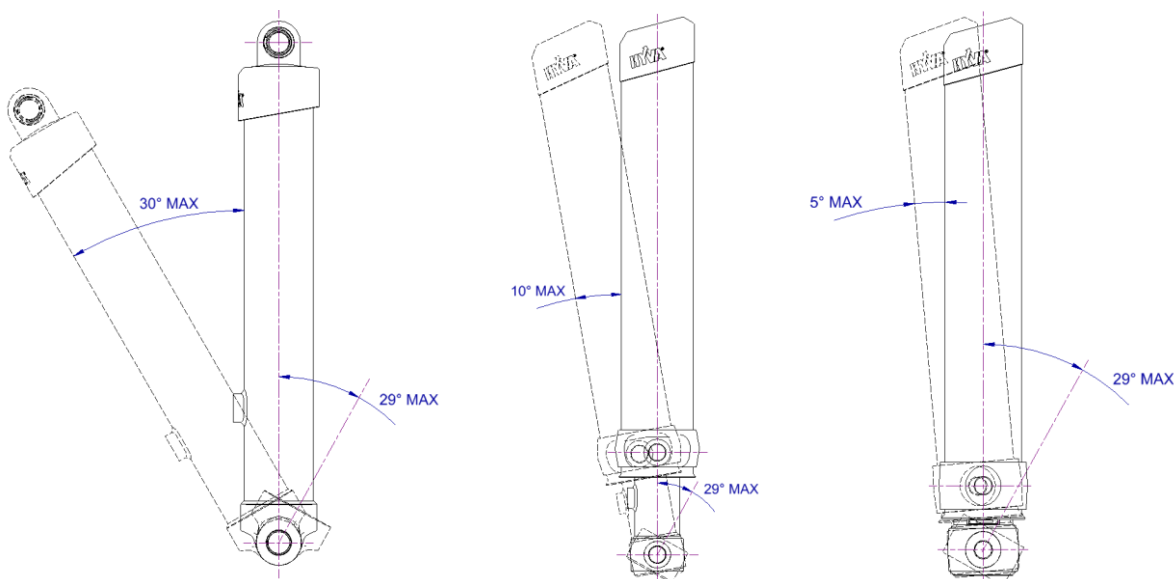
The application requirements (lifting capacity and tipping angle) of the cylinder are governed by the load capacity of the vehicle and the physical shape of the body (overhang, body-length, pivot point, etc.). The axle loading for the vehicle is governed by legal requirements in the country of use and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

Cylinder must be mounted in the exact centerline of the body. Cylinder must be mounted exactly vertical, looking to the body front.



The angle of the cylinder when mounted, the distance from articulation points and the angle of the cylinder after fully extended are critical dimensions for a good application. This limit values could vary for different cylinder types and are clearly indicated on each cylinder specification sheet.

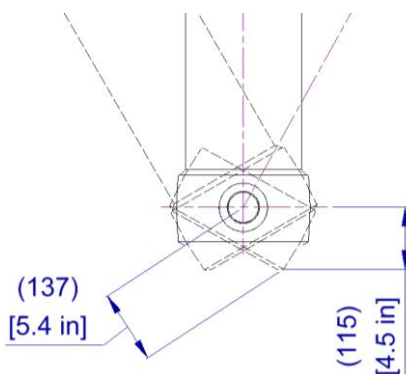
The below picture illustrates the difference of the installation angle, pay attention to the max installation angle; it varies from max 30° for some cylinder types up to 5° for others, please check cylinder specification sheet for each case.



Additional factors that may affect the mounting position:

Cab clearance – ensure enough clearance is left between the body and cab, allow for tilting of the cab, movement of the body during tipping and access to other equipment in the mounting area.

Rotation clearance – during the tipping cycle the cylinder rotates on its lower pivot point, ensure there is enough clearance around the lower part of the cylinder body, cab and gearbox. All cylinder specification sheets indicate these dimensions as on example picture below.



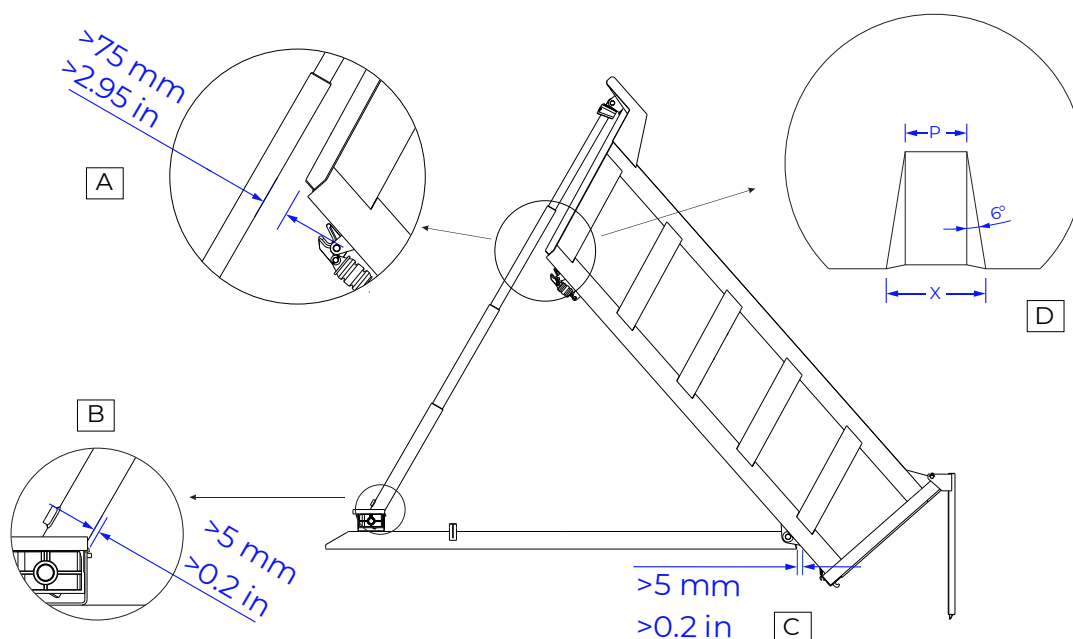
End of stroke clearance

- Check if there is at least 75 mm [2.9 in] clearance between the front of the body and the stages of the cylinder at the end of stroke.
- We also recommend to keep at least 5 mm [0.2 in] clearance between cylinder and cradle or cross members.
- Same minimum clearance should be considered for the end of chassis in relation to the body.
- To avoid scratches on the stages due to collision between body and cylinder, make sure to create some clearance on the body, often called doghouse. On the top right corner of the picture below you can see suggested dimensions where:

P = outer diameter of the second last stage + 150 mm [5.9 in]

$X = P + (0.21 \times K)$

K = Cylinder closed length (see cylinder specification sheet)



MOUNTING INSTRUCTIONS

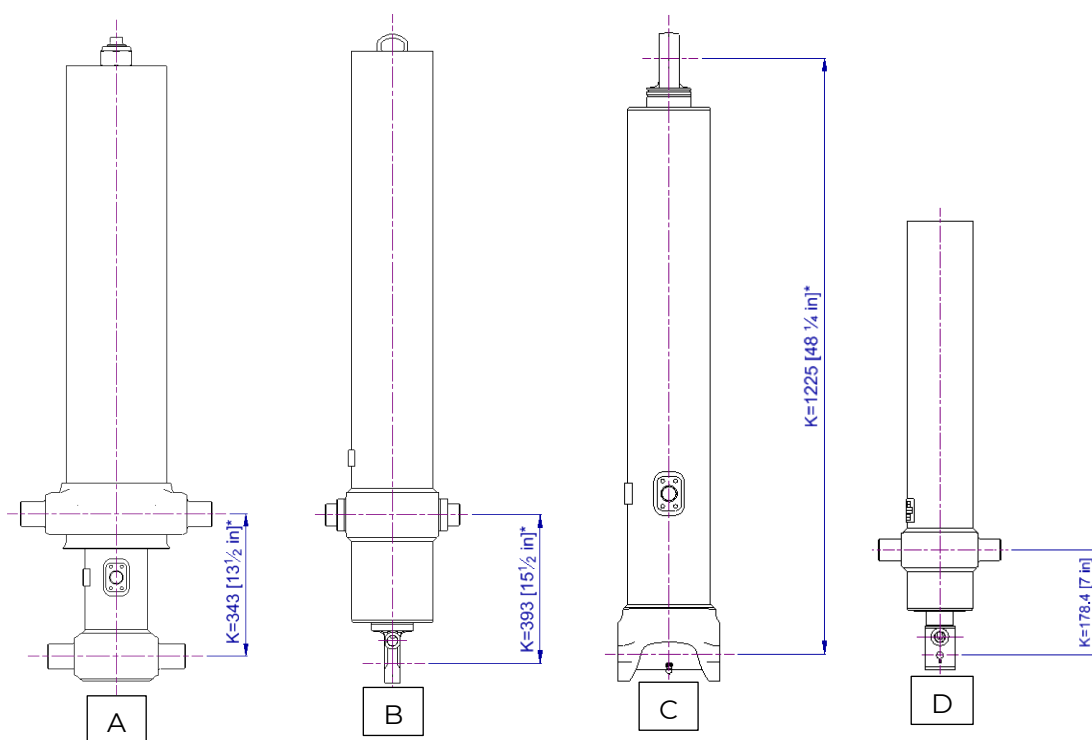
ALPHA CYLINDERS

Maintenance access – remember to allow space for the use of tools, connection of hoses and so on during fitting and service.

Caution!

The cylinder should be mounted with a minimum pull out of 15 mm [0.6 in] and a maximum pull out of 50 mm [1.97 in].

Note: the closed length of the cylinder on the Hyva specification sheet already includes 20 mm [0.79 in] pull out.



For example, the FC cylinder on this picture has a build in dimension of 343 mm or 13.5 in. When mounted on the truck this dimension should be between 338 and 373 mm [13.31 in and 14.69 in]. Same rule applies for all Hyva front end cylinders, each one with its own closed length (see specification sheet).

Pos	Metric (mm)			Imperial (in)		
	Nominal	Min	Max	Nominal	Min	Max
A	343	338	373	13.50	13.31	14.69
B	393	388	423	15.47	15.28	16.65
C	1225	1220	1255	48.23	48.03	49.41
D	178	173	208	7	6.81	8.18

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

The non-observance of the recommended installation dimensions could generate problems and may cause warranty loss.

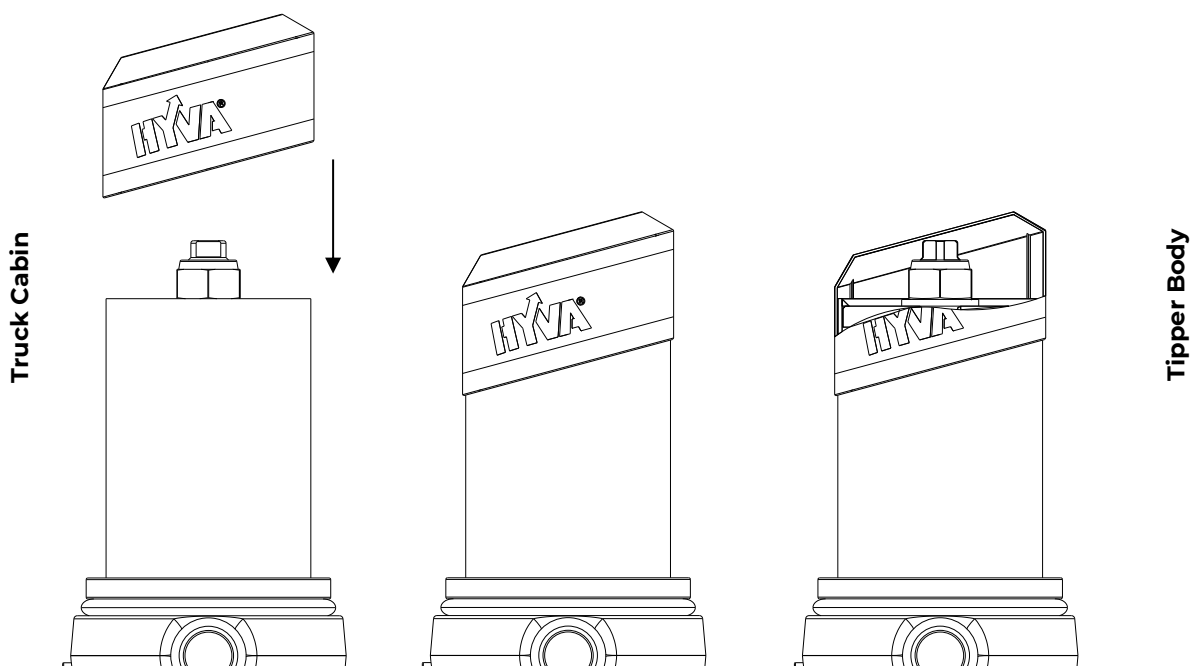
2.3 Mounting dust cover

Cylinders are delivered with dust cover or dust ring depending on the cylinder type. when the dustcover will interfere with the body it may not be mounted, the below pictures intend to instruct how to mount this part on the cylinder.

2.3.1 FC, FCE and EF cylinders

Align the dust cover with the lowest side pointed to the front of the cylinder.

Slide the dust cover down equally over the cover tube till the internal ribs hit the top of the tube.



2.3.2 FE, FEE and FSE cylinders

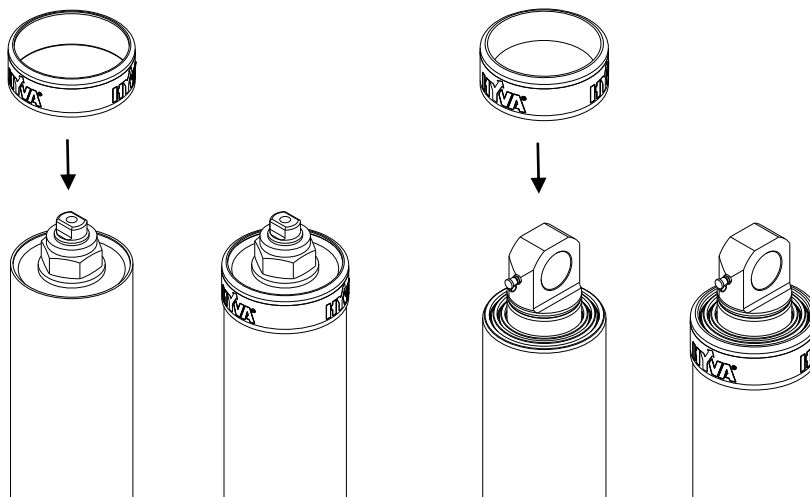
Presses both flaps down and mount the dust cover on the eye with the arrow pointing to the front side of the cylinder.

First guide the front flap into the groove then push the dust cover back to drive second flap into place.



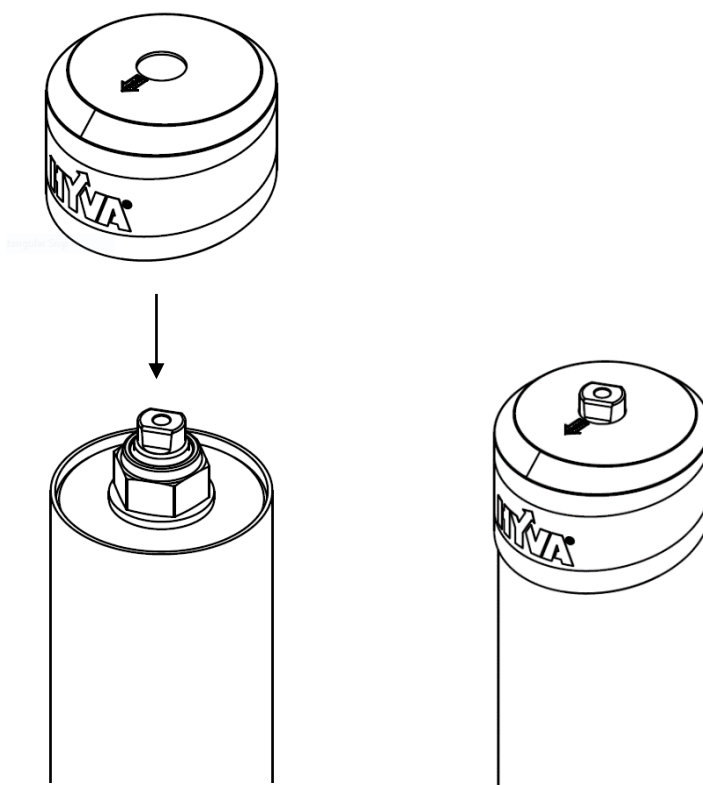
2.3.3 Cylinders with dust ring

Some cylinders have a different eye type, inlet or extended piston that makes it impossible to mount the standard dust cover. For these cylinders Hyva has designed a dust ring, to mount this part you just have to slide it down around the base tube or cover.



2.3.4 Double acting cylinders

For DA and 1DA FC cylinders, a different dust cover is designed. To mount this part, you just have to slide it down around the cover. Make sure the lowest part of the dustcover is to the frontside of the cylinder and truck.



2.4 Attaching the cylinder to the chassis

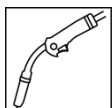
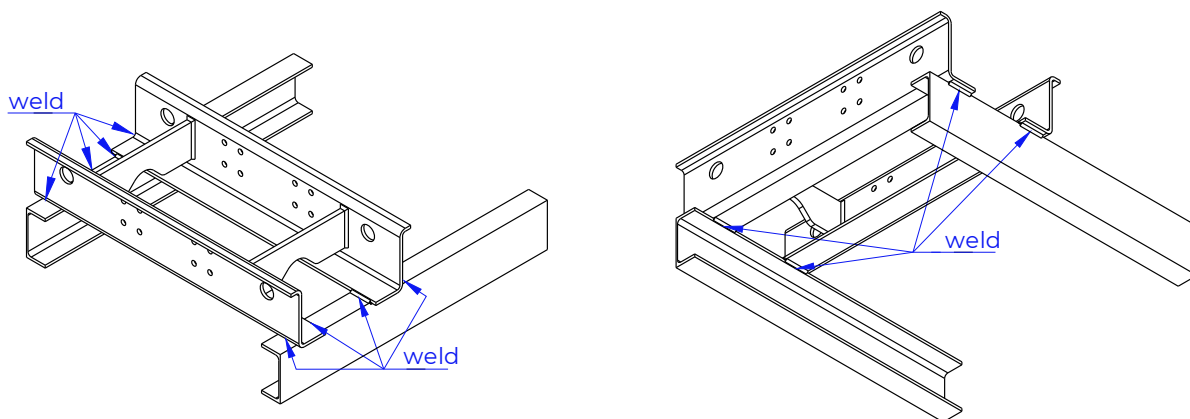
2.4.1 Trunnion mount [FC and FE type]

Cylinder such as FC and FE have trunnion pins on the base, the installation and connection with the truck chassis is normally made using chassis brackets and cradles. Hyva has a full range of chassis brackets. The correct reference to the brackets can be found on the specification sheet of each cylinder (015BRA...).

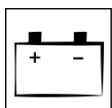
2.4.1.1. Mounting the cradle on a subframe

In some cases it will be necessary to mount a cradle on the subframe, for this kind of installation some aspects must be observed to guarantee a correct mounting. Remember to always follow the instructions from the truck manufacturers

The cradle must be either bolted or welded to the subframe in a rigid way.

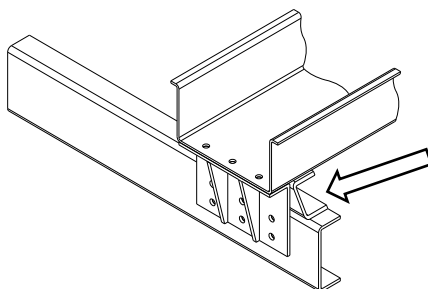


Fully weld the cradle to the subframe with a minimum a6 weld size and a wire with at least 350 MPa.



Caution! Disconnect the battery leads before welding

It is possible that the cradle will have interference with the truck gearbox. In that case we recommend using a (UPN) profile underneath the cradle to set it to the proper height, remember to follow the truck manufacturer recommendation for subframe profiles.

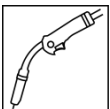
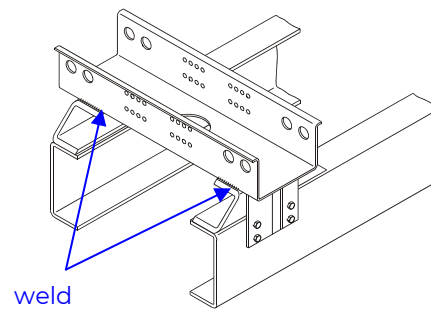
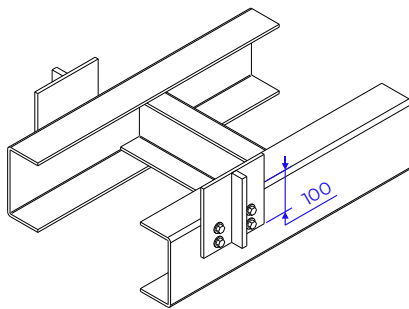


- Channel must be angled with rounded edges to minimize stress on the chassis.
- Fabricate the attachment plates to run down to the chassis from the underside of the cradle.

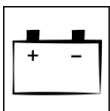
MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

- The brackets must run the full width of the cradle and at least 100 mm on the depth of the chassis.
- Where the attachment plate interferes with parts on the chassis (such as a suspension bracket), the plate may be cut to fit. Follow the shape of the bracket as closely as possible using rounded corners.
- Refer to the truck manufacturer's guide before moving any vehicle components. It may be possible to reposition the parts on the chassis or fit the plate behind.
- If the chassis is formed at the fixing points, the attachment plates may be formed to suit. If necessary the plates can be cut and welded at the required angle with the stiffener rib over the weld.
- Bolt the attachment plates to the chassis. Use a minimum of four M16x1.5 or six M14x1.5 bolts with quality 8.8 per plate. We recommend to use bolts with thread pitch 1.5 to reduce the risk of the bolt coming loose. Use the existing holes wherever possible according truck guidelines.

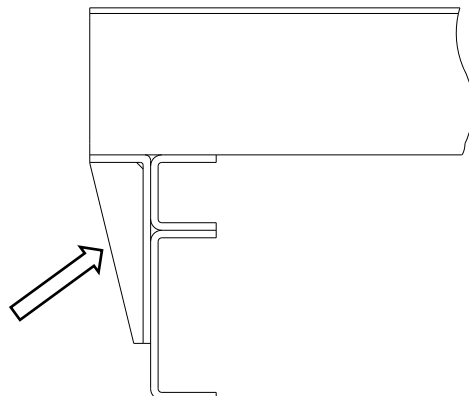
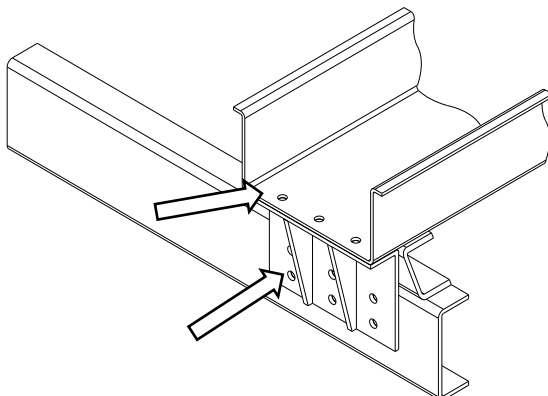


Fully weld the cradle to the subframe with a minimum a6 weld size and a wire with at least 350 MPa.



Caution! Disconnect the battery leads before welding

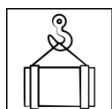
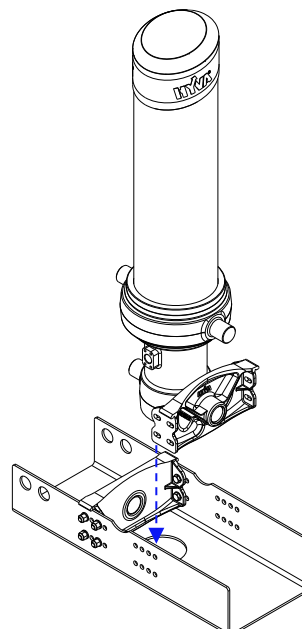
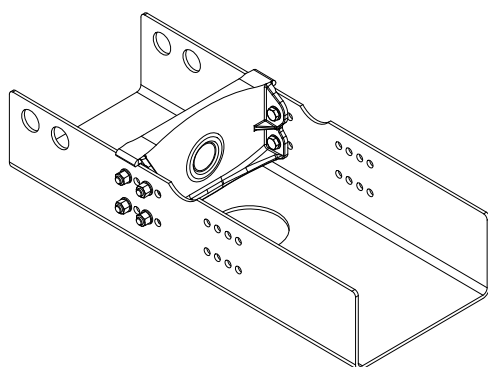
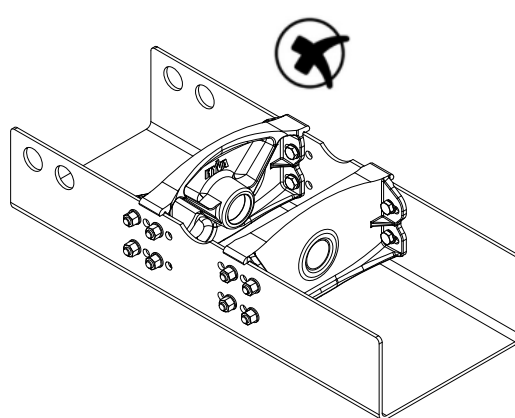
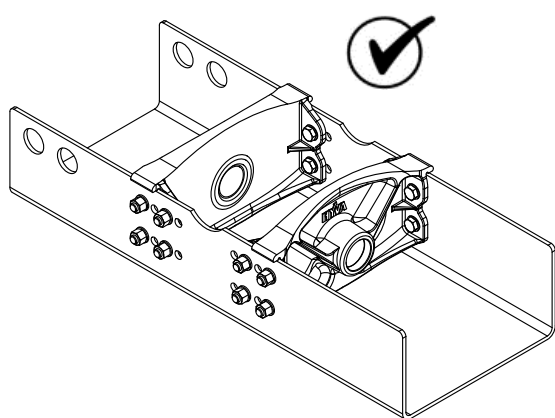
If the cradle needs to be removable, we recommend the cradle be fixed as shown below picture. Use at least four M16x1.5 or six M14x1.5 bolts for mounting to the chassis at each side. Use at least three M16x1.5 or four M14x1.5 bolts for mounting the cradle to the attachment plates. Reinforce the attachment plates to withstand the loads. In case in doubt please contact your nearest Hyva Service Partner.



Mounting the chassis brackets and cylinder into the cradle

Use the pre-drilled holes in the cradle to mount the chassis brackets. Position one of the chassis brackets and hand tight bolts, washers and self-locking nuts. Carefully lift the cylinder to move it to its final position, before lowering it inside the cradle, remove protection caps and apply grease on the pins to prevent corrosion. After greasing the pins, the cylinder can be lowered and placed in the first mounted chassis bracket.

Make sure chassis brackets are not mounted inside out, the correct mounting position is shown on the picture below. Brackets shouldn't be mounted with interference and must have a sliding fit inside the cradle.



Lift the cylinder carefully; make sure to use proper lifting devices. When lifting an FC or FCE remember to put the rope around cover and base. Keep the oil plug mounted tight on the oil inlet during the lifting process; this helps to prevent stages from opening.

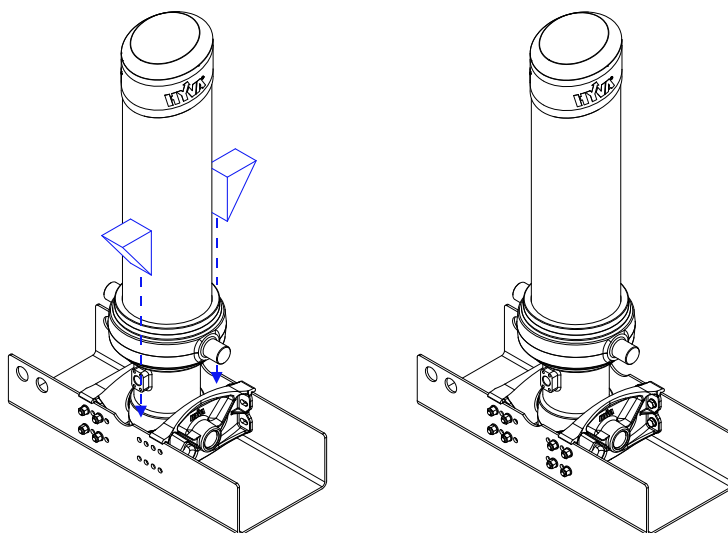


Apply grease on the cylinder pins before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.

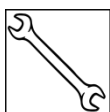
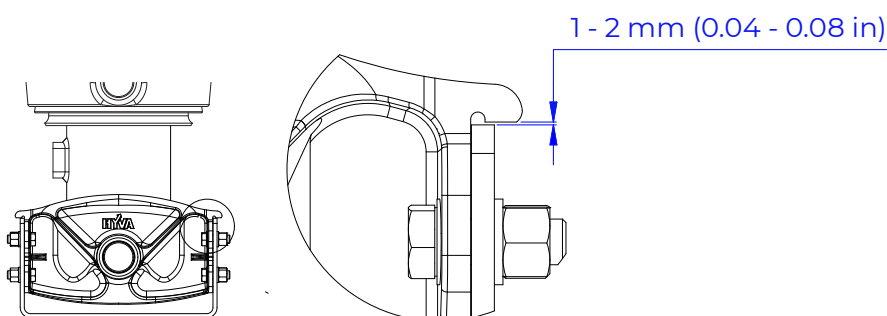
MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

Wooden blocks can be placed between cylinder and cradle to avoid cylinder from rotate. The second chassis bracket can now be mounted into place; bolts, washers and self-locking nuts must be hand tight on this step.

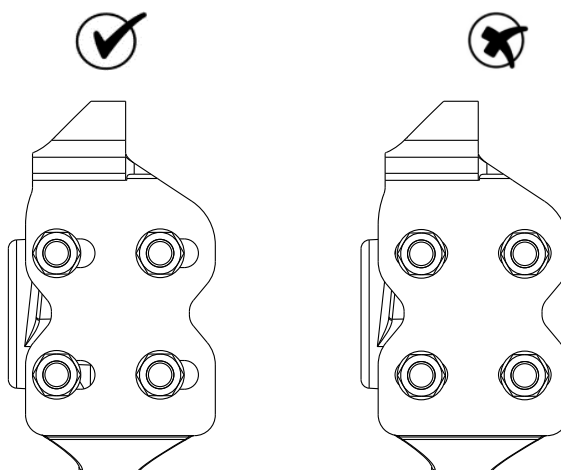


Make sure chassis brackets are supported by the bolts and not by the cradle, a gap should be maintained between 1 and 2 mm [0.04 – 0.08 in] as indicated on the picture bellow.

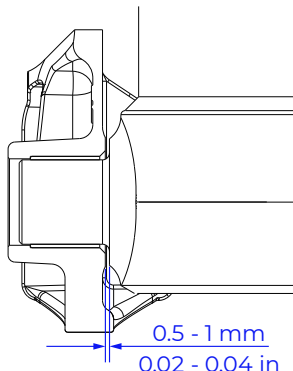


Make sure to apply the correct torque to the bolts. Correct torque for each bolt size is available on TABLE 1 at page 29.

Always place the bolts on the far end of the slotted holes, never at the center.



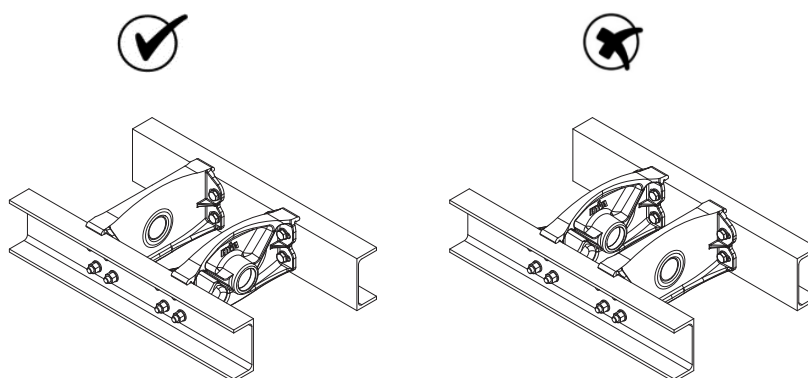
It is also very important to respect the recommended gap between cylinder trunnion and chassis brackets, this gap is to ensure cylinder will rotate free from friction caused by the contact between the trunnion and the chassis brackets.



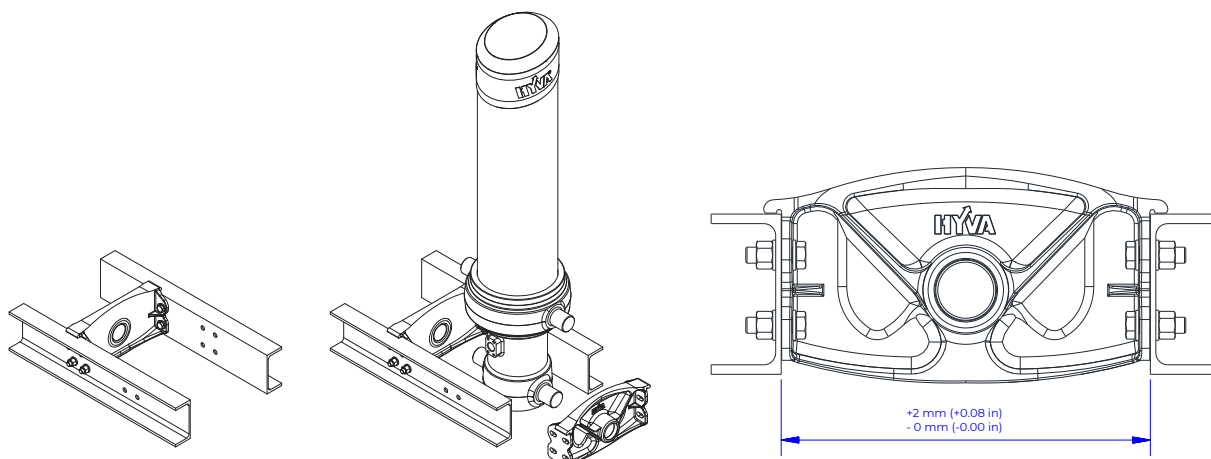
2.4.1.2. Mounting the chassis bracket and cylinder on cross members

In some installations the chassis brackets could be directly bolted on cross subframe. It is important to ensure that the cross members have a sufficient cross section to withstand the cylinder load. Please check the truck manufacturer bodybuilders guide and the tables on chapter 5.2.2 for recommended cross member profiles and dimensions.

Make sure chassis brackets are not mounted inside out, the correct mounting position is shown on the picture below. Brackets must have a sliding fit between the cross members.

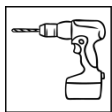


Drill holes on the cross members, hole pattern is available on bracket specifications sheets that are mentioned on the cylinder specifications sheets. Distance between cross members should consider a tolerance of +2 -0 mm in relation to chassis bracket length.

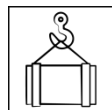


MOUNTING INSTRUCTIONS

ALPHA CYLINDERS



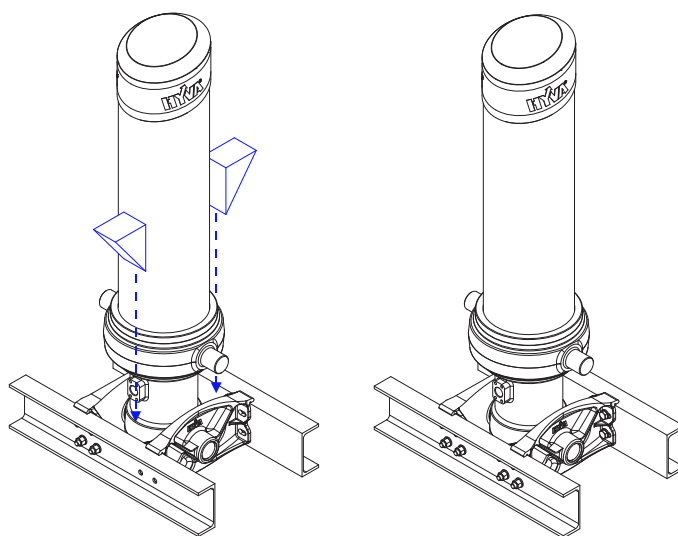
Hole pattern is available on bracket specification sheets that are mentioned on the cylinders specification sheet.



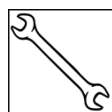
Lift the cylinder carefully; make sure to use proper lifting devices. When lifting an FC or FCE remember to put the rope around cover and base. Keep the oil plug mounted tight on the oil inlet during the lifting process; this helps to prevent stages from opening.



Apply grease on the cylinder pins before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.

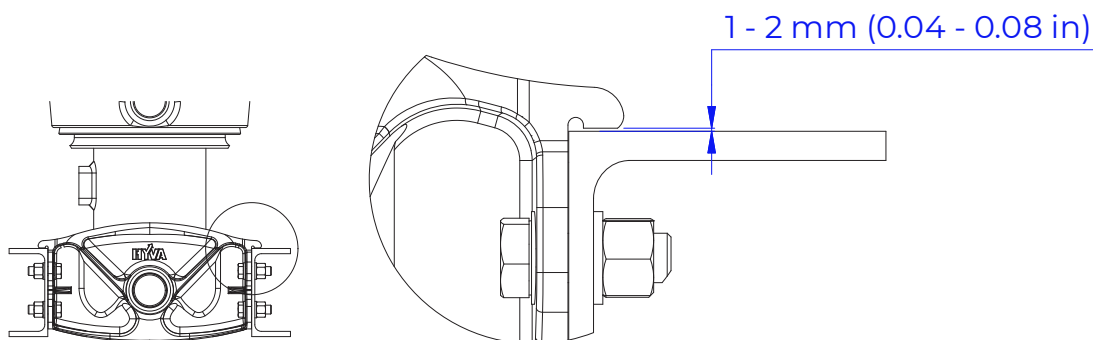


Wooden blocks can be placed between cylinder and cross members to avoid cylinder from rotate. The second chassis bracket can now be mounted into place; bolts, washers and self-locking nuts must be hand tight on this step.

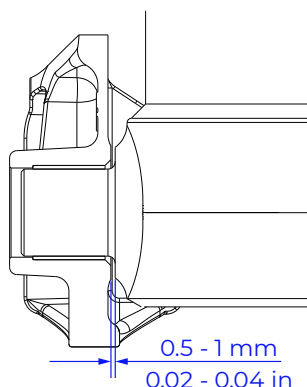


Make sure to apply the correct torque to the bolts. Correct torque for each bolt size is available on TABLE 1 at page 29.

Make sure chassis brackets are supported by the bolts and not by the cradle, we recommend a gap should be maintained between 1 and 2 mm [0.04 – 0.08 in] as indicated on the picture bellow.



It is also very important to respect the recommended gap between cylinder trunnion and chassis brackets, this gap is to ensure cylinder will rotate free from friction caused by the contact between the trunnion and the chassis brackets.

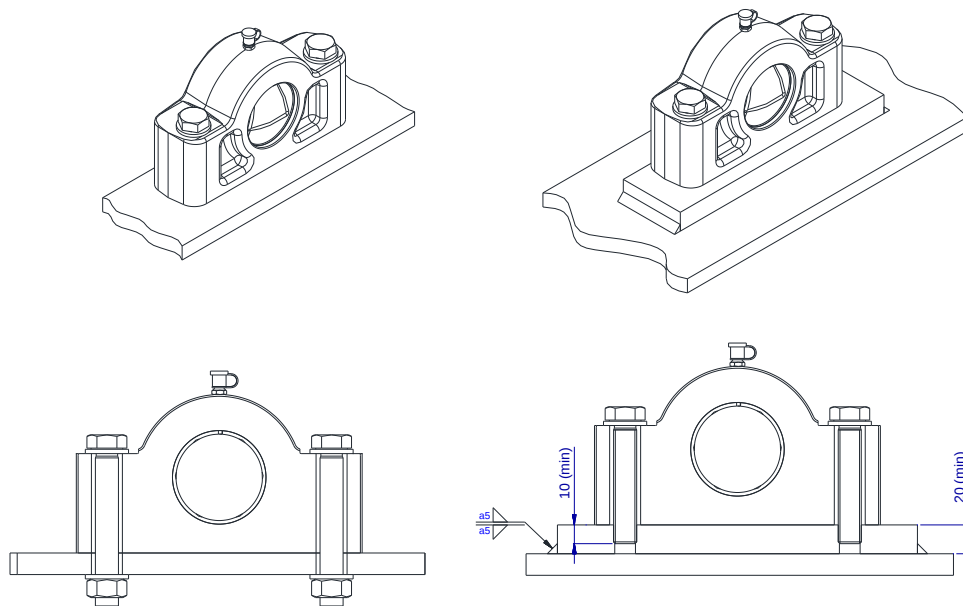


2.4.1.3. Foot mount chassis brackets

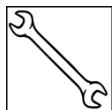
Foot mount chassis brackets can be installed in two ways, they can either be bolted or screwed. If the option of choice is the bolted installation, follow the advised cross members sizes indicated on chapter 5.2.2 – Cross member profiles.

If the option of choice is for a screwed installation, we recommend to use a 20 mm thick mounting plate, select a material with at least 355 MPa of yield strength and weld it on at least 2 opposite sides. Ensure at least 10 mm of thread connection between the screw and the thread on the mounting plate.

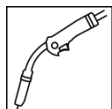
As illustrated on chapter 2.4.1.2, same clearance of 0.5 - 1 mm [0.02 – 0.04 in] between trunnion and bracket should be considered.



Screws and bolts should be size M16x1.5, class 8.8 or higher.



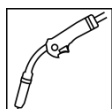
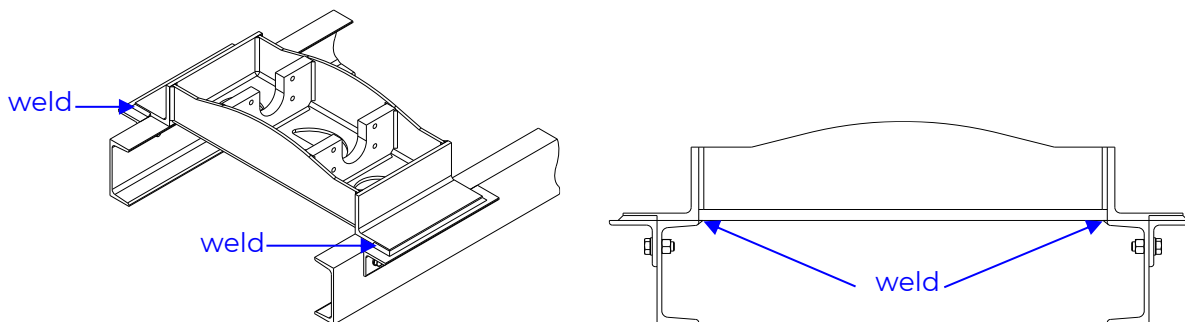
Make sure to apply the correct torque to the bolts. Correct torque for each bolt size is available on TABLE 1 at page 29.



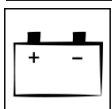
Weld with an a5 weld size and a wire with at least 350 MPa.

2.4.2 Eye trunnion mount [FEE and FCE type]

The FEE and FCE cylinder is usually connected to the cradle through a solid pin. When using the Hyva cradle, the cradle should be welded to the subframe full around.



Fully weld cradle to the chassis with an a5 weld size and a wire with at least 350 MPa.

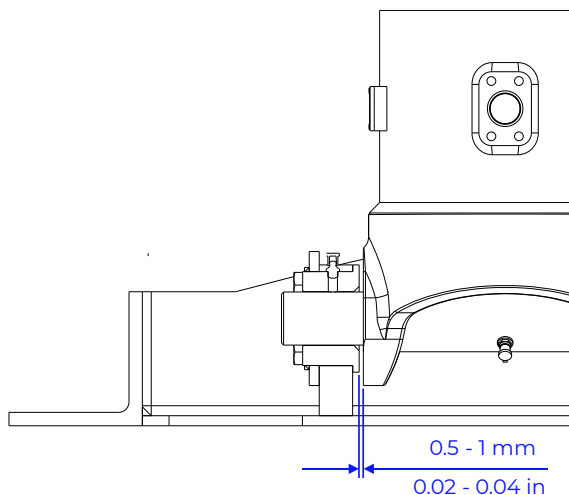


Caution! Disconnect the battery leads before welding

When designing or selecting cradles make sure the cylinder will be able to rotate freely and therefore some dimensions must be considered. Each cylinder has a specific specification sheet; please refer to each one individually in order to get the information that you need. The picture below illustrates an example of a specific FEE cylinder.



We recommend keeping a side clearance between base trunnion and mountings to ensure no friction will interfere during the tipping cycle. A gap between 0.5 and 1 mm on each side is recommended.

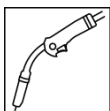
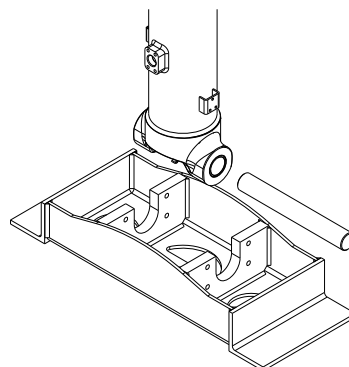
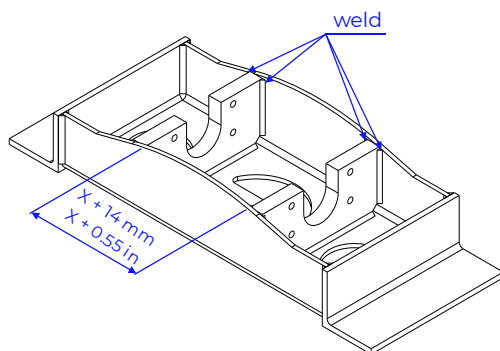


MOUNTING INSTRUCTIONS

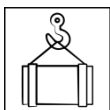
ALPHA CYLINDERS

To design the pin please take into account dimensions indicated on the specification sheet. We recommend the pin diameter to be equal to the inner diameter of the trunnion bush with a tolerance $h9 +0 -0.074 \text{ mm}$ [$+0 -0.029 \text{ in}$]. The **maximum gap allowed** between trunnion bush inner diameter and pin is 2 mm [$1/13 \text{ in}$]. More information for the pin is available on the file 015PIN01.

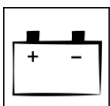
Based on the width of the trunnion (dimension X in below picture) which is mentioned on the cylinder specification sheet. Weld the bracket plates on the cradle with an a5 size welding. After the cradle is installed on the truck chassis, carefully lift the cylinder, grease the pin and mount it on the eye trunnion bush.



Fully weld bracket plates (all seams, inside and outside) to the cradle with an a5 weld size and a wire with at least 350 MPa.



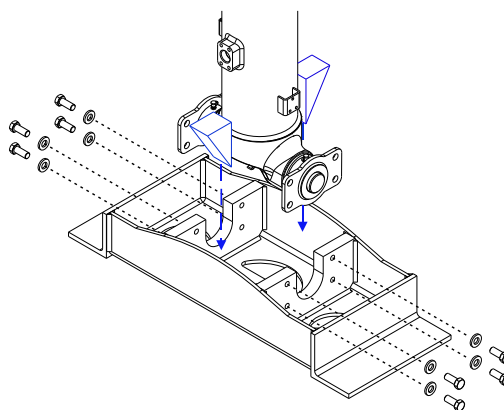
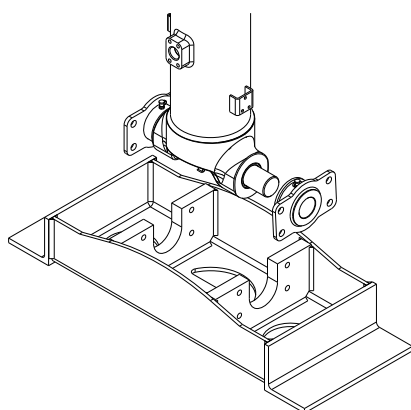
Lift the cylinder carefully; make sure to use proper lifting devices. Keep the oil plug mounted tight on the oil inlet during the lifting process; this helps to prevent stages from opening.



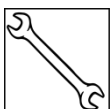
Caution! Disconnect the battery leads before welding



Apply grease on the pin before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.



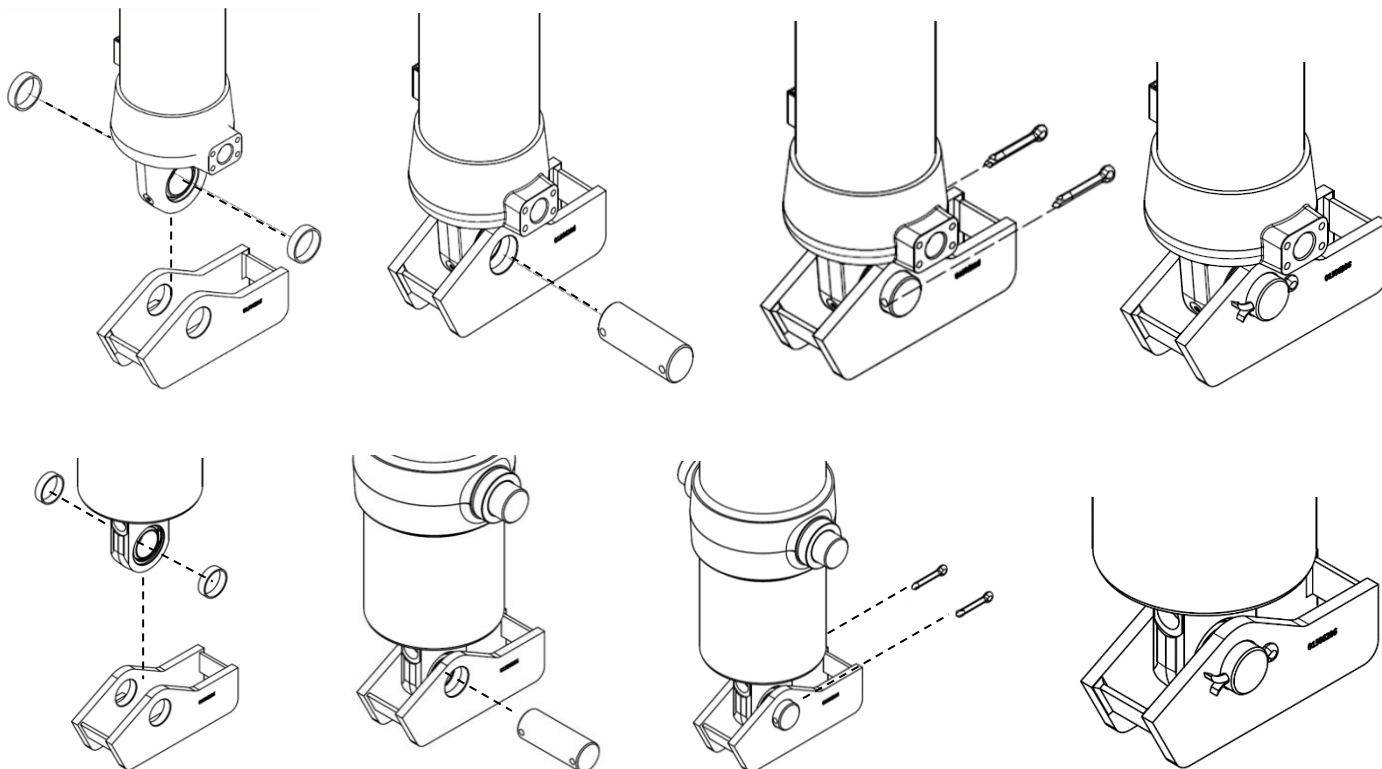
Mount the chassis bracket on the pin and place in the cradle, mount the bolts and washers. Wooden blocks can be placed between cylinder and cradle to avoid cylinder from rotation. Pin must be secured in the brackets to prevent axial movement and rotation. The cylinder must rotate, not pin itself.



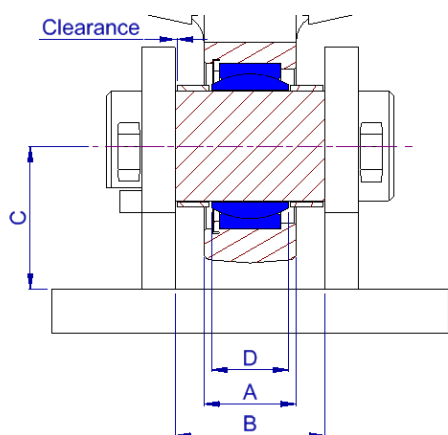
Make sure to apply the correct torque to the bolts. Correct torque for each bolt size is available on TABLE 1 at page 29.

2.4.3 Spherical eye mount [FSE, USE and EF type]

Inside our range of cylinder, two types of cylinders have spherical bearing at the bottom, the FSE and the EF. The spherical bearing could be either greased or maintenance free. Bearing function is to avoid the cylinder to receive any external forces caused by misalignments, uneven loading, side winds acting on the body, etc.



- The bracket construction must have a minimum space required to avoid interferences.
- Bracket and filler rings must be designed respecting the following dimensions.

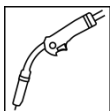


Unit	A	B	C	D	Clearance
mm	42	min 68	min 65	35	0.5 - 1
	52	min 75	min 75	44	0.5 - 1
	79	min 100	min 110	70	0.5 - 1
in	1.65	min 2.68	min 2.56	1.38	0.02 - 0.04
	2.05	min 2.95	min 2.95	1.73	0.02 - 0.04
	3.11	min 3.94	min 4.33	2.76	0.02 - 0.04

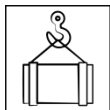
TIP:

Bearing, lifting and chassis brackets which are maintenance free do not need regular greasing to work, however we recommend to grease it at least once a year to prevent corrosion.

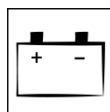
Same remarks apply for both cylinder types. Carefully lift cylinder using a proper lifting device, place the cylinder on the cradle together with the spacer rings. Apply grease on the pin to prevent corrosion and after that mount the pin on the cylinder. Pin must be locked to avoid it from rotate or move sideways (standard on Hyva brackets implemented in the design).



Fully weld the bracket to a cross member with a5 weld size and a wire with at least 350 MPa.



Lift the cylinder carefully; make sure to use proper lifting devices. Keep the oil plug mounted tight on the oil inlet during the lifting process; this helps to prevent stages from opening.



Caution! Disconnect the battery leads before welding



Apply grease on the pin before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.

2.5 Attaching the cylinder to the body

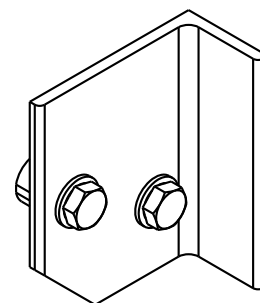
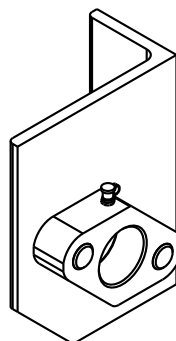
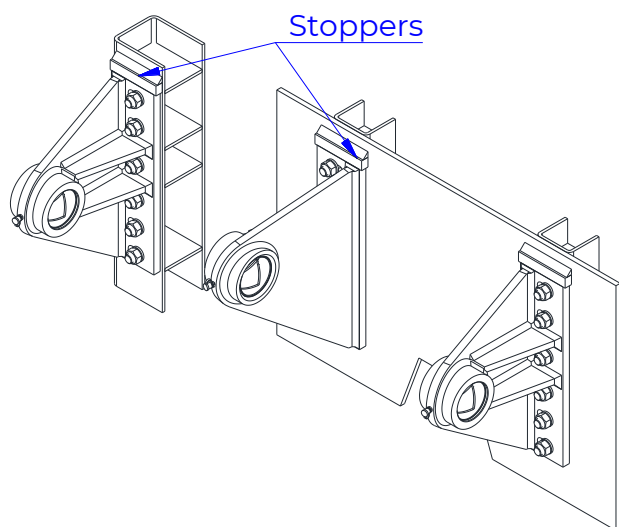
2.5.1 Trunnion mount [FC, FCE and EF type]

The connection of FC or FCE cylinders and the body is done through the cover trunnion and lifting brackets. The EF type is connected to the body through the base trunnion and lifting brackets.

Lifting brackets should be bolted on a rigid structure, that can be a cross member or a flat reinforced plate. The structure must be sturdy enough to withstand the loads without excessive deformation, otherwise it can result in the cylinder coming out of the lifting brackets.

Stoppers should be used on applications where the maximum cylinder load exceeds 245 kN [55 klbs].

Be aware lifting brackets have a correct mounting position.

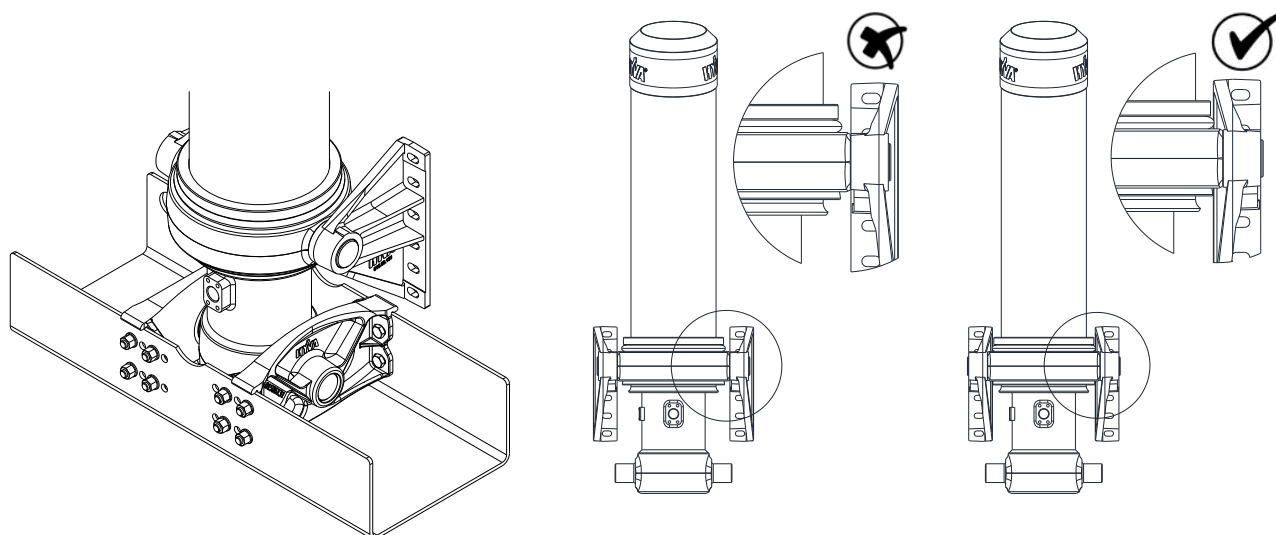


MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

Bolts and torque vary according to the type of lifting bracket that must be chosen considering the trunnion pins diameter and cylinder lifting capacity. For the correct torque see fastener table in chapter 3. Hyva has a complete range of lifting brackets, specified on the cylinder specification sheets.

Bracket specification sheet contains the relevant information that you need to select the correct lifting bracket for your cylinder and application, details of the hole pattern are also available on this specification sheets. If you still have any doubts on the selection of the lifting brackets please contact your nearest Hyva Service Partner.

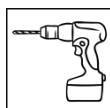
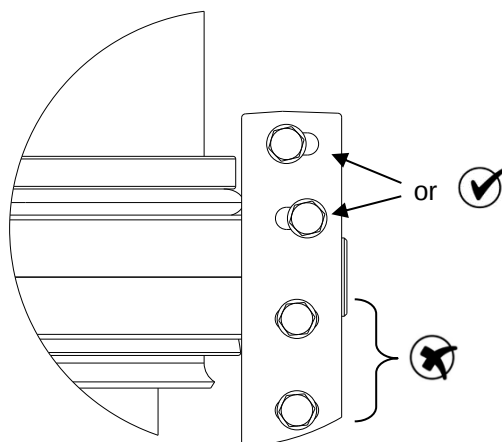
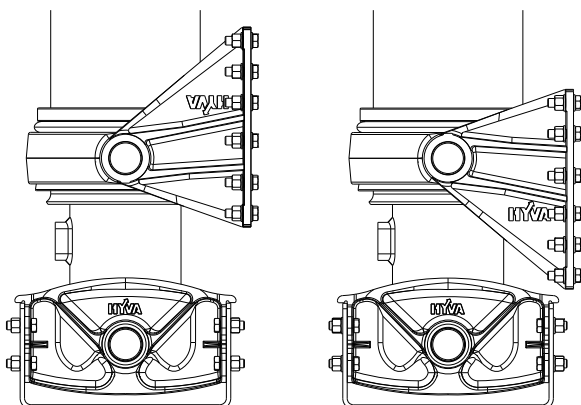


Lifting brackets have a correct position to be mounted, if mounted upside down the cylinder load should never exceed 245 kN [55 klbs].

Bolts must be placed on the far end of the slotted holes but never on the center as on the picture bellow.

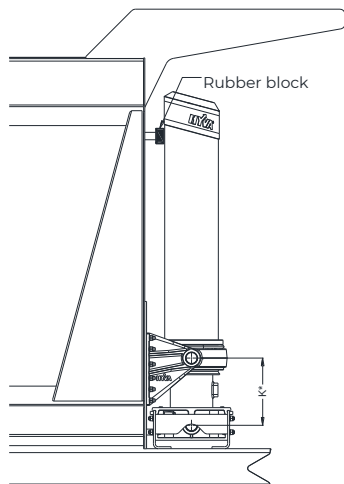


Max cyl load 245 kN
Max cyl load 55 klbs

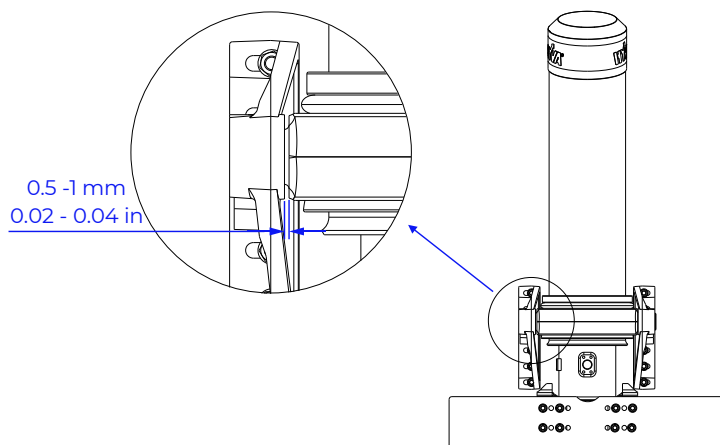


Hole pattern is available on bracket specification sheets that are mentioned on the cylinders specification sheet.

When a cylinder with cover is mounted vertically, it is advised to use a rubber block between the body and the cover to reduce rattling/movement of the cover. See RUB-0001 for more details.

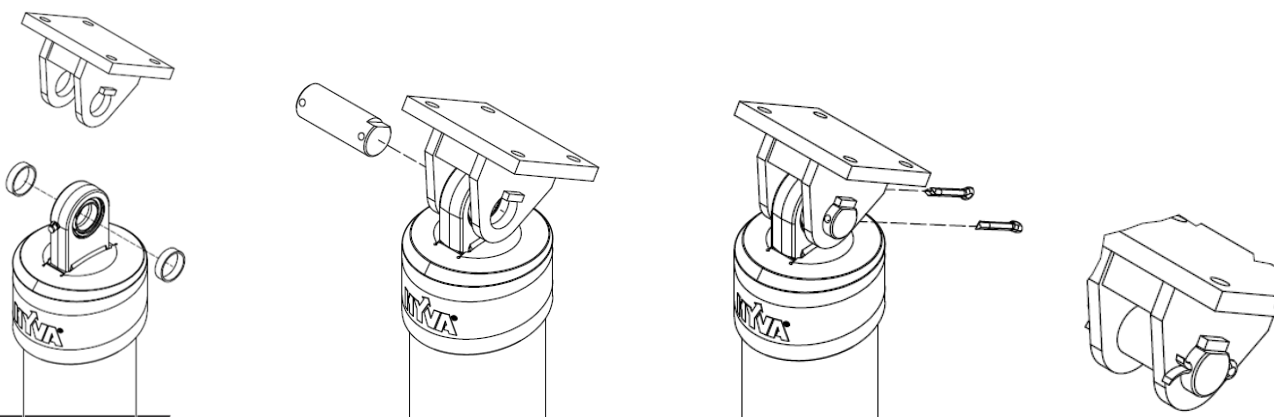


It is important to respect the recommended gap between cover trunnion and lifting brackets, this gap is to ensure cylinder will rotate free from friction caused by the contact between the cover trunnion and the lifting brackets.



2.5.2 Spherical eye mount [FE, FEE and FSE type]

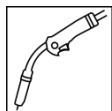
Hyva cylinders with eye mounting have as standard a spherical bearing that could be either greased or maintenance free. Its main function is to avoid the cylinder to receive any external forces caused by misalignments, uneven loading, side winds, etc.



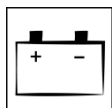
MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

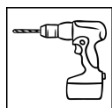
Bracket options are mentioned on the cylinder specification sheet. The bracket can be welded (fully weld with a5) or bolted to the body. Use the bracket specification sheet for the hole pattern.



Fully weld the bracket to the body with a5 weld size and a wire with at least 350 MPa.



Caution! Disconnect the battery leads before welding



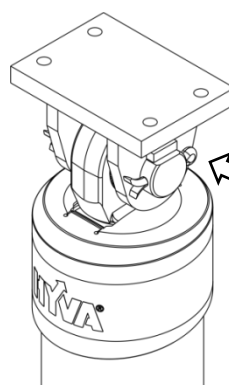
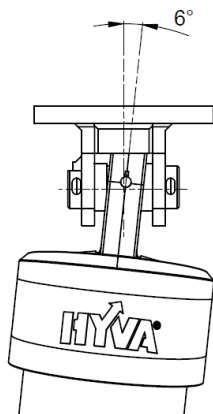
Hole pattern is available on bracket specification sheets that are mentioned on the cylinder specification sheet.



Apply grease on the pin before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.

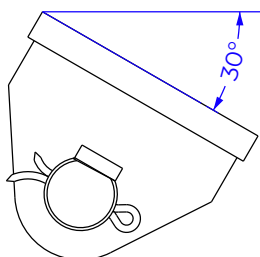
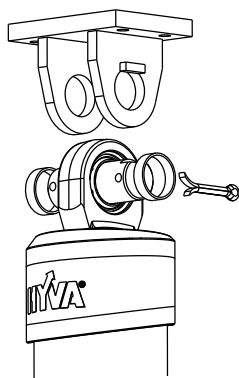
To ensure everything works correctly some dimensions and conditions must be followed.

- Eyes with spherical bearing must be mounted with filler rings at both sides; this will allow a rotation of max 6° to each side.



The pin should be locked to not rotate or move sideways.

- When using a Hyva top bracket we recommend to not exceeding a maximum of 30 degrees. When exceeding this angle of the top bracket, make sure your design is capable of withstand the load and it has enough play for the needed cylinder movement.

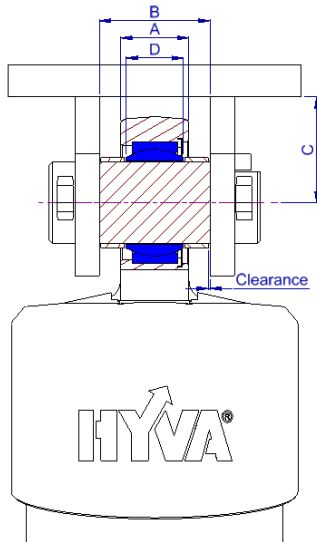


- The top bracket construction must have a minimum space required to avoid interferences.

MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

- Top bracket and filler rings must be designed respecting the following dimensions.



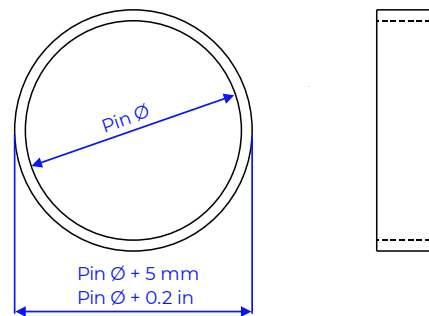
Unit	A	B	C	D	Clearance
mm	42	min 68	min 65	35	0.5 - 1
	52	min 75	min 75	44	0.5 - 1
in	1.65	min 2.68	min 2.56	1.38	0.02 - 0.04
	2.05	min 2.95	min 2.95	1.73	0.02 - 0.04

TIP:

Bearing, lifting and chassis brackets which are maintenance free do not need regular greasing to work, however we recommend to grease it at least once a year to prevent corrosion.

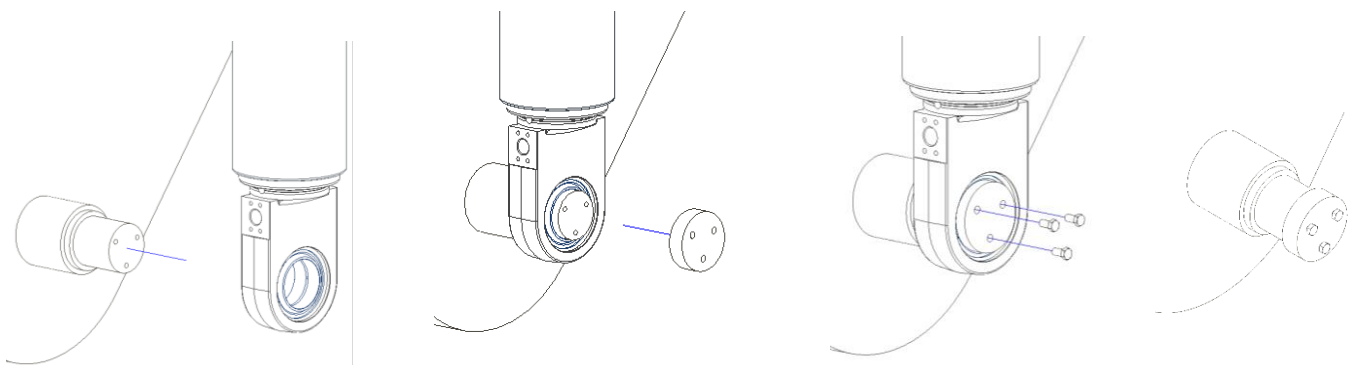
Filler rings dimensions:

mm		in	
ID	OD	ID	OD
- 0 + 0.2	- 0.2 + 0	- 0 + 0.01	- 0.01 + 0
Pin Ø	Pin Ø + 5	Pin Ø	Pin Ø + 0.2

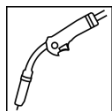


2.5.3 Spherical eye mount [USE type]

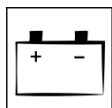
Hyva cylinders with eye mounting have as standard a spherical bearing that could be either greased or maintenance free. It's main function is to avoid the cylinder to receive any external forces caused by misalignments, uneven loading, side winds, etc.



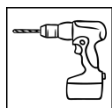
Bracket options are mentioned on the cylinder specification sheet. The bracket can be welded or bolted to the body. Use the bracket specification sheet for the hole pattern.



Fully weld the bracket to the body with a5 weld size and a wire with at least 350 MPa.



Caution! Disconnect the battery leads before welding



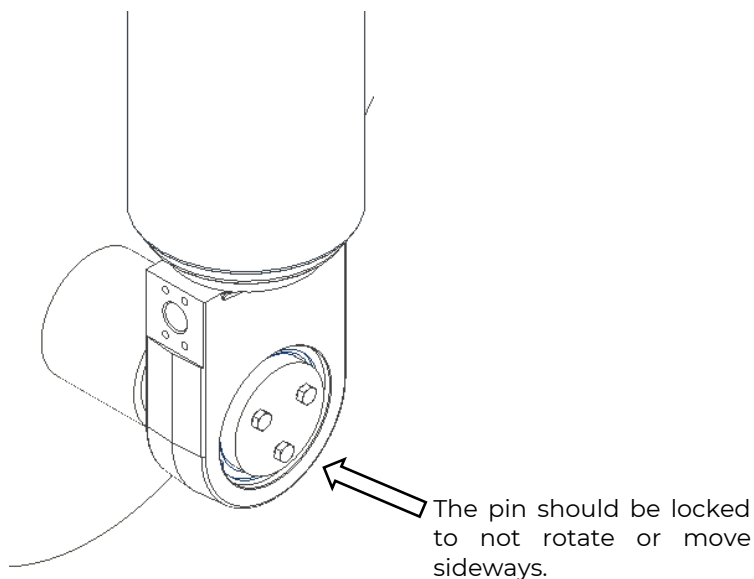
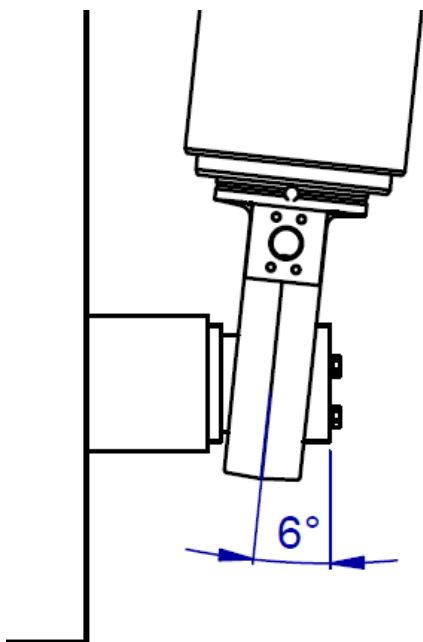
Hole pattern is available on bracket specification sheets that are mentioned on the cylinder specification sheet.



Apply grease on the pin before mounting on the chassis bracket to prevent corrosion. We recommend the use of the Hyva pack set grease, Dinitrol Paste, Molykote G-4500 or Shell Ensio.

To ensure everything works correctly some dimensions and conditions must be followed.

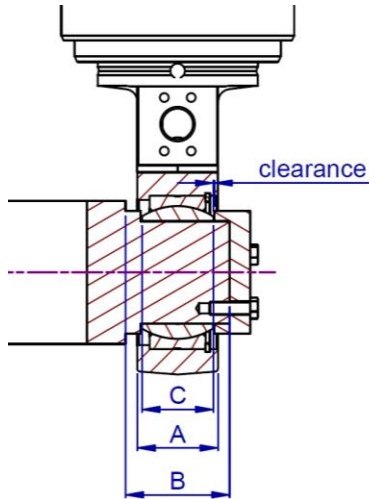
- Eyes with spherical bearing must be mounted with filler rings at both sides; this will allow a rotation of max 6° to each side.



MOUNTING INSTRUCTIONS

ALPHA CYLINDERS

- The top bracket construction must have a minimum space required to avoid interferences.
- Top bracket and filler rings can design respecting the following dimensions.



Unit	A	B	C	Clearance
mm	79	min 100	70	0.5 - 1
in	3.11	min 3.94	2.76	0.02 - 0.04

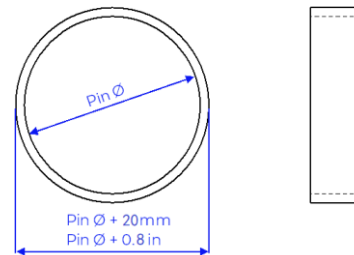
TIP:

Bearing, lifting and chassis brackets which are maintenance free do not need regular greasing to work, however we recommend to grease it at least once a year to prevent corrosion.

For greased bearing, we recommend to grease it at least every 10 days to prevent corrosion.

Special Filler rings dimensions (just for according):

mm		in	
ID	OD	ID	OD
- 0 + 0.2	- 0.2 + 0	- 0 + 0.01	- 0.01 + 0
Pin Ø	Pin Ø + 20	Pin Ø	Pin Ø + 0.8

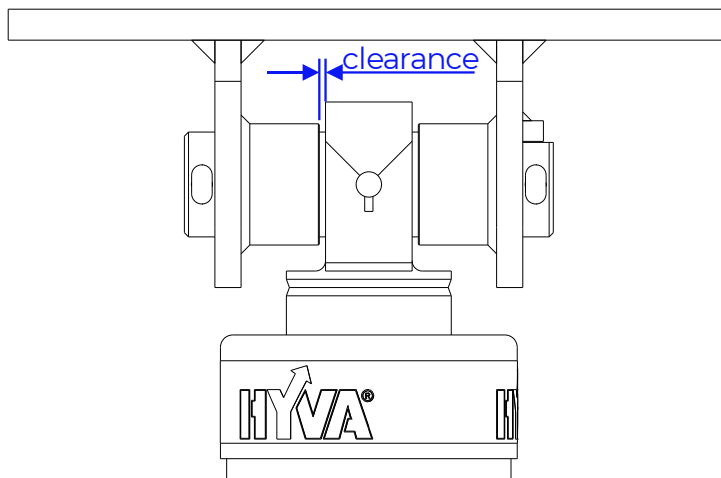


2.5.4 Eye (rigid) mount

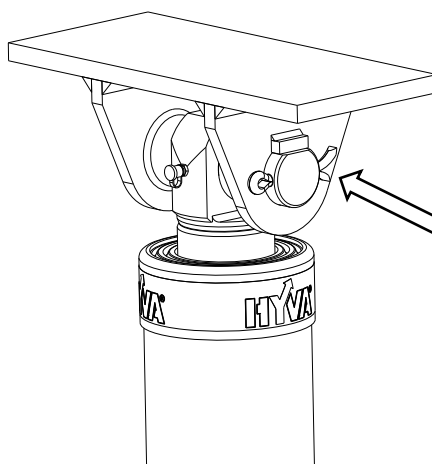
As mentioned on the previous topic, Hyva cylinders have as standard a spherical bearing on the eye. A different condition that is also available in the solid mounting that could be either a rigid bush mounted in the eye or a solid one-piece eye. A rigid mounting is slightly different, some points must be observed in order to have a correct mounting condition. This can be checked by keeping a close eye on the cylinder during extending. Point of attention are mismatching, strange sounds and the straightness of the body and truck frame and does not mean there is something wrong with the cylinder.

- As this type of mounting does not allow the cylinder to rotate to the sides, there is no need to machine spacer rings as specified on the topic 2.5.2, if convenient the outer diameter can be bigger, this will not interfere on cylinder function on this mounting condition.
- Filler rings can be used to guarantee that cylinder will remain at the center plane of the truck, reducing the gap between eye and top bracket. A side gap between 0.5 and 1 mm (0.02 and 0.04 in) is desired to guarantee that cylinder will rotate freely during the tipping cycles, without any friction on the side of the eye.

MOUNTING INSTRUCTIONS ALPHA CYLINDERS



- Make sure to keep the connection between pin and eye well lubricated to avoid corrosion and to reduce friction during the tipping cycles.



The pin should be locked to not rotate or move sideways.

3. FASTENERS AND ADAPTERS

Most of installations types require the use of bolts; the table below provides information of the most used types, the recommended class / grade and the torque that must be applied in each case.

TABLE 1

Hole diameter		Bolt		Available lengths	Min. Quality		Torque	
(mm)	(in)	Metric	Imperial	(mm)	Class	Grade	Required torque (Nm)	Required torque (lbf * ft)
Ø13	Ø 0.51	M12x1.25	7/16"-20 UNF	50	8.8	5	80	65
Ø15	Ø 0.59	M14x1.5	9/16"-18 UNF	-	8.8	5	140	105
Ø17	Ø 0.67	M16x1.5	5/8"-18 UNF	60/70	8.8	5	210	155
Ø19	Ø 0.75	M18x1.5	N/A	60/70	8.8	5	270	200
Ø21	Ø 0.83	M20x1.5	3/4"-16 UNF	80	8.8	5	400	295
Ø25	Ø 0.98	M24x2.0	N/A	80	8.8	5	700	515
-	-	M48x3.0	M48x3.0	-	8.8	5	800 min	590 min

A visual check needs to be done weekly on all the bolted joints looking for any indication of loose parts, double check torque every time you feel is need.

The following table contains the recommended torque values for the most common sizes of adapters

TABLE 2

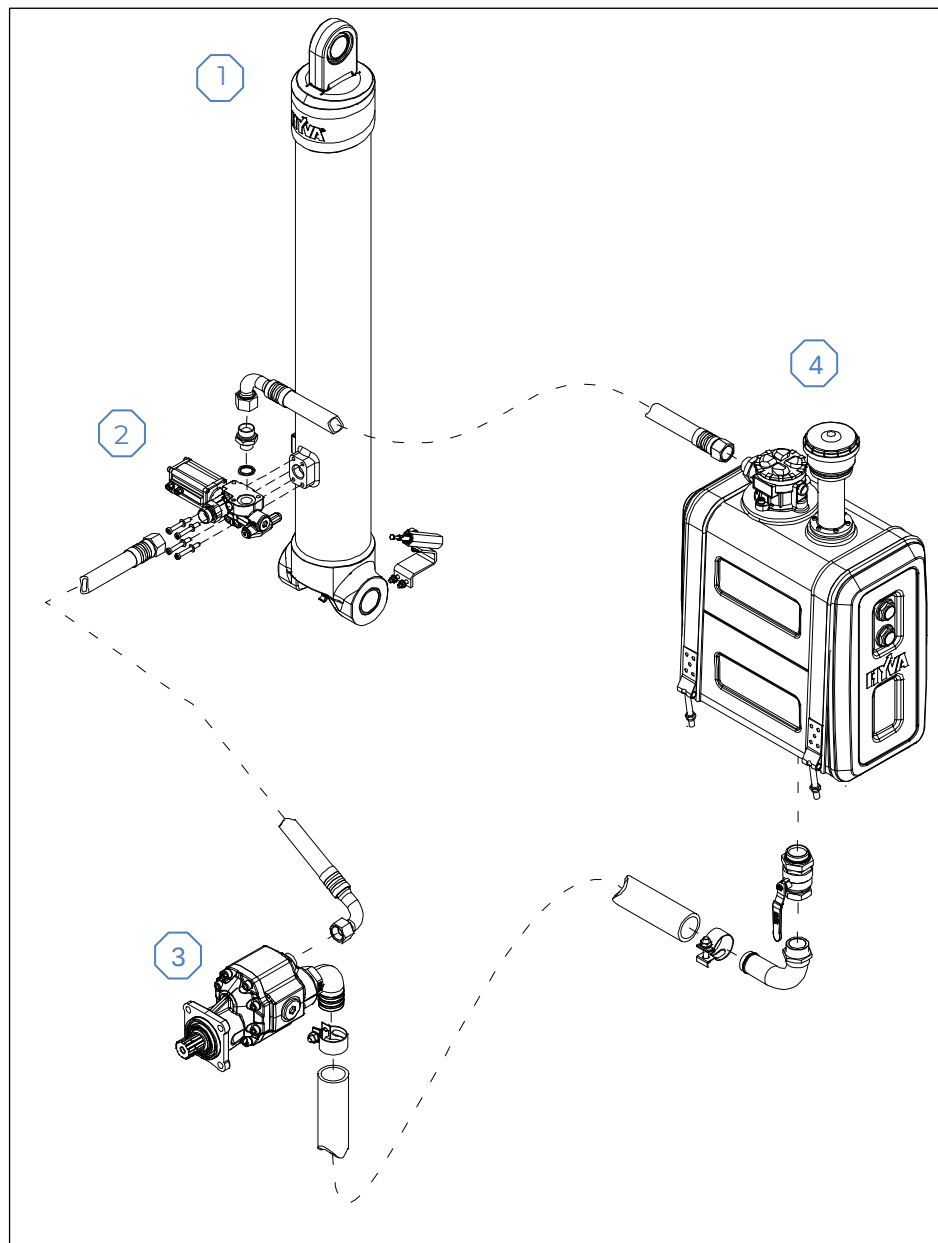
Size	Type	Torque (Nm)	Torque (lbf * ft)
3/4"	BSP	80 - 90	59 - 66
1"	BSP	120 - 130	88 - 96
3/4"	NPT *	80 - 90	59 - 66
1"	NPT *	120 - 130	88 - 96
3/4"	UN	80-90	59-66
1 - 1/16"	UN	170 - 180	125 - 133
1 - 5/16"	UN	260 - 270	192 - 199

* For NPT threads it is required to apply sealant on the thread before tightening it. The use of Loctite 567 or 570 (or equivalent) is recommended. **Do not use Teflon tape.**

4. CONNECTING THE CYLINDER

4.1 Connecting a single acting cylinder

Hyva offers a big variety of wet kits, each one is dedicated to specific cylinders and application. To connect the cylinder to the wet kit you need to remove the plug from the cylinder oil inlet and mount the adapter and hose or valve supplied with the wet kit. For illustration purpose the image below illustrate a common cylinder / wet kit connection.



1 – Cylinder
2 – Tipping valve
3 – Pump
4 – Oil tank

Example of a hydraulic system

Note:

- When removing the oil plugs some residual pressure can be trapped in the cylinder. Great care must be taken with removing the plugs to prevent injuries. Proper safety equipment should be used. Make sure this oil is caught.

4.2 Connecting a double acting cylinder

Connecting the double acting cylinder works in a similar way as a single acting. Remove the plugs from the oil-inlets and connect the cylinder to the hydraulic system. Make sure the oil flow to the retraction port is restricted to the amount stated on the spec sheet.

Ensure there is sufficient hose length, so it does not obstruct the movement of the cylinder while tipping.

It is not necessary to bleed air from the cylinder after assembly (air is automatically discharged during the first few tipping cycles).

Note:

- When removing the oil plugs some residual pressure can be trapped in the cylinder. Great care must be taken with removing the plugs to prevent injuries. Proper safety equipment should be used. Make sure this oil is caught.

5. HYDRAULIC OIL AND MATERIAL FOR INSTALATION

5.1. Hydraulic oil

The correct hydraulic oil must be chosen to provide an optimal solution. Hyva has a specific document to guide you on the oil selection. To have access to this information please request the file OIL-0011. If after that you still have any question, please contact your nearest Hyva Service Partner.

5.2 Recommended materials

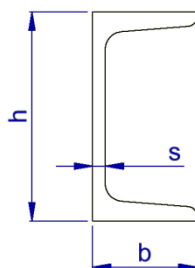
The installation of the cylinder usually requires some extra parts such as pins and cross member profiles. Pins are used to connect cylinder to the body or chassis through an eye. Cross member could be used to cradles, extra frame or support for lifting brackets.

5.2.1 Pins

Cylinder bottom or top pins are usually manufactured out of structural steel. Hyva recommends materials with minimum yield strength of 330 N/mm² or 47.8 ksi. As reference, commonly used materials are S355JR, ST52-3, EN 10025-2, C45K, C60K, SAE 1045, SAE 8620, AISI 1018 Cold Rolled.

5.2.2 Cross member profiles

C- profiles (yield 235 MPa / 34.1 ksi)



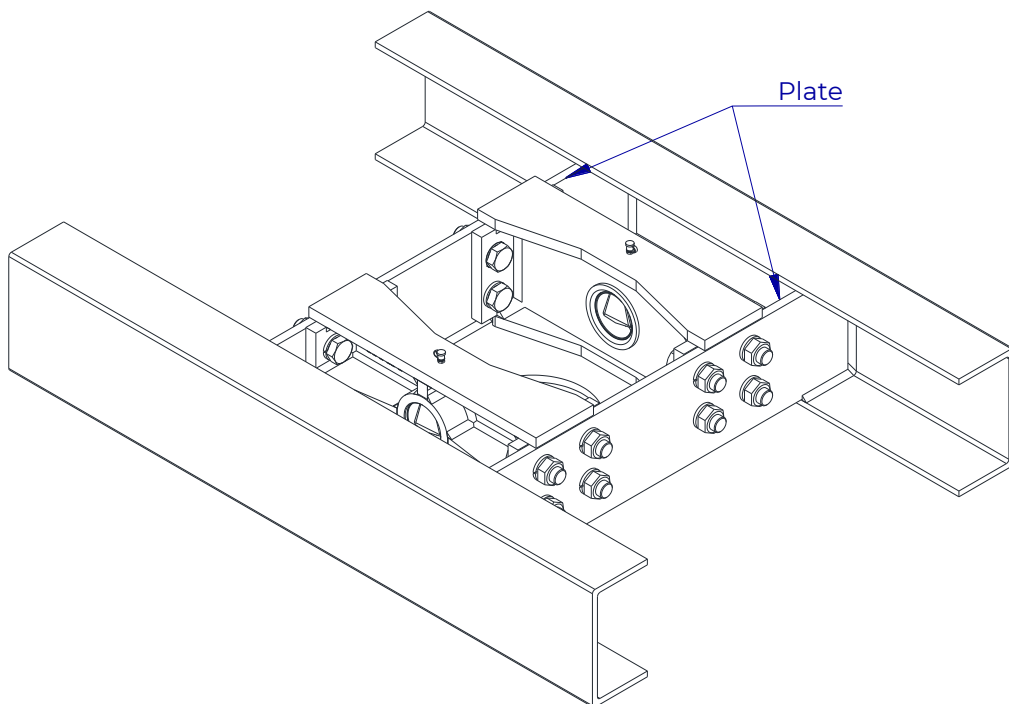
Metric (mm)	Cylinder capacity (kN)	Min Wxx (cm ³)	Suggested profile	h	b	s	kg/m
	Up to 145	60	UPN 120	120	55	7	13.4
	Up to 195	80	UPN 140	140	60	7	16.0
	Up to 245	100	UPN 160	160	65	7,5	18.8
	Up to 345	140	UPN 180	180	70	8	22.0

Imperial (in)	Cylinder capacity (x 1000 lbs)	Min Wxx (in ³)	Suggested profile	h	b	s	lb/ft
	Up to 33	3.66	C 6 x 8.2	6	1.92	0.20	8.2
	Up to 44	4.88	C 6 x 10.5	6	2.03	0.31	10.5
	Up to 55	6.10	C 7 x 12.25	7	2.09	0.31	12.2
	Up to 75	8.54	C 8 x 13.75	8	2.34	0.30	13.7
	75 and over	8.54+	C 8 x 18.75	8	2.53	0.49	18.7

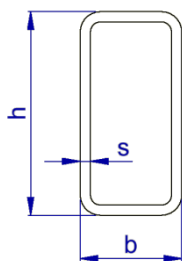
Build in dimensions from UPN profiles make those not a suitable option for cylinders with capacity above 345 kN, where interference between fasteners and inner radius will happen. For such cases we recommend the use of cross plates in a cradle construction.

MOUNTING INSTRUCTIONS

ALPHA CYLINDERS



Rectangular profile (yield 235 MPa / 34.1 ksi)



Metric (mm)	Cylinder capacity (kN)	Min Wxx (cm ³)	Suggested profile	h	b	s	kg/m
	Up to 145	60	120 x 60 x 6	120	55	7	13.4
	Up to 195	80	140 x 60 x 8	140	60	7	16.0
	Up to 245	100	140 x 60 x 8	160	65	7.5	18.8
	Up to 340	140	160 x 80 x 8	180	70	8	22.0
	345 and over	140+	180 x 80 x 8	200	75	8.5	25.3

Imperial (in)	Cylinder capacity (x 1000 lbs)	Min Wxx (in ³)	Suggested profile	h	b	s	lb/ft
	Up to 33	3.66	HSS 5 x 2 x 5/16	5	2	0.31	12.7
	Up to 44	4.88	HSS 6 x 2 x 5/16	6	2	0.31	14.8
	Up to 55	6.10	HSS 7 x 3 x 3/16	7	3	0.19	12.0
	Up to 75	8.54	HSS 7 x 3 x 1/4	7	3	0.25	15.6
	75 and over	8.54+	HSS 7 x 3 x 5/16	7	3	0.31	19.1

6. FINAL CHECKS

The first tipping cycle should be executed slowly and all movements are to be closely observed to check:

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

Tip the body 4 or 5 times and check there is no side-load on the cylinder and the clearances are correct. This must be done by visually inspecting the cylinder. Sideload can cause scratches on the cylinder tubes.

If you find the cylinder movement is stiff, loosen the bolts and realign the cylinder. Make sure that the bolts are set to the right torque. Protect hoses where they move against metal parts (if they cannot be repositioned). It is not necessary to bleed air from the cylinder.

During the first tipping cycles a little amount of grease can appear on the top of the stages.

Make sure all the greasing points are properly lubricated, this will help avoiding friction, wear and corrosion at this points.

Cylinder stages should extend in right sequence: largest (first stage) extends first, then second stage etc. With a new cylinder, a light empty body and high pump flow however, stages can extend in wrong sequence (mismatching). But this will disappear in normal operation (loaded body).

When painting the body, do not paint the blank parts of the cylinder as trunnion pins, piston, stages, wipers, bearings. Hyva cylinders already have layer of paint that provides at least 480 hours in neutral salt spray test according to ISO 9227 (ISO 10289, rating 9).