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# COMPACT UNDERFLOOR

## INSTALLATION MANUAL

**THIS MANUAL IS SUPPLIED AS A FITTING GUIDELINE AND IS SUBJECT TO CHANGE  
WITHOUT PRIOR NOTICE.**



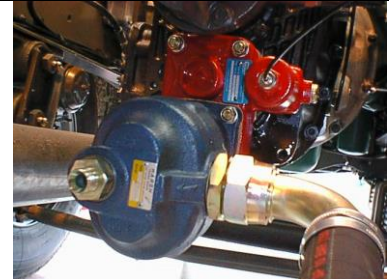
FM 13737

**HARSH**<sup>®</sup>  
[www.harshuk.com](http://www.harshuk.com)

Registered office as above. Registered in England No. 2168135. VAT Reg. No. 475 4892 00

Your HARSH tipping gear will be supplied in kit form to suit the type of chassis you have ordered. The kit will be one bundle comprising of the stabiliser frame and kit box. The kit packing list will be attached to the top of the box. This should be checked against the contents before fitting commences.

Once the full kit is checked you should take out the PTO and pump – checking against the front of the packing list and also checking the actual gearbox in the vehicle is the same as that listed on the paperwork. The PTO will have separate instructions supplied in the kit.



A suitable air supply should be located to enable the PTO engagement switch and cab control to be installed (the bodybuilder guideline booklet for your particular chassis will give an air location point).



The cab control should be positioned to customer specifications, if non are given it must be easily accessible, but **must not** obstruct the drivers entrance and exit to the vehicle and also must not be located where possible knee or other injuries could occur. Ensure clearance on all areas of seating including height adjustment seats.



The control switch should be piped up as follows to ensure correct operation.

Single; Port 1 = air in  
Port 3 = exhaust  
Port 21 = lower  
Port 22 = raise

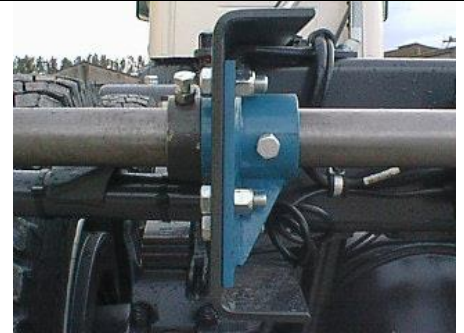
Dual; Port 1 = air in  
Port 3 = exhaust  
Port 21 = lower  
Port 22 = raise  
Port 23 = P T O



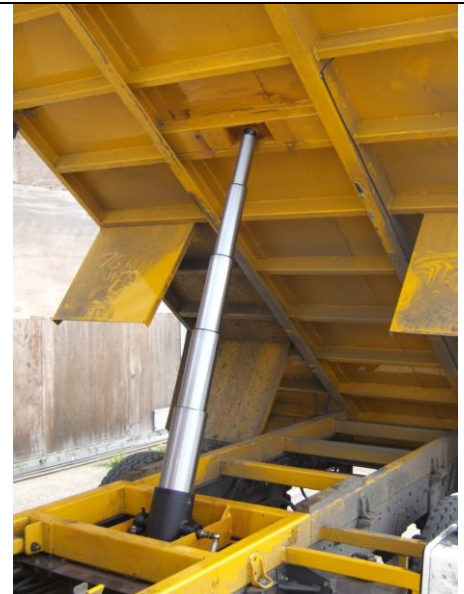
The tipper hinge point must now be located as to chassis manufacturers recommendations. Install the relevant bracketry supplied ensuring the hinge bar is level.



The hinge bar should be drilled and locked at the chassis bracket / boss points once the hinge bar is centralised.



Now the hinge bar is installed you can work out the mounting length for the tipping Gear. This dimension needs to be from the centre line of the tipper hinge bar to where the centre line of the ram pivot bracket will be located. In your kit a mounting length chart will be supplied giving measurements for your model of tipping gear from 45 ° to 55 °. If you have a mounting length given on a HARSH drawing you will note this for reference only and should be checked against your actual chassis and against the swing diagrams for your tipping gear. See appendix at rear of manual. If you are uncertain of the space / clearance available it is recommended that the tipping gears is first clamped in position and re-calculated to ensure adequate clearance on forward and rearward crossmembers, propshafts and other chassis mounted equipment.



MOUNTING LENGTH CALCULATION  
 $\text{STROKE} - \text{PULLOUT} \div \text{MOUNT LENGTH} \times 60$

**CYLINDER MUST NEVER BE REARWARD OF CENTRE.**

PU75 STROKE  
1432mm

PU12 STROKE  
1435mm

PU15 STROKE  
1940mm

PU18 STROKE  
1950mm

#### Subframe Mounted Applications;

If mounting in conjunction with a Subframe the hinge boss should pass through the subframe. Leave the required amount through the subframe to give adequate body bracket clearance. Once welded in place fit a crossmember and gussets as required. If the installation of a full length chassis subframe is required it should be mounted in line with chassis manufacturers recommendations. Locate the Tipper Hinge point to the manufacturers recommendations. Install the relevant bracketry supplied ensuring the Hinge Bar is level and centralised.



Ensure a suitable crossmember is fitted in front of the Hinge Bar. The Hinge Boss must also be fabricated with suitable gussets.




Liberal apply grease to the clamping cup, circlip - again liberal greased with the grease hole located in line with the grease nipple in the side of the cup.



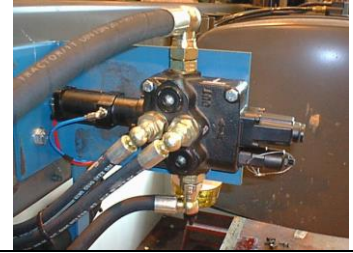
Now attach the other hoses ensuring again a good loop/curve. Re-check all fittings are tight. Cable tie the lower hoses to the rams.





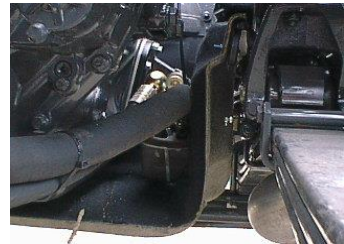
<p>Now grease and insert the lower mounting brackets. These can be identified by the tube and the bracket construction is of a rolled steel. Ensure all grease nipples are installed and none have been damaged in transit, then liberally grease all points.</p>	
<p>Subframe Mounted Applications; Attach mounting side angles onto subframe and down the chassis. Follow the mounting procedure as detailed, but ensure a crossmember is installed for under the rear third of the lower mount. The crossmember must be full width and installed to support the subframe top flange. Ensure the location will not interfere with the ram swing.</p>	
<p>With the tipping gear clamped you can use the swing diagrams to ensure clear cycle of the tipping gear. If required the tipping gear could be mock elevated to ensure no contact with chassis obstructions.</p>	
<p>The hydraulic oil tank should be mounted at the same side as the PTO/pump if possible to ensure a smooth pipe run to the pump. Locate it as near to the tipping gear as possible.</p>	
<p>The valve should then be located next to the tank on the plate supplied. Where possible mount the valve as shown below or in such a way no water can settle on the valve. It is also useful to use the valve bracket as a guard from wheel spray etc. The bolts that hold the valve in place should be tightened to no more than 20NM</p>	

The valve ports will be marked with the following references.  
A = Pressure to rams. B = Power down. P = Pressure from the pump.  
T = Tank return.



The system piping should follow the instructions in the fitting manual. The pipes should run as direct as possible with regular clamping and any bends required should be large natural curves to allow for hose compression. Always ensure **NO** hose is straight as this will pull the ends off the hoses when compressed. A body packer is required to ensure the minimum of 45mm pull out on the cylinder.

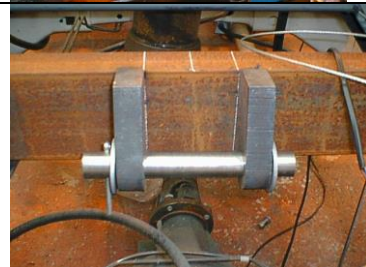
The low pressure feed from the tank to the pump should run along side the high pressure return from the pump to the valve.



The tank return hose can now be fitted. Make sure if there is a curve in the hose it is not too loose / large as when under pressure it pulls upwards and touches the floor of the body.



Snatch Ropes should be installed with the tension mounted so the cylinder does not reach full stroke.



The tipping gear is now installed and a final check of the system should be made.

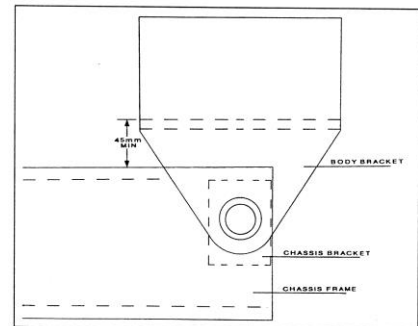


## Body Mounting

The next step is to construct your body and this is up to you as to its design, however there are still many areas you must take care over. Whether your design incorporates body longitudinal and crossbearers or "V" runners etc. you must always ensure that floor height is adequate to allow for a 45mm pull out on the cylinder. This is achieved by fitting a minimum of 45mm wood packers to the longitudinal. The runner depth is also imperative to ensure the top ram clamping lugs do not in any way interfere with the body floor as this can cause extensive damage to both body and tipping gear and ultimately could contribute to turnovers or other acts relating to possible fatal injuries.

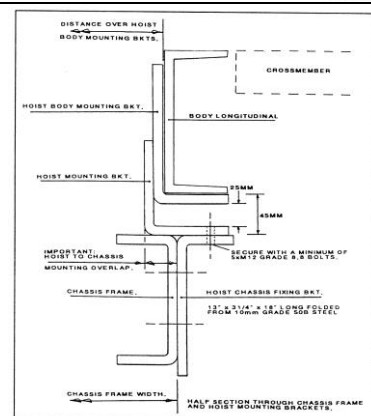
It is highly recommended that when allowing the ram clamp clearance as detailed above, future body floor characteristics are taken into account i.e. floor sag etc. As the tipping gear and body installer you could be liable for any errors occurring from incorrect set-up.

The body runner width is also an essential area of a tipper as incorrect set-up could produce unstable operating i.e., tipping, cornering etc. As HARSH recommend that when mounting the tipping gear the lower mounting brackets must NOT overlap the chassis or subframe flange and also due to the chassis width / tipping gear width compatibility you will have the two following possibilities.



### One

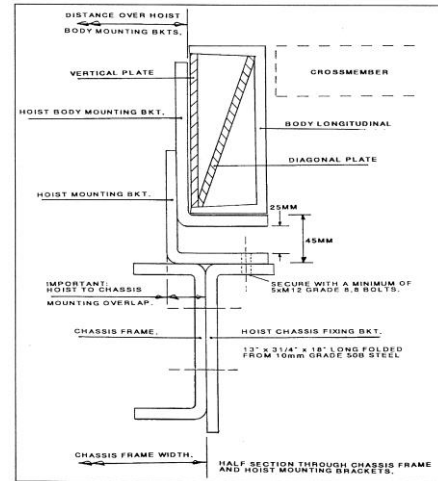
A straight longitudinal will be possible to incorporate your standard body design. If you have had to pull out the body mounts to meet the body runners ensure to install the half moon stop rings to the tube of the body mount.



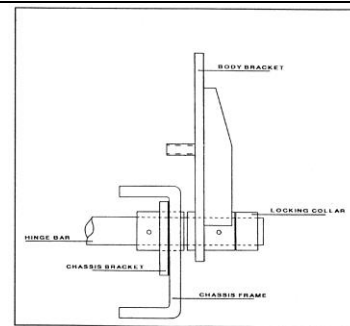


## Two

If the tipping gear installation does not allow a straight longitudinal you will need to carry out the following. Firstly assess the area around the tipping gear and measure the offending areas of protrusion. Subject to the severity of the extra width it may not be possible to still have runner edge in line with the chassis but it will be far less severe. You will need to make the area of protrusion onto the flange of your runner. Ensuring that you are comfortable with the amount of cut out in relation to your body design (HARSH recommend no more than a third of the runner) we propose cutting out the area required and then inserting a diagonal plate and then a further vertical plate to the runner as shown. This reinforcement should be a minimum of twice the length of the cut out and placed centrally at the cut out to spread the loads imposed. If required a external strengthening plate may be attached.



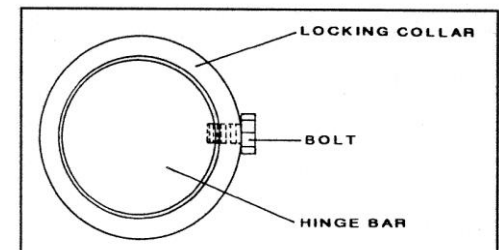
When installing the rear body brackets the following is intended as a guide to the fitment of a UK standard hinge assembly. It may not be possible to fit the following due to chassis spring hanger arrangements or crossmembers etc, which may restrict the use of a standard chassis bracket or the design of body may require non-standard body brackets.



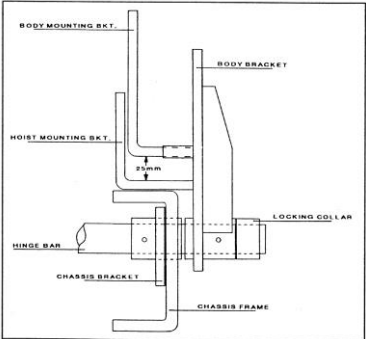
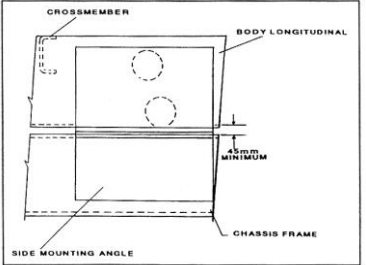
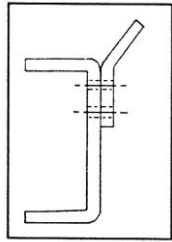

The body brackets supplied will have pre-determined height to suit the chassis and application as detailed in your order. Before inserting the bracket over the hinge bar you must grease the hinge bar over the area the bracket will sit, once installed push up lightly against the boss face protruding through the chassis / subframe. Rotate the bracket by hand to ensure clearance on bolt heads and chassis top rail when tipping. You may be supplied with a flat bracket which will require a loose runner mounting strip, this should be welded to the body bracket at the required height to suit your set-up with the required packers as shown. If mounting with loadcells please refer to the instructions supplied with your kit.



Once you have sat the body in position, before bolting to the body brackets ensure there will be no side movement from the hinge or body. Once bolted ensure the locking collars are fitted as shown with the bolt locked into the hinge bar. To achieve this you may wish to position the collar then through the tapped hole drill a pilot hole. Remove the collar and drill to suit the bolt size and depth remaining. Re-position the collar. Add locktite to the locking bolt and fix in place.





<p>The following shows a cross section of the final hinge set-up and gear mounting brackets. Ensure all points are well greased.</p>	
<p>When fixing body mount brackets to body longitudinals ensure, the tipping gear and body are in a fully down position to prevent the hoist jamming open. Bolting should use high grade countersunk bolts to allow for bracket positioning in down position.</p>	
<p>The body builder should ensure suitable body guides are fitted either to the chassis as shown or to the body but ensuring a chassis wear plate is installed.</p>	
<p>A suitable body warning device MUST now be installed, one such system is available from HARSH that allows various mounting positions without pin point accuracy.</p>	
<p>You must now fill the oil tank and test the system. You will also need to bleed the rams. This is done by cycling the system as detailed in the maintenance section. While tipped liberally grease the stabiliser frame. There are up to 19 grease points depending on which model gear is fitted.</p>	

## FINAL CHECKS:

### ONCE THE BODY IS MOUNTED IT IS ESSENTIAL TO RE-CHECK THE FOLLOWING POINTS.

- 1) ENSURE THE BODY SITS ON THE CHASSIS AND IS NOT OFF THE CHASSIS AT ANY POINT OTHER THAN IN POINT 2.
- 2) ENSURE THAT A 25MM GAP IS MAINTAINED BETWEEN THE LOWER AND UPPER MOUNTS. THIS CAN BE ACHIEVED BY FITTING A MINIMUM OF 45MM THICK HARDWOOD / RUBBER LONGITUDINAL PACKINGS BETWEEN THE BODY RUNNER AND THE CHASSIS FRAME / SUBFRAME.
- 3) CHECK TOP OF RAMS CLEAR BODY FLOOR WITH CLEARANCE FOR BODY WEAR AND CHECK RAMS ARE CLEAR OF PROPSHAFT AND ALL OTHER CHASSIS OBSTRUCTIONS.
- 4) WHEN MOUNTING WITH A SUBFRAME RE-CHECK THE CLEARANCE ON THE SUBFRAME CROSSMEMBER WITH THE BODY AT FULL TIP. WELD IN PLACE WHEN ADEQUATE CLEARANCE IS ACHIEVED.
- 5) ENSURE BODY WARNING DEVICE WORKS CORRECTLY AND DEACTIVATION ARM / SENSOR IS CORRECTLY POSITIONED.
- 6) RE-CHECK ALL BOLTS AND FITTINGS.
- 7) AGAIN BLEED THE SYSTEM AND RE-FILL WITH OIL AS REQUIRED. ENSURE TO ADEQUATELY TIGHTEN BLEED SCREW AND CLEAN OFF EXCESS OIL.
- 8) ENSURE ALL OPERATION STICKERS ARE FITTED IN THE CAB AND ALL WARNING SIGNS ARE CLEARLY VISIBLE.
- 9) ENSURE FITTING AND MAINTENANCE MANUAL ARE PLACED ALONG WITH WARRANTY AND CE DOCUMENTS IN THE CAB FOR THE OPERATOR.

HARSH LTD has a policy of continuous improvement and therefore reserves the right at any time without notice to change the supply origin, price and specification of any products supplied by it. Any prices, descriptions or other data relating to any products supplied by HARSH LTD are given in good faith but HARSH LTD shall have no liability of any nature should there be any discrepancy between any products supplied and prices, descriptions or data.

If further general technical information is required consult the tipping gear and mounting guidelines booklet available at [www.harshuk.com](http://www.harshuk.com) or alternatively call our technical department on **01759 372100**.



## MAINTENANCE INSTRUCTIONS

Periodic maintenance and inspection will increase the working life of the Tipping hoist. Follow the routine of the check list set out below at least **once per week** or every **50 cycles** whichever is sooner to ensure efficiency and safety of the tipping gear.

- **Liberal** grease all grease points on the tipping gear and rear hinge.
- Check all high pressure pipes and connections for oil leaks.
- Check oil level in tank when Tipping hoist is at rest. Top up if necessary using the following:-
  - Elf - Hydrelf 68.
  - Morris - Triad HV37a.
  - Texaco - Rando HD268.
  - Shell - Tellus 68.
- Check fixing bolts for damage and tightness.
- Check vehicle for any form of damage or wear and take measures to fully repair or replace damage on the vehicle.
- Replace any damaged tipping gear parts immediately with genuine HARSH replacements.

## SAFETY INSTRUCTION

### While Tipping

Always check for overhead wires, obstructions and make sure that no other people are in the vicinity of the vehicle or tipping area before tipping.

Tip with the vehicle at rest, on level ground and with a balanced even load.  
(Never overload, or heap the load).

Always check the conditions of the area where tipping. For example, do not tip when there is wet or unstable ground which may collapse, or in high winds.

Stay in cab when Tipping. If the load sticks or any problems develop immediately lower the body.  
(Never shunt load free or leave cab and go under a raised loaded body.)

After tipping, always lower the body fully before driving off and disengage the PTO.



### While Working on Vehicle.

Never work under a raised loaded body, even if propped.

Never work under a raised empty body, unless propped.

Look for any signs of wear not only on the tipping gear but also the wood packers, hinge assembly, hoses, valve and tank assembly.

**NEVER ALLOW ANYONE UNDER AN UNPROPPED BODY**



## PU75 - 3103601055001 TECHNICAL DATA

mounting dimension						150 mm + 20 mm min pull out			total stroke			1432 mm	max pressure		200 bar
model: BL360 1432 105 5						code: 3103601055001			weight: 30 kg				1222 000107		
extension	1	2	3	4	5	-	-	-	-	-	-	-	number of stages: 5		
diameter [mm]	105	90	75	60	45	--	--	--	--	--	--	--			
stroke [mm]	293	280	283	285	291	--	--	--	--	--	--	--	total: 1432 mm		
thrust [kN]	173	127	88	57	32	--	--	--	--	--	--	--	max thrust admitted: 61 kN		
oil [dm <sup>3</sup> ]	2.5	1.8	1.2	0.8	0.5	--	--	--	--	--	--	--	total: 6.8 dm <sup>3</sup>		

### TECHNICAL NOTES AND SPECIFICATIONS

- The normal application of telescopic cylinder is to lift up tipping bodies, loaded with different materials, and consequently discharge this material whilst the cylinder is extended all along its stroke.
- The body weight plus the max payload are the max tipping weight that can be raised by the cylinder. This value, calculated at the max pressure, is a rough indication of the tipping power of the cylinder and must be used as a first criteria for the selection of the cylinder. The real tipping mass can only be calculated by the design engineer of the dump truck, and must take into account the geometry of the dump body and operating conditions. Never exceed the maximum thrust.
- Never exceed maximum pressure.
- The cylinder has been designed for loads along the longitudinal axis: the cylinder is a lifting device only and may not be used as structural member or be subject to side load.
- The ordinary use of telescopic cylinder does not require any coating as the telescopic stages are exposed to atmospheric agents only during the tip-up operation. Therefore telescopic cylinders will be supplied without any coating in absence of any specific requirements.
- H.S.PENTA warranty does not apply to any kind of corrosion of coated or non-coated parts. See terms of warranty.
- Maximum extension speed less than 0.2 m/s.
- Hydraulic oil temperature admitted between -40°C and +100°C.
- In case the cylinders must be stored, do not remove the package. Store them in a dry place, not exposed to rain. Do not store the cylinders for more than 6 (six) months.
- Further specifications see mounting instructions, hydraulic oil specification sheet, user & maintenance manual.

#### REMARKS

[2004.06.07] [2004.06.07]

Old code: BL065Z (Codice vecchio: BL065Z)

#### REVISIONS

2011.06.01 - Aggiornamento dati guide FSP	01
2011.09.14 - Aggiornamento dati guide FSP bassa 105	02
	03
	04



Modulo "Figurino" - 2008.10.27



Modulo "Figurino" - 2008.10.27

mounting dimension						150 mm + 20 mm min pull out			total stroke			1432 mm	max pressure		200 bar
model: BL360 1432 105 5						code: 3103601055001			weight: 30 kg				1222 000107		
extension	1	2	3	4	5	-	-	-	-	-	-	-	number of stages: 5		
diameter [mm]	105	90	75	60	45	--	--	--	--	--	--	--			
stroke [mm]	293	280	283	285	291	--	--	--	--	--	--	--	total: 1432 mm		
thrust [kN]	173	127	88	57	32	--	--	--	--	--	--	--	max thrust admitted: 61 kN		
oil [dm <sup>3</sup> ]	2.5	1.8	1.2	0.8	0.5	--	--	--	--	--	--	--	total: 6.8 dm <sup>3</sup>		

### TECHNICAL NOTES AND SPECIFICATIONS

- The normal application of telescopic cylinder is to lift up tipping bodies, loaded with different materials, and consequently discharge this material whilst the cylinder is extended all along its stroke.
- The body weight plus the max payload are the max tipping weight that can be raised by the cylinder. This value, calculated at the max pressure, is a rough indication of the tipping power of the cylinder and must be used as a first criteria for the selection of the cylinder. The real tipping mass can only be calculated by the design engineer of the dump truck, and must take into account the geometry of the dump body and operating conditions. Never exceed the maximum thrust.
- Never exceed maximum pressure.
- The cylinder has been designed for loads along the longitudinal axis: the cylinder is a lifting device only and may not be used as structural member or be subject to side load.
- The ordinary use of telescopic cylinder does not require any coating as the telescopic stages are exposed to atmospheric agents only during the tip-up operation. Therefore telescopic cylinders will be supplied without any coating in absence of any specific requirements.
- H.S.PENTA warranty does not apply to any kind of corrosion of coated or non-coated parts. See terms of warranty.
- Maximum extension speed less than 0.2 m/s.
- Hydraulic oil temperature admitted between -40°C and +100°C.
- In case the cylinders must be stored, do not remove the package. Store them in a dry place, not exposed to rain. Do not store the cylinders for more than 6 (six) months.
- Further specifications see mounting instructions, hydraulic oil specification sheet, user & maintenance manual.

#### REMARKS

[2004.06.07] [2004.06.07]

Old code: BL065Z (Codice vecchio: BL065Z)

#### REVISIONS

2011.06.01 - Aggiornamento dati guide FSP	01
2011.09.14 - Aggiornamento dati guide FSP bassa 105	02
	03
	04

Modulo "Figurino" - 2008.10.27

Modulo "Figurino" - 2008.10.27

## PU12 - 3103601205002 TECHNICAL DATA

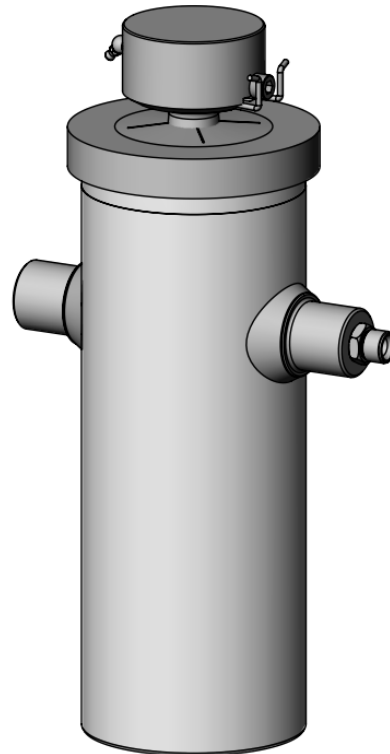
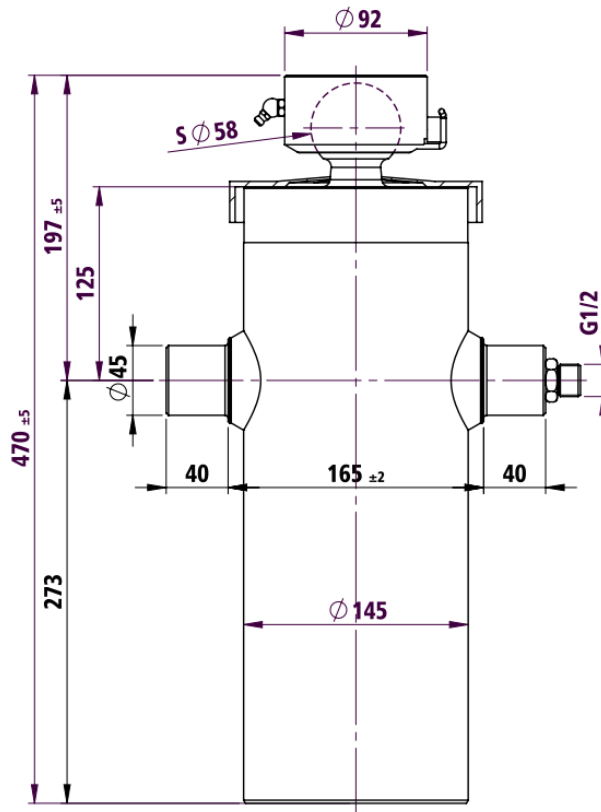
Light duty, ball - pins

Part Number

3103601205002

Tipping weight

9-17 ton



mounting dimension					197 mm + 20 mm min pull out					total stroke		1435 mm	max pressure		200 bar
model: BL360 1435 120 5 CRL					code: 3103601205002					weight: 44 kg			HS Penta		
extension	1	2	3	4	5	-	-	-	-	-	-	-	number of stages: 5		
diameter [mm]	120	105	90	75	60	--	--	--	--	--	--	--	total: 1435 mm		
stroke [mm]	293	293	280	283	286	--	--	--	--	--	--	--	max thrust admitted: 90 kN		
thrust [kN]	226	173	127	88	57	--	--	--	--	--	--	--	total: 9.7 dm³		
oil [dm³]	3.3	2.5	1.8	1.3	0.8	--	--	--	--	--	--	--			

### TECHNICAL NOTES AND SPECIFICATIONS

- The normal application of telescopic cylinder is to lift up tipping bodies, loaded with different materials, and consequently discharge this material whilst the cylinder is extended all along its stroke.
- The body weight plus the max payload are the max tipping weight that can be raised by the cylinder. This value, calculated at the max pressure, is a rough indication of the tipping power of the cylinder and must be used as a first criteria for the selection of the cylinder. The real tipping mass can only be calculated by the design engineer of the dump truck, and must take into account the geometry of the dump body and operating conditions. Never exceed the maximum thrust.
- Never exceed maximum pressure.
- The cylinder has been designed for loads along the longitudinal axis: the cylinder is a lifting device only and may not be used as structural member or be subject to side load.
- Chrome coating type CRL (40 h corrosion test ISO 9227-rating 9 ISO 10289/minimum thickness: 15 µm) on telescopic stages.
- H.S.PENTA warranty does not apply to any kind of corrosion of coated or non-coated parts. See terms of warranty.
- Maximum extension speed less than 0.2 m/s.
- Hydraulic oil temperature admitted between -40°C and +100°C.
- In case the cylinders must be stored, do not remove the package. Store them in a dry place, not exposed to rain. Do not store the cylinders for more than 6 (six) months.
- Further specifications see mounting instructions, hydraulic oil specification sheet, user & maintenance manual.

### REMARKS

[2012.02.16] [2012.02.16]

Old code: BL08558C (Codice vecchio: BL08558C)

### REVISIONS

.	01
	02
	03
	04



## PU15 - 3104001406005 TECHNICAL DATA

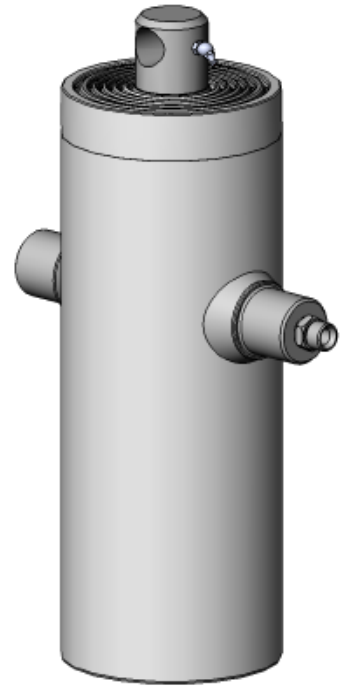
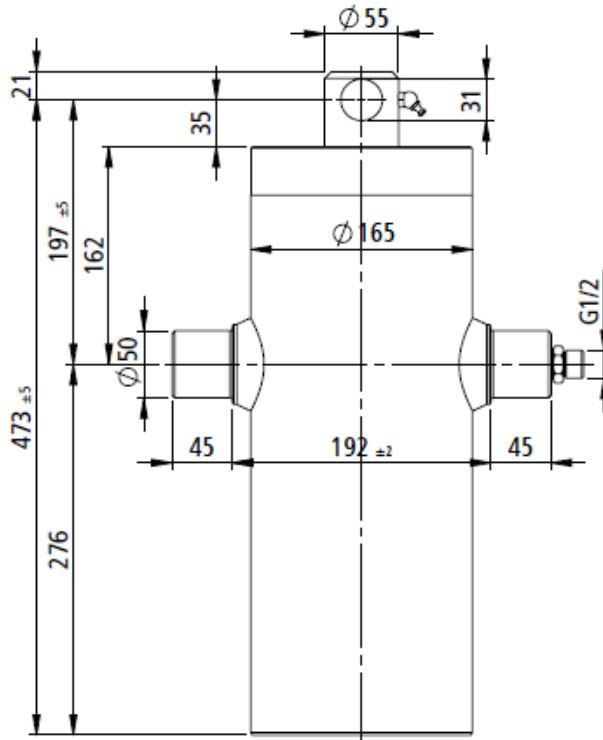
Light duty cylinder, eye - pins

Part Number

3104001406005

Tipping weight

11-18 ton



mounting dimension								197 mm + 20 (-5;+30) mm min pull out				total stroke			1940 mm		max pressure		180 bar	
model: BL400 1940 140 6 CRN								code: 3104001406005				weight: 58 kg			1222 000280					
extension	1	2	3	4	5	6	-	-	-	-	-	number of stages: 6								
diameter [mm]	140	120	105	90	75	60	-	-	-	-	-									
stroke [mm]	328	325	330	316	319	322	-	-	-	-	-	total: 1940 mm								
thrust [kN] at pmax	277	204	156	115	80	51	-	-	-	-	-	max admitted thrust: 105 kN								
oil [dm³]	5.0	3.7	2.9	2.0	1.4	0.9	-	-	-	-	-	total: 15.9 dm³								

### TECHNICAL NOTES AND SPECIFICATIONS

**User responsibility.** Incorrect selection or incorrect use of the here described component and its related items may cause death, personal injury and property damage. All the information here reported are intended for further investigations by users with technical knowledge. The user, as manufacturer of the completed machinery which will incorporate the here described components, is the solely responsible for the final selection of the components. The user must carry out necessary research and tests on components to determine whether, by its design and construction, all performance, endurance, maintenance, safety and warning requirements are met. The user must assure the compliance of the completed machinery with all appropriate laws, directives, norms, industry standards.

The normal application of telescopic cylinder is to lift up tipping bodies, loaded with different materials, and consequently discharge this material whilst the cylinder is extended all along its stroke.

The cylinder has been designed to provide only a linear pushing force. The cylinder is not a structural member and must not be used as a stabilizer or be subject to side or pulling load. The cylinder will not prevent the dump body or trailer from rollover or lateral tilt.

The body weight plus the max payload are the max tipping weight that can be raised by the cylinder. This value, calculated at the max pressure, is a rough indication of the tipping power of the cylinder and must be used as a first criteria for the selection of the cylinder. The real tipping mass can only be calculated by the design engineer of the completed machinery, and must take into account the geometry of the dump body, operating conditions and all reasonably foreseeable uses.

Refer to [www.hspenta.it](http://www.hspenta.it) for mounting instructions, bracket details, hydraulic oil specification, user & maintenance, service, general precautions, general guarantee conditions.

**Never exceed the herein specified limits of the cylinder.**

Cylinder rated pressure reflect only the capability of the pressure-containing envelope and not the force transmitting capability of mounting configurations.

The ordinary use of telescopic cylinder will not require any coating since the telescopic stages are exposed to atmospheric agents only during the tip-up operation, if duration is below 2 hours. Surface coatings can be supplied on request. H.S.PENTA warranty does not apply to any kind of corrosion of coated or non-coated parts.

When closed, leave the tipping control in descent position. The exposed surface of first moving stage may get rusty, but it will not affect the functionality of the cylinder.

Maximum extension speed less than 0.5 m/s.

Hydraulic oil temperature admitted between -40°C and +100°C.

In case the cylinders must be stored, do not remove the package. Store them in a dry place, not exposed to rain. Do not store the cylinders for more than 6 months.

User shall pay attention to stroke length, loading and cylinder mounting in order to avoid bending or buckling of the cylinder at any position.

Chrome coating type CRN (40 h corrosion test ISO9227-rating 9 ISO10289 - min. thickness 15 µm) on telescopic stages.

#### REMARKS

[2014.10.16] [2014.10.16]

#### REVISIONS

01

02

